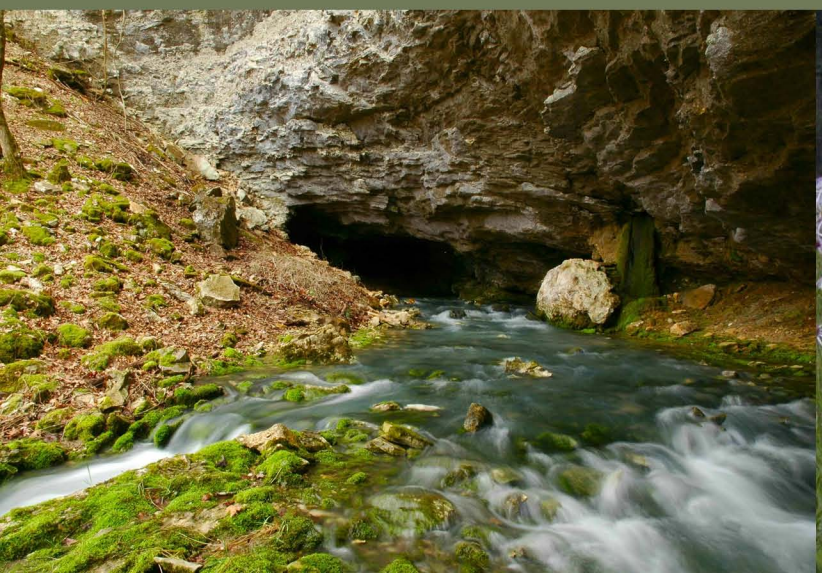
ARKANSAS Wildlife Action PLAN

2010 Executive Summary



Executive Summary

What is the Arkansas Wildlife Action Plan?

The Arkansas Wildlife Action Plan is a dynamic compendium of knowledge that is used to prioritize the research, monitoring and conservation actions required to address the conservation needs of 369 species of greatest conservation need in the context of 45 terrestrial habitats and 18 aquatic habitats in 7 ecoregions in Arkansas. It provides the essential scientific foundation and direction for actions and decisions to benefit wildlife conservation and an opportunity for state agencies, federal agencies and other conservation partners to fit together individual and coordinated roles in conservation efforts across the state.

Why did we create the Wildlife Action Plan?

Arkansas was required by Congress to prepare and submit a Wildlife Action Plan in order to retain funds provided by the State Wildlife Grants program and to be eligible for future funds.

Congress identified eight required elements to be addressed in wildlife conservation plans. Further, the plan must identify and be focused on the "species in greatest need of conservation," yet address the "full array of wildlife" and wildlife-related issues. They must provide and make use of:

(1) Information on the distribution and abundance of species of wildlife, including low and declining populations as the State fish and wildlife agency deems appropriate, that are indicative of the diversity and health of the State's wildlife; and,

(2) Descriptions of locations and relative condition of key habitats and community types essential to conservation of species identified in (1); and,

(3) Descriptions of problems which may adversely affect species identified in (1) or their habitats, and priority research and survey efforts needed to identify factors which may assist in restoration and improved conservation of these species and habitats; and,

(4) Descriptions of conservation actions proposed to conserve the identified species and habitats and priorities for implementing such actions; and,

(5) Proposed plans for monitoring species identified in (1) and their habitats, for monitoring the effectiveness of the conservation actions proposed in (4), and for adapting these conservation actions to respond appropriately to new information or changing conditions; and,

(6) Descriptions of procedures to review the plan at intervals not to exceed ten years; and,

(7) Plans for coordinating the development, implementation, review, and revision of the plan with Federal, State, and local agencies and Indian tribes that manage significant land and water areas within the State or administer programs that significantly affect the conservation of identified species and habitats.

(8) Congress also affirmed through this legislation, that broad public participation is an essential element of developing and implementing these plans, the projects that are carried out while these plans are developed, and the Species in Greatest Need of Conservation that Congress has indicated such programs and projects are intended to emphasize.

Who is involved in creating and maintaining the Arkansas Wildlife Action Plan?

In addition to representatives of the Arkansas Game and Fish Commission, the Arkansas Natural Heritage Commission, Audubon Arkansas, The Nature Conservancy, U.S. Forest Service, The Arkansas Academy of Science, University of Arkansas Cooperative Extension Service, U.S. Fish and Wildlife Service, several Arkansas Universities and private citizens. See Table 1.

Was Arkansas' plan approved?

Our plan was approved by the U.S. Fish and Wildlife Service on January 17, 2007.

Where can I see a copy of the Wildlife Action Plan?

The 2,028-page document is available online at www.WildlifeArkansas.com. The database associated with it is updated as conservation actions are completed and additional information becomes available.

What if an issue arises after the AWAP was approved?

The Plan is intended to be flexible enough to address emerging issues. To date, Arkansas has received approval to add four emerging issues as fundable topics:

1. Climate change effects on Species of Greatest Conservation Need (SGCN);
2. Wind energy development effects on mammalian and avian species of concern;
3. Effects of Fayetteville shale gas exploration and extraction on SGCN; and
4. White Nose Syndrome in bats.

Does the AWAP affect other programs?

Reports from Congress to the Association of Fish and Wildlife Agencies indicate that they are pleased with the targeted results that have occurred as a result of using Wildlife Action Plans to focus efforts. In the past two years, we have seen many millions of dollars come to Arkansas as a result of using conservation priorities developed in the AWAP that were incorporated into Farm Bill programs.

In 2008, Congress passed the Farm Bill which directed states to develop long term statewide assessments and strategies for forest resources. The Arkansas Forestry Commission is currently in the process of developing a statewide assessment and strategies plan that will fulfill both state and federal legislative mandates. The target date for completion is June 18, 2010, when it will be submitted to the Secretary of Agriculture. Our AWAP provides significant input into the process.

Currently, several Climate Change bills before Congress have proposed significant additional funding for habitat protection with important consequences for Arkansas using conservation priorities derived from the Arkansas Wildlife Action Plan.

What are State Wildlife Grants?

Federal funds are available to Arkansas through State Wildlife Grants to monitor, research and implement conservation action to address the needs of wildlife not addressed by funding available for game species or endangered species.

What must the funds be used for?

Congress intends that State Wildlife Grants should be used to address the species and their habitats identified in state Wildlife Action Plans. SWG funds must be used to address conservation needs, such as research, surveys, species and habitat management, and monitoring, identified within each state's plan.

Are matching funds from applicants required?

Yes. Applicants are required to provide 50 percent matching funds (ie., for a $20,000 project, the applicant provides $10,000 in cash or inkind contribution). For Fiscal Year 2010, the match rate was reduced to a 35% match requirement to 65% in grant funds. Federal funds may not be used as match. Match can be "in-kind" effort or other value provided documentation of such meets federal approval.

On what criteria are proposals evaluated?

Each year, proposals are evaluated on the basis of the following criteria:

1) is feasible and practical in 2-3 year time period;

2) demonstrates cost-effectiveness;

3) addresses the priorities identified in the annual Request for Proposals; and

4) is within qualifications and abilities of organization/individuals proposing the project.

Who decides where the money goes?

The Arkansas Game and Fish Commission is responsible for administering State Wildlife Grants to support the implementation of the Arkansas Wildlife Action Plan. The process of determining funding priorities is described in Table 1.

How much money has Arkansas gotten from State Wildlife Grants so far?

FY 2001	$ 566,536	FY 2006	$ 695,695
FY 2002	$ 906,478	FY 2007	$ 695,695
FY 2003	$ 673,699	FY 2008	$ 706,832
FY 2004	$ 714,925	FY 2009	$ 711,348
FY 2005	$ 713,115	FY 2010	$ 892,097

Who's who and who does what?

There are 12 **Science Teams**. Taxa association teams include: Bird, Mammal, Fish, Insect, Crayfish, Mussel, Amphibian, Reptile, Invertebrates - other. Habitat Teams include: Karst habitat, Aquatic Habitat and Terrestrial Habitat. Professional specialists from agencies, organizations and universities assemble in a specialty group and participate in workshops to determine priority conservation actions and review resulting actions.

Steering Committee: A select group of generalist biologist/administrators who take the work of the science teams and pare their priorities down to an annual request for proposals. The Steering Committee reviews, discusses and decides over-arching AWAP policy and process as directives to the AWAP Coordinator. This group meets once annually, although communication by means of email happens more frequently.

Implementation Team: AGFC Assistant Director for Conservation, AGFC Wildlife Management Chief, AGFC Fisheries Chief and administrative leaders of two partner organizations on a rotation. The Implementation Team meets once a year to review pre-proposals that have been provided to them and select projects for funding. This group may recommend changes to projects. Their directives are carried out by the AWAP Coordinator.

AWAP Coordinator: Currently this position is unfilled. Duties are being handled by Assistant Chief of Wildlife Management Division.

Table 1. Science - based decision making process

Step 1

Assemble best available science

To address the requirements of Congress, Science Teams (Taxa Association Teams and Habitat Teams) populated a database with information on 369 species of greatest conservation need ranked by species priority score. The teams linked each species to ecoregions, ecobasins and habitats and weighted the relative importance of those relationships. For each of the species, Science Teams described problems faced, threats and sources; and data gaps; then recommended conservation actions and monitoring strategies to abate these problems.

Responsibility: Science teams, AWAP Coordinator
Frequency: The initial database is complete and in use

Step 2

Generate list of needs

AWAP database is used to generate a ranked list of needs for each Science Team based on information provided in Step 1. There are thousands of needs on this list.

Responsibility: AWAP Coordinator
Frequency: Every two years (August)

Step 3

Determine priorities; Biennial Conference

In reviewing the ranked list of needs, each science team creates a "Hot List" of up to 10 top conservation actions for the benefit of species of greatest conservation need. The "Hot List" includes recommendations to be addressed within the next two years.

At the end of this process, the number of conservation actions re commended may equal 120.

Science teams may recommend emerging issues for eligibility for funding.

Responsibility: Science teams, AWAP Coordinator
Frequency: Every two years (September)

Step 4

Further refine priorities

Taking the "Hot Lists" from the 12 science teams, the Steering Committee refines "Hot Lists" to a manageable annual list of implementation priorities. Decisions are made regarding including emerging issues for funding.

Responsibility: Steering Committee, AWAP Coordinator
Frequency: Annually in October.

Step 5

Request project pre-proposals

Projects are solicited that address the priorities selected by the Steering Committee in Step 4.
Responsibility: AWAP Coordinator
Frequency: Annually in November.

Step 6

Request reviews of pre-proposals

Any interested party, including science teams and the public, is invited to review pre-proposals and provide comments about the submitted pre-proposals. These comments are used by the Implementation Team for Step 7.
Responsibility: Science Teams
Frequency: Annually in January

Step 7

Select projects for funding

Implementation Team selects projects for funding from the array of pre-proposals submitted. The Team may ask for adaptations to some pre-proposals.
Responsibility: Implementation Team
Frequency: Annually in February, prior to AGFC budget deadlines.

Step 8

Full proposals; budget and grant approvals

Request full proposals with alterations requested by Implementation Team for selected projects; submit budget to AGFC Budget Committee; if approved, create grant proposal and submit to US Fish and Wildlife Service; if approved, execute contracts with successful subgrantees.
Responsibility: AWAP Coordinator
Frequency: New projects (10 - 20) each year.

Step 9

Implement projects, monitor and report

These usually 2 - 3 years in duration. Each project is required to provide an annual progress report and, upon completion, a full report. Provisions in the contract require communication of results to Science Teams; appropriate communication to the public and other stakeholders, spatial details reported to and mapped on the Conservation Registry, monitoring results reported to the Natural Resources Monitoring Partnership database and website, and participation in the biennial AWAP conference.
Responsibility: Subgrantees, AWAP Coordinator
Frequency: Continually

Step 10

Review project reports. Update database

The database is updated as data gaps are filled and conservation actions are completed. With each update, the status of species of greatest conservation need and the relationships between species, habitats and conservation actions can be reexamined in an efficient manner to demonstrate progress over time.

Science Teams are scheduling database updates in summer, 2010 after a review of completed projects.
Responsibility: Science Teams, AWAP Coordinator
Frequency: Biennially prior to AWAP Conference

Each Science Team reports to the larger group about progress attained while grantees present project results.

Then return to Step 3 to determine priorities and repeat process until 2015 when a new Arkansas Wildlife Action Plan will be due.

STATE WILDLIFE GRANTS &
WILDLIFE CONSERVATION AND RESTORATION PROGRAM

LEGISLATIVE HISTORY

The State Wildlife Grants (SWG) program traces back to the Conservation and Reinvestment Act (CARA). CARA proposed amending the Pittman-Robertson Wildlife Restoration Act to create the Wildlife Conservation and Restoration Program (WCRP), and it would have dedicated funding for the WCRP at a level of $350 million annually. The program would have allocated funds to state fish and wildlife agencies according to a formula based on population and land area, with a 75 percent federal/25 percent state match requirement. States would also have been required to prepare comprehensive wildlife conservation strategies by October 2005 with required elements outlined in the law. CARA passed the House of Representatives in May 2000, but it was not brought up for a vote in the Senate.

In October 2000, a "CARA-compromise" package of conservation funding was included in the Fiscal Year 2001 Interior Appropriations Act. One component of this package was the new State Wildlife Grants program, which was structured to provide $50 million in competitively awarded, cost-shared grants to state fish and wildlife agencies. In addition, this program required states to develop comprehensive wildlife conservation plans according to criteria to be defined by the US Fish and Wildlife Service. Shortly thereafter, the Fiscal Year 2001 Commerce, Justice, and State Department Appropriations Act authorized the Wildlife Conservation and Restoration Program under Pittman-Robertson, as outlined in CARA, and funded it at a level of $50 million. Subsequently, the Fish and Wildlife Service decided that the 'strategy' states were preparing under the Wildlife Conservation and Restoration Program would satisfy the 'plan' requirement under the State Wildlife Grants program.

In Fiscal Year 2002, Congress changed the State Wildlife Grants program to apportion funds on a formula basis, require states to submit wildlife conservation plans by October 2005, and provides for 75 percent 75 percent federal/25 percent state match for planning and a 50 percent match for implementation. The State Wildlife Grants program has continued in this form in subsequent years. The program does not have an authorization and exists only through the appropriations process. In contrast, the Wildlife Conservation and Restoration Program remains authorized but has no received any additional funding through the appropriations process.

1999-2000: Conservation and Reinvestment Act	
[note: this is not the complete legislative history of the Conservation and Reinvestment Act. These excerpts are highlighted to introduce the WCRP and SWG programs.]	
House	Conservation and Reinvestment Act (H.R. 701) introduced on February 10, 1999 with $350 million for apportioned funding through the Wildlife Conservation and Restoration Program.
	H.R. 701 reported by House Resources Committee on February 16, 1999 (H. Rep. 106-499).
	H.R. 701 approved by House on May 11, 2000 (roll call vote 179: 315-102).
Senate	H.R. 701 reported by Senate Energy and Natural Resources Committee on September 14, 2000 (S. Rep. 106-413).

2000, part 1: FY 2001 State Wildlife Grants (Competitive Grants)	
FY 2001 Interior Appropriations Act	
Conference	Conference Report (H. Rep. 106-914) H.R. 4578 approved by House on October 3, 2000 (roll call vote 507: 348-69) with $50 million for competitive State Wildlife Grants.
	Conference Report (H. Rep. 106-914) approved by Senate on October 5, 2000 (roll call vote 266: 83-13)
President	H.R. 4578 signed into law on October 11, 2000 (Public Law 106-291) with $50 million for competitive State Wildlife Grants.
2000, part 2: FY 2001 Wildlife Conservation and Restoration Program	
FY 2001 Commerce Justice State Appropriations Act	
Conference	Conference Report (H Rep. 106-1005) on H.R. 4942 approved by House on December 15, 2000 (roll call vote 603: 292-60) with $50 million for apportioned funding through Wildlife Conservation and Restoration Program (WCRP).
	Conference Report (H Rep. 106-1005) approved by Senate on December 15 2000 (unanimous consent).
President	H.R. 4942 signed into law on December 21, 2000 (P.L. 106-553) with $50 million for apportioned funding through WCRP.

2001-2005: FY 2002-2006 State Wildlife Grants Program (Apportioned Grants)	
FY 2002 Interior Appropriations Act	
President	President's FY 2002 Budget Request includes no funding for competitive State Wildlife Grants or the Wildlife Conservation and Restoration Program
House	H.R. 2217 reported by House Appropriations Committee on June 13, 2001 (H. Rep. 107-103) with $100 million for apportioned State Wildlife Grants
	H.R. 2217 passed House June 21, 2001 (roll call vote 185: 376-32)
Senate	H.R. 2217 reported by Senate Appropriations Committee on June 28, 2001 (S. Rep. 107-36) with $100 million for apportioned State Wildlife Grants
	H.R. 2217 passed Senate July 12, 2001 (voice vote)
Conference	Conference report (H. Rep 107-234) oh H.R. 2217 reported on October 11, 2001 with $85 million for State Wildlife Grants ($5 million allocated for competitive grants to Indian tribes).
	Conference report (H. Rep 107-234) approved by House on October 17, 2001 (roll call vote 393: 380-28).
	Conference report (H. Rep 107-234) approved by Senate on October 17, 2001 (roll call vote 304: 95-3).
Final	*H.R. 2217 signed into law on November 5, 2001 (P.L. 107-63) with $85 million for State Wildlife Grants ($5 million for grants to tribes)*

FY 2003 Interior Appropriations Act	
President	President's FY 2003 Budget Request includes $60 million for State And Tribal Wildlife Grants ($5 million for competitive grants to tribes)
House	H.R. 5093 reported by House Appropriations Committee on July 11, 2003 (H. Rep. 107-564) with $100 million for State Wildlife Grants ($5 million for tribes).
	H.R. 5093 passed July 17, 2002 (roll call vote 318: 377-46)
Senate	S. 2708 reported June 28, 2002 (S. Rep. 107-201) with $60 million for State Wildlife Grants ($5 million for tribes).
	S. 2708 considered in Senate without final vote (September 2002).
The 107th Congress adjourned with no final resolution of the Interior bill, so Interior programs were funded at FY 02 levels through a series of continuing resolutions. The Interior bill was ultimately included in the FY 2003 Consolidated Appropriations Resolution (H.J. Res 2) at the start of the 108th Congress.	
FY 2003 Consolidated Appropriations Act	
Conference	Conference report (H. Rep. 108-10) reported on February 13, 2002 with $65 million for State Wildlife Grants ($5 million for tribes).
	Conference report (H. Rep. 108-10) approved by House on February 13, 2003 (roll call vote 32: 338-83).
	Conference report (H. Rep. 108-10) approved by Senate on February 13, 2003 (roll call vote 34: 76-20).
Final	*FY 2003 Consolidated Appropriations Act (H.J. Res 2) signed into law February 20, 2003 (P.L. 108-7) with $65 million for State Wildlife Grants ($5 million for tribal grants).*
FY 2004 Interior Appropriations Act	
President	President's Budget Request included $60 million for State and Tribal Wildlife Grants
House	H.R. 2691 reported by House Appropriations Committee on July 10, 2003 (H. Rep 108-195) with $75 million for State and Tribal Wildlife Grants
	H.R. 2691 approved by House July 17, 2003 (roll call vote 389: 268-152)
Senate	S. 1391 reported July 10, 2003 (S. Rep. 108-89) with $75 million for State and Tribal Wildlife Grants
	H.R. 2691 passed Senate on September 23, 2003 (voice vote)
Conference	Conference report (H. Rep. 108-330) reported on October 28, 2003 with $70 million for State and Tribal Wildlife Grants.
	Conference report approved by House on October 30, 2003 (roll call vote 595: 216-205)
	Conference report approved by Senate November 3, 2003 (roll call vote 433: 87-2)
Final	*H.R. 2691 signed into law November 10, 2003 (Public Law 108-108) with $70 million for State and Tribal Wildlife Grants ($6 million for tribal grants).*

FY 2005 Interior Appropriations Act	
President	President's Budget Request included $80 million for State and Tribal Wildlife Grants.
House	H.R. 4568 reported by House Appropriations Committee on June 15, 2004 (H. Rep. 108-542) with $67.5 million for State and Tribal Wildlife Grants.
	H.R. 4568 approved by House on June 18, 2004 (roll call vote 264: 334-86)
Senate	H.R. 4568 reported by Senate Appropriations Committee on September 14, 2004 (Sen. Rep. 108-341) with $75 million for State and Tribal Wildlife Grants.
FY 2005 Consolidated Appropriations Act	
Conference	Conference report to H.R. 4818 (H. Rep. 108-792) reported on November 19, 2004 with $70 million for State and Tribal Wildlife Grants (including $6 million for tribal grants) subject to two across-the-board cuts.
	Conference report approved by House on November 20, 2004 (roll call vote 542: 344-51)
	Conference report approved by Senate on November 20, 2004 (roll call vote 215: 65-30)
Final	*H.R. 4818 signed into law on December 8, 2004 (P.L. 108-447) with $70 million for State and Tribal Wildlife Grants (including $6 million for tribal grants) subject to two across-the-board cuts.*
FY 2006 Interior & Environment Appropriations Act	
President	President's Budget Request included $74 million for State and Tribal Wildlife Grants
House	H.R. 2361 reported by House Appropriations Committee on May 13, 2005 (H. Rep. 109-80) with $69 million for State and Tribal Wildlife Grants (including $6 million for tribal grants).
	H.R. 2361 approved by House of Representatives on May 19, 2005 (roll call vote 199: 329-89)
Senate	H.R. 2361 reported by Senate Appropriations Committee on June 10, 2005 (S. Rep. 109-80) with $72 million for State and Tribal Wildlife Grants (including $6 million for tribal grants)
	H.R. 2361 approved by Senate on June 29, 2006 (roll call vote 168: 94-0)
Conference	Conference Report to H.R. 2361 (H. Rep. 109-188) with $68.5 million for State and Tribal Wildlife Grants (including $6 million for tribal grants).
	Conference Report approved by House on July 28, 2005 (roll call vote 450: 410-10).
	Conference Report approved by Senate on July 29, 2005 (roll call vote 210: 99-1)
Final	*H.R. 2361 signed into law on August 2, 2005 (Public Law 109-54) with $68.5 million for State and Tribal wildlife grants (including $6 million for tribal grants).*

is transferred, or until the land ceases to be included within designated critical habitat of the species, whichever is shorter.

(g) PAYMENTS.—(1) The State agency shall establish an equitable method for determining the annual payments under this section, including through the submission of bids in such manner as the Secretary may prescribe.

(2) The Secretary shall pay the cost of establishing management measures and practices required pursuant to the approved management plan.

(3) Any payments received by an owner or operator under this section shall be in addition to, and shall not affect, the total amount of payments that the owner or operator is otherwise eligible to receive under this section, or any other program administered by the Secretary or any other Federal department or agency.

TITLE III—WILDLIFE CONSERVATION AND RESTORATION

SEC. 301. FINDINGS.

The Congress finds and declares that—

(1) a diverse array of species of fish and wildlife is of significant value to the Nation for many reasons: aesthetic, ecological, educational, cultural, recreational, economic, and scientific;

(2) it should be the objective of the United States to retain for present and future generations the opportunity to observe, understand, and appreciate a wide variety of wildlife;

(3) millions of citizens participate in outdoor recreation through hunting, fishing, and wildlife observation, all of which have significant value to the citizens who engage in these activities;

(4) providing sufficient and properly maintained wildlife-associated recreational opportunities is important to enhancing public appreciation of a diversity of wildlife and the habitats upon which they depend;

(5) lands and waters which contain species classified neither as game nor identified as endangered or threatened also provide opportunities for wildlife-associated recreation and education such as hunting and fishing permitted by applicable State or Federal law;

(6) hunters and anglers have for more than 60 years willingly paid user fees in the form of Federal excise taxes on hunting and fishing equipment to support wildlife diversity and abundance, through enactment of the Federal Aid in Wildlife Restoration Act (commonly referred to as the Pittman-Robertson

Act) and the Federal Aid in Sport Fish Restoration Act (commonly referred to as the Dingell-Johnson/Wallop-Breaux Act);

(7) State programs, adequately funded to conserve a broad array of wildlife in an individual State and conducted in coordination with Federal, State, tribal, and private landowners and interested organizations, would continue to serve as a vital link in an effort to restore game and nongame wildlife, and the essential elements of such programs should include conservation measures which manage for a diverse variety of populations of wildlife; and

(8) it is proper for Congress to bolster and extend this highly successful program to aid game and nongame wildlife in supporting the health and diversity of habitat, as well as providing funds for conservation education.

SEC. 302. PURPOSES.

The purposes of this title are—

(1) to extend financial and technical assistance to the States under the Federal Aid to Wildlife Restoration Act for the benefit of a diverse array of wildlife and associated habitats, including species that are not hunted or fished, to fulfill unmet needs

of wildlife within the States in recognition of the primary role of the States to conserve all wildlife;

(2) to assure sound conservation policies through the development, revision and implementation of wildlife-associated recreation and wildlife-associated education and wildlife conservation law enforcement;

(3) to encourage State fish and wildlife agencies to participate with the Federal Government, other State agencies, wildlife conservation organizations, and outdoor recreation and conservation interests through cooperative planning and implementation of this title; and

(4) to encourage State fish and wildlife agencies to provide for public involvement in the process of development and implementation of a wildlife conservation and restoration program.

SEC. 303. DEFINITIONS.

(a) REFERENCE TO LAW.—In this title, the term ''Federal Aid in Wildlife Restoration Act'' means the Act of September 2, 1937 (16 U.S.C. 669 et seq.), commonly referred to as the Federal Aid in Wildlife Restoration Act or the Pittman-Robertson Act.

(b) WILDLIFE CONSERVATION AND RESTORATION PROGRAM.—Section 2 of the Federal Aid in Wildlife Res-

toration Act (16 U.S.C. 669a) is amended by inserting after ''shall be construed'' in the first place it appears the following: ''to include the wildlife conservation and restoration program and''.

(c) STATE AGENCIES.—Section 2 of the Federal Aid in Wildlife Restoration Act (16 U.S.C. 669a) is amended by inserting ''or State fish and wildlife department'' after ''State fish and game department''.

(d) CONSERVATION.—Section 2 of the Federal Aid in Wildlife Restoration Act (16 U.S.C. 669a) is amended by striking the period at the end thereof, substituting a semicolon, and adding the following: ''the term 'conservation' shall be construed to mean the use of methods and procedures necessary or desirable to sustain healthy populations of wildlife including all activities associated with scientific resources management such as research, census, monitoring of populations, acquisition, improvement and management of habitat, live trapping and transplantation, wildlife damage management, and periodic or total protection of a species or population as well as the taking of individuals within wildlife stock or population if permitted by applicable State and Federal law; the term 'wildlife conservation and restoration program' means a program developed by a State fish and wildlife department that the Secretary determines meets the criteria in section 6(d), the projects

that constitute such a program, which may be implemented in whole or part through grants and contracts by a State to other State, Federal, or local agencies wildlife conservation organizations and outdoor recreation and conservation education entities from funds apportioned under this title, and maintenance of such projects; the term 'wildlife' shall be construed to mean any species of wild, free-ranging fauna including fish, and also fauna in captive breeding programs the object of which is to reintroduce individuals of a depleted indigenous species into previously occupied range; the term 'wildlife-associated recreation' shall be construed to mean projects intended to meet the demand for outdoor activities associated with wildlife including, but not limited to, hunting and fishing, such projects as construction or restoration of wildlife viewing areas, observation towers, blinds, platforms, land and water trails, water access, trail heads, and access for such projects; and the term 'wildlife conservation education' shall be construed to mean projects, including public outreach, intended to foster responsible natural resource stewardship.''.

(e) 10 PERCENT.—Subsection 3(a) of the Federal Aid in Wildlife Restoration Act (16 U.S.C. 669b(a)) is amended in the first sentence by—

(1) inserting ''(1)'' after ''(beginning with the fiscal year 1975)''; and

(2) inserting after ''Internal Revenue Code of 1954'' the following: '', and (2) from 10 percent of the qualified Outer Continental Shelf revenues, as defined in section 102 of the Conservation and Reinvestment Act of 1999,''.

SEC. 304. SUBACCOUNT AND REFUNDS.

Section 3 of the Federal Aid in Wildlife Restoration Act (16 U.S.C. 669b) is amended by adding at the end the following new subsections:

''(c) A subaccount shall be established in the Federal aid to wildlife restoration fund in the Treasury to be known as the 'wildlife conservation and restoration account' and the credits to such account shall be equal to the 10 percent of Outer Continental Shelf revenues referred to in subsection (a)(2). Amounts credited to such account (other than interest) shall be invested by the Secretary of the Treasury as set forth in subsection (b) and shall be made available without further appropriation, in the next succeeding fiscal year, for apportionment to carry out State wildlife conservation and restoration programs. All interest on such amounts shall be available, without further appropriation, for obligation or expenditure for

purposes of the North American Wetlands Conservation Act of 1989 (16 U.S.C. 4401 and following).

''(d) Funds covered into the wildlife conservation and restoration account shall supplement, but not replace, existing funds available to the States from the sport fish restoration and wildlife restoration accounts and shall be used for the development, revision, and implementation of wildlife conservation and restoration programs and should be used to address the unmet needs for a diverse array of wildlife and associated habitats, including species that are not hunted or fished, for wildlife conservation, wildlife conservation education, and wildlife-associated recreation projects; provided such funds may be used for new programs and projects as well as to enhance existing programs and projects.

''(e) Notwithstanding subsections (a) and (b) of this section, with respect to the wildlife conservation and restoration account so much of the appropriation apportioned to any State for any fiscal year as remains unexpended at the close thereof is authorized to be made available for expenditure in that State until the close of the fourth succeeding fiscal year. Any amount apportioned to any State under this subsection that is unexpended or unobligated at the end of the period during which it is available for

expenditure on any project is authorized to be reapportioned to all States during the succeeding fiscal year.

''(f) In those instances where through judicial decision, administrative review, arbitration, or other means there are royalty refunds owed to entities generating revenues available for purposes of this Act, 10 percent of such refunds shall be paid from amounts available under subsection (a)(2).''.

SEC. 305. ALLOCATION OF SUBACCOUNT RECEIPTS.

Section 4 of the Federal Aid in Wildlife Restoration Act (16 U.S.C. 669c) is amended by adding the following new subsection:

''(c)(1) Notwithstanding subsection (a), so much, not to exceed one percent, of the revenues covered into the wildlife conservation and restoration account in each fiscal year as the Secretary of the Interior may estimate to be necessary for expenses in the administration and execution of programs carried out under the wildlife conservation and restoration account shall be deducted for that purpose, and such sum shall be available, without further appropriation, for such purposes in the next succeeding fiscal year, and within 60 days after the close of such fiscal year the Secretary of the Interior shall apportion such part thereof as remains unexpended, if any, on the same basis

and in the same manner as is provided under paragraphs (2) and (3).

''(2) The Secretary of the Interior, after making the deduction under paragraph (1), shall make the following apportionment from the amount remaining in the wildlife conservation and restoration account:

''(A) To the District of Columbia and to the Commonwealth of Puerto Rico, each a sum equal to not more than ½ of 1 percent thereof; and

''(B) to Guam, American Samoa, the Virgin Islands, and the Commonwealth of the Northern Mariana Islands, each a sum equal to not more than ⅙ of 1 percent thereof.

''(3) The Secretary of the Interior, after making the deduction under paragraph (1) and the apportionment under paragraph (2), shall apportion the remaining amount in the wildlife conservation and restoration account for each year among the States in the following manner:

''(A) ⅓ of which is based on the ratio to which the land area of such State bears to the total land area of all such States; and

''(B) ⅔ of which is based on the ratio to which the population of such State bears to the total population of all such States;

The amounts apportioned under this paragraph shall be adjusted equitably so that no such State shall be apportioned a sum which is less than ½ of 1 percent of the amount available for apportionment under this paragraph for any fiscal year or more than 5 percent of such amount.''.

''(d) WILDLIFE CONSERVATION AND RESTORATION PROGRAMS.—Any State, through its fish and wildlife department, may apply to the Secretary for approval of a wildlife conservation and restoration program or for funds to develop a program, which shall—

''(1) contain provision for vesting in the fish and wildlife department of overall responsibility and accountability for development and implementation of the program;

''(2) contain provision for development and implementation of—

''(A) wildlife conservation projects which expand and support existing wildlife programs to meet the needs of a diverse array of wildlife species,

''(B) wildlife-associated recreation projects, and

''(C) wildlife conservation education projects; and

''(3) contain provision for public participation in the development, revision, and implementation of projects and programs stipulated in paragraph (2) of this subsection.

If the Secretary of the Interior finds that an application for such program contains the elements specified in paragraphs (1) and (2), the Secretary shall approve such application and set aside from the apportionment to the State made pursuant to section 4(c) an amount that shall not exceed 90 percent of the estimated cost of developing and implementing segments of the program for the first 5 fiscal years following enactment of this subsection and not to exceed 75 percent thereafter. Not more than 10 percent of the amounts apportioned to each State from this subaccount for the State's wildlife conservation and restoration program may be used for law enforcement. Following approval, the Secretary may make payments on a project that is a segment of the State's wildlife conservation and restoration program as the project progresses but such payments, including previous payments on the project, if any, shall not be more than the United States pro rata share of such project. The Secretary, under such regulations as he may prescribe, may advance funds representing the United States pro rata share of a project that is a segment of a wildlife conservation and restoration pro-

gram, including funds to develop such program. For purposes of this subsection, the term 'State' shall include the District of Columbia, the Commonwealth of Puerto Rico, the United States Virgin Islands, Guam, American Samoa, and the Commonwealth of the Northern Mariana Islands.''.

(b) FACA.—Coordination with State fish and wildlife agency personnel or with personnel of other State agencies pursuant to the Federal Aid in Wildlife Restoration Act or the Federal Aid in Sport Fish Restoration Act shall not be subject to the Federal Advisory Committee Act (5 U.S.C. App.) Except for the preceding sentence, the provisions of this title relate solely to wildlife conservation and restoration programs as defined in this title and shall not be construed to affect the provisions of the Federal Aid in Wildlife Restoration Act relating to wildlife restoration projects or the provisions of the Federal Aid in Sport Fish Restoration Act relating to fish restoration and management projects.

SEC. 306. LAW ENFORCEMENT AND EDUCATION.

The third sentence of subsection (a) of section 8 of the Federal Aid in Wildlife Restoration Act (16 U.S.C. 669g) is amended by inserting before the period at the end thereof: '', except that funds available from this sub-

account for a State wildlife conservation and restoration program may be used for law enforcement and education''.

SEC. 307. PROHIBITION AGAINST DIVERSION.

No designated State agency shall be eligible to receive matching funds under this title if sources of revenue available to it after January 1, 1999, for conservation of wildlife are diverted for any purpose other than the administration of the designated State agency, it being the intention of Congress that funds available to States under this title be added to revenues from existing State sources and not serve as a substitute for revenues from such sources. Such revenues shall include interest, dividends, or other income earned on the forgoing.

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velopments, any new single development would create a negligible difference in a State's share, thus eliminating any perceived incentive.

Title II provides $900 million to guarantee stable and annual funding for the Land and Water Conservation Fund (LWCF) at its authorized level. This dedicated funding would provide for both the State and Federal programs included in the LWCF, while protecting the rights of private property owners. H.R. 701 equally divides the $900 million between the State and Federal programs. The State portion would be *entirely* distributed to States and U.S. insular areas via the formula set forth in H.R. 701.

Title III provides $350 million for wildlife conservation and education, which includes funding for game and nongame species. This Title distributes the funds through the successful mechanism of the Federal Aid in Wildlife Restoration Act (commonly known as the Pittman-Robertson Act). The new source of Federal funding is nearly double the funds available through the Pittman-Robertson Act and the Federal Aid in Sportfish Restoration Act (commonly known as the Dingell-Johnson Act). Since 1937, these programs have contributed more than $5 billion, matched by the States, to benefit conservation of wildlife and fish.

Title IV provides $125 million to be used for Urban Park and Recreation Recovery Act of 1978 matching grants for local governments to rehabilitate recreation areas and facilities, and provides for the development of improved recreation programs, sites and facilities.

Title V provides $100 million for the programs within the Historic Preservation Act, including grants to the States, maintaining the National Register of Historic Places, and administering numerous historic preservation programs, including support for Congressionally-authorized Heritage areas and corridors.

Title VI provides $200 million for a coordinated program on Federal and Indian lands to restore degraded lands, protect resources that are threatened with degradation, and protect public health and safety.

Title VII provides $150 million for annual and dedicated funding for conservation easements and funding for landowner incentives to aid in the recovery of endangered and threatened species.

Finally, since oil and gas royalty payments are not deposited into the Federal Treasury as an end-of-year lump sum under CARA, revenue held within the "CARA Fund" accrues interest. Up to $200 million of this annual interest will match, dollar for dollar, the amount appropriated during the appropriations process for the Payment In-Lieu of Taxes and Refuge Revenue Sharing programs. This provision is intended to fully fund these two programs.

COMMITTEE ACTION

H.R. 701 was introduced on February 10, 1999, by Congressman Don Young (R-AK). The bill was referred to the Committee on Resources.

On March 9 and 10, 1999, the Committee held a two-day hearing on the bill, where 28 witnesses testified on both H.R. 701 and H.R. 798, a bill authored by Congressman George Miller (D-CA). Panels included current and former Members of Congress, governors,

pelling reasons to the contrary, the States shall allocate at least 50% to local governments.

Section 207. State planning

This Section provides that each State will set its own priorities and criteria for selecting eligible projects, as long as the public is involved in the process and the State publishes a "State Action Agenda" within five years of enactment of CARA. The State Action Agenda should take into account Federal, regional, and local government resources and plans for similar activities and correlate State activities with these activities. Until the State Action Agenda is in place (but no later than five years from enactment of CARA), the State shall rely on its existing Comprehensive State Plan.

Section 208. Assistance to States for other projects

This Section amends LWCF to allow States to use funding for costs relating to acquisition, including costs incurred during land exchanges, and to provide for public safety.

Section 209. Conversion of property to other use

This Section amends the process for approval of conversion of State properties that no longer qualify as an outdoor conservation and recreation facility or are unsafe for such use. The Secretary must ensure that other conservation and recreation properties take the place of the converted properties.

Section 210. Water rights

This Section clarifies that nothing in the newly amended LWCF affects any water law or interstate compact governing water, alters any allocations of water rights, or creates any new water rights.

Title III—Wildlife Conservation and Restoration

Section 301. Purposes

This Section sets forth the purposes of this Title, which are: (1) to extend the assistance to the States under the longstanding Federal Aid in Wildlife Restoration Act (popularly called the "Pittman-Robertson Act"), including for the benefit of wildlife and habitat; (2) to promote sound conservation policies; (3) to encourage participation between the States and the Federal Government, other State agencies, and private conservation and recreation organizations; and (4) to promote public involvement in these processes.

Section 302. Definitions

This Section sets forth definitions of key terms which recur throughout the Title, including (a) "Federal Aid in Wildlife Restoration Act"; (b) "Wildlife Conservation and Restoration Program"; (c) "State Agencies"; and (d) "Conservation." While the term "Conservation" does allow funds to be used for wildlife damage management, it is not intended that these funds be used for controlling wildlife damage to livestock and agricultural crops.

Section 303. Treatment of amounts transferred from Conservation and Reinvestment Act Fund

This Section amends the Pittman-Robertson Act to create a new subaccount within the Pittman-Robertson Act (the "wildlife conservation and restoration account") and designates the purposes of the new funding. This new funding is a supplement, not a replacement, for existing funding.

The States shall use it to develop, revise and implement wildlife conservation and restoration programs, particularly to meet the unmet needs of a wide array of wildlife and habitats, including game and non-game species. Funding is available for new and existing programs related to conservation, conservation education, and wildlife-associated recreation. These new supplemental monies are not designated by CARA for any particular form of wildlife management or restoration efforts.

Section 304. Apportionment of amounts transferred from Conservation and Reinvestment Act Fund

This Section sets forth the apportionment of the CARA funds to the States, the District of Columbia, and the U.S. Territories. It sets amounts going to the District of Columbia and the Territories as a percentage of the amount transferred to the LWCF from the CARA fund, and amounts going to the individual States based upon a formula of 1/3 based upon land area and 2/3 based upon population, with upper and lower limits. This Title provides a Federal match and requires the States to provide 25 percent of the project costs.

This Section also sets forth the process by which States apply for funds, describes the circumstances under which the Secretary of the Interior approves the program and distributes the funds (including the requirement for a State plan), places limits on funding related to wildlife-associated recreation, and clarifies the inapplicability of certain other laws.

Section 305. Education

This Section clarifies that amounts transferred to the "wildlife conservation and restoration account" from the CARA fund are available for wildlife conservation education. This Section prohibits funds from CARA being used for programs that oppose the regulated taking of wildlife.

Section 306. Prohibition against diversion

It is the intent of the Committee that States fund this program, and other programs within this CARA, from new or excess funds from existing sources of revenue to leverage this new Federal contribution. Also, States that divert revenue available to it for conservation of wildlife to other purposes will not be eligible to receive matching funds under this Title.

(2) EXISTING STATE PLANS.—Comprehensive State Plans developed by any State under section 6(d) of the Land and Water Conservation Fund Act of 1965 before the date that is 5 years after the enactment of this Act shall remain in effect in that State until a State Action Agenda has been adopted pursuant to the amendment made by this subsection, but no later than 5 years after the enactment of this Act.

(b) MISCELLANEOUS.—Section 6(e) (16 U.S.C. 460*l*–8(e)) is amended as follows:

(1) In the matter preceding paragraph (1) by striking "State comprehensive plan" and inserting "State Action Agenda".

(2) In paragraph (1) by striking "comprehensive plan" and inserting "State Action Agenda".

SEC. 208. ASSISTANCE TO STATES FOR OTHER PROJECTS.

Section 6(e) (16 U.S.C. 460l–8(e)) is amended—

(1) in subsection (e)(1) by striking ", but not including incidental costs relating to acquisition"; and

(2) in subsection (e)(2) by inserting before the period at the end the following: "or to enhance public safety within a designated park or recreation area".

SEC. 209. CONVERSION OF PROPERTY TO OTHER USE.

Section 6(f)(3) (16 U.S.C. 460l–8(f)(3)) is amended—

(1) by inserting "(A)" before "No property"; and

(2) by striking the second sentence and inserting the following:

"(B) The Secretary shall approve such conversion only if the State demonstrates no prudent or feasible alternative exists with the exception of those properties that no longer meet the criteria within the State Plan or Agenda as an outdoor conservation and recreation facility due to changes in demographics or that must be abandoned because of environmental contamination which endangers public health and safety. Any conversion must satisfy such conditions as the Secretary deems necessary to assure the substitution of other conservation and recreation properties of at least equal fair market value and reasonably equivalent usefulness and location and which are consistent with the existing State Plan or Agenda; except that wetland areas and interests therein as identified in the wetlands provisions of the action agenda and proposed to be acquired as suitable replacement property within that same State that is otherwise acceptable to the Secretary shall be considered to be of reasonably equivalent usefulness with the property proposed for conversion.".

SEC. 210. WATER RIGHTS.

Title I is amended by adding at the end the following:

"WATER RIGHTS

"SEC. 14. Nothing in this title—

"(1) invalidates or preempts State or Federal water law or an interstate compact governing water;

"(2) alters the rights of any State to any appropriated share of the waters of any body of surface or ground water, whether determined by past or future interstate compacts or by past or future legislative or final judicial allocations;

"(3) preempts or modifies any Federal or State law, or interstate compact, dealing with water quality or disposal; or

"(4) confers on any non-Federal entity the ability to exercise any Federal right to the waters of any stream or to any ground water resource.".

TITLE III—WILDLIFE CONSERVATION AND RESTORATION

SEC. 301. PURPOSES.

The purposes of this title are—

(1) to extend financial and technical assistance to the States under the Federal Aid to Wildlife Restoration Act for the benefit of a diverse array of wildlife and associated habitats, including species that are not hunted or fished, to fulfill unmet needs of wildlife within the States in recognition of the primary role of the States to conserve all wildlife;

(2) to assure sound conservation policies through the development, revision, and implementation of a comprehensive wildlife conservation and restoration plan;

(3) to encourage State fish and wildlife agencies to participate with the Federal Government, other State agencies, wildlife conservation organizations, and outdoor recreation and conservation interests through cooperative planning and implementation of this title; and

(4) to encourage State fish and wildlife agencies to provide for public involvement in the process of development and implementation of a wildlife conservation and restoration program.

SEC. 302. DEFINITIONS.

(a) REFERENCE TO LAW.—In this title, the term "Federal Aid in Wildlife Restoration Act" means the Act of September 2, 1937 (16 U.S.C. 669 and following), commonly referred to as the Federal Aid in Wildlife Restoration Act or the Pittman-Robertson Act.

(b) WILDLIFE CONSERVATION AND RESTORATION PROGRAM.—Section 2 of the Federal Aid in Wildlife Restoration Act (16 U.S.C. 669a) is amended by inserting after "shall be construed" the first place it appears the following: "to include the wildlife conservation and restoration program and".

(c) STATE AGENCIES.—Section 2 of the Federal Aid in Wildlife Restoration Act (16 U.S.C. 669a) is amended by inserting "or State fish and wildlife department" after "State fish and game department".

(d) DEFINITIONS.—Section 2 of the Federal Aid in Wildlife Restoration Act (16 U.S.C. 669a) is amended by striking the period at the end thereof, substituting a semicolon, and adding the following: "the term 'conservation' shall be construed to mean the use of methods and procedures necessary or desirable to sustain healthy populations of wildlife including all activities associated with scientific resources management such as research, census, monitoring of populations, acquisition, improvement and management of habitat, live trapping and transplantation, wildlife damage management, and periodic or total protection of a species or population as well as the taking of individuals within wildlife stock or population if permitted by applicable State and Federal law; the term 'wildlife conservation and restoration program' means a program developed by a State fish and wildlife department and approved by the Secretary under section 4(d), the projects that constitute such a program, which may be implemented in whole or part through grants and contracts by a State to other State, Federal, or local agencies (including those that gather, evaluate, and disseminate information on wildlife and their habitats), wildlife conservation organizations, and outdoor recreation and conservation education entities from funds apportioned under this title, and maintenance of such projects; the term 'wildlife' shall be construed to mean any species of wild, free-ranging fauna including fish, and also fauna in captive breeding programs the object of which is to reintroduce individuals of a depleted indigenous species into previously occupied range; the term 'wildlife-associated recreation' shall be construed to mean projects intended to meet the demand for outdoor activities associated with wildlife including, but not limited to, hunting and fishing, wildlife observation and photography, such projects as construction or restoration of wildlife viewing areas, observation towers, blinds, platforms, land and water trails, water access, trail heads, and access for such projects; and the term 'wildlife conservation education' shall be construed to mean projects, including public outreach, intended to foster responsible natural resource stewardship.".

SEC. 303. TREATMENT OF AMOUNTS TRANSFERRED FROM CONSERVATION AND REINVESTMENT ACT FUND.

Section 3 of the Federal Aid in Wildlife Restoration Act (16 U.S.C. 669b) is amended—

(1) in subsection (a) by inserting "(1)" after "(a)", and by adding at the end the following:

"(2) There is established in the Federal aid to wildlife restoration fund a subaccount to be known as the 'wildlife conservation and restoration account'. Amounts transferred to the fund for a fiscal year under section 5(b)(3) of the Conservation and Reinvestment Act of 1999 shall be deposited in the subaccount and shall be available without further appropriation, in each fiscal year, for apportionment in accordance with this Act to carry out State wildlife conservation and restoration programs."; and

(2) by adding at the end the following:

"(c) Amounts transferred to the fund from the Conservation and Reinvestment Act Fund and apportioned under subsection (a)(2) shall supplement, but not replace, existing funds available to the States from the sport fish restoration account and wildlife restoration account and shall be used for the development, revision, and implementation of wildlife conservation and restoration programs and should be used to address the unmet needs for a diverse array of wildlife and associated habitats, in-

cluding species that are not hunted or fished, for wildlife conservation, wildlife conservation education, and wildlife-associated recreation projects. Such funds may be used for new programs and projects as well as to enhance existing programs and projects.

"(d)(1) Notwithstanding subsections (a) and (b) of this section, with respect to amounts transferred to the fund from the Conservation and Reinvestment Act Fund so much of such amounts as is apportioned to any State for any fiscal year and as remains unexpended at the close thereof shall remain available for expenditure in that State until the close of—

"(A) the fourth succeeding fiscal year, in the case of amounts transferred in any of the first 10 fiscal years beginning after the date of enactment of the Conservation and Reinvestment Act of 1999; or

"(B) the second succeeding fiscal year, in the case of amounts transferred in a fiscal year beginning after the 10-fiscal-year period referred to in subparagraph (A).

"(2) Any amount apportioned to a State under this subsection that is unexpended or unobligated at the end of the period during which it is available under paragraph (1) shall be reapportioned to all States during the succeeding fiscal year.".

SEC. 304. APPORTIONMENT OF AMOUNTS TRANSFERRED FROM CONSERVATION AND REINVESTMENT ACT FUND.

(a) IN GENERAL.—Section 4 of the Federal Aid in Wildlife Restoration Act (16 U.S.C. 669c) is amended by adding at the end the following new subsection:

"(c) AMOUNTS TRANSFERRED FROM CONSERVATION AND REINVESTMENT ACT FUND.—(1) The Secretary of the Interior shall make the following apportionment from the amount transferred to the fund from the Conservation and Reinvestment Act Fund for each fiscal year:

"(A) To the District of Columbia and to the Commonwealth of Puerto Rico, each a sum equal to not more than ½ of 1 percent thereof.

"(B) To Guam, American Samoa, the Virgin Islands, and the Commonwealth of the Northern Mariana Islands, each a sum equal to not more than ⅙ of 1 percent thereof.

"(2)(A) The Secretary of the Interior, after making the apportionment under paragraph (1), shall apportion the remainder of the amount transferred to the fund from the Conservation and Reinvestment Act Fund for each fiscal year among the States in the following manner:

"(i) ⅓ of which is based on the ratio to which the land area of such State bears to the total land area of all such States.

"(ii) ⅔ of which is based on the ratio to which the population of such State bears to the total population of all such States.

"(B) The amounts apportioned under this paragraph shall be adjusted equitably so that no such State shall be apportioned a sum which is less than ½ of 1 percent of the amount available for apportionment under this paragraph for any fiscal year or more than 5 percent of such amount.

"(3) Amounts transferred to the fund from the Conservation and Reinvestment Act Fund shall not be available for any expenses incurred in the administration and execution of programs carried out with such amounts.

"(d) WILDLIFE CONSERVATION AND RESTORATION PROGRAMS.—(1) Any State, through its fish and wildlife department, may apply to the Secretary of the Interior for approval of a wildlife conservation and restoration program, or for funds to develop a program. To apply, a State shall submit a comprehensive plan that includes—

"(A) provisions vesting in the fish and wildlife department of the State overall responsibility and accountability for the program;

"(B) provisions for the development and implementation of—

"(i) wildlife conservation projects that expand and support existing wildlife programs, giving appropriate consideration to all wildlife;

"(ii) wildlife-associated recreation projects; and

"(iii) wildlife conservation education projects pursuant to programs under section 8(a); and

"(C) provisions to ensure public participation in the development, revision, and implementation of projects and programs required under this paragraph.

"(2) A State shall provide an opportunity for public participation in the development of the comprehensive plan required under paragraph (1).

"(3) If the Secretary finds that the comprehensive plan submitted by a State complies with paragraph (1), the Secretary shall approve the wildlife conservation and restoration program of the State and set aside from the apportionment to the State

made pursuant to subsection (c) an amount that shall not exceed 75 percent of the estimated cost of developing and implementing the program.

"(4)(A) Except as provided in subparagraph (B), after the Secretary approves a State's wildlife conservation and restoration program, the Secretary may make payments on a project that is a segment of the State's wildlife conservation and restoration program as the project progresses. Such payments, including previous payments on the project, if any, shall not be more than the United States pro rata share of such project. The Secretary, under such regulations as he may prescribe, may advance funds representing the United States pro rata share of a project that is a segment of a wildlife conservation and restoration program, including funds to develop such program.

"(B) Not more than 10 percent of the amounts apportioned to each State under this section for a State's wildlife conservation and restoration program may be used for wildlife-associated recreation.

"(5) For purposes of this subsection, the term 'State' shall include the District of Columbia, the Commonwealth of Puerto Rico, the Virgin Islands, Guam, American Samoa, and the Commonwealth of the Northern Mariana Islands.".

(b) FACA.—Coordination with State fish and wildlife agency personnel or with personnel of other State agencies pursuant to the Federal Aid in Wildlife Restoration Act or the Federal Aid in Sport Fish Restoration Act shall not be subject to the Federal Advisory Committee Act (5 U.S.C. App.). Except for the preceding sentence, the provisions of this title relate solely to wildlife conservation and restoration programs and shall not be construed to affect the provisions of the Federal Aid in Wildlife Restoration Act relating to wildlife restoration projects or the provisions of the Federal Aid in Sport Fish Restoration Act relating to fish restoration and management projects.

SEC. 305. EDUCATION.

Section 8(a) of the Federal Aid in Wildlife Restoration Act (16 U.S.C. 669g(a)) is amended by adding the following at the end thereof: "Funds available from the amount transferred to the fund from the Conservation and Reinvestment Act Fund may be used for a wildlife conservation education program, except that no such funds may be used for education efforts, projects, or programs that promote or encourage opposition to the regulated taking of wildlife.".

SEC. 306. PROHIBITION AGAINST DIVERSION.

No designated State agency shall be eligible to receive matching funds under this title if sources of revenue available to it after January 1, 1999, for conservation of wildlife are diverted for any purpose other than the administration of the designated State agency, it being the intention of Congress that funds available to States under this title be added to revenues from existing State sources and not serve as a substitute for revenues from such sources. Such revenues shall include interest, dividends, or other income earned on the forgoing.

TITLE IV—URBAN PARK AND RECREATION RECOVERY PROGRAM AMENDMENTS

SEC. 401. AMENDMENT OF URBAN PARK AND RECREATION RECOVERY ACT OF 1978.

Except as otherwise expressly provided, whenever in this title an amendment or repeal is expressed in terms of an amendment to, or repeal of, a section or other provision, the reference shall be considered to be made to a section or other provision of the Urban Park and Recreation Recovery Act of 1978 (16 U.S.C. 2501 and following).

SEC. 402. PURPOSE.

The purpose of this title is to provide a dedicated source of funding to assist local governments in improving their park and recreation systems.

SEC. 403. TREATMENT OF AMOUNTS TRANSFERRED FROM CONSERVATION AND REINVESTMENT ACT FUND.

Section 1013 (16 U.S.C. 2512) is amended to read as follows:

"TREATMENT OF AMOUNTS TRANSFERRED FROM CONSERVATION AND REINVESTMENT ACT FUND

"SEC. 1013. (a) IN GENERAL.—Amounts transferred to the Secretary of the Interior under section 5(b)(4) of the Conservation and Reinvestment Act of 1999 in a fiscal year shall be available to the Secretary without further appropriation to carry out

"(h) REQUIREMENTS FOR ACQUISITION OF LANDS IN MONTANA.—The Secretary of the Interior and the Secretary of Agriculture shall jointly develop and issue a plan for acquisition and disposal of lands in the State of Montana that will result in consolidation of private lands and Federal public lands. The plan shall be designed to ensure that—

"(1) acquisitions of lands with the Federal portion consolidate Federal ownership of lands in Montana under the administrative jurisdiction of the Department of the Interior and the Department of Agriculture; and

"(2) any increase in the total acreage of lands in Montana under the administrative jurisdictions of those Departments that results from acquisitions of lands with the Federal portion is de minimis.".

TITLE III—WILDLIFE CONSERVATION AND RESTORATION

SEC. 301. PURPOSES.

The purposes of this title are—

(1) to extend financial and technical assistance to the States under the Federal Aid to Wildlife Restoration Act for the benefit of a diverse array of wildlife and associated habitats, including species that are not hunted or fished, to fulfill unmet needs

of wildlife within the States in recognition of the primary role of the States to conserve all wildlife;

(2) to assure sound conservation policies through the development, revision, and implementation of a comprehensive wildlife conservation and restoration plan;

(3) to encourage State fish and wildlife agencies to participate with the Federal Government, other State agencies, wildlife conservation organizations, Indian tribes, and in the case of Alaska, Alaska Native Corporations, and outdoor recreation and conservation interests through cooperative planning and implementation of this title; and

(4) to encourage State fish and wildlife agencies to provide for public involvement in the process of development and implementation of a wildlife conservation and restoration program.

SEC. 302. DEFINITIONS.

(a) REFERENCE TO LAW.—In this title, the term "Federal Aid in Wildlife Restoration Act" means the Act of September 2, 1937 (16 U.S.C. 669 et seq.), commonly referred to as the Federal Aid in Wildlife Restoration Act or the Pittman-Robertson Act.

(b) WILDLIFE CONSERVATION AND RESTORATION PROGRAM.—Section 2 of the Federal Aid in Wildlife Res-

toration Act (16 U.S.C. 669a) is amended by inserting after ''shall be construed'' the first place it appears the following: ''to include the wildlife conservation and restoration program and''.

(c) STATE AGENCIES.—Section 2 of the Federal Aid in Wildlife Restoration Act (16 U.S.C. 669a) is amended by inserting ''or State fish and wildlife department'' after ''State fish and game department''.

(d) DEFINITIONS.—Section 2 of the Federal Aid in Wildlife Restoration Act (16 U.S.C. 669a) is amended by striking the period at the end thereof, substituting a semicolon, and adding the following: ''the term 'conservation' shall be construed to mean the use of methods and procedures necessary or desirable to sustain healthy populations of wildlife including all activities associated with scientific resources management such as research, census, monitoring of populations, acquisition, improvement and management of habitat, live trapping and transplantation, wildlife damage management, and periodic or total protection of a species or population as well as the taking of individuals within wildlife stock or population if permitted by applicable State and Federal law; the term 'wildlife conservation and restoration program' means a program developed by a State fish and wildlife department and approved by the Secretary under section 4(d), the projects

that constitute such a program, which may be implemented in whole or part through grants and contracts by a State to other State, Federal, or local agencies (including those that gather, evaluate, and disseminate information on wildlife and their habitats), wildlife conservation organizations, and outdoor recreation and conservation education entities from funds apportioned under this title, and maintenance of such projects; the term 'wildlife' shall be construed to mean any species of wild, free-ranging fauna including fish, and also fauna in captive breeding programs the object of which is to reintroduce individuals of a depleted indigenous species into previously occupied range; the term 'wildlife-associated recreation' shall be construed to mean projects intended to meet the demand for outdoor activities associated with wildlife including, but not limited to, hunting and fishing, wildlife observation and photography, such projects as construction or restoration of wildlife viewing areas, observation towers, blinds, platforms, land and water trails, water access, trail heads, and access for such projects; and the term 'wildlife conservation education' shall be construed to mean projects, including public outreach, intended to foster responsible natural resource stewardship.''.

SEC. 303. TREATMENT OF AMOUNTS TRANSFERRED FROM CONSERVATION AND REINVESTMENT ACT FUND.

Section 3 of the Federal Aid in Wildlife Restoration Act (16 U.S.C. 669b) is amended—

(1) in subsection (a) by inserting ''(1)'' after ''(a)'', and by adding at the end the following:

''(2) There is established in the Federal aid to wildlife restoration fund a subaccount to be known as the 'wildlife conservation and restoration account'. Amounts transferred to the fund for a fiscal year under section 5(b)(3) of the Conservation and Reinvestment Act of 2000 shall be deposited in the subaccount and shall be available without further appropriation, in each fiscal year, for apportionment in accordance with this Act to carry out State wildlife conservation and restoration programs.''; and

(2) by adding at the end the following:

''(c) Amounts transferred to the fund from the Conservation and Reinvestment Act Fund and apportioned under subsection (a)(2) shall supplement, but not replace, existing funds available to the States from the sport fish restoration account and wildlife restoration account and shall be used for the development, revision, and implementation of wildlife conservation and restoration programs and should be used to address the unmet needs for a diverse array of wildlife and associated habitats, including

species that are not hunted or fished, for wildlife conservation, wildlife conservation education, and wildlife-associated recreation projects. Such funds may be used for new programs and projects as well as to enhance existing programs and projects.

''(d)(1) Notwithstanding subsections (a) and (b) of this section, with respect to amounts transferred to the fund from the Conservation and Reinvestment Act Fund so much of such amounts as is apportioned to any State for any fiscal year and as remains unexpended at the close thereof shall remain available for expenditure in that State until the close of—

''(A) the fourth succeeding fiscal year, in the case of amounts transferred in any of the first 10 fiscal years beginning after the date of the enactment of the Conservation and Reinvestment Act of 2000; or

''(B) the second succeeding fiscal year, in the case of amounts transferred in a fiscal year beginning after the 10-fiscal year period referred to in subparagraph (A).

''(2) Any amount apportioned to a State under this subsection that is unexpended or unobligated at the end of the period during which it is available under paragraph

(1) shall be reapportioned to all States during the succeeding fiscal year.''.

SEC. 304. APPORTIONMENT OF AMOUNTS TRANSFERRED FROM CONSERVATION AND REINVESTMENT ACT FUND.

(a) IN GENERAL.—Section 4 of the Federal Aid in Wildlife Restoration Act (16 U.S.C. 669c) is amended by adding at the end the following new subsection:

''(c) AMOUNTS TRANSFERRED FROM CONSERVATION AND REINVESTMENT ACT FUND.—(1) The Secretary of the Interior shall make the following apportionment from the amount transferred to the fund from the Conservation and Reinvestment Act Fund for each fiscal year:

''(A) To the District of Columbia and to the Commonwealth of Puerto Rico, each a sum equal to not more than one-half of 1 percent thereof.

''(B) To Guam, American Samoa, the Virgin Islands, and the Commonwealth of the Northern Mariana Islands, each a sum equal to not more than one-sixth of 1 percent thereof.

''(2)(A) The Secretary of the Interior, after making the apportionment under paragraph (1), shall apportion the remainder of the amount transferred to the fund from the Conservation and Reinvestment Act Fund for each fiscal year among the States in the following manner:

''(i) One-third of which is based on the ratio to which the land area of such State bears to the total land area of all such States.

''(ii) Two-thirds of which is based on the ratio to which the population of such State bears to the total population of all such States.

''(B) The amounts apportioned under this paragraph shall be adjusted equitably so that no such State shall be apportioned a sum which is less than one-half of 1 percent of the amount available for apportionment under this paragraph for any fiscal year or more than 5 percent of such amount.

''(3) Amounts transferred to the fund from the Conservation and Reinvestment Act Fund shall not be available for any expenses incurred in the administration and execution of programs carried out with such amounts.

''(d) WILDLIFE CONSERVATION AND RESTORATION PROGRAMS.—(1) Any State, through its fish and wildlife department, may apply to the Secretary of the Interior for approval of a wildlife conservation and restoration program, or for funds to develop a program. To apply, a State shall submit a comprehensive plan that includes—

''(A) provisions vesting in the fish and wildlife department of the State overall responsibility and accountability for the program;

"(B) provisions for the development and implementation of—

"(i) wildlife conservation projects that expand and support existing wildlife programs, giving appropriate consideration to all wildlife;

"(ii) wildlife-associated recreation projects; and

"(iii) wildlife conservation education projects pursuant to programs under section 8(a); and

"(C) provisions to ensure public participation in the development, revision, and implementation of projects and programs required under this paragraph.

"(2) A State shall provide an opportunity for public participation in the development of the comprehensive plan required under paragraph (1).

"(3) If the Secretary finds that the comprehensive plan submitted by a State complies with paragraph (1), the Secretary shall approve the wildlife conservation and restoration program of the State and set aside from the apportionment to the State made pursuant to subsection (c) an amount that shall not exceed 75 percent of the estimated cost of developing and implementing the program.

"(4)(A) Except as provided in subparagraph (B), after the Secretary approves a State's wildlife conservation and restoration program, the Secretary may make payments on a project that is a segment of the State's wildlife conservation and restoration program as the project progresses. Such payments, including previous payments on the project, if any, shall not be more than the United States pro rata share of such project. The Secretary, under such regulations as he may prescribe, may advance funds representing the United States pro rata share of a project that is a segment of a wildlife conservation and restoration program, including funds to develop such program.

"(B) Not more than 10 percent of the amounts apportioned to each State under this section for a State's wildlife conservation and restoration program may be used for wildlife-associated recreation.

"(5) For purposes of this subsection, the term 'State' shall include the District of Columbia, the Commonwealth of Puerto Rico, the Virgin Islands, Guam, American Samoa, and the Commonwealth of the Northern Mariana Islands.''.

(b) FACA.—Coordination with State fish and wildlife agency personnel or with personnel of other State agencies pursuant to the Federal Aid in Wildlife Restoration Act

or the Federal Aid in Sport Fish Restoration Act shall not be subject to the Federal Advisory Committee Act (5 U.S.C. App.). Except for the preceding sentence, the provisions of this title relate solely to wildlife conservation and restoration programs and shall not be construed to affect the provisions of the Federal Aid in Wildlife Restoration Act relating to wildlife restoration projects or the provisions of the Federal Aid in Sport Fish Restoration Act relating to fish restoration and management projects.

SEC. 305. EDUCATION.

Section 8(a) of the Federal Aid in Wildlife Restoration Act (16 U.S.C. 669g(a)) is amended by adding the following at the end thereof: ''Funds available from the amount transferred to the fund from the Conservation and Reinvestment Act Fund may be used for a wildlife conservation education program, except that no such funds may be used for education efforts, projects, or programs that promote or encourage opposition to the regulated taking of wildlife.''.

SEC. 306. PROHIBITION AGAINST DIVERSION.

No designated State agency shall be eligible to receive matching funds under this title if sources of revenue available to it after January 1, 1999, for conservation of wildlife are diverted for any purpose other than the administration of the designated State agency, it being the intention of Congress that funds available to States under this title be added to revenues from existing State sources and not serve as a substitute for revenues from such sources. Such revenues shall include interest, dividends, or other income earned on the forgoing.

TITLE IV—URBAN PARK AND RECREATION RECOVERY PROGRAM AMENDMENTS

SEC. 401. AMENDMENT OF URBAN PARK AND RECREATION RECOVERY ACT OF 1978.

Except as otherwise expressly provided, whenever in this title an amendment or repeal is expressed in terms of an amendment to, or repeal of, a section or other provision, the reference shall be considered to be made to a section or other provision of the Urban Park and Recreation Recovery Act of 1978 (16 U.S.C. 2501 et seq.).

SEC. 402. PURPOSE.

The purpose of this title is to provide a dedicated source of funding to assist local governments in improving their park and recreation systems.

SEC. 403. TREATMENT OF AMOUNTS TRANSFERRED FROM CONSERVATION AND REINVESTMENT ACT FUND.

Section 1013 (16 U.S.C. 2512) is amended to read as follows:

The Committee adopted language to require the Secretaries of the Interior and Agriculture to consult with the Governors of the States in preparing the priority list for land acquisition. The Committee has not prescribed any particular method or process for such consultation and expects that such consultation will occur on an ongoing basis at the State as well as at the local level. State and local governments can assess the potential benefits and costs of Federal land acquisition and the Federal Government should carefully consider any recommendations and suggestions. The Committee intends to carefully review the list submitted by the President and obtain the views of affected States and their representatives on areas included as well as priority lands excluded from the list. The Committee will carefully consider local concerns, including any recommendations from Governors, through advisory boards or other entities, on the extent of public needs and requests, the availability of property, alternatives to fee acquisition, effect on local tax revenue and local business, habitat benefits or costs, and public access. The Committee expects that close consultation by the Congress and the administration with the States will make the process of establishing and funding a priority list as beneficial as possible for both the objectives for which Federal areas are established and for the States and local communities where such areas are located.

The Committee-reported bill eliminates several restrictions and limitations on Federal land acquisitions projects which were included in the House-passed bill. The objective of the legislation is to provide a guaranteed funding source for Federal land acquisition projects not to alter existing law for any project. The authorizing and appropriating committees remain free to develop specific provisions for individual projects as they do currently.

LWCF State Grant Program.—H.R. 701, as passed by the House of Representatives, provides $450 million for the state-side LWCF matching grant program with 30% equally divided among all States and 70% allocated based on population. The Committee also provides $450 million for the state-side LWCF matching grant program. However, the Committee does not believe that population provides the sole indicator of the demand for State and local park and recreation programs. For example, in many western States with relatively low year-round population but significant Federal land ownership, adjacent State and local parks often experience seasonal fluctuations in visitors. Accordingly, the Committee allocates state-side funding with 60% divided among all States and 40% allocated based on population. The Committee believes this is a more equitable distribution of state-side funds throughout the country.

Wildlife Conservation and Restoration.—As passed by the House, H.R. 701 does not provide any guidance on how States should prioritize their use of funds from the Wildlife Conservation and Restoration Account. As reported by the Committee, H.R. 701 directs States to give priority for funding from the Wildlife Conservation and Restoration Account for species with the greatest conservation need. The Committee included this requirement in recognition of the ongoing debate between the protection of game and nongame species. The Committee did not want to make an arbitrary judgment on the relative importance of a species in any individual States. Rather, the Committee believes that a State fish and

wildlife department is in the best position to determine what species within a State have the greatest conservation need. To facilitate this determination, the Committee requires that State fish and wildlife agencies prepare a wildlife conservation strategy that uses existing available data and to conduct periodic monitoring of wildlife species and their habitats.

H.R. 701, as ordered reported, also provides that 2¼ percent of the funds in the Wildlife Conservation and Restoration Account be made available to Federally recognized Indian tribes. This figure is equivalent to the percentage of tribal trust land to total acreage of the continental United States. Currently, tribes are not eligible to share in Federal Aid in Wildlife Restoration Account funds even though tribal members pay excise taxes on fishing and hunting equipment. H.R. 701 does not change this limitation in the underlying law. However, by allowing Indian tribes to share in this new funding source, the Committee reported legislation helps address the funding shortfalls that tribes experience in managing fish and wildlife populations on their lands. Indian tribes, just like the States, would have to submit, and have approved by the Secretary of the Interior, a wildlife conservation and restoration program.

With few exceptions, the provisions of the Title 3 relate solely to wildlife conservation and restoration programs funded by the Conservation and Reinvestment Act Fund and do not affect the provisions of the Federal Aid in Wildlife Restoration Act relating to wildlife restoration projects or provisions of the Federal Aid in Sportfish Restoration Act relating to fish restoration and management projects.

Historic Preservation Funding.—H.R. 701, as passed by the House, provides $100 million for National Historic Preservation Act purposes with at least one-half to be spent on preservation projects on historic properties. Further, the bill expands the use of State historic preservation moneys to allow cooperative historic preservation planning and development at national heritage areas or national heritage corridors established by the Federal Government.

As reported by the Committee, H.R. 701 provides $150 million, the full existing authorization, for the Historic Preservation Fund. Of this total, at least one-half, or $75 million, must be provided to State, local and tribal historic preservation programs and $15 million is to be made available for the American Battlefield Protection Program. The remainder is available for Federal historic preservation purposes with at least one-half to be spent on preservation projects on historic properties and archaeological sites.

The Committee believes that it is important that adequate financial resources be provided for non-Federal historic preservation efforts. By providing $75 million each year for State, local and tribal historic preservation programs, the Committee is hopeful that this funding will decrease the pressure on the Federal Government to preserve these historic sites.

Similarily, the American Battlefield Protection Program provides funding for non-Federal entities to protect threatened battlefields. The Committee amendment directs the Secretary to give priority for financial assistance for the preservation of Civil War battlefields to sites identified as Priority 1 battlefields in the "Civil War Sites Advisory Commission Report on the Nation's Civil War Battlefields" issued in 1993.

"(b) ACQUISITION RESTRICTIONS.—(1) LIMITATION ON EXPENDITURE.—No money shall be obligated or expended for Federal land acquisition purposes under this section unless approved in an Act making appropriations.

"(2) AUTHORIZATION REQUIREMENT.—Appropriations from the funds pursuant to this section shall not be used for acquisition unless such acquisition is otherwise authorized by law: *Provided, however,* That appropriations from the fund may be used for preacquisition work in instances where authorization is imminent and where substantial monetary savings could be realized.

"(3) WILLING SELLER.—Amounts made available for Federal land acquisition purposes under this section shall not be used to acquire property unless—

"(A) the owner of the property is willing to sell; or

"(B) the acquisition is authorized by law and is conducted in accordance therewith.".

TITLE III—WILDLIFE CONSERVATION AND RESTORATION

SEC. 301. DEFINITIONS.

(a) REFERENCE TO LAW.—The term "Federal Aid in Wildlife Restoration Act" means the Act of September 2, 1937 (16 U.S.C. 669 et seq.), commonly referred to as the Federal Aid in Wildlife Restoration Act or the Pittman-Robertson Act.

(b) DEFINITIONS.—Section 2 of the Federal Aid in Wildlife Restoration Act (16 U.S.C. 669a) is amended to read as follows:

"SEC. 2. DEFINITIONS.

"As used in this Act—

"(1) the term 'conservation' means the use of methods and procedures necessary or desirable to sustain healthy populations of wildlife, including all activities associated with scientific resources management such as research, census, monitoring of populations, acquisition, improvement and management of habitat, live trapping and transplantation, wildlife damage management, and periodic or total protection of a species or population, as well as the taking of individuals within wildlife stock or population if permitted by applicable State and Federal law;

"(2) the term 'Secretary' means the Secretary of the Interior,

"(3) the term 'State fish and game department' or 'State fish and wildlife department' means any department or division of department of another name, or commission, or official or officials, of a State empowered under its laws to exercise the functions ordinarily exercised by a State fish and game department or State fish and wildlife department.

"(4) the term 'wildlife' means any species of wild, free-ranging fauna including fish, and also fauna in captive breeding programs the object of which is to reintroduce individuals of a depleted indigenous species into previously occupied range;

"(5) the term 'wildlife-associated recreation' means projects intended to meet the demand for outdoor activities associated with wildlife including, but not limited to, hunting and fishing, wildlife observation and photography, such projects as construction or restoration of wildlife viewing areas, observation towers, blinds, platforms, land and water trails, water access, trail heads, and access for such projects;

"(6) the term 'wildlife conservation and restoration program' means a program developed by a State fish and wildlife department and approved by the Secretary under section 304(d), the projects that constitute such a program, which may be implemented in whole or part through grants and contracts by a State to other State, Federal, or local agencies (including those that gather, evaluate, and disseminate information on wildlife and their habitats), wildlife conservation organizations, and outdoor recreation and conservation education entities from funds apportioned under this title, and maintenance of such projects;

"(7) the term 'wildlife conservation education' means projects, including public outreach, intended to foster responsible natural resource stewardship; and

"(8) the term 'wildlife-restoration project' includes the wildlife conservation and restoration program and means the selection, restoration, rehabilitation, and improvement of areas of land or water adaptable as feeding, resting, or breeding places for wildlife, including acquisition of such areas or estates or interests therein as are suitable or capable of being made suitable therefor, and the construction thereon or therein of such works as may be necessary to make them available for such purposes and also including such research into problems of wildlife management as may be necessary to efficient administration affecting wildlife resources, and such preliminary or incidental costs and expenses as may be incurred in and about such projects."

SEC. 302. WILDLIFE CONSERVATION AND RESTORATION ACCOUNT.

Section 3 of the Federal aid in Wildlife Restoration Act (16 U.S.C. 669b) is amended—

(1) in subsection (a) by inserting "(1)" after "(a)", and by adding at the end the following:

"(2) There is established in the fund a subaccount to be known as the "Wildlife Conservation and Restoration Account". Amounts transferred to the Secretary under section 2(b)(5) of the Conservation and Reinvestment Act shall be deposited in the subaccount and shall be available without further appropriation for obligation and expenditure, in each fiscal year, for apportionment in accordance with this Act to carry out State wildlife conservation and restoration programs."; and

(2) by adding at the end the following—

"(c)(1) Amounts transferred to the Wildlife Conservation and Restoration Account shall supplement, but not replace, existing funds available to the States from the sport fish restoration account and wildlife restoration account and shall be used for the development, revision, and implementation of wildlife conservation and restoration programs and should be used to address the unmet needs for a diverse array of wildlife and associated habitats, including species not hunted or fished.

"(2) Funds may be used by a State or an Indian tribe for the planning and implementation of its wildlife conservation and restoration program and wildlife conservation strategy, as provided in section 4(d) and (e) of this Act, including wildlife conservation, wildlife conservation education, and wildlife-associated recreation projects. Such funds may be used for new programs and projects as well as to enhance existing programs and projects.

"(3) Priority for funding from the Wildlife Conservation and Restoration Account shall be for those species with the greatest conservation need.

"(d) Notwithstanding subsections (a) and (b) of this section, with respect to amounts transferred to the Wildlife Conservation and Restoration Account from the Conservation and Reinvestment Act Fund, so much of such amounts apportioned to any State for any fiscal year as remains unexpended at the close thereof shall remain available for obligation in that State until the close of the second succeeding fiscal year.".

SEC. 303. STATE APPORTIONMENTS.

Section 4 of the Federal Aid in Wildlife Restoration Act (16 U.S.C. 669c) is amended by adding the following—

"(c) APPORTIONMENT OF WILDLIFE CONSERVATION AND RESTORATION ACCOUNT.—(1) Notwithstanding subsection (a), the Secretary may use not more than 2 percent of the revenues deposited into the Wildlife Conservation and Restoration Account in each fiscal year as necessary for expenses in the administration and execution of programs carried out under the Wildlife Conservation and Restoration Account and such amount shall be available therefor until the expiration of the next succeeding fiscal year. Within 60 days after the close of such fiscal year, the Secretary shall apportion any portion thereof as remains unexpended, if any, on the same basis and in the same manner as is provided under paragraphs (2) and (3).

"(2) The Secretary, after deducting administrative expenses shall make the following apportionment from the Wildlife Conservation and Restoration Account:

"(A) to the District of Columbia and to the Commonwealth of Puerto Rico, each a sum equal to not more than one-half of 21 percent thereof;

"(B) to Guam, American Samoa, the Virgin Islands, and the Commonwealth of the Northern Mariana Islands, each a sum equal to not more than one-fourth of 1 percent thereof; and

"(C) to Federally recognized Indian tribes, a sum equal to not more than 2 and ¼ percent, one-third of which shall be allocated among the various tribes based on the ratio to which the trust land area of such tribe bears to the total trust land area of all such tribes and two-thirds of which hall be allocated based on the ration to which the population of such tribe bears to the total population of all such tribes; except that no Indian tribe shall receive more than 5 percent per annum of the total annual amount made available to Indian tribes under this subsection.

"(3) The Secretary shall apportion the remaining amount in the Wildlife Conservation and Restoration Account for each year among the States in the following manner:

"(A) one-third of which is based on the ratio to which the land area of such State bears to the total land area of all such States; and

"(B) two-thirds of which is based on the ratio to which the population of such State bears to the total population of all such States.

"(4) The amounts apportioned under this paragraph shall be adjusted equitably so that no State shall be apportioned a sum which is less than 1 percent of the

amount available for apportionment under this paragraph for any fiscal year or more than 5 percent of such amount.

"(d) WILDLIFE CONSERVATION AND RESTORATION PROGRAM.—(1) Any State, may apply to the Secretary for approval of a wildlife conservation and restoration program or for funds from the Wildlife Conservation and Restoration Account to develop a program which shall—

"(A) contain provision for vesting in the State fish and wildlife department overall responsibility and accountability for development and implementation of the program; and

"(B) contain provision for development and implementation of—

"(i) wildlife conservation projects that expand and support existing wildlife programs to meet the needs of a diverse array of wildlife species, including a wildlife strategy as set forth in subsection (e),

"(ii) wildlife associated recreation programs,

"(iii) wildlife conservation education projects; and

"(C) contain provisions for public participation in the development, revision, and implementation of projects and programs identified in subparagraph (B) of this subsection.

"(2) If the Secretary finds that the wildlife conservation and restoration program submitted by a State complies with paragraph (1), the Secretary shall approve the program and shall set aside from the apportionment to the State made pursuant to subsection (c) an amount that shall not exceed 75 percent of the estimated cost of developing and implementing the program.

"(3)(A) Except as provided in subparagraphs (B) and (C), after the Secretary approves a State's wildlife conservation and restoration program, the Secretary may make payments on a project that is a segment of the State's wildlife conservation and restoration program as the project progresses. Such payments, including previous payments on the project, if any, shall not be more than the pro rata share of the United States for such project. The Secretary, under such regulations as he may prescribe, may advance funds representing the United States pro rata share of a project that is a segment of a wildlife conservation and restoration program, including funds to develop such program.

"(B) Not more than 10 percent of the amounts apportioned to each State under this section for a State's wildlife conservation and restoration program may be used for wildlife-associated recreation.

"(C) Not more than 10 percent of the amounts apportioned to each State under this section for a State's wildlife conservation and restoration program may be used for law enforcement.

"(4) For purposes of this subsection, the term "State" shall include the District of Columbia, the Commonwealth of Puerto Rico, the Virgin Islands, Guam, American Samoa, and the Commonwealth of the Northern Mariana Islands and any of the Federally recognized Indian tribes with a wildlife conservation and restoration program.

"(e) WILDLIFE CONSERVATION STRATEGY.—Any State that receives an apportionment pursuant to subsection (c) shall, within five years of the date of the initial apportionment, develop and begin implementation of a wildlife conservation strategy based upon the best scientific information and data available that—

"(1) integrates available information on the distribution and abundance of species of wildlife, including low population and declining species as the State fish and wildlife department deems appropriate, that exemplify and are indicative of the diversity and health of a wildlife of the State;

"(2) identifies the extent and condition of habitats and community types essential to conservation of species identified under paragraph (1);

"(3) identifies the problems which may adversely affect the species identified under paragraph (1) and their habitats, and provides for research and surveys to identify factors which may assist in restoration and more effective conservation of such species and their habitats;

"(4) determines those actions which should be taken to conserve the species identified under paragraph (1) and their habitats and establishes priorities for implementing such conservation actions;

"(5) provides for periodic monitoring of species identified under paragraph (1) and their habitats and the effectiveness of the conservation actions determined under paragraph (4), and for adapting conservation actions as appropriate to respond to new information or changing conditions;

"(6) provides for the review of the State wildlife conservation strategy and, if appropriate, revision at intervals of not more than ten years;

"(7) provides for coordination by the State fish and wildlife department, during the development, implementation, review, and revision of the wildlife conservation strategy, with Federal, State, and local agencies and Indian tribes

that manage significant areas of land or water within the States, or administer programs that significantly affect the conservation of species identified under paragraph (1) or their habitats."

TITLE IV—URBAN PARK PROGRAM

SEC. 401. TREATMENT OF AMOUNTS TRANSFERRED FROM THE CONSERVATION AND REINVESTMENT ACT FUND.

Section 1013 of the Urban Park and Recreation Recovery Act (16 U.S.C. 2512) is amended to read as follows:

"TREATMENT OF AMOUNTS TRANSFERRED FROM CONSERVATION AND REINVESTMENT ACT FUND

"SEC. 1013. (a) IN GENERAL.—Amounts transferred to the Secretary of the Interior under section 2(B)(6) of the Conservation and Reinvestment Act in a fiscal year shall be available for obligation and expenditure for the purpose of this section, without further appropriation and without fiscal year limitation. Any amounts that have not been paid or obligated by the Secretary before the end of the second fiscal year beginning after the first fiscal year in which the amount is available shall be reapportioned by the Secretary among grantees under this title.

"(b) ADMINISTRATIVE EXPENSES.—Not more than four percent of the amounts made available under this section in each fiscal year, may be deducted by the Secretary for expenses in the administration and execution of this Act.

"(c) LIMITATIONS ON ANNUAL GRANTS.—After making the deduction under subsection (b), of the amounts available in a fiscal year under subsection (a)—

"(1) not more than 3 percent may be used for grants for the development of local park and recreation recovery action programs pursuant to sections 1007(a) and 1007(c);

"(2) not more than 10 percent may be used for innovation grants pursuant to section 1006; and

"(3) not more than 15 percent may be provided as grants (in the aggregate) for projects in any one State.

"(d) LIMITATION ON USE FOR GRANT ADMINISTRATION.—The Secretary shall establish a limit on the portion of any grant under this title, not to exceed 25 percent that may be used for grant and program administration.".

SEC. 402. AUTHORITY TO DEVELOP NEW AREAS AND FACILITIES.

Section 1003 of the Urban Park and Recreation Recovery Act (16 U.S.C. 2502) is amended by inserting "development of new recreation areas and facilities, including the acquisition of lands for such development," after "rehabilitation of critically needed recreation areas, facilities.".

SEC. 403. DEFINITIONS.

Section 1004 of the Urban Park and Recreation Recovery Act (16 U.S.C. 2503) is amended to read as follows:

(1) In paragraph (j), by striking "and" after the semicolon.

(2) In paragraph (k), by adding "Commonwealth of" after "and" and before "the" and by striking the period at the end and inserting a semicolon.

(3) By adding at the end the following:

"(l) 'development grants' means matching capital grants to units of local government to cover costs of development and construction on existing or new neighborhood recreation site, including indoor and outdoor recreational areas and facilities, support facilities, and landscaping but excluding routine maintenance and upkeep activities; and

"(m) 'Secretary' means the Secretary of the Interior.".

SEC. 404. ELIGIBILITY.

Section 1005(a) of the Urban Park and Recreation Recovery Act (16 U.S.C. 2504(a)) is amended to read as follows:

"(a) Eligibility of general purpose local governments to compete for assistance under this title shall be based upon need as determined by the Secretary and shall include, but not be limited to, the following:

"(1) All political subdivisions included in Metropolitan, Primary, or Consolidated Statistical Areas, as determined by the most recent Census.

"(2) Any other city, town, or group of cities or towns (or both) within such a Metropolitan Statistical Area, that has a total population of 50,000 or more as determined by the most recent Census.

"(3) Any other county, parish, or township with a total population of 250,000 or more as determined by the most recent Census.".

Appropriations in consultation with the land management agencies. The final distribution will be based on programmatic needs and will be determined by the Committees during fiscal year 2001.

In making funding distributions for maintenance projects, the managers expect the agencies to address critical maintenance backlogs. These additional funds are for repair and rehabilitation of existing facilities or roads and may not be used for new and expanded facilities or roads.

The managers expect the U.S. Fish and Wildlife Service to develop a cost-shared, competitively-awarded, project-based program for the use of State wildlife grant funding and to present their proposal to the House and Senate Committees on Appropriations for review and approval prior to the use of any funds for these grants. The funds should not be distributed on a formula basis and every effort should be made to leverage Federal funding to the maximum extent possible. The managers point to the joint venture program as a good model to pursue.

The managers expect the U.S. Fish and Wildlife Service to work with the States to develop wildlife conservation plans. The managers do not object to the use of a portion of the funds provided for State wildlife grants for such required plans, subject to cost sharing by the States. Each State plan should meet requirements that are eastblished by the Service. Each plan should provide for the conservation of the State's full array of wildlife and their habitats, with emphasis placed on those species conservation efforts that are most underfunded and have the greatest conservation need. The Service shall not provide a grant to any State unless the State has, or commits to develop by a mutually agreed date certain, the required plan.

The specific amounts for programs within each category for the Departments of the Interior and Agriculture are shown in the following table:

LAND CONSERVATION, PRESERVATION AND INFRASTRUCTURE PROGRAM

[Dollars in thousands]

Program categories	This title	Other titles	Total in this bill
Dept. of the Interior Land Acquisition	$130,000	$163,940	$293,.940
US Forest Service Land Acquisition	49,000	106,505	155,505
State Land Acquisition and Assistance	50,000	40,500	90,500
Federal and State LWCF	229,000	310,945	539,945
FWS—Cooperative Endangered Species Fund	78,000	26,925	104,925
FWS—State Wildlife Grants	50,000	0	50,000
FWS—N. American Wetlands Conservation	20,000	20,000	40,000
USGS—Science Programs	20,000	5,000	25,000
FS—Forest Legacy	30,000	30,000	60,000
FS—additional planning/inventory/monitoring	20,000	NA	20,000
State and Other Conservation Programs	218,000	81,925	299,925
NPS—Urban Parks Restoration and Recovery	20,000	10,000	30,000
NPS—Historic Preservation	15,000	73,347	88,347
FS—Urban & Community Forestry	4,000	31,721	35,721
Youth Conservation Corps	0	6,000	6,000
Urban and Historic Preservation	39,000	121,068	160,068

(A) was not a signatory to the 1981 or later National Bituminous Coal Wage Agreement or any "me too" agreement related to such Coal Wage Agreement;

(B) reported credit hours to the UMWA 1974 Pension Plan on fewer than ten classified mine workers in every month during its last year of operations under the National Bituminous Coal Wage Agreement of 1978 or any "me too" agreement related to such Coal Wage Agreement;

(C) has had not more than 60 beneficiaries, including eligible dependents of retired miners, assigned to it under section 9706 of the Internal Revenue Code of 1986 not including beneficiary assignments relieved by the Social Security Administration;

(D) was assessed premiums by the Combined Fund in October 1999, made payments pursuant to that assessment and has no delinquency as of September 30, 2000; and

(E) is not directly engaged in the production or sale of coal and has no related person engaged in the production of coal as of September 30, 2000.

(b) SEPARABILITY CLAUSE.—If any provision of this title or the application thereof to any person or circumstances is held invalid, the remainder of the title and the application of such provision to other persons or circumstances shall not be affected thereby.

TITLE VIII—LAND CONSERVATION, PRESERVATION AND INFRASTRUCTURE IMPROVEMENT

For activities authorized by law for the acquisition, conservation, and maintenance of Federal and non-Federal lands and resources, and for Payments in Lieu of Taxes, in addition to the amounts provided under previous titles of this Act, $686,000,000, to remain available until expended, of which $179,000,000 is for the acquisition of lands or interests in lands; and of which $50,000,000 is for "National Park Service, Land Acquisition and State Assistance" for the state assistance program; and of which $20,000,000 is for "Forest Service, National Forest System" for inventory and monitoring activities and planning; and of which $78,000,000 is for "United States Fish and Wildlife Service, Cooperative Endangered Species Fund"; and of which $20,000,000 is for "United States Fish and Wildlife Service, North American Wetlands Conservation Fund"; and of which $20,000,000 is for "United States Geological Survey, Surveys, Investigations, and Research" for science and cooperative programs; and of which $30,000,000 is for "Forest Service, State and Private Forestry" for the Forest Legacy program; and of which $50,000,000 is for "United States Fish and Wildlife Service, State Wildlife Grants"; and of which $20,000,000 is for "National Park Service, Urban Park and Recreation Fund"; and of which $15,000,000 is for "National Park Service, Historic Preservation Fund" for grants to states and Indian tribes; and of which $4,000,000 is for "Forest Service, State and Private Forestry" for urban and community forestry programs; and of which $50,000,000 is for "Bureau of Land Management, Payments in Lieu of Taxes"; and of which $150,000,000 is for "Federal Infrastructure Improvement" for the

deferred maintenance needs of the Federal land management agencies: *Provided*, That of the funds provided under this heading for the acquisition of lands or interests in lands, $130,000,000 shall be available to the Department of the Interior and $49,000,000 shall be available to the Department of Agriculture, Forest Service: *Provided further*, That none of the funds provided under this heading for the acquisition of lands or interests in lands shall be available until the House Committee on Appropriations and the Senate Committee on Appropriations provide to the Secretaries, in writing, a list of specific acquisitions to be undertaken with such funds: *Provided further*, That of the funds provided under this heading for "Federal Infrastructure Improvement" for the deferred maintenance needs of the Federal land management agencies, $25,000,000 shall be for the Bureau of Land Management, $25,000,000 shall be for the United States Fish and Wildlife Service, $50,000,000 shall be for the National Park Service and $50,000,000 shall be for the Forest Service.

SEC. 801. (a) CATEGORIES.—Section 251(c) of the Balanced Budget and Emergency Deficit Control Act of 1985 (2 U.S.C. 901(c)) is amended—

(1) in paragraph (6), by—

(A) in subparagraph (B), by striking "and" after the semicolon;

(B) in subparagraph (C), by inserting "and" after the semicolon; and

(C) adding at the end the following:

"(D) for the conservation spending category: $1,760,000,000, in new budget authority and $1,232,000,000 in outlays;";

(2) in paragraph (7), by—

(A) in subparagraph (A), by striking "and" after the semicolon;

(B) in subparagraph (B), by striking the period and inserting "; and"; and

(C) adding at the end the following:

"(C) for the conservation spending category: $1,920,000,000, in new budget authority and $1,872,000,000 in outlays;"; and

(3) by inserting after paragraph (7) the following:

"(8) with respect to fiscal year 2004 for the conservation spending category: $2,080,000,000, in new budget authority and $2,032,000,000 in outlays;

"(9) with respect to fiscal year 2005 for the conservation spending category: $2,240,000,000, in new budget authority and $2,192,000,000 in outlays;

"(10) with respect to fiscal year 2006 for the conservation spending category: $2,400,000,000, in new budget authority and $2,352,000,000 in outlays;

"(11) with respect to each fiscal year 2002 through 2006 for the Federal and State Land and Water Conservation Fund sub-category of the conservation spending category: $540,000,000 in new budget authority and the outlays flowing therefrom;

"(12) with respect to each fiscal year 2002 through 2006 for the State and Other Conservation sub-category of the conservation spending category: $300,000,000 in new budget authority and the outlays flowing therefrom;

"(13) with respect to each fiscal year 2002 through 2006 for the Urban and Historic Preservation sub-category of the conservation spending category: $160,000,000 in new budget authority and the outlays flowing therefrom;

"(14) with respect to each fiscal year 2002 through 2006 for the Payments in Lieu of Taxes sub-category of the conservation spending category: $50,000,000 in new budget authority and the outlays flowing therefrom;

"(15) with respect to each fiscal year 2002 through 2006 for the Federal Deferred Maintenance sub-category of the conservation spending category: $150,000,000 in new budget authority and the outlays flowing therefrom;

"(16) with respect to fiscal year 2002 for the Coastal Assistance sub-category of the conservation spending category: $440,000,000 in new budget authority and the outlays flowing therefrom; with respect to fiscal year 2003 for the Coastal Assistance sub-category of the conservation spending category: $480,000,000 in new budget authority and the outlays flowing therefrom; with respect to fiscal year 2004 for the Coastal Assistance sub-category of the conservation spending category: $520,000,000 in new budget authority and the outlays flowing therefrom; with respect to fiscal year 2005 for the Coastal Assistance sub-category of the conservation spending category: $560,000,000 in new budget authority and the outlays flowing therefrom; and with respect to fiscal year 2006 for the Coastal Assistance sub-category of the conservation spending category: $600,000,000 in new budget authority and the outlays flowing therefrom;".

(b) ADDITION TO DISCRETIONARY SPENDING LIMITS.—Section 251(b)(2) of the Balanced Budget and Emergency Deficit Control Act of 1985 (2 U.S.C. 901(b)(2)) is amended by adding at the end the following:

"(H) CONSERVATION SPENDING.—(i) If a bill or resolution making appropriations for any fiscal year appropriates an amount for the conservation spending category that is less than the limit for the conservation spending category as specified in subsection (c), then the adjustment for new budget authority and outlays for the following fiscal year for that category shall be the amount of new budget authority and outlays that equals the difference between the amount appropriated and the amount of that category specified in subsection (c).

"(ii) If a bill or resolution making appropriations for any fiscal year appropriates an amount for any conservation spending sub-category that is less than the limit for that conservation spending sub-category as specified in subsections (c)(11)–(c)(16), then the adjustment for new budget authority for the following fiscal year for that sub-category shall be the amount of new budget authority that equals the difference between the amount appropriated and the amount of that sub-category specified in subsection (c)(11)–(c)(16).

"(iii) The total amount provided for any conservation activity within the conservation spending category may not exceed any authorized ceiling for that activity.".

(c) CATEGORIES DEFINED.—Section 250(c)(4) of the Balanced Budget and Emergency Deficit Control Act of 1985 (2 U.S.C. 900(c)(4)) is amended by adding at the end the following:

"(E) The term 'conservation spending category' means discretionary appropriations for conservation activities in the following budget accounts or portions thereof providing appropriations to preserve and protect lands, habitat, wildlife, and other natural resources, to provide recreational opportunities, and for related purposes:

"(i) 14–5033 Bureau of Land Management Land Acquisition.

"(ii) 14–5020 Fish and Wildlife Service Land Acquisition.

"(iii) 14–5035 National Park Service Land Acquisition and State Assistance.

"(iv) 12–9923 Forest Service Land Acquisition.

"(v) 14–5143 Fish and Wildlife Service Cooperative Endangered Species Conservation Fund.

"(vi) 14–5241 Fish and Wildlife Service North American Wetlands Conservation Fund.

"(vii) 14–1694 Fish and Wildlife Service State Wildlife Grants.

"(viii) 14–0804 United States Geological Survey Surveys, Investigations, and Research, the State Planning Partnership programs: Community/Federal Information Partnership, Urban Dynamics, and Decision Support for Resource Management.

"(ix) 12–1105 Forest Service State and Private Forestry, the Forest Legacy Program, Urban and Community Forestry, and Smart Growth Partnerships.

"(x) 14–1031 National Park Service Urban Park and Recreation Recovery program.

"(xi) 14–5140 National Park Service Historic Preservation Fund.

"(xii) Youth Conservation Corps.

"(xiii) 14–1114 Bureau of Land Management Payments in Lieu of Taxes.

"(xiv) Federal Infrastructure Improvement (as established in title VIII of the Department of the Interior and Related Agencies Appropriations Act, 2001).

"(xv) 13–1460 NOAA Procurement Acquisition and Construction, the National Marine Sanctuaries and the National Estuarine Research Reserve Systems.

"(xvi) 13–1450 NOAA Operations, Research, and Facilities, the Coastal Zone Management Act programs, the National Marine Sanctuaries, the National Estuarine Research Reserve Systems, and Coral Restoration programs.

"(xvii) 13–1451 NOAA Pacific Coastal Salmon Recovery.

"(F) The term 'Federal and State Land and Water Conservation Fund sub-category' means discretionary appropriations for activities in the accounts described in (E)(i)–(E)(iv) or portions thereof.

"(G) The term 'State and Other Conservation sub-category' means discretionary appropriations for activities in

the accounts described in (E)(v)–(E)(ix), with the exception of Urban and Community Forestry as described in (E)(ix), or portions thereof.

"(H) The term 'Urban and Historic Preservation sub-category' means discretionary appropriations for activities in the accounts described in (E)(ix)–(E)(xii), with the exception of Forest Legacy and Smart Growth Partnerships as described in (E)(ix), or portions thereof.

"(I) The term 'Payments in Lieu of Taxes sub-category' means discretionary appropriations for activities in the account described in (E)(xiii) or portions thereof.

"(J) The term 'Federal Deferred Maintenance sub-category' means discretionary appropriations for activities in the account described in (E)(xiv) or portions thereof.

"(K) The term 'Coastal Assistance sub-category' means discretionary appropriations for activities in the accounts described in (E)(xv)–(E)(xvii) or portions thereof.".

TITLE IX

DEPARTMENT OF THE TREASURY

BUREAU OF THE PUBLIC DEBT

GIFTS TO THE UNITED STATES FOR REDUCTION OF THE PUBLIC DEBT

For deposit of an additional amount into the account established under section 3113(d) of title 31, United States Code, to reduce the public debt, $5,000,000,000.

This Act may be cited as the "Department of the Interior and Related Agencies Appropriations Act, 2001".

Speaker of the House of Representatives.

Vice President of the United States and
President of the Senate.

TITLE IX—WILDLIFE, OCEAN AND COASTAL CONSERVATION

SEC. 901. WILDLIFE CONSERVATION AND RESTORATION PLANNING.

For expenses necessary to support activities that supplement, but not replace, existing funding available to the States and territories from the sport fish restoration account and wildlife restoration account and shall be used for the development, revision, and implementation of wildlife conservation and restoration plans and programs, $50,000,000, to remain available until expended: Provided, That these funds may be used by a State, territory or an Indian Tribe for the planning and implementation of its wildlife conservation and restoration program and wildlife conservation strategy, including wildlife conservation, wildlife conservation education, and wildlife-associated recreation projects: Provided further, That the Secretary, after deducting administrative expenses shall make the following apportionment from the Wildlife Conservation and Restoration Account: (A) to the District of Columbia and to the Commonwealth of Puerto Rico, each a sum equal to not more than one-half of 1 percent thereof; (B) to Guam, American Samoa, the Virgin Islands, and the Commonwealth of the Northern Mariana Islands, each a sum equal to not more than one-fourth of 1 percent thereof: Provided further, That the Secretary shall apportion the remaining amount in the Wildlife Conservation and Restoration Account for each year among the States in the following manner: (A) one-third of which is based on the ratio to which the land area of such State bears to the total land area of all such States; and, (B) two-thirds of which is based on the ratio to which the population of such State bears to the total population of all such States: Provided further, That the amounts apportioned under this paragraph shall be adjusted equitably so that no State shall be apportioned a sum which is less than 1 percent of the amount available for apportionment under this paragraph for any fiscal year or more than 5 percent of such amount: Provided further, That no State, territory or other jurisdiction shall receive a grant unless it has certified to the Service that it has in place, or has agreed to develop by a mutually agreed date certain, a wildlife conservation strategy and plan.

SEC. 902. WILDLIFE CONSERVATION AND RESTORATION.

(a) PURPOSES.—The purposes of this section are—

(1) to extend financial and technical assistance to the States under the Federal Aid to Wildlife Restoration Act for the benefit of a diverse array of wildlife and associated habitats, including species that are not hunted or fished, to fulfill unmet needs of wildlife within the States in recognition of the primary role of the States to conserve all wildlife;

(2) to assure sound conservation policies through the development, revision, and implementation of a comprehensive wildlife conservation and restoration plan;

(3) to encourage State fish and wildlife agencies to participate with the Federal Government, other State agencies, wildlife conservation organizations and outdoor recreation and conservation interests through cooperative planning and implementation of this title; and

(4) to encourage State fish and wildlife agencies to provide for public involvement in the process of development and implementation of a wildlife conservation and restoration program.

(b) REFERENCE TO LAW.—In this section, the term ''Federal Aid in Wildlife Restoration Act'' means the Act of September 2, 1937 (16 U.S.C. 669 et seq.), commonly referred to as the Federal Aid in Wildlife Restoration Act or the Pittman-Robertson Act.

(c) DEFINITIONS.—Section 2 of the Federal Aid in Wildlife Restoration Act (16 U.S.C. 669a) is amended to read as follows:

''SEC. 2. DEFINITIONS.

''As used in this Act—

''(1) the term 'conservation' means the use of methods and procedures necessary or desirable to sustain healthy populations of wildlife, including all activities associated with scientific resources management such as research, census, monitoring of populations, acquisition, improvement and management of habitat, live trapping and transplantation, wildlife damage management, and periodic or total protection of a species or population, as well as the taking of individuals within wildlife stock or population if permitted by applicable State and Federal law;

''(2) the term 'Secretary' means the Secretary of the Interior;

''(3) the term 'State fish and game department' or 'State fish and wildlife department' means any department or division of department of another name, or commission, or official or officials, of a State empowered under its laws to exercise the functions ordinarily exercised by a State fish and game department or State fish and wildlife department.

''(4) the term 'wildlife' means any species of wild, free-ranging fauna including fish, and also fauna in captive breeding programs the object of which is to reintroduce individuals of a depleted indigenous species into previously occupied range;

''(5) the term 'wildlife-associated recreation' means projects intended to meet the demand for outdoor activities associated with wildlife including, but not limited to, hunting and fishing, wildlife observation and photography, such projects as construction or restoration of wildlife viewing areas, observation towers, blinds, platforms, land and water trails, water access, field trialing, trail heads, and access for such projects;

''(6) the term 'wildlife conservation and restoration program' means a program developed by a State fish and wildlife department and approved by the Secretary under section 304(d), the projects that constitute such a program, which may be implemented in whole or part through grants and contracts by a State to other State, Federal, or local agencies (including those that gather, evaluate, and disseminate information on wildlife and their habitats), wildlife conservation organizations, and outdoor recreation and conservation education entities from funds apportioned under this title, and maintenance of such projects;

''(7) the term 'wildlife conservation education' means projects, including public outreach, intended to foster responsible natural resource stewardship; and

''(8) the term 'wildlife-restoration project' includes the wildlife conservation and restoration program and means the selection, restoration, rehabilitation, and improvement of areas of land or water adaptable as feeding, resting, or breeding places for wildlife, including acquisition of such areas or estates or interests therein as are suitable or capable of being made suitable therefor, and the construction thereon or therein of such works as may be necessary to make them available for such purposes and also including such research into problems of wildlife management as may be necessary to efficient administration affecting wildlife resources, and such preliminary or incidental costs and expenses as may be incurred in and about such projects.''.

(d) WILDLIFE CONSERVATION AND RESTORATION ACCOUNT.—Section 3 of the Federal Aid in Wildlife Restoration Act (16 U.S.C. 669b) is amended—

(1) in subsection (a) by inserting ''(1)'' after ''(a)'', and by adding at the end the following:

''(2) There is established in the Federal aid to wildlife restoration fund a subaccount to be known as the 'Wildlife Conservation and Restoration Account'. There are authorized to be appropriated for the purposes of the Wildlife Conservation and Restoration Account $50,000,000 in fiscal year 2001 for apportionment in accordance with this Act to carry out State wildlife conservation and restoration programs. Further, interest on amounts transferred shall be treated in a manner consistent with 16 U.S.C. 669(b)(1)).''; and

(2) by adding at the end the following:

''(c)(1) Amounts transferred to the Wildlife Conservation and Restoration Account shall supplement, but not replace, existing funds available to the States from the sport fish restoration account and wildlife restoration account and shall be used for the development, revision, and implementation of wildlife conservation and restoration programs and should be used to address the unmet needs for a diverse array of wildlife and associated habitats, including species that are not hunted or fished, for wildlife conservation, wildlife conservation education, and wildlife-associated recreation

projects. Such funds may be used for new programs and projects as well as to enhance existing programs and projects.

''(2) Funds may be used by a State or an Indian tribe for the planning and implementation of its wildlife conservation and restoration program and wildlife conservation strategy, as provided in sections 4(d) and (e) of this Act, including wildlife conservation, wildlife conservation education, and wildlife-associated recreation projects. Such funds may be used for new programs and projects as well as to enhance existing programs and projects.

''(3) Priority for funding from the Wildlife Conservation and Restoration Account shall be for those species with the greatest conservation need as defined by the State wildlife conservation and restoration program.

''(d) Notwithstanding subsections (a) and (b) of this section, with respect to amounts transferred to the Wildlife Conservation and Restoration Account, so much of such amounts apportioned to any State for any fiscal year as remains unexpended at the close thereof shall remain available for obligation in that State until the close of the second succeeding fiscal year.''.

(e) APPORTIONMENTS OF AMOUNTS.—Section 4 of the Federal Aid in Wildlife Restoration Act (16 U.S.C. 669c) is amended by adding at the end the following new subsection:

''(c) APPORTIONMENT OF WILDLIFE CONSERVATION AND RESTORATION ACCOUNT.—

''(1) The Secretary of the Interior shall make the following apportionment from the Wildlife Conservation and Restoration Account:

''(A) to the District of Columbia and to the Commonwealth of Puerto Rico, each a sum equal to not more than one-half of 1 percent thereof;

''(B) to Guam, American Samoa, the Virgin Islands, and the Commonwealth of the Northern Mariana Islands, each a sum equal to not more than one-fourth of 1 percent thereof.

''(2)(A) The Secretary of the Interior, after making the apportionment under paragraph (1), shall apportion the remaining amount in the Wildlife Conservation and Restoration Account for each fiscal year among the States in the following manner:

''(i) one-third of which is based on the ratio to which the land area of such State bears to the total land area of all such States; and

''(ii) two-thirds of which is based on the ratio to which the population of such State bears to the total population of all such States.

''(B) The amounts apportioned under this paragraph shall be adjusted equitably so that no such State shall be apportioned a sum which is less than one percent of the amount available for apportionment under this paragraph for any fiscal year or more than five percent of such amount.

''(3) Of the amounts transferred to the Wildlife Conservation and Restoration Account, not to exceed 3 percent shall be available for any Federal expenses incurred in the administration and execution of programs carried out with such amounts.

''(d) WILDLIFE CONSERVATION AND RESTORATION PROGRAMS.—

''(1) Any State, through its fish and wildlife department, may apply to the Secretary of the Interior for approval of a wildlife conservation and restoration program, or for funds from the Wildlife Conservation and Restoration Account, to develop a program. To apply, a State shall submit a comprehensive plan that includes—

''(A) provisions vesting in the fish and wildlife department of the State overall responsibility and accountability for the program;

''(B) provisions for the development and implementation of—

''(i) wildlife conservation projects that expand and support existing wildlife programs, giving appropriate consideration to all wildlife;

''(ii) wildlife-associated recreation projects; and

''(iii) wildlife conservation education projects pursuant to programs under section 8(a); and

''(C) provisions to ensure public participation in the development, revision, and implementation of projects and programs required under this paragraph.

''(D) WILDLIFE CONSERVATION STRATEGY.—Within five years of the date of the initial apportionment, develop and begin implementation of a wildlife conservation strategy based upon the best available and appropriate scientific information and data that—

''(i) uses such information on the distribution and abundance of species of wildlife, including low population and declining species as the State fish and wildlife department deems appropriate, that are indicative of the diversity and health of wildlife of the State;

''(ii) identifies the extent and condition of wildlife habitats and community types essential to conservation of species identified under paragraph (1);

''(iii) identifies the problems which may adversely affect the species identified under paragraph (1) or their habitats, and provides for priority research and surveys to identify factors which may assist in restoration and more effective conservation of such species and their habitats;

''(iv) determines those actions which should be taken to conserve the species identified under paragraph (1) and their habitats and establishes priorities for implementing such conservation actions;

''(v) provides for periodic monitoring of species identified under paragraph (1) and their habitats and the effectiveness of the conservation actions determined under paragraph (4), and for adapting conservation actions as appropriate to respond to new information or changing conditions;

''(vi) provides for the review of the State wildlife conservation strategy and, if appropriate, revision at intervals of not more than ten years;

''(vii) provides for coordination to the extent feasible the State fish and wildlife department, during the development, implementation, review, and revision of the wildlife conservation strategy, with Federal, State, and local agencies and Indian tribes that manage significant areas of land or water within the State, or administer programs that significantly affect the conservation of species identified under paragraph (1) or their habitats.

''(2) A State shall provide an opportunity for public participation in the development of the comprehensive plan required under paragraph (1).

''(3) If the Secretary finds that the comprehensive plan submitted by a State complies with paragraph (1), the Secretary shall approve the wildlife conservation and restoration program of the State and set aside from the apportionment to the State made pursuant to subsection (c) an amount that shall not exceed 75 percent of the estimated cost of developing and implementing the program.

''(4)(A) Except as provided in subparagraph (B), after the Secretary approves a State's wildlife conservation and restoration program, the Secretary may make payments on a project that is a segment of the State's wildlife conservation and restoration program as the project progresses. Such payments, including previous payments on the project, if any, shall not be more than the United States pro rata share of such project. The Secretary, under such regulations as he may prescribe, may advance funds representing the United States pro rata share of a project that is a segment of a wildlife conservation and restoration program, including funds to develop such program.

''(B) Not more than 10 percent of the amounts apportioned to each State under this section for a State's wildlife conservation and restoration program may be used for wildlife-associated recreation.

''(5) For purposes of this subsection, the term 'State' shall include the District of Columbia, the Commonwealth of Puerto Rico, the Virgin Islands, Guam, American Samoa, and the Commonwealth of the Northern Mariana Islands.''.

(f) FACA.—Coordination with State fish and wildlife agency personnel or with personnel of other State agencies pursuant to the Federal Aid in Wildlife Restoration Act or the Federal Aid in Sport Fish Restoration Act shall not be subject to the Federal Advisory Committee Act (5 U.S.C. App.). Except for the preceding sentence, the provisions of this title relate solely to wildlife conservation and restoration programs and shall not be construed to affect the provisions of the Federal Aid in Wildlife Restoration Act relating to wildlife restoration projects or the provisions of the Federal Aid in Sport Fish Restoration Act relating to fish restoration and management projects.

(g) EDUCATION.—Section 8(a) of the Federal Aid in Wildlife Restoration Act (16 U.S.C. 669g(a)) is amended by adding the following at the end thereof: ''Funds from the Wildlife Conservation and Restoration Account may be used for a wildlife conservation education program, except that no such funds may be used for education efforts, projects, or programs that promote or encourage opposition to the regulated taking of wildlife.''.

(h) PROHIBITION AGAINST DIVERSION.—No designated State agency shall be eligible to receive matching funds under this title if sources of revenue available to it after January 1, 2000, for conservation of wildlife are diverted for any purpose other than the administration of the designated State agency, it being the intention of Congress that funds available to States under this title be added to revenues from existing State sources and not serve as a substitute for revenues from such sources. Such revenues shall include interest, dividends, or other income earned on the foregoing.

(i) NORTH AMERICAN WETLANDS CONSERVATION ACT.—Section 7(c) of the North American Wetlands Conservation Act (16 U.S.C. 4406(c)) is amended by striking ''$30,000,000'' and inserting ''$50,000,000''.

STATE WILDLIFE GRANTS

The State wildlife grant program provides funds for States to develop and implement wildlife management and habitat restoration for the most critical wildlife needs in each State. States are required to develop comprehensive wildlife conservation plans to be eligible for grants and to provide at least a 25 percent cost share for planning grants and at least a 50 percent cost share for implementation grants. This program is funded under the conservation spending category.

Appropriation enacted, 2001	$49,890,000
Budget estimate, 2002	0
Recommended, 2002	100,000,000
Comparison:	
Appropriation, 2001	+50,110,000
Budget estimate, 2002	+100,000,000

The Committee recommends $100,000,000 for State wildlife grants, an increase of $100,000,000 above the budget request and $50,110,000 above the amount provided through the fiscal year 2001 Interior and Related Agencies Appropriations Act. The fiscal year 2002 funds are to be distributed to States and territories through a formula that is based 30 percent on land area and 70 percent on population. Each State or eligible entity must have developed, or committed to develop by October 1, 2005, a comprehensive wildlife conservation plan that must be approved by the Secretary of the Interior or her designee. These plans are to address the conservation of each State's or eligible entity's full array of wildlife, but are not expected to address every representative species or taxonomic group that may be present. With the preceding clarification of the ''full array'' requirement, the Committee believes that the plan elements identified in the Service's January 2001 Federal Register notice provide a solid scientific basis for these plans.

Each State or eligible entity has two years to enter into specific grant agreements with the Service using fiscal year 2002 funding. If funds remain unobligated at the end of fiscal year 2003, the unobligated funds will be reapportioned to all States and eligible entities, together with any new appropriations provided in fiscal year 2004.

The method for the distribution of funds, and the conditions associated thereto, consolidate the previously appropriated allocation grant program and the competitive grant program into a single allocation formula. Under the new program, States are required to comply with the planning and cost sharing requirements of the former competitive grants program but are guaranteed an allocation based on the new formula described above. The Committee is concerned that these grants result in on-the-ground improvements for wildlife as soon as possible and has included a requirement that fiscal year 2002 funds be obligated within 2 fiscal years.

Not more than 3 percent of the appropriated amount may be used for Federal administration of the program. Administrative costs for each grantee should also be held to a minimum so that the maximum amount of funding is used for on-the-ground projects.

$757,000 above the budget estimate and an increase of $757,000 above the fiscal year 2001 enacted level. Within the amounts provided, $1,000,000 is included for African elephants, $1,000,000 is for Asian elephants, $1,000,000 is for rhinoceros and tiger conservation, and $1,000,000 is for great ape conservation.

STATE WILDLIFE GRANTS FUND

(INCLUDING RECISSION)

Appropriations, 2001	$49,890,000
Budget estimate, 2002	.....
House allowance	100,000,000
Committee recommendation	100,000,000

The Committee recommends $100,000,000 for State wildlife grants, an increase of $100,000,000 above the budget request. Additionally, the Committee recommends rescinding the $49,890,000 in competitive State wildlife grants appropriated last fiscal year.

The fiscal year 2002 funds are to be distributed to States and territories through a formula that is based 30 percent on land area and 70 percent on population. Each State or eligible entity must have developed, or committed to develop by October 1, 2005, a comprehensive wildlife conservation plan that must be approved by the Secretary of the Interior or her designee. These plans are to address the conservation of each State's or eligible entity's broad range of wildlife.

Each State or eligible entity has 2 years to enter into specific grant agreements with the Service using fiscal year 2002 funding. If funds remain unobligated at the end of fiscal year 2003, the unobligated funds will be reapportioned to all States and eligible entities, together with any new appropriations provided in fiscal year 2004.

The method for the distribution of funds, and the conditions associated thereto, consolidate the previously appropriated allocation grant program and the competitive grant program into a single allocation formula. Under the new program, States are required to comply with the planning and cost sharing requirements of the former competitive grants program but are guaranteed an allocation based on the new formula described above. The Committee is concerned that these grants result in on-the-ground improvements for wildlife as soon as possible and has included a requirement that fiscal year 2002 funds be obligated within 2 fiscal years.

Not more than 3 percent of the appropriated amount may be used for Federal administration of the program. Administrative costs for each grantee should also be held to a minimum so that the maximum amount of funding is used for on-the-ground projects.

NATIONAL PARK SERVICE

OPERATION OF THE NATIONAL PARK SYSTEM

Appropriations, 2001	$1,386,190,000
Budget estimate, 2002	1,470,499,000
House allowance	1,480,336,000
Committee recommendation	1,473,128,000

interested in pursuing a RAMSAR-based wetlands science, site management and education program. The managers strongly encourage the Service to work with these groups to explore the possibility of funding such an activity through a North American Wetlands Conservation Act grant or another Service program.

The managers have agreed to bill language, as proposed by the House, limiting increased grant funding above the fiscal year 2001 level to projects in the United States. The Senate had no similar provision.

NEOTROPICAL MIGRATORY BIRD CONSERVATION

The conference agreement provides $3,000,000 for the neotropical migratory bird conservation program instead of $5,000,000 as proposed by the House and no funding as proposed by the Senate. None of these funds are charged against the conservation spending category.

The managers expect the program to be administered by the division of bird habitat conservation but the Service should incorporate international program staff expertise into the oversight and administration of the program.

MULTINATIONAL SPECIES CONSERVATION FUND

The conference agreement provides $4,000,000 for the multinational species conservation fund as proposed by both the House and the Senate.

The managers have agreed to bill language, as proposed by the House, specifying the public law citations for the Asian elephant and the rhino and tiger funds.

STATE WILDLIFE GRANTS

(INCLUDING RESCISSION OF FUNDS)

The conference agreement provides $85,000,000 for State wildlife grants in fiscal year 2002 instead of $100,000,000 as proposed by both the House and the Senate. Within this amount, $5,000,000 is for a competitive grant program for Indian tribes. The agreement also provides for the rescission of $25,000,000 from the fiscal year 2001 appropriation rather than a rescission of $49,890,000 as proposed by the Senate and no rescission as proposed by the House.

The managers agree to the clarification of the ''full array'' of wildlife requirement for planning contained in the House report.

The managers have agreed to the distribution formula in bill language proposed by the Senate rather than the formula proposed by the House. The managers have also agreed to a technical change to the conservation spending category bill language proposed by the Senate.

TRIBAL WILDLIFE GRANTS

The conference agreement provides no funding under this heading for tribal wildlife grants; however, $5,000,000 is earmarked under the State wildlife grant program for this purpose.

STATE WILDLIFE GRANTS

(INCLUDING RESCISSION OF FUNDS)

For wildlife conservation grants to States and to the District of Columbia, Puerto Rico, Guam, the United States Virgin Islands, the Northern Mariana Islands, American Samoa, and federally recognized Indian tribes under the provisions of the Fish and Wildlife Act of 1956 and the Fish and Wildlife Coordination Act, for the development and implementation of programs for the benefit of wildlife and their habitat, including species that are not hunted or fished, $85,000,000, to be derived from the Land and Water Conservation Fund, to remain available until expended, and to be for the conservation activities defined in section 250(c)(4)(E) of the Balanced Budget and Emergency Deficit Control Act of 1985, as amended, for the purposes of such Act: *Provided*, That of the amount provided herein, $5,000,000 is for a competitive grant program for Indian tribes not subject to the remaining provisions of this appropriation: *Provided further*, That the Secretary shall, after deducting said $5,000,000 and administrative expenses, apportion the amount provided herein in the following manner: (A) to the District of Columbia and to the Commonwealth of Puerto Rico, each a sum equal to not more than one-half of 1 percent thereof: and (B) to Guam, American Samoa, the United States Virgin Islands, and the Commonwealth of the Northern Mariana Islands, each a sum equal to not more than one-fourth of 1 percent thereof: *Provided further*, That the Secretary shall apportion the remaining amount in the following manner: (A) one-third of which is based on the ratio to which the land area of such State bears to the total land area of all such States; and (B) two-thirds of which is based on the ratio to which the population of such State bears to the total population of all such States: *Provided further*, That the amounts apportioned under this paragraph shall be adjusted equitably so that no State shall be apportioned a sum which is less than 1 percent of the amount available for apportionment under this paragraph for any fiscal year or more than 5 percent of such amount: *Provided further*, That the Federal share of planning grants shall not exceed 75 percent of the total costs of such projects and the Federal share of implementation grants shall not exceed 50 percent of the total costs of such projects: *Provided further*, That the non-Federal share of such projects may not be derived from Federal grant programs: *Provided further*, That no State, territory, or other jurisdiction shall receive a grant unless it has developed, or committed to develop by October 1, 2005, a comprehensive wildlife conservation plan, consistent with criteria established by the Secretary of the Interior, that considers the broad range of the State, territory, or other jurisdiction's wildlife and associated habitats, with appropriate priority placed on those species with the greatest conservation need and taking into consideration the relative level of funding available for the conservation of those species: *Provided further*, That any amount apportioned in 2002 to any State, territory, or other jurisdiction that remains unobligated as of September 30, 2003, shall be reapportioned, together with funds appropriated in 2004, in the manner provided herein.

Of the amounts appropriated in title VIII of Public Law 106–291, $25,000,000 for State Wildlife Grants are rescinded.

qualified organizations and individuals to protect and manage critical populations of these elephants.

The Rhinoceros and Tiger Conservation Act of 1994 authorized programs to enhance compliance with the Convention on International Trade in Endangered Species (CITES) and U.S. or foreign laws prohibiting the taking or trade of rhinoceros, tigers or their habitat.

The Asian Elephant Conservation Act of 1997 authorized a grant program, similar to the African elephant program, to enable cooperators from regional and range country agencies and organizations to address Asian elephant conservation problems. The world's surviving populations of wild Asian elephants are found in 13 south and southeastern Asian countries.

The Great Ape Conservation Act of 2000 authorized grants to foreign government, the CITES secretariat, and non-governmental organizations for the conservation of great apes.

Appropriation enacted, 2002	$4,000,000
Budget estimate, 2003	5,000,000
Recommended, 2003	4,800,000
Comparison:	
Appropriation, 2002	+800,000
Budget estimate, 2003	−200,000

The Committee recommends $4,800,000 for the multinational species conservation fund, an increase of $800,000 above the fiscal year 2002 level and $200,000 below the budget request. Changes to the budget request include a decrease of $1,000,000 for neotropical migratory birds (which is funded in a separate account) and an increase of $800,000, which includes $200,000 each for African elephant conservation, rhinoceros and tiger conservation, Asian elephant conservation, and great ape conservation. The Committee expects these funds to be matched by non-Federal funding to leverage private contributions to the maximum extent possible. This program is funded under the conservation spending category.

STATE WILDLIFE GRANTS

The State wildlife grant program provides funds for States to develop and implement wildlife management and habitat restoration for the most critical wildlife needs in each State. States are required to develop comprehensive wildlife conservation plans to be eligible for grants and to provide at least a 25 percent cost share for planning grants and at least a 50 percent cost share for implementation grants. This program is funded under the conservation spending category.

Appropriation enacted, 2002	$60,000,000
Budget estimate, 2003	60,000,000
Recommended, 2003	100,000,000
Comparison:	
Appropriation, 2002	+40,000,000
Budget estimate, 2003	+40,000,000

The Committee recommends $100,000,000 for State wildlife grants, an increase of $40,000,000 above both the budget request and the 2002 level, after adjusting for the $25,000,000 rescission in the 2002 Act. Within the amount provided, $5,000,000 is for competitively awarded grants to Indian tribes.

The Committee notes that the State wildlife grants program has had numerous problems with implementation over the past two years and reminds the Service that the centerpiece to a strong program must be solid, scientifically-based State plans. These plans should address the conservation of each State's or eligible entity's full array of wildlife and stress on the ground restoration and protection of habitat for the species of greatest concern. State plans should not be approved if they do not meet the standards set by the Service.

The Committee has recommended a $1,000,000 increase in the Service's resource management appropriation for the Service to contract with the National Academy of Sciences to ensure that the criteria established by the Service for State plans under the State wildlife grants program are appropriate and that those standards are strictly adhered to in each State plan. The Service should proceed with the distribution of funds and the implementation of the program. There should be no disruption or delay pending the Academy's review.

Each State or eligible entity has two years to enter into specific grant agreements with the Service using fiscal year 2003 funding. If funds remain unobligated at the end of fiscal year 2004, the unobligated funds will be reapportioned to all States and eligible entities, together with any new appropriations provided in fiscal year 2005.

Not more than 3 percent of the appropriated amount may be used for Federal administration of the program. Administrative costs for each grantee should also be held to a minimum so that the maximum amount of funding is used for on-the-ground projects.

NATIONAL PARK SERVICE

The mission of the National Park Service is to preserve unimpaired the natural and cultural resources and values of the national park system for the enjoyment, education, and inspiration of this and future generations. The National Park Service cooperates with partners to extend the benefits of natural and cultural resource conservation and outdoor recreation throughout this country and the world.

The National Park Service, established in 1916, has stewardship responsibilities for the protection and preservation of the heritage resources of the National Park System. The system, consisting of 385 separate and distinct units, is recognized globally as a leader in park management and resource preservation. The national park system represents much of the finest the Nation has to offer in terms of scenery, historical and archeological relics, and cultural heritage. Through its varied sites, the National Park Service attempts to explain America's history, interpret its culture, preserve examples of its natural ecosystems, and provide recreational and educational opportunities for U.S. citizens and visitors from all over the world. In addition, the National Park Service provides support to tribal, local, and State governments to preserve culturally significant, ecologically important, and public recreational lands.

MULTINATIONAL SPECIES CONSERVATION FUND

Appropriations, 2002	$4,000,000
Budget estimate, 2003	5,000,000
Committee recommendation	5,500,000

The Committee recommends an appropriation of $5,500,000 for the multinational species conservation fund, an increase of $500,000 above the budget estimate. The increase is provided for rhinoceros and tiger conservation.

STATE WILDLIFE GRANTS FUND

Appropriations, 2002	$60,000,000
Budget estimate, 2003	60,000,000
Committee recommendation	60,000,000

The Committee recommends $60,000,000 for the State and Tribal Wildlife grant program. Of the $60,000,000 provided, $5,000,000 is provided for tribal grants. The Committee believes there are opportunities to develop synergies between the State and Tribal Wildlife Grants program and the State Assistance program funded through the National Park Service. The Committee has addressed this issue in the National Park Service, Land Acquisition and State Assistance section of the report.

NATIONAL PARK SERVICE

OPERATION OF THE NATIONAL PARK SYSTEM

Appropriations, 2002	$1,487,075,000
Budget estimate, 2003	1,584,565,000
Committee recommendation	1,585,065,000

The Committee recommends $1,585,065,000 for operation of the national park system, an increase of $97,990,000 above the fiscal year 2002 enacted level, and $500,000 above the budget request. Increases above the current enacted level include $16,466,000 in fixed costs, and an overall increase of $20,000,000 in basic park operations. The Committee is aware of the unmet needs in many our nation's parks and has included the additional $20,000,000 in an effort to address those needs.

The following table shows the amounts recommended by the Committee as compared with the budget request:

	Budget estimate	Committee recommendation	Change
Park management:			
Resource stewardship	$334,923,000	$340,227,000	+$5,304,000
Visitor services	309,681,000	319,128,000	+9,447,000
Maintenance	531,428,000	537,823,000	+6,395,000
Park support	300,297,000	279,651,000	−20,646,000
External administrative costs	108,236,000	108,236,000	.....
Total, Operation of the National Park System	1,584,565,000	1,585,065,000	+500,000

Resource Stewardship.—The Committee recommends $340,227,000 for resource stewardship, an increase of $21,915,000 above the fiscal year 2002 enacted level, and $5,304,000 above the budget request. Within the amount provided, $600,000 is for additional funding for the Vanishing Treasures program, and $500,000

Area and State	*Committee Recommendation*
State Assistance Grant Administration	4,000,000
Subtotal, NPS State Land Acquisition	144,000,000
Total, NPS Land Acquisition and State Assistance	238,205,000

The amount provided for the acquisition of Cat Island at the Gulf Island National Seashore is based on the latest information available to the Committee regarding the acreage and value of lands to be acquired. The Committee is aware that discussions are ongoing among the National Park Service, the landowner and third party interests, and that the amount required to complete phase two of this acquisition may change. The Service should keep the Committee informed of the status of these discussions.

The Committee recognizes the historical importance of the Elkhorn Ranch in western North Dakota, and understands that the National Park Service is issuing an Environmental Assessment (EA) concerning the purchase of this land for use as a National Preserve. The EA is currently being drafted with a target completion date of August 30, 2002. Should the NPS recommend the purchase of the Elkhorn Ranch, the Committee will consider funding for this purchase.

The Committee is aware that legislation is pending to authorize the acquisition of Pemberton's Headquarters for inclusion in Vicksburg National Military Park. Should such legislation be enacted, the Committee directs the Service to complete the acquisition using acquisition balances available at the Park, together with additional carryover balances if necessary.

The Committee has provided $200,000 to purchase the interpretive center at Cross Plains along the Ice Age Scenic Trail. The Committee understands that this amount combined with the current unobligated balance is sufficient to complete the purchase.

The Committee authorizes the purchase of land from willing sellers under the Inholding program of the National Park Service (Units of the System authorized before fiscal year 1960) without referring the offers to the Committee for approval unless the acquisition is more than the approved appraisal and said appraised value is greater than $500,000.

In addition to the amount provided for State Assistance, the Committee has provided significant funding for State and Tribal Wildlife Grants through the U.S. Fish and Wildlife Service. The Committee believes that these two programs can be mutually beneficial, as grants supported by the State Assistance program may be beneficial to non-game wildlife and grants supported by the State and Tribal Wildlife Grants program may have associated recreation benefits. The Committee urges the Department to work with States, tribes and other relevant stakeholders to explore opportunities to develop synergies between these two programs.

$5,000,000 as proposed by the House and $2,000,000 as proposed by the Senate.

MULTINATIONAL SPECIES CONSERVATION FUND

The conference agreement provides $4,800,000 for the multinational species conservation fund as proposed by the House instead of $4,200,000 as proposed by the Senate.

STATE AND TRIBAL WILDLIFE GRANTS

The conference agreement provides $65,000,000 for State and tribal wildlife grants instead of $100,000,000 as proposed by the House and $45,000,000 as proposed by the Senate. Within this amount, $5,000,000 is for a competitive grant program for Indian tribes as proposed by the House instead of $3,000,000 as proposed by the Senate.

The conference agreement changes the title of this account from "State Wildlife Grants" to "State and Tribal Wildlife Grants" as proposed by the Senate and includes statutory language permitting the merger of funds in the old account with funds in the new account.

The Committee has not included $1,000,000 in the resource management account as proposed by the House for a National Academy of Sciences review of the State wildlife plans funded under this account. This issue will be revisited in the 2004 budget process.

ADMINISTRATIVE PROVISIONS

The conference agreement authorizes the use of $500,000 in previously appropriated funds for land acquisition of the Great Salt Pond burial tract for the Narragansett Tribe as proposed by the Senate. The House had no similar provision.

NATIONAL PARK SERVICE

OPERATION OF THE NATIONAL PARK SYSTEM

The conference agreement provides $1,565,565,000 for the operation of the national park system instead of $1,605,593,000 as proposed by the House and $1,571,065,000 as proposed by the Senate.

The conference agreement provides $344,227,000 for resource stewardship. The change to the House level is a reduction of $2,093,000 for uncontrollable costs. Within these totals, an increase of $600,000 is provided for Vanishing Treasures.

The conference agreement provides $319,128,000 for visitor services. The change to the House level is a reduction of $3,536,000 for uncontrollable costs.

The conference agreement provides $522,823,000 for maintenance. Changes to the House level include decreases of $3,837,000 for uncontrollable costs, $5,000,000 for cyclic maintenance, $2,000,000 for condition assessments, $3,000,000 for repair and rehabilitation, and $1,000,000 for a strategic business advisor.

The conference agreement provides $277,151,000 for park support. Changes to the House level include decreases of $2,562,000

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February 20, 2003

MULTINATIONAL SPECIES CONSERVATION FUND

For expenses necessary to carry out the African Elephant Conservation Act (16 U.S.C. 4201–4203, 4211–4213, 4221–4225, 4241–4245, and 1538), the Asian Elephant Conservation Act of 1997 (Public Law 105–96; 16 U.S.C. 4261–4266), the Rhinoceros and Tiger Conservation Act of 1994 (16 U.S.C. 5301–5306), and the Great Ape Conservation Act of 2000 (16 U.S.C. 6301), $4,800,000, to remain available until expended.

STATE AND TRIBAL WILDLIFE GRANTS

For wildlife conservation grants to States and to the District of Columbia, Puerto Rico, Guam, the United States Virgin Islands, the Northern Mariana Islands, American Samoa, and federally recognized Indian tribes under the provisions of the Fish and Wildlife Act of 1956 and the Fish and Wildlife Coordination Act, for the development and implementation of programs for the benefit of wildlife and their habitat, including species that are not hunted or fished, $65,000,000, to be derived from the Land and Water Conservation Fund and to remain available until expended: *Provided,* That of the amount provided herein, $5,000,000 is for a competitive grant program for Indian tribes not subject to the remaining provisions of this appropriation: *Provided further,* That the Secretary shall, after deducting said $3,000,000 and administrative expenses, apportion the amount provided herein in the following manner: (A) to the District of Columbia and to the Commonwealth of Puerto Rico, each a sum equal to not more than one-half of 1 percent thereof: and (B) to Guam, American Samoa, the United States Virgin Islands, and the Commonwealth of the Northern Mariana Islands, each a sum equal to not more than one-fourth of 1 percent thereof: *Provided further,* That the Secretary shall apportion the remaining amount in the following manner: (A) one-third of which is based on the ratio to which the land area of such State bears to the total land area of all such States; and (B) two-thirds of which is based on the ratio to which the population of such State bears to the total population of all such States: *Provided further,* That the amounts apportioned under this paragraph shall be adjusted equitably so that no State shall be apportioned a sum which is less than 1 percent of the amount available for apportionment under this paragraph for any fiscal year or more than 5 percent of such amount: *Provided further,* That the Federal share of planning grants shall not exceed 75 percent of the total costs of such projects and the Federal share of implementation grants shall not exceed 50 percent of the total costs of such projects: *Provided further,* That the non-Federal share of such projects may not be derived from Federal grant programs: *Provided further,* That no State, territory, or other jurisdiction shall receive a grant unless it has developed, or committed to develop by October 1, 2005, a comprehensive wildlife conservation plan, consistent with criteria established by the Secretary of the Interior, that considers the broad range of the State, territory, or other jurisdiction's wildlife and associated habitats, with appropriate priority placed on those species with the greatest conservation need and taking into consideration the relative level of funding available for the conservation of those species: *Provided further,* That any amount apportioned in 2003 to any State, territory, or other jurisdiction that remains unobligated as of September 30, 2004, shall be reapportioned,

together with funds appropriated in 2005, in the manner provided herein: *Provided further,* That balances from amounts previously appropriated under the heading "State Wildlife Grants" shall be transferred to and merged with this appropriation and shall remain available until expended.

ADMINISTRATIVE PROVISIONS

Appropriations and funds available to the United States Fish and Wildlife Service shall be available for purchase of not to exceed 102 passenger motor vehicles, of which 75 are for replacement only (including 39 for police-type use); repair of damage to public roads within and adjacent to reservation areas caused by operations of the Service; options for the purchase of land at not to exceed $1 for each option; facilities incident to such public recreational uses on conservation areas as are consistent with their primary purpose; and the maintenance and improvement of aquaria, buildings, and other facilities under the jurisdiction of the Service and to which the United States has title, and which are used pursuant to law in connection with management and investigation of fish and wildlife resources: *Provided,* That notwithstanding 44 U.S.C. 501, the Service may, under cooperative cost sharing and partnership arrangements authorized by law, procure printing services from cooperators in connection with jointly produced publications for which the cooperators share at least one-half the cost of printing either in cash or services and the Service determines the cooperator is capable of meeting accepted quality standards: *Provided further,* That the Service may accept donated aircraft as replacements for existing aircraft: *Provided further,* That the United States Fish and Wildlife Service is authorized to grant $500,000 appropriated in Public Law 107–63 for land acquisition to the Narragansett Indian Tribe for acquisition of the Great Salt Pond burial tract: *Provided further,* That notwithstanding any other provision of law, the Secretary of the Interior may not spend any of the funds appropriated in this Act for the purchase of lands or interests in lands to be used in the establishment of any new unit of the National Wildlife Refuge System unless the purchase is approved in advance by the House and Senate Committees on Appropriations in compliance with the reprogramming procedures contained in Senate Report 105–56.

NATIONAL PARK SERVICE

OPERATION OF THE NATIONAL PARK SYSTEM

For expenses necessary for the management, operation, and maintenance of areas and facilities administered by the National Park Service (including special road maintenance service to trucking permittees on a reimbursable basis), and for the general administration of the National Park Service, $1,565,565,000, of which $10,878,000 for planning and interagency coordination in support of Everglades restoration shall remain available until expended; of which $85,280,000, to remain available until September 30, 2004, is for maintenance repair or rehabilitation projects for constructed assets, operation of the National Park Service automated facility management software system, and comprehensive facility condition assessments; and of which $2,000,000 is for the Youth Conservation Corps for high priority projects: *Provided,* That the only funds

national Trade in Endangered Species (CITES) and U.S. or foreign laws prohibiting the taking or trade of rhinoceros, tigers or their habitat.

The Asian Elephant Conservation Act of 1997 authorized a grant program, similar to the African elephant program, to enable cooperators from regional and range country agencies and organizations to address Asian elephant conservation problems. The world's surviving populations of wild Asian elephants are found in 13 south and southeastern Asian countries.

The Great Ape Conservation Act of 2000 authorized grants to foreign government, the CITES secretariat, and non-governmental organizations for the conservation of great apes.

Appropriation enacted, 2003	$4,768,000
Budget estimate, 2004	7,000,000
Recommended, 2004	5,000,000
Comparison:	
Appropriation, 2003	+232,000
Budget estimate, 2004	−2,000,000

The Committee recommends $5,000,000 for the multinational species conservation fund, an increase of $232,000 above the fiscal year 2003 level and $2,000,000 below the budget request. Changes to the budget request include a decrease of $3,000,000 for neotropical migratory birds (which is funded in a separate account) and an increase of $1,000,000 including $200,000 each for African elephant conservation, Asian elephant conservation, and great ape conservation and $400,000 for rhinoceros and tiger conservation. The Committee expects these funds to be matched by non-Federal funding to leverage private contributions to the maximum extent possible.

STATE AND TRIBAL WILDLIFE GRANTS

The State and tribal wildlife grant program provides funds for States to develop and implement wildlife management and habitat restoration for the most critical wildlife needs in each State. States are required to develop comprehensive wildlife conservation plans to be eligible for grants and to provide at least a 25 percent cost share for planning grants and at least a 50 percent cost share for implementation grants.

Appropriation enacted, 2003	$64,577,000
Budget estimate, 2004	59,983,000
Recommended, 2004	75,000,000
Comparison:	
Appropriation, 2003	+10,423,000
Budget estimate, 2004	+15,017,000

The Committee recommends $75,000,000 for State and tribal wildlife grants, an increase of $15,017,000 above the budget request and $10,423,000 above the fiscal year 2003 level. Within the amount provided, $6,000,000 is for competitively awarded grants to Indian tribes.

Each State or eligible entity has two years to enter into specific grant agreements with the Service using fiscal year 2004 funding. If funds remain unobligated at the end of fiscal year 2005, the unobligated funds will be reapportioned to all States and eligible entities, together with any new appropriations provided in fiscal year 2006.

Not more than 3 percent of the appropriated amount may be used for Federal administration of the program. Administrative costs for each grantee should also be held to a minimum so that the maximum amount of funding is used for on-the-ground projects.

NATIONAL PARK SERVICE

The mission of the National Park Service is to preserve unimpaired the natural and cultural resources and values of the national park system for the enjoyment, education, and inspiration of this and future generations. The National Park Service cooperates with partners to extend the benefits of natural and cultural resource conservation and outdoor recreation throughout this country and the world.

The National Park Service, established in 1916, has stewardship responsibilities for the protection and preservation of the heritage resources of the national park system. The system, consisting of 388 separate and distinct units, is recognized globally as a leader in park management and resource preservation. The national park system represents much of the finest the Nation has to offer in terms of scenery, historical and archeological relics, and cultural heritage. Through its varied sites, the National Park Service attempts to explain America's history, interpret its culture, preserve examples of its natural ecosystems, and provide recreational and educational opportunities for U.S. citizens and visitors from all over the world. In addition, the National Park Service provides support to tribal, local, and State governments to preserve culturally significant, ecologically important, and public recreational lands.

OPERATION OF THE NATIONAL PARK SYSTEM

Appropriation enacted, 2003	$1,564,331,000
Budget estimate, 2004	1,631,882,000
Recommended, 2004	1,636,882,000
Comparison:	
Appropriation, 2003	+72,551,000
Budget estimate, 2004	+5,000,000

The amounts recommended by the Committee compared with the budget estimates by activity are shown in the following table:

groups involved in endangered species recovery efforts on private lands.

COOPERATIVE ENDANGERED SPECIES CONSERVATION FUND

Appropriations, 2003	$80,473,000
Budget estimate, 2004	86,614,000
Committee recommendation	86,614,000

The Committee recommends $86,614,000 for the cooperative endangered species conservation fund, of which $2,585,000 is for administration and $50,000,000 is for habitat conservation plan land acquisition.

NATIONAL WILDLIFE REFUGE FUND

Appropriations, 2003	$14,320,000
Budget estimate, 2004	14,414,000
Committee recommendation	14,414,000

The Committee recommends $14,414,000 for the national wildlife refuge fund, the same as the budget request.

NORTH AMERICAN WETLANDS CONSERVATION FUND

Appropriations, 2003	$38,309,000
Budget estimate, 2004	49,560,000
Committee recommendation	42,982,000

The Committee recommends $42,982,000 for the North American wetlands conservation fund, a reduction of $6,578,000 below the budget request.

NEOTROPICAL MIGRATORY BIRD CONSERVATION

Appropriations, 2003	$2,981,000
Budget estimate, 2004	.....
Committee recommendation	3,000,000

The Committee recommends $3,000,000 for neotropical migratory bird conservation.

MULTINATIONAL SPECIES CONSERVATION FUND

Appropriations, 2003	$4,768,000
Budget estimate, 2004	7,000,000
Committee recommendation	6,000,000

The Committee recommends an appropriation of $6,000,000 for the multinational species conservation fund, a decrease of $1,000,000 below the budget estimate. The funds for neotropical birds have been provided under a separate heading. Funds within this account shall be equally divided between the four programs (African elephant, Rhino and Tiger, Asian elephant and Great ape conservation).

STATE AND TRIBAL WILDLIFE GRANTS

Appropriations, 2003	$64,577,000
Budget estimate, 2004	59,983,000
Committee recommendation	75,000,000

The Committee recommends $75,000,000 for State and tribal wildlife grants. Of the amount provided, $5,000,000 is provided for tribal grants.

In addition to the amount provided for State and Tribal Wildlife Grants, the Committee has provided significant funding for the LWCF State Assistance program through the National Park Service. The Committee believes that these two programs can be mutually beneficial, as grants supported by the State Assistance program may be beneficial to non-game wildlife and grants supported by the State and Tribal Wildlife Grants program may have associated recreation benefits. The Committee urges the Department to work with States, tribes, and other relevant stakeholders to explore opportunities to develop synergies between these two programs.

The Committee expects that funds provided under this heading shall be added to revenues from existing State sources and not serve as a substitute for revenues from such sources.

The Committee has included bill language that allows individual States to use up to 10 percent of the funds they receive under this heading to be used for wildlife conservation education efforts that contribute significantly to the conservation of wildlife species or their habitats.

NATIONAL PARK SERVICE

OPERATION OF THE NATIONAL PARK SYSTEM

Appropriations, 2003	$1,564,331,000
Budget estimate, 2004	1,631,882,000
Committee recommendation	1,636,299,000

The Committee recommends $1,636,299,000 for operation of the National Park System, an increase of $71,968,000 over the enacted level. The amount provided reflects all proposed transfers and IT savings, and includes an increase of $20,000,000 over the budget request for park base operating budgets. Of the funds provided above the budget request for park base operating increases, $1,000,000 should be allocated to the National Trails program.

Resource Stewardship.—The Committee recommends $342,485,000 for resource stewardship, an increase of $4,336,000 over the enacted level. Changes to the enacted level included increases of $1,945,000 for fixed costs, $225,000 for the Cumberland Piedmont Network Learning Center, $750,000 to monitor chronic wasting disease, $5,000,000 for inventory and monitoring, $600,000 for water quality monitoring, $750,000 for vanishing treasures, and $6,862,000 for park operations. Decreases include $200,000 for Greenspaces for Living as proposed in the budget request.

Visitor Services.—The Committee recommends $323,965,000 for visitor services, and increase of $8,590,000 over the enacted level. Changes to the enacted level included increases of $3,350,000 for fixed costs, $1,400,000 for law enforcement training, and $6,866,000 for park operations. The recommended amount also reflects the decreases proposed in the budget request.

Maintenance.—The Committee recommends $567,294,000 for maintenance, an increase of $47,324,000 over the enacted level. Changes to the enacted level included increases of $3,645,000 for fixed costs, $9,315,000 for repair and rehabilitation, $2,606,000 for

Area and State	Committee recommendation
State Assistance Grant Administration	4,000,000
Total, State Assistance	104,000,000
TOTAL, NPS Land Acquisition and State Assistance	158,473,000

The Committee understands that the funds provided for Valley Forge NP, together with reprogrammed funds and carryover balances, are sufficient to complete Phase I of the Toll Brothers acquisition. The Committee further understands that reprogrammed funds are being made available for the acquisition of 15 acres recently added to Booker T. Washington NM. The amount provided for Hawaii Volcanoes NP, together with carryover balances and reprogrammed funds, are sufficient to complete the acquisition of Kahuku Ranch.

The National Park Service is currently completing an environmental assessment on expanding the boundary of Theodore Roosevelt National Park to include the Elkhorn Ranch. The Committee is aware that, while local comments overwhelmingly support the creation of a National Preserve, the Park Service has not considered this option. Given expressed local support, the Committee directs the Park Service to reevaluate study comments to consider the creation of a National Preserve. The Committee expects the Park Service to report back to the Committee on its findings within 90 days of enactment of this Act.

In addition to the amount provided for State Assistance, the Committee has provided significant funding for State and Tribal Wildlife Grants through the U.S. Fish and Wildlife Service. The Committee believes that these two programs can be mutually beneficial, as grants supported by the State Assistance program may be beneficial to non-game wildlife and grants supported by the State and Tribal Wildlife Grants may have associated recreation benefits. The Committee urges the Department to work with States, tribes and other relevant stakeholders to explore opportunities to develop synergies between these two programs.

In the absence of mitigating circumstances, the governors of the States and territories shall be officially informed of LWCF State assistance apportionments within 30 days of enactment.

ENERGY AND MINERALS

U.S. GEOLOGICAL SURVEY

SURVEYS, INVESTIGATIONS, AND RESEARCH

Appropriations, 2003	$919,272,000
Budget estimate, 2004	895,505,000
Committee recommendation	928,864,000

The Committee recommends an appropriation of $928,864,000 for the United States Geological Survey (USGS) for fiscal year 2004, an amount of $9,592,000 above the fiscal year 2003 enacted level. The detail table at the back of the report displays the Committee's proposed distribution of funds among the Survey's activities.

STEWARDSHIP GRANTS

The conference agreement provides $7,500,000 for stewardship grants instead of $10,000,000 as proposed by both the House and the Senate.

COOPERATIVE ENDANGERED SPECIES CONSERVATION FUND

The conference agreement provides $82,614,000 for the cooperative endangered species conservation fund instead of $86,614,000 as proposed by both the House and the Senate. The managers have agreed to a decrease of $4,000,000 for Section 6 grants.

NATIONAL WILDLIFE REFUGE FUND

The conference agreement provides $14,414,000 for the national wildlife refuge fund as proposed by both the House and the Senate.

NORTH AMERICAN WETLANDS CONSERVATION FUND

The conference agreement provides $38,000,000 for the North American wetlands conservation fund instead of $24,560,000 as proposed by the House and $42,982,000 as proposed by the Senate. Increases to the House proposed level include $12,902,000 for wetlands conservation and $538,000 for administration.

NEOTROPICAL MIGRATORY BIRD CONSERVATION

The conference agreement provides $4,000,000 for Neotropical migratory bird conservation instead of $5,000,000 as proposed by the House and $3,000,000 as proposed by the Senate.

MULTINATIONAL SPECIES CONSERVATION FUND

The conference agreement provides $5,600,000 for the multinational species conservation fund instead of $5,000,000 as proposed by the House and $6,000,000 as proposed by the Senate. Changes to the House level include an increase of $200,000 each for the African elephant program, the Asian elephant program, and the great apes program.

STATE AND TRIBAL WILDLIFE GRANTS

The conference agreement provides $70,000,000 for State and tribal wildlife grants instead of $75,000,000 as proposed by both the House and the Senate.

Bill Language.—The conference agreement earmarks $6,000,000 for competitive grants with tribes as proposed by the House instead of $5,000,000 as proposed by the Senate. The conference agreement does not include bill language proposed by the Senate on the use of funds for education efforts. This issue is addressed below.

The managers agree that the purpose of State and tribal wildlife grants is to restore and protect habitat. To the extent that an education component is critical to the success of a habitat restoration and preservation project, it is permissible. The managers expect that such an education component should involve a de minimus amount of funding and will not be required for many projects.

An example of an acceptable education component is on-site posting of signs explaining the purpose of a habitat restoration project and explaining why it is important to avoid trespassing on newly restored habitat. Another example is the development of an explanatory handout or simple brochure that could be distributed to interested parties. In no case should the cost of an education component exceed 10 percent of the funding for a project.

While the managers agree that there may be synergies between the State and tribal wildlife grant program and the State assistance program in the National Park Service, the managers caution the Service and the States that the mission of the State and tribal wildlife grant program is habitat restoration and preservation.

ADMINISTRATIVE PROVISIONS

The conference agreement includes language referring to the reprogramming guidelines in the front of the statement of the managers accompanying this Act. The House and Senate had referenced the reprogramming guidelines in earlier reports.

NATIONAL PARK SERVICE

OPERATION OF THE NATIONAL PARK SYSTEM

The conference agreement provides $1,629,641,000 for the operation of the national park system instead of $1,630,882,000 as proposed by the House and $1,636,299,000 as proposed by the Senate.

The conference agreement provides $340,114,000 for resource stewardship. Changes to the House level include a reduction of $1,106,000 to restore half of the fiscal year 2003 across the board reduction, an increase of $3,102,000 for park specific increases, a reduction of $2,924,000 for inventory and monitoring programs, an increase of $225,000 for Cumberland Piedmont Network, and an increase of $375,000 for Vanishing Treasures.

The conference agreement provides $324,348,000 for Visitor Services. Changes to the House level include a decrease of $1,031,000 to restore half of the fiscal year 2003 across the board reduction, and an increase of $649,000 for park specific increases.

The conference agreement provides $567,230,000 for maintenance. Changes to the House level include a reduction of $1,701,000 to restore half of the fiscal year 2003 across the board reduction, an increase of $1,765,000 for park specific increases, and a reduction of $2,000,000 for facility condition assessments.

The conference agreement provides $286,378,000 for park support. Changes to the House level include reductions of $516,000 for park specific increases, $500,000 for management accountability review, and $927,000 to restore half of the fiscal year 2003 across the board reduction and increases of $300,000 for partnership wild and scenic rivers programs and $400,000 to expand the volunteers in parks programs.

The conference agreement provides $114,571,000 for external administrative costs. This is a reduction of $352,000 from the House level.

There is a general reduction of $3,000,000.

FY 2004 Interior Appropriations Act
(H.R. 2691/P.L. 108-108)
November 10, 2003

STATE AND TRIBAL WILDLIFE GRANTS

For wildlife conservation grants to States and to the District of Columbia, Puerto Rico, Guam, the United States Virgin Islands, the Northern Mariana Islands, American Samoa, and federally recognized Indian tribes under the provisions of the Fish and Wildlife Act of 1956 and the Fish and Wildlife Coordination Act, for the development and implementation of programs for the benefit of wildlife and their habitat, including species that are not hunted or fished, $70,000,000 to be derived from the Land and Water Conservation Fund, and to remain available until expended: *Provided,* That of the amount provided herein, $6,000,000 is for a competitive grant program for Indian tribes not subject to the remaining provisions of this appropriation: *Provided further,* That the Secretary shall, after deducting said $6,000,000 and administrative expenses, apportion the amount provided herein in the following manner: (A) to the District of Columbia and to the Commonwealth of Puerto Rico, each a sum equal to not more than one-half of 1 percent thereof; and (B) to Guam, American Samoa, the United States Virgin Islands, and the Commonwealth of the Northern Mariana Islands, each a sum equal to not more than one-fourth of 1 percent thereof: *Provided further,* That the Secretary shall apportion the remaining amount in the following manner: (A) one-third of which is based on the ratio to which the land area of such State bears to the total land area of all such States; and (B) two-thirds of which is based on the ratio to which the population of such State bears to the total population of all such States: *Provided further,* That the amounts apportioned under this paragraph shall be adjusted equitably so that no State shall be apportioned a sum which is less than 1 percent of the amount available for apportionment under this paragraph for any fiscal year or more than 5 percent of such amount: *Provided further,* That the Federal share of planning grants shall not exceed 75 percent of the total costs of such projects and the Federal share of implementation grants shall not exceed 50 percent of the total costs of such projects: *Provided further,* That the non-Federal share of such projects may not be derived from Federal grant programs: *Provided further,* That no State, territory, or other jurisdiction shall receive a grant unless it has developed, or committed to develop by October 1, 2005, a comprehensive wildlife conservation plan, consistent with criteria established by the Secretary of the Interior, that considers the broad range of the State, territory, or other jurisdiction's wildlife and associated habitats, with appropriate priority placed on those species with the greatest conservation need and taking into consideration the relative level of funding available for the conservation of those species: *Provided further,* That any amount apportioned in 2004 to any State, territory, or other jurisdiction that remains unobligated as of September 30, 2005, shall be reapportioned, together with funds appropriated in 2006, in the manner provided herein: *Provided further,* That balances from amounts previously appropriated under the heading "State Wildlife Grants" shall be transferred to and merged with this appropriation and shall remain available until expended.

ADMINISTRATIVE PROVISIONS

Appropriations and funds available to the United States Fish and Wildlife Service shall be available for purchase of not to exceed

MULTINATIONAL SPECIES CONSERVATION FUND

This account combines funding for programs under the former rewards and operations (African elephant) account, the former rhinoceros and tiger conservation account, the Asian elephant conservation program, and the great ape conservation program.

The African Elephant Act of 1988 established a fund for assisting nations and organizations involved with conservation of African elephants. The Service provides grants to African Nations and to qualified organizations and individuals to protect and manage critical populations of these elephants.

The Rhinoceros and Tiger Conservation Act of 1994 authorized programs to enhance compliance with the Convention on International Trade in Endangered Species (CITES) and U.S. or foreign laws prohibiting the taking or trade of rhinoceros, tigers, or their habitat.

The Asian Elephant Conservation Act of 1997 authorized a grant program, similar to the African elephant program, to enable cooperators from regional and range country agencies and organizations to address Asian elephant conservation problems. The world's surviving populations of wild Asian elephants are found in 13 south and southeastern Asian countries.

The Great Ape Conservation Act of 2000 authorized grants to foreign governments, the CITES secretariat, and non-governmental organizations for the conservation of great apes.

Appropriation enacted, 2004	$5,532,000
Budget estimate, 2005	9,500,000
Recommended, 2005	5,900,000
Comparison:	
Appropriation, 2004	+368,000
Budget estimate, 2005	−3,600,000

The Committee recommends $5,900,000 for the multinational species conservation fund, an increase of $368,000 above the fiscal year 2004 level and $3,600,000 below the budget request. Changes to the budget request include a decrease of $4,000,000 for neotropical migratory birds (which is funded in a separate account) and an increase of $100,000 each for African elephant conservation, Asian elephant conservation, great ape conservation, and rhinoceros and tiger conservation. The Committee expects these funds to be matched by non-Federal funding to leverage private contributions to the maximum extent possible.

STATE AND TRIBAL WILDLIFE GRANTS

The State and tribal wildlife grants program provides funds for States to develop and implement wildlife management and habitat restoration for the most critical wildlife needs in each State. States are required to develop comprehensive wildlife conservation plans to be eligible for grants and to provide at least a 25 percent cost share for planning grants and at least a 50 percent cost share for implementation grants.

Appropriation enacted, 2004	$69,138,000
Budget estimate, 2005	80,000,000
Recommended, 2005	67,500,000
Comparison:	
Appropriation, 2004	−1,638,000
Budget estimate, 2005	−12,500,000

The Committee recommends $67,500,000 for State and tribal wildlife grants, a decrease of $1,638,000 below the fiscal year 2004 level and $12,500,000 below the budget request. Within the amount provided, $6,000,000 is for competitively awarded grants to Indian tribes.

Each State or eligible entity has two years to enter into specific grant agreements with the Service using fiscal year 2005 funding. If funds remain unobligated at the end of fiscal year 2006, the unobligated funds will be reapportioned to all States and eligible entities, together with any new appropriations provided in fiscal year 2007.

Not more than 3 percent of the appropriated amount may be used for Federal administration of the program. Administrative costs for each grantee should also be held to a minimum so that the maximum amount of funding is used for on-the-ground projects.

Funds made available under this account should be added to revenues from existing State sources and not serve as a substitute for revenues from such sources.

Priority for the use of these funds should be placed on those species with the greatest conservation need. Funds should be used to address the life needs and habitat requirements of those species in order to preclude the need to list them as threatened or endangered under the Endangered Species Act.

The Committee expects each State and other participating entity in the formula grant program to submit its comprehensive wildlife conservation plan on time. The Service should notify each State or other entity as soon as possible after receipt of its plan if the plan is approved, conditionally approved, or disapproved. If a plan is conditionally approved, the submitting entity should be given a limited but reasonable amount of time to address the Service's concerns and submit a revised plan for approval. The Committee suggests that such extension of time should not exceed 6 months. If a plan is disapproved, the submitting entity is no longer entitled to receive funds from the program. Should an entity with a disapproved plan elect to submit a revised plan in the future, it may do so but, until a plan is approved, that entity will not be entitled to receive any funds from the program.

NATIONAL PARK SERVICE

The mission of the National Park Service is to preserve unimpaired the natural and cultural resources and values of the national park system for the enjoyment, education, and inspiration of this and future generations. The National Park Service cooperates with partners to extend the benefits of natural and cultural resource conservation and outdoor recreation throughout this country and the world.

The National Park Service, established in 1916, has stewardship responsibilities for the protection and preservation of the heritage resources of the national park system. The system, consisting of 388 separate and distinct units, is recognized globally as a leader in park management and resource preservation. The national park system represents much of the finest the Nation has to offer in terms of scenery, historical and archeological relics, and cultural heritage. Through its varied sites, the National Park Service attempts to explain America's history, interpret its culture, preserve

NATIONAL WILDLIFE REFUGE FUND

Appropriations, 2004	$14,237,000
Budget estimate, 2005	14,414,000
Committee recommendation	14,414,000

The Committee recommends $14,414,000 for the national wildlife refuge fund, the same as the budget request.

NORTH AMERICAN WETLANDS CONSERVATION FUND

Appropriations, 2004	$37,531,000
Budget estimate, 2005	54,000,000
Committee recommendation	38,000,000

The Committee recommends $38,000,000 for the North American wetlands conservation fund, a reduction of $16,000,000 below the budget request.

NEOTROPICAL MIGRATORY BIRD CONSERVATION

Appropriations, 2004	$3,951,000
Budget estimate, 2005	
Committee recommendation	4,000,000

The Committee recommends $4,000,000 for neotropical migratory bird conservation. Funding for this program was proposed in the budget request within the Multinational Species Conservation Fund account.

MULTINATIONAL SPECIES CONSERVATION FUND

Appropriations, 2004	$5,532,000
Budget estimate, 2005	9,500,000
Committee recommendation	5,700,000

The Committee recommends an appropriation of $5,700,000 for the multinational species conservation fund. The funds for neotropical birds have been provided under a separate heading. The Rhino and Tiger conservation fund shall receive $1,500,000, and the remaining three funds shall each receive $1,400,000.

STATE AND TRIBAL WILDLIFE GRANTS

Appropriations, 2004	$69,138,000
Budget estimate, 2005	80,000,000
Committee recommendation	75,000,000

The Committee recommends $75,000,000 for State and tribal wildlife grants. Of the amount provided, $6,000,000 is provided for tribal grants.

NATIONAL PARK SERVICE

OPERATION OF THE NATIONAL PARK SYSTEM

Appropriations, 2004	$1,609,560,000
Budget estimate, 2005	1,686,067,000
Committee recommendation	1,688,915,000

The Committee recommends $1,688,915,000 for operation of the national park system, an increase of $2,848,000 over the budget request and $79,355,000 over the enacted level. The amount provided includes an increase of $44,024,000 for park base operating budg-

Canaan Valley NWR (WV), Cypress Creek NWR (IL), and Red River NWR (LA) shall be funded out of the inholdings account.

2. Lands acquired for the James Campbell NWR (HI) must be within the authorized refuge boundary.

LANDOWNER INCENTIVE PROGRAM

The conference agreement provides $22,000,000 for the landowner incentive program instead of $15,000,000 as proposed by the House and $29,000,000 as proposed by the Senate.

PRIVATE STEWARDSHIP GRANTS

The conference agreement provides $7,000,000 for private stewardship grants instead of $5,000,000 as proposed by the House and $7,500,000 as proposed by the Senate.

Bill Language.—The conference agreement includes bill language, as proposed by the House providing for the merger of funds previously appropriated under the ''Stewardship Grants'' heading. The Senate had no similar provision.

COOPERATIVE ENDANGERED SPECIES FUND

The conference agreement provides $81,596,000 for the cooperative endangered species fund as proposed by the House instead of $82,600,000 as proposed by the Senate.

Bill Language.—The conference agreement earmarks $32,212,000 to be derived from the Cooperative Endangered Species Fund instead of $49,384,000 as proposed by the House and $32,600,000 as proposed by the Senate. The amount derived from the Land and Water Conservation Fund is $49,384,000 as proposed by the House instead of $50,000,000 as proposed by the Senate.

NATIONAL WILDLIFE REFUGE FUND

The conference agreement provides $14,414,000 for the national wildlife refuge fund as proposed by both the House and the Senate.

NORTH AMERICAN WETLANDS CONSERVATION FUND

The conference agreement provides $38,000,000 for the North American wetlands conservation fund as proposed by both the House and the Senate.

NEOTROPICAL MIGRATORY BIRD CONSERVATION

The conference agreement provides $4,000,000 for neotropical migratory bird conservation as proposed by the Senate instead of $4,400,000 as proposed by the House.

MULTINATIONAL SPECIES CONSERVATION FUND

The conference agreement provides $5,800,000 for multinational species conservation fund programs instead of $5,900,000 as proposed by the House and $5,700,000 as proposed by the Senate. Changes to the House recommended level include decreases of $50,000 for African elephants, $50,000 for rhinoceros and tigers, $50,000 for Asian elephants, and $50,000 for great apes, and an increase of $100,000 to initiate the newly authorized marine turtles program. The managers expect the Service to keep the funding for marine turtles in the base budget and to increase funding, as appropriate, for this program in future budget requests.

Bill Language.—The conference agreement includes the statutory citation for the Marine Turtle Conservation Act of 2004.

STATE AND TRIBAL WILDLIFE GRANTS

The conference agreement provides $70,000,000 for State and tribal wildlife grants instead of $67,500,000 as proposed by the House and $75,000,000 as proposed by the Senate. The managers reiterate the importance of comprehensive wildlife conservation strategies toward the conservation of each State's full array of wildlife and their habitats. The strategies, produced in each State and territory plan, are expected to be complete by October 1, 2005. Emphasis should be on those habitats and conservation actions that support the species of greatest conservation need. Program funds should be directed to those actions and habitats that will best implement the comprehensive wildlife conservation strategies and preclude the need to list many more species as threatened or endangered under the Endangered Species Act.

Bill Language.—The conference agreement includes bill language, as proposed by the House, providing for the merger of funds previously appropriated under the ''State Wildlife Grants''heading. The Senate had no similar provision.

NATIONAL PARK SERVICE

OPERATION OF THE NATIONAL PARK SYSTEM

FY 2005 Consolidated Appropriations Act (H.R. 4818)
Conference Report (H. Rep. 108-792)
Joint Explanatory Statement
Reported November 19, 2004

parks will have an additional $74,666,000 in park programmatic increases for fiscal year 2005. This is the largest park base programmatic increase ever for the National Park Service and in keeping with the large increases in operating funds provided by the Congress over the past 10 years.

The Administration's budget requests for parks in recent years have not sufficiently addressed growing shortfalls in core operating programs at the parks. Recent budgets have seen increasing emphasis placed on expanding law enforcement and security, facility maintenance, information technology, and natural resource data gathering. Core park operations have also been impacted by the absorption of pay costs within budget requests, Congressionally mandated pay increases in excess of budget requests, and storm damage. New security and anti-terrorism requirements and other new mandates and responsibilities have also been assigned by the Department and the Office of Management and Budget. The managers have been supportive of these requirements and have provided significant increases for security at icon and border parks while consistently including additional park maintenance funding to ensure the maintenance backlog reduction efforts continue on track. However important these new responsibilities, the budget of the National Park Service cannot continue to be limited to a few parks and purposes while core visitor service requirements are going unmet nationwide. All parks need to remain open and accessible to visitors and basic visitor services need to be available at all parks across the system.

Of the additional amount provided for park base operations, $40,000,000 should be distributed to all park units as an across-the-board increase in all budget subactivities within park management to help offset the impact of recent absorptions. This will provide each unit with a minimum increase of approximately 5 percent above their fiscal year 2004 level. Also, $500,000 of the additional amount should be distributed to national trails on a priority basis. The remaining balance of $12,154,000 for additional park operations funding shall be used solely to restore basic visitor services and address resource preservation needs in accordance with National Park Service priorities.

The conference agreement provides $342,967,000 for resource stewardship. Changes to the House level include a reduction of $1,000,000 for inventory and monitoring and an increase of $500,000 for Vanishing Treasures.

The conference agreement provides $326,856,000 for visitor services, the same as the House level.

The conference agreement provides $573,178,000 for maintenance, the same as the House level.

The conference agreement provides $285,946,000 for park support. Changes to the House level include an additional $871,000 for e-government initiatives, $250,000 for wild and scenic rivers, $500,000 for the traditional challenge cost share program and $94,000 for the Lewis and Clark program. The House position on the CCI challenge cost share program is adopted.

Bill language.—The conference agreement retains the House language regarding one year funding for repair and rehabilitation funds. The conference agreement earmarks $2,000,000 for the YCC program

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age and lighting repairs at Amistad NRA; $300,000 to continue cultural landscaping improvements at Gettysburg NMP, $400,000 for Natchez Trace Parkway; $325,000 for rehab of Fort Piute at Mojave National Preserve; $400,000 for rehab of structures at Stiltsville in Biscayne NP; and $200,000 for restoration at International Peace Garden, ND.

The conference agreement continues to earmark one-third of the challenge cost share program for the National Trails System. The managers have retained the House language concerning National Park Service travel. Foreign travel must be pre-approved by the House and Senate Committees on Appropriations.

The managers recognize the successful partnership between the National Park Service and Southeast Community College, KY, in providing important employee training. The managers encourage the Service to consider additional training opportunities with the college.

UNITED STATES PARK POLICE

The conference agreement provides $81,204,000 for the United States Park Police as proposed by the House and the Senate.

It has been three years since the National Academy of Public Administration's comprehensive financial and management review of the U.S. Park Police. As of two months ago, NAPA reported that none of the major reforms had been implemented. The managers expect the Secretary and the Director of the National Park Service to implement fully the major reforms and be prepared to discuss those changes at the fiscal year 2006 hearings.

NATIONAL RECREATION AND PRESERVATION

The conference agreement provides $61,832,000 for national recreation and preservation, instead of $53,877,000 as proposed by the House and $63,023,000 as proposed by the Senate.

The conference agreement provides $551,000 for recreation programs, the same as the House and Senate. Also included is $11,018,000 for natural programs. Changes to the House level include an additional $300,000 for the rivers and trails program. The managers expect that the reforms made to the strategic plan will be closely followed. This is a technical assistance program. Direct grants are not authorized.

The conference agreement provides $20,214,000 for cultural programs. Changes to the House level include increases of $100,000 for the Louisiana Creole Heritage Center and $300,000 for a National Underground Railroad Network grant program, which is authorized.

The conference agreement provides $1,616,000 for International park affairs, the same as the House and Senate.

$32,212,000 is to be derived from the Cooperative Endangered Species Conservation Fund and $49,384,000 is to be derived from the Land and Water Conservation Fund and to remain available until expended.

NATIONAL WILDLIFE REFUGE FUND

For expenses necessary to implement the Act of October 17, 1978 (16 U.S.C. 715s), $14,414,000.

NORTH AMERICAN WETLANDS CONSERVATION FUND

For expenses necessary to carry out the provisions of the North American Wetlands Conservation Act, Public Law 101–233, as amended, $38,000,000, to remain available until expended.

NEOTROPICAL MIGRATORY BIRD CONSERVATION

For financial assistance for projects to promote the conservation of neotropical migratory birds in accordance with the Neotropical Migratory Bird Conservation Act, Public Law 106–247 (16 U.S.C. 6101–6109), $4,000,000, to remain available until expended.

MULTINATIONAL SPECIES CONSERVATION FUND

For expenses necessary to carry out the African Elephant Conservation Act (16 U.S.C. 4201–4203, 4211–4213, 4221–4225, 4241–4245, and 1538), the Asian Elephant Conservation Act of 1997 (Public Law 105–96; 16 U.S.C. 4261–4266), the Rhinoceros and Tiger Conservation Act of 1994 (16 U.S.C. 5301–5306), the Great Ape Conservation Act of 2000 (16 U.S.C. 6301), and the Marine Turtle Conservation Act of 2004 (Public Law 108–266; 16 U.S.C. 6601), $5,800,000, to remain available until expended.

STATE AND TRIBAL WILDLIFE GRANTS

For wildlife conservation grants to States and to the District of Columbia, Puerto Rico, Guam, the United States Virgin Islands, the Northern Mariana Islands, American Samoa, and federally recognized Indian tribes under the provisions of the Fish and Wildlife Act of 1956 and the Fish and Wildlife Coordination Act, for the development and implementation of programs for the benefit of wildlife and their habitat, including species that are not hunted or fished, $70,000,000, to be derived from the Land and Water Conservation Fund, and to remain available until expended: Provided, That of the amount provided herein, $6,000,000 is for a competitive grant program for Indian tribes not subject to the remaining provisions of this appropriation: Provided further, That the Secretary shall, after deducting said $6,000,000 and administrative expenses, apportion the amount provided herein in the following manner: (A) to the District of Columbia and to the Commonwealth of Puerto Rico, each a sum equal to not more than one-half of 1 percent thereof; and (B) to Guam, American Samoa, the United States Virgin Islands, and the Commonwealth of the Northern Mariana Islands, each a sum equal to not more than one-fourth of 1 percent thereof: Provided further, That the Secretary shall apportion the remaining amount in the following manner: (A) one-third of which is based on the ratio to which the land area of such State bears to the total land area of all such States; and (B) two-thirds of which is based on the ratio to which the population of such State bears to the total population of all such States: Provided further, That the amounts apportioned under this paragraph shall be adjusted equitably so that no State shall be apportioned a sum which is less than 1 percent of the amount available for apportionment under this paragraph for any fiscal year or more than 5 percent of such amount: Provided further, That the Federal share of planning grants shall not exceed 75 percent of the total costs of such projects and the Federal share of implementation grants shall not exceed 50 percent of the total costs of such projects: Provided further, That the non-Federal share of such projects may not be derived from Federal grant programs: Provided further, That no State, territory, or other jurisdiction shall receive a grant unless it has developed, or committed to develop by October 1, 2005, a comprehensive wildlife conservation plan, consistent with criteria established by the Secretary of the Interior, that considers the broad range of the State, territory, or other jurisdiction's wildlife and associated habitats, with appropriate priority placed on those species with the greatest conservation need and taking into consideration the relative level of funding available for the conservation of those species: Provided further, That any amount apportioned in 2005 to any State, territory, or other jurisdiction that remains unobligated as of September 30, 2006, shall be reapportioned, together with funds appropriated in 2007, in the manner provided herein: Provided further, That balances from amounts previously appropriated under the heading ''State Wildlife Grants'' shall be transferred to and merged with this appropriation and shall remain available until expended.

ADMINISTRATIVE PROVISIONS

Appropriations and funds available to the United States Fish and Wildlife Service shall be available for purchase of n... senger motor vehicles, of w... placement only (including ... use); repair of damage to ... and adjacent to reservation ... erations of the Service; opti... of land at not to exceed $1... cilities incident to such public recreational uses on conservation areas as are consistent with their primary purpose; and the maintenance and improvement of aquaria, buildings, and other facilities under the jurisdiction of the Service and to which the United States has title, and which are used pursuant to law in connection with management, and investigation of fish and wildlife resources: Provided, That notwithstanding 44 U.S.C. 501, the Service may, under cooperative cost sharing and partnership arrangements authorized by law, procure printing services from cooperators in connection with jointly produced publications for which the cooperators share at least one-half the cost of printing either in cash or services and the Service determines the cooperator is capable of meeting accepted quality standards: Provided further, That notwithstanding any other provision of law, the Service may use up to $2,000,000 from funds provided for contracts for employment-related legal services: Provided further, That the Service may accept donated aircraft as replacements for existing aircraft: Provided further, That notwithstanding any other provision of law, the Secretary of the Interior may not spend any of the funds appropriated in this Act for the purchase of lands or interests in lands to be used in the establishment of any new unit of the National Wildlife Refuge System unless the purchase is approved in advance by the House and Senate Committees on Appropriations in compliance with the reprogramming procedures contained in House Report 108–330.

NATIONAL PARK SERVICE

OPERATION OF THE NATIONAL PARK SYSTEM

For expenses necessary for the management, operation, and maintenance of areas and facilities administered by the National Park Service (including special road maintenance service to trucking permittees on a reimbursable basis), and for the general administration of the National Park Service, $1,707,282,000, of which $10,708,000 is for planning and interagency coordination in support of Everglades restoration and shall remain available until expended; of which $96,440,000 is for maintenance, repair or rehabilitation projects for constructed assets, operation of the National Park Service automated facility management software system, and comprehensive facility condition assessments; and of which $2,000,000 is for the Youth Conservation Corps for high priority projects: Provided, That the only funds in this account which may be made available to support United States Park Police are those funds approved for emergency law and order incidents pursuant to established National Park Service procedures, those funds needed to maintain and repair United States Park Police administrative facilities, and those funds necessary to reimburse the United States Park Police account for the unbudgeted overtime and travel costs associated with special events for an amount not to exceed $10,000 per event subject to the review and concurrence of the Washington headquarters office.

UNITED STATES PARK POLICE

For expenses necessary to carry out the programs of the United States Park Police, $81,204,000.

NATIONAL RECREATION AND PRESERVATION

For expenses necessary to carry out recreation programs, natural programs, cultural programs, heritage partnership programs, environmental compliance and review, international park affairs, statutory or contractual aid for other activities, and grant administration, not otherwise provided for, $61,832,000: Provided, That $700,000 from the Statutory and Contractual Aid Account shall be provided to the City of Ta... ...cting ...oun... ...f the ...Con... ...d for ...nents ...final ... strategic plan: Provided further, That notwithstanding section 8(b) of Public Law 102–543 (16 U.S.C. 410yy–8(b)), amounts made available under this heading to the Keweenaw National Historical Park shall be matched on not less than a 1-to-1 basis by non-Federal funds.

HISTORIC PRESERVATION FUND

For expenses necessary in carrying out the Historic Preservation Act of 1966, as amended (16 U.S.C. 470), and the Omnibus Parks and Public Lands Management Act of 1996 (Public Law 104–333), $72,750,000, to be derived from the Historic Preservation Fund, to remain available until September 30, 2006, of which $30,000,000 shall be for Save America's Treasures for preservation of nationally significant sites, structures, and artifacts: Provided, That any individual Save America's Treasures grant shall be matched by non-Federal funds: Provided further, That individual projects shall only be eligible for one grant: Provided further, That all projects to be funded shall be approved by the Secretary of the Interior in consultation with the House and Senate Committees on Appropriations and the President's Committee on the Arts and Humanities prior to the commitment of Save America's Treasures grant funds: Provided further, That Save America's Treasures funds allocated for Federal projects, following approval, shall be available by transfer to appropriate accounts of individual agencies: Provided further, That hereinafter and notwithstanding 20 U.S.C. 951 et seq. the National Endowment for the Arts may award Save America's Treasures grants based upon the recommendations of the Save America's Treasures grant selection panel convened by the President's Committee on the Arts and the Humanities and the National Park Service.

CONSTRUCTION

For construction, improvements, repair or replacement of physical facilities, including the modifications authorized by section 104 of the Everglades National Park Protection and Expansion Act of 1989, $307,362,000, to remain available until expended, of which $500,000 for the L.Q.C. Lamar House National Historic Landmark shall be derived from the Historic Preservation Fund pursuant to 16 U.S.C. 470a: Provided, That none of the funds available to the National Park Service may be used to plan, design, or construct any partnership project with a total value in excess of $5,000,000, without advance approval of the House and Senate Committees on Appropriations: Provided further, That, notwithstanding any other provision of law, the National Park Service may not accept donations or services associated with the

FY 2005 Consolidated Appropriations Act (H.R. 4818) Legislative Text

The Committee recommends $5,900,000 for the multinational species conservation fund, an increase of $181,000 above the fiscal year 2005 level and $2,400,000 below the budget request. Changes to the budget request include a decrease of $4,000,000 for neotropical migratory birds (which is funded in a separate account) and increases of $400,000 for African elephant conservation, $400,000 for Asian elephant conservation, $300,000 for rhinoceros and tiger conservation and $500,000 for great ape conservation. The Committee expects these funds to be matched by non-Federal funding to leverage private contributions to the maximum extent possible.

STATE AND TRIBAL WILDLIFE GRANTS

The State and tribal wildlife grants program provides funds for States to develop and implement wildlife management and habitat restoration for the most critical wildlife needs in each State. States are required to develop comprehensive wildlife conservation plans to be eligible for grants and to provide at least a 25 percent cost share for planning grants and at least a 50 percent cost share for implementation grants.

Appropriation enacted, 2005	$69,028,000
Budget estimate, 2006	74,000,000
Recommended, 2006	65,000,000
Comparison:	
Appropriation, 2005	−4,028,000
Budget estimate, 2006	−9,000,000

The Committee recommends $65,000,000 for State and tribal wildlife grants, a decrease of $4,028,000 below the fiscal year 2005 level and $9,000,000 below the budget request. Within the amount provided, $6,000,000 is for competitively awarded grants to Indian tribes.

Bill Language.—Bill language is continued specifying that each State or eligible entity has two years to enter into specific grant agreements. If fiscal year 2006 funds remain unobligated at the end of fiscal year 2007, the unobligated funds will be reapportioned to all States and eligible entities, together with any new appropriations provided in fiscal year 2008. Bill language also is included providing direction on redistributing funds for States with disapproved plans.

The Committee agrees to the following:

1. Not more than 3 percent of the appropriated amount may be used for Federal administration of the program. Administrative costs for each grantee should also be held to a minimum so that the maximum amount of funding is used for on-the-ground projects.

2. Funds made available under this account should be added to revenues from existing State sources and not serve as a substitute for revenues from such sources.

3. Priority for the use of these funds should be placed on those species with the greatest conservation need. Funds should be used to address the habitat requirements of species identified in State wildlife plans/strategies in order to preclude the need to list more species as threatened or endangered under the Endangered Species Act.

The Committee reiterates its expectation that each State and other participating entity in the formula grant program will submit

its comprehensive wildlife conservation plan on time. The Service should notify each State or other entity, as soon as possible after receipt of its plan, whether the plan is approved, conditionally approved, or disapproved. If a plan is conditionally approved, the submitting entity should be given a limited but reasonable amount of time to address the Service's concerns and submit a revised plan for approval. Such extension of time should not exceed 6 months. If a plan is disapproved, the submitting entity is no longer entitled to receive funds from the program. Should an entity with a disapproved plan elect to submit a revised plan in the future, it may do so but, until a plan is approved, that entity will not be entitled to receive any funds from the program.

NATIONAL PARK SERVICE

The mission of the National Park Service is to preserve unimpaired the natural and cultural resources and values of the national park system for the enjoyment, education, and inspiration of this and future generations. The National Park Service cooperates with partners to extend the benefits of natural and cultural resource conservation and outdoor recreation throughout this country and the world.

The National Park Service, established in 1916, has stewardship responsibilities for the protection and preservation of the heritage resources of the national park system. The system, consisting of 388 separate and distinct units, is recognized globally as a leader in park management and resource preservation. The national park system represents much of the finest the Nation has to offer in terms of scenery, historical and archeological relics, and cultural heritage. Through its varied sites, the National Park Service attempts to explain America's history, interpret its culture, preserve examples of its natural ecosystems, and provide recreational and educational opportunities for U.S. citizens and visitors from all over the world. In addition, the National Park Service provides support to tribal, local, and State governments to preserve culturally significant, ecologically important, and public recreational lands.

OPERATION OF THE NATIONAL PARK SYSTEM

Appropriation enacted, 2005	$1,683,564,000
Budget estimate, 2006	1,734,053,000
Recommended, 2006	1,754,199,000
Comparison:	
Appropriation, 2005	+70,635,000
Budget estimate, 2006	+20,146,000

The amounts recommended by the Committee compared with the budget estimates by activity are shown in the following table:

$600,000 above the House recommended level. The funds for neotropical migratory birds have been provided under a separate heading. The rhino and tiger conservation fund shall receive $1,600,000, and the remaining funds shall each receive $1,400,000. The marine turtles program shall receive $700,000.

STATE AND TRIBAL WILDLIFE GRANTS

Appropriations, 2005	$69,028,000
Budget estimate, 2006	74,000,000
House allowance	65,000,000
Committee recommendation	72,000,000

The Committee recommends $72,000,000 for State and tribal wildlife grants which is $2,972,000 above the enacted level, $2,000,000 below the budget request, and $7,000,000 above the House recommendation. Of the recommended amount, $6,000,000 is provided for tribal grants.

NATIONAL PARK SERVICE

Since the creation of Yellowstone National Park in 1872, the national park system has grown to encompass 388 sites spanning more than 84,000,000 acres in 49 States, the District of Columbia, American Samoa, Guam, Puerto Rico, Saipan, and the Virgin Islands. The National Park Service, created in 1916, is charged with preserving these sites "unimpaired for the enjoyment of future generations." The Service and its more than 20,000 employees also contribute to the protection of other historical, cultural and recreational resources through a variety of grant and technical assistance programs.

OPERATION OF THE NATIONAL PARK SYSTEM

Appropriations, 2005	$1,683,564,000
Budget estimate, 2006	1,734,053,000
House allowance	1,754,199,000
Committee recommendation	1,748,486,000

PROGRAM DESCRIPTION

The operation of the national park system account is the primary source of funding for the national parks, and supports the activities, programs and services essential to their day-to-day operations. It includes base funding for individual park units, as well as pooled funding administered at the national or regional level for training; repair, preservation and rehabilitation of facilities and resources; information technology; and a variety of other purposes.

COMMITTEE RECOMMENDATION

The Committee recommends $1,748,486,000 for operation of the national park system, an increase of $64,922,000 over the fiscal year 2005 enacted level, an increase of $14,433,000 over the budget request, and a decrease of $5,713,000 below the House recommended funding level.

The amount provided includes an increase over the budget request of $20,000,000 for recurring park base operating budgets. Of

Bill Language.—The conference agreement includes language earmarking $62,039,000 to be derived from the Land and Water Conservation Fund instead of $64,239,000 as proposed by the House and $45,653,000 as proposed by the Senate. A total of $20,161,000 is derived from the Cooperative Endangered Species Conservation Fund as proposed by the House instead of $34,347,000 as proposed by the Senate.

NATIONAL WILDLIFE REFUGE FUND

The conference agreement provides $14,414,000 for the national wildlife refuge fund as proposed by both the House and the Senate.

NORTH AMERICAN WETLANDS CONSERVATION FUND

The conference agreement provides $40,000,000 for the North American wetlands conservation fund as proposed by the House instead of $39,500,000 as proposed by the Senate.

NEOTROPICAL MIGRATORY BIRD CONSERVATION

The conference agreement provides $4,000,000 for neotropical migratory bird conservation as proposed by both the House and the Senate.

MULTINATIONAL SPECIES CONSERVATION FUND

The conference agreement provides $6,500,000 for the multinational species conservation fund as proposed by the Senate instead of $5,900,000 as proposed by the House. Changes to the House recommended level include increases of $200,000 for rhinoceros and tiger conservation and $400,000 for marine turtle conservation.

STATE AND TRIBAL WILDLIFE GRANTS

The conference agreement provides $68,500,000 for State and Tribal wildlife grants instead of $65,000,000 as proposed by the House and $72,000,000 as proposed by the Senate.

Bill Language.—The conference agreement includes language proposed by the House restating the October 1, 2005, deadline for completion of State comprehensive wildlife conservation plans and providing direction on distributing funds for States with disapproved plans. The Senate had no similar provisions.

ADMINISTRATIVE PROVISIONS

The conference agreement does not specify the number of replacement passenger motor vehicles that may be purchased by the Service.

The conference agreement includes a reference to the current reprogramming guidelines, which are contained in the front of the statement of the managers in this report.

NORTH AMERICAN WETLANDS CONSERVATION FUND

For expenses necessary to carry out the provisions of the North American Wetlands Conservation Act, Public Law 101–233, as amended, $40,000,000, to remain available until expended.

NEOTROPICAL MIGRATORY BIRD CONSERVATION

For financial assistance for projects to promote the conservation of neotropical migratory birds in accordance with the Neotropical Migratory Bird Conservation Act, Public Law 106–247 (16 U.S.C. 6101–6109), $4,000,000, to remain available until expended.

MULTINATIONAL SPECIES CONSERVATION FUND

For expenses necessary to carry out the African Elephant Conservation Act (16 U.S.C. 4201–4203, 4211–4213, 4221–4225, 4241–4245, and 1538), the Asian Elephant Conservation Act of 1997 (Public Law 105–96; 16 U.S.C. 4261–4266), the Rhinoceros and Tiger Conservation Act of 1994 (16 U.S.C. 5301–5306), the Great Ape Conservation Act of 2000 (16 U.S.C. 6301), and the Marine Turtle Conservation Act of 2004 (Public Law 108–266; 16 U.S.C. 6601), $6,500,000, to remain available until expended.

STATE AND TRIBAL WILDLIFE GRANTS

For wildlife conservation grants to States and to the District of Columbia, Puerto Rico, Guam, the United States Virgin Islands, the Northern Mariana Islands, American Samoa, and federally recognized Indian tribes under the provisions of the Fish and Wildlife Act of 1956 and the Fish and Wildlife Coordination Act, for the development and implementation of programs for the benefit of wildlife and their habitat, including species that are not hunted or fished, $68,500,000, to be derived from the Land and Water Conservation Fund and to remain available until expended: *Provided*, That of the amount provided herein, $6,000,000 is for a competitive grant program for Indian tribes not subject to the remaining provisions of this appropriation: *Provided further*, That the Secretary shall, after deducting said $6,000,000 and administrative expenses, apportion the amount provided herein in the following manner: (1) to the District of Columbia and to the Commonwealth of Puerto Rico, each a sum equal to not more than one-half of 1 percent thereof; and (2) to Guam, American Samoa, the United States Virgin Islands, and the Commonwealth of the Northern Mariana Islands, each a sum equal to not more than one-fourth of 1 percent thereof: *Provided further*, That the Secretary shall apportion the remaining amount in the following manner: (1) one-third of which is based on the ratio to which the land area of such State bears to the total land area of all such States; and (2) two-thirds of which is based on the ratio to which the population of such State bears to the total population of all such States: *Provided further*, That the amounts apportioned under this paragraph shall be adjusted equitably so that no State shall be apportioned a sum which is less than 1 percent of the amount available for apportionment under this paragraph for any fiscal year or more than 5 percent of such amount: *Provided further*, That the Federal share of planning grants shall not exceed 75 percent of the total costs of such projects and the Federal share of implementation grants shall not exceed 50 percent of the total costs of such

projects: *Provided further*, That the non-Federal share of such projects may not be derived from Federal grant programs: *Provided further*, That no State, territory, or other jurisdiction shall receive a grant unless it has developed, by October 1, 2005, a comprehensive wildlife conservation plan, consistent with criteria established by the Secretary of the Interior, that considers the broad range of the State, territory, or other jurisdiction's wildlife and associated habitats, with appropriate priority placed on those species with the greatest conservation need and taking into consideration the relative level of funding available for the conservation of those species: *Provided further,* That no State, territory, or other jurisdiction shall receive a grant if its comprehensive wildlife conservation plan is disapproved and such funds that would have been distributed to such State, territory, or other jurisdiction shall be distributed equitably to States, territories, and other jurisdictions with approved plans: *Provided further*, That any amount apportioned in 2006 to any State, territory, or other jurisdiction that remains unobligated as of September 30, 2007, shall be reapportioned, together with funds appropriated in 2008, in the manner provided herein: *Provided further*, That balances from amounts previously appropriated under the heading "State Wildlife Grants" shall be transferred to and merged with this appropriation and shall remain available until expended.

ADMINISTRATIVE PROVISIONS

Appropriations and funds available to the United States Fish and Wildlife Service shall be available for purchase of passenger motor vehicles; repair of damage to public roads within and adjacent to reservation areas caused by operations of the Service; options for the purchase of land at not to exceed $1 for each option; facilities incident to such public recreational uses on conservation areas as are consistent with their primary purpose; and the maintenance and improvement of aquaria, buildings, and other facilities under the jurisdiction of the Service and to which the United States has title, and which are used pursuant to law in connection with management, and investigation of fish and wildlife resources: *Provided*, That notwithstanding 44 U.S.C. 501, the Service may, under cooperative cost sharing and partnership arrangements authorized by law, procure printing services from cooperators in connection with jointly produced publications for which the cooperators share at least one-half the cost of printing either in cash or services and the Service determines the cooperator is capable of meeting accepted quality standards: *Provided further*, That, notwithstanding any other provision of law, the Service may use up to $2,000,000 from funds provided for contracts for employment-related legal services: *Provided further*, That the Service may accept donated aircraft as replacements for existing aircraft: *Provided further*, That, notwithstanding any other provision of law, the Secretary of the Interior may not spend any of the funds appropriated in this Act for the purchase of lands or interests in lands to be used in the establishment of any new unit of the National Wildlife Refuge System unless the purchase is approved in advance by the House and Senate Committees on Appropriations in compliance with the reprogramming procedures contained in the statement of the managers accompanying this Act.

Summary of Changes under the 2015 Revision

The Arkansas Game and Fish Commission submitted a formal letter of intent to review and revise the Arkansas Wildlife Action Plan in June of 2012. Since that time, numerous staff from the agency and staff from many partner agencies have reviewed the lists of species of greatest conservation need and the threats and conservation actions associated with those species. One of the largest undertakings involved many taxa teams reviewing the NatureServe state rankings. The NatureServe ranks are an important component of the species account, as the specie's priority score (degree of imperilment) is calculated using the global rank and state rank. State ranks were re-evaluated, and updated ranks were submitted to NatureServe for birds, fish, crayfish, amphibians, reptiles, and butterflies.

Changes to Species of Greatest Conservation Need

The re-evaluation of ranks resulted in the addition of several new species to the list of species of greatest conservation need, as well as the deletion of species. These additions and deletions are summarized in Tables 1.1 and 1.2. Newly discovered species and updated genetic analyses also resulted in the addition of new species.

The insect taxa team added 19 new species of butterflies and dragonflies, based on review of species' status. Among the species added is the Monarch butterfly. This species was added due to the drastic decline of the migratory subspecies and based on the recommendation of the Association of Fish and Wildlife Agencies.

All required elements for species (distribution, threats, data gaps, monitoring, and conservation actions) are provided in the species reports in Section 2, pages 44 – 1114.

Addition of Threats and Conservation Actions

New threats have emerged or worsened since the completion of the original Plan. Added to the Plan are specific conservation actions to address new threats: white-nose syndrome, feral hogs, and wind energy impacts. White-nose syndrome was confirmed in the state in 2014. Six bat SGCN are threatened by white-nose syndrome. The specific threat of white- nose syndrome is covered in the Plan under the threat "extraordinary predation/parasitism/disease" with a source of "parasites/pathogens". The feral hog population has worsened in the state over the past 10 years. As a result, several ground nesting birds and amphibian species are at risk. The specific threat of feral hogs is covered in the Plan under "extraordinary predation/parasitism/disease" with a source of "exotic species". Although not seen on a large scale, some wind energy development is present within the state. Species may be impacted by colliding with towers or turbines. To address this, the threat "collision with man-made structures" was added to the Plan. New threats and sources are incorporated into associated species' accounts in Section 2.

Table 1.1. Species added to the Arkansas Wildlife Action Plan under the 2015 revision as SGCN.

Common Name	Scientific Name	Taxa Association
grotto salamander "western clade"	*Eurycea spelaea*	amphibian
grotto salamander "eastern clade"	*Eurycea spelaea*	amphibian
ouachita streambed salamander	*Eurycea subfluvicola*	amphibian
squirrel tree frog	*Hyla squirella*	amphibian
boreal chorus frog	*Pseudacris maculata*	amphibian
Sharp-shinned Hawk	*Accipiter striatus*	bird
Sprague's Pipit	*Anthus spragueii*	bird
Ruddy Turnstone	*Arenaria interpres*	bird
Common Nighthawk	*Chordeiles minor*	bird
Tricolored Heron	*Egretta tricolor*	bird
American Kestrel	*Falco sparverius*	bird
Purple Finch	*Haemorhous purpureus*	bird
American Golden-Plover	*Pluvialis dominica*	bird
Hubbs' crayfish	*Cambarus hubbsi*	crayfish
Pine Hills Digger	*Fallicambarus dissitus*	crayfish
redspotted stream crayfish	*Orconectes acares*	crayfish
Little River Creek Crayfish	*Orconectes leptogonopodus*	crayfish
Brown Bullhead	*Ameiurus nebulosus*	fish
American Eel	*Anguilla rostrata*	fish
Highfin Carpsucker	*Carpiodes velifer*	fish
Autumn Darter	*Etheostoma autumnale*	fish
Beaded Darter	*Etheostoma clinton*	fish
Sunburst Darter	*Etheostoma mihileze*	fish
Highland Darter	*Etheostoma teddyroosevelt*	fish
Lowland Topminnow	*Fundulus blairae*	fish
Mooneye	*Hiodon tergisus*	fish
Plains Minnow	*Hybognathus placitus*	fish
Least Brook Lamprey	*Lampetra aepyptera*	fish
American Brook Lamprey	*Lethenteron appendix*	fish
Ouachita Mountain Shiner	*Lythrurus snelsoni*	fish
Shoal Chub	*Macrhybopsis hyostoma*	fish
Striped Mullet	*Mugil cephalus*	fish
Chub Shiner	*Notropis potteri*	fish
Rocky Shiner	*Notropis suttkusi*	fish
Channel Shiner	*Notropis wickliffi*	fish
Stonecat	*Noturus flavus*	fish
Gilt Darter	*Percina evides*	fish
Saddleback Darter	*Percina vigil*	fish
arogos skipper	*Atrytone arogos*	insect

golden banded skipper	*Autochton cellus*	insect
Northern metalmark	*Calephelis borealis*	insect
Appalachian azure	*Celastrina neglecta major*	insect
dusky azure	*Celastrina nigra*	insect
outis skipper	*Cogia outis*	insect
Ouachita spiketail	*Cordulegaster talaria*	insect
mottled duskywing	*Erynnis martialis*	insect
Baltimore checkerspot	*Euphydryas phaeton ozarkae*	insect
dion skipper	*Euphyes dion*	insect
leonard's skipper	*Hesperia leonardus*	insect
cobweb skipper	*Hesperia metea*	insect
bronze copper	*Lycaena hyllus*	insect
rattlesnake master borer moth	*Papaipema eryngii*	insect
Ozark swallowtail	*Papilio joanae*	insect
broad-winged skipper	*Poanes viator*	insect
gray comma	*Polygonia progne*	insect
oak hairstreak	*Satyrium favonius ontario*	insect
Ozark emerald	*Somatochlora ozarkensis*	insect
Little Brown Bat	*Myotis lucifugus*	mammal
Northern Long-eared Bat	*Myotis septentrionalis*	mammal
Ozark fanshell	*Cyprogenia aberti*	mussel
Ouachita fanshell	*Cyprogenia sp. Cf aberti*	mussel
elongate elktoe	*Fusconaia sp. Cf. sampsoniana*	mussel
Texas pigtoe	*Pleurobema riddellii*	mussel
purple pimpleback	*Quadrula refulgens*	mussel
lilliput	*Toxolasma parvum*	mussel
lined snake	*Tropidoclonion lineatum*	reptile

Table 1.2. Species removed from the Arkansas Wildlife Action Plan under the 2015 Revision.

Common Name	Scientific Name	Taxa Association
Northern Pintail	*Anas acuta*	bird
Short-eared Owl	*Asio flammeus*	bird
Upland Sandpiper	*Bartramia longicauda*	bird
Ruffed Grouse	*Bonasa umbellus*	bird
Western Sandpiper	*Calidris mauri*	bird
Least Sandpiper	*Calidris minutilla*	bird
Semipalmated Sandpiper	*Calidris pusilla*	bird
Ivory-billed Woodpecker	*Campephilus principalis*	bird
Chuck-will's-widow	*Caprimulgus carolinensis*	bird

Lark Sparrow	*Chondestes grammacus*	bird
Northern Harrier	*Circus cyaneus*	bird
Prairie Warbler	*Dendroica discolor*	bird
Yellow Warbler	*Dendroica petechia*	bird
Little Blue Heron	*Egretta caerulea*	bird
Snowy Egret	*Egretta thula*	bird
Bald Eagle	*Haliaeetus leucocephalus*	bird
Worm-eating Warbler	*Helmitheros vermivorus*	bird
Mississippi Kite	*Ictinia mississippiensis*	bird
Hudsonian Godwit	*Limosa haemastica*	bird
Red-headed Woodpecker	*Melanerpes erythrocephalus*	bird
Wood Stork	*Mycteria americana*	bird
Black-crowned Night-Heron	*Nycticorax nycticorax*	bird
Kentucky Warbler	*Oporornis formosus*	bird
Osprey	*Pandion haliaetus*	bird
American White Pelican	*Pelecanus erythrorhynchos*	bird
Wilson's Phalarope	*Phalaropus tricolor*	bird
Eastern Towhee	*Pipilo erythrophthalmus*	bird
Pied-billed Grebe	*Podilymbus podiceps*	bird
Prothonotary Warbler	*Protonotaria citrea*	bird
American Avocet	*Recurvirostra americana*	bird
Brown-headed Nuthatch	*Sitta pusilla*	bird
Lesser Yellowlegs	*Tringa flavipes*	bird
Greater Yellowlegs	*Tringa melanoleuca*	bird
Solitary Sandpiper	*Tringa solitaria*	bird
Greater Prairie Chicken	*Tympanuchus cupido*	bird
Barn Owl	*Tyto alba*	bird
Blue-winged Warbler	*Vermivora pinus*	bird
Hooded Warbler	*Wilsonia citrina*	bird
crayfish	*Procambarus ferrugineus*	crayfish
Ozark Chub	*Erimystax harryi*	fish
Sturgeon Chub	*Macrhybopsis gelida*	fish
Tailight Shiner	*Notropis maculatus*	fish
Seminole Bat	*Lasiurus seminolus*	mammal
Black Bear	*Ursus americanus americanus*	mammal
Flat Floater	*Anodonta suborbiculata*	mussel
Rock Pocketbook	*Arcidens confragosus*	mussel
Purple Wartyback	*Cyclonaias tuberculata*	mussel
Butterfly	*Ellipsaria lineolata*	mussel
Round Pearlshell	*Glebula rotundata*	mussel
Louisiana Fatmucket	*Lampsilis hydiana*	mussel
Arkansas Brokenray	*Lampsilis reeveiana*	mussel

Flutedshell	*Lasmigona costata*	mussel
Black Sandshell	*Ligumia recta*	mussel
Round Hickorynut	*Obovaria subrotunda*	mussel
Pyramid Pigtoe	*Pleurobema rubrum*	mussel
Creeper	*Strophitus undulatus*	mussel
Ouachita Creekshell	*Villosa arkansasensis*	mussel

Re-evaluation of Terrestrial Habitats

After reviewing the list of terrestrial habitats, the habitat team decided to combine similar habitats to streamline the plan. In addition, a new habitat type, herbaceous wetland, was added. This habitat type captures the vegetation parameters required by several marshbird species of greatest conservation need. The number of terrestrial habitats decreased from 46 to 37. A revised list of terrestrial habitats is provided in Table 1.3. A crosswalk of habitat changes is provided in Section 8, Appendix 2.3. The herbaceous wetland habitat description is located in Section 4, page 1258. Habitat indicators and species lists were reviewed for each habitat type and are provided in the habitat reports, Section 4.

Table 1.3. Revised List of Terrestrial Habitats included in the Arkansas Wildlife Action Plan.

Habitat Name
Caves, Mines, Sinkholes and other Karst Features
Crop Land
Crowley's Ridge Loess Slope Forest
Cultivated Forest
Herbaceous Wetland
Interior Highlands Calcareous Glade and Barrens
Interior Highlands Dry Acidic Glade and Barrens
Lower Mississippi Alluvial Plain Grand Prairie
Lower Mississippi Flatwoods Woodland and Forest
Lower Mississippi River Bottomland Depression
Lower Mississippi River Dune Woodland and Forest
Lower Mississippi River High Bottomland Forest
Lower Mississippi River Low Bottomland Forest
Lower Mississippi River Riparian Forest
Mud Flats
Ouachita Montane Oak Forest
Ozark-Ouachita Cliff and Talus
Ozark-Ouachita Dry Oak and Pine Woodland
Ozark-Ouachita Dry-Mesic Oak Forest
Ozark-Ouachita Forested Seep
Ozark-Ouachita Large Floodplain
Ozark-Ouachita Mesic Hardwood Forest

Ozark-Ouachita Pine/Bluestem Woodland
Ozark-Ouachita Pine-Oak Forest/Woodland
Ozark-Ouachita Prairie and Woodland
Ozark-Ouachita Riparian
Pasture Land
Ponds, Lakes, and Water Holes
Urban/Suburban
West Gulf Coastal Plain Calcareous Prairie
West Gulf Coastal Plain Large River Floodplain Forest
West Gulf Coastal Plain Pine-Hardwood Flatwoods
West Gulf Coastal Plain Pine-Hardwood Forest/Woodland
West Gulf Coastal Plain Red River Floodplain Forest
West Gulf Coastal Plain Sandhill Oak and Shortleaf Pine Forest/Woodland
West Gulf Coastal Plain Seepage Swamp and Baygall
West Gulf Coastal Plain Small Stream/River Forest

Addressing Climate Change

Climate change impacts were not addressed in the original version of the Plan. A chapter has been added in the revised version to summarize potential changes in climate in Arkansas, to detail potential impacts to species and habitats, and to outline strategies to adapt to and lessen climate change impacts on species of greatest conservation need. The climate change chapter can be found in Section 7, pages 1638 – 1658.

Arkansas Wildlife Action Plan

DESIGNING
A FUTURE for Arkansas Wildlife

www.WildlifeArkansas.com

The Arkansas Wildlife Action Plan

Revised, October 2006,
October 2015

Letter from AGFC Director to USFWS

In preparation

Purpose

The Arkansas Wildlife Action Plan (AWAP), formerly known as the comprehensive wildlife conservation strategy (CWCS), serves as a guiding document for the conservation community in identifying those species that are at risk of becoming further imperiled and the actions needed to conserve those species.

Acknowledgments

The preparation of Arkansas' original AWAP involved the input and participation of a wide variety of individuals, including staff within multiple divisions of the Commission, as well as from other state and federal agencies, conservation organizations, private industry, and academia. The 2015 revision of the Plan involved many of those same partner organizations, a testament to the continued strength of conservation partnerships within Arkansas.

We extend our warmest thanks to everyone who has contributed their support, knowledge, time and energy in the development of the Plan.

Champions
Sen. Blanche Lincoln, Gov. Mike Huckabee, Sen. Mark Pryor, Rep. Vic Snyder, Rep. Mike Ross, Director Scott Henderson and Deputy Director David Goad.

Served on teams and committees:
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Arkansas Game and Fish Commission

Mission

The mission of the Arkansas Game & Fish Commission is to wisely manage all the fish and wildlife resources of Arkansas while providing maximum enjoyment for the people.

Authorities

"The control, management, restoration, conservation, and regulation of birds, fish, game and wildlife resources of the State, including hatcheries, sanctuaries, refuges, reservations and all property now used for said purposes and the acquisition and establishment of same, the administration of the laws now and/or hereafter pertaining thereto" is vested in the Arkansas Game and Fish Commission by Amendment 35 to the Arkansas Constitution, approved in the general election of November 7, 1944.

Funding

Amendment 35 to the Arkansas Constitution establishes the Game Protection Fund as the depository of all Commission revenues and restricts appropriation to the purposes defined above. It also contains specific authority for the Commission to "spend such monies as are necessary to match federal grants under the Pittman- Robertson or similar acts for the propagation, conservation, and restoration" of wildlife.

In the 1996 general election, Arkansans approved Amendment 75 to the Arkansas Constitution, finding that "fish, wildlife, parks, tourism and natural heritage constitute a major economic and natural resource of the State and they desire to provide additional funds to the Arkansas Game and Fish Commission, the Department of Parks and Tourism, the Department of Heritage and Keep Arkansas Beautiful." Forty-five percent of all monies collected from an additional excise tax of one-eighth of one percent on taxable sales of property and services is credited to the Game Protection Fund established by Amendment 35 for exclusive use by the Arkansas Game and Fish Commission, as appropriated by the General Assembly.

To make the case for revenue expansion, the Arkansas Game and Fish Commission prepared the Plan For Conservation – a vision document reflecting the agency's planned resource allocation among broad programmatic areas (e.g., fish and wildlife management, enforcement, nongame and threatened species management, conservation education, etc.). These allocations were developed using historic allocations as a baseline, but with prioritization of new Conservation Sales Tax funding relying heavily on public input. Since the passage of Amendment 75, Plan For Conservation has guided agency budgeting and helped us keep our promises to Arkansans.

Major AWAP Partners

Arkansas constructed its Wildlife Action Plan with key partners who served on the Steering Committee from the beginning. Aiding the Arkansas Game and Fish Commission were The Nature Conservancy, Audubon Arkansas, U. S. Fish and Wildlife Service, U. S. Forest Service and Arkansas Natural Heritage Commission. As the work on the Plan progressed, additional members joined: The Arkansas Academy of Science, the Cooperative Extension Service and Natural Resources Conservation Service.

Through numerous meetings during the development phases, the Steering Committee's role was to make key decisions to direct the cooperative effort that forms the structure of the AWAP.

Since the approval of the Plan, the members of the Steering Committee have remained involved in the implementation of the Plan, by participating in the state wildlife grant process. Specifically, the steering committee is charged with helping to determine the highest priority research and monitoring needs and conservation actions for Species of Greatest Conservation Need (SGCN) and their habitats.

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Road Map to the Eight Elements

Congress identified eight required elements to be addressed in these wildlife conservation plans. Further, the plan must identify and focus on the "species in greatest need of conservation," yet address the "full array of wildlife" and wildlife- related issues. They must provide and make use of:

(1) Information on the distribution and abundance of species of wildlife, including low and declining populations as the State fish and wildlife agency deems appropriate, that are indicative of the diversity and health of the State's wildlife; and,

(2) Descriptions of locations and relative condition of key habitats and community types essential to conservation of species identified in (1); and,

(3) Descriptions of problems which may adversely affect species identified in (1) or their habitats, and priority research and survey efforts needed to identify factors which may assist in restoration and improved conservation of these species and habitats; and,

(4) Descriptions of conservation actions proposed to conserve the identified species and habitats and priorities for implementing such actions; and,

(5) Proposed plans for monitoring species identified in (1) and their habitats, for monitoring the effectiveness of the conservation actions proposed in (4), and for adapting these conservation actions to respond appropriately to new information or changing conditions; and,

(6) Descriptions of procedures to review the plan at intervals not to exceed ten years; and,

(7) Plans for coordinating the development, implementation, review, and revision of the plan with Federal, State, and local agencies and Indian tribes that manage significant land and water areas within the State or administer programs that significantly affect the conservation of identified species and habitats.

(8) Congress also affirmed through this legislation, that broad public participation is an essential element of developing and implementing these plans, the projects that are carried out while these plans are developed, and the Species in Greatest Need of Conservation that Congress has indicated such programs and projects are intended to emphasize.

The following section is a guide to how Arkansas addressed the eight required elements.

Element 1. Information on the distribution and abundance of species of wildlife, including low and declining populations as the State fish and wildlife agency deems appropriate, that are indicative of the diversity and health of the State's wildlife;

Locations: The methodology of selecting, scoring and ranking **species that are indicative of the diversity and health of the State's wildlife** is provided in Section 2. Species of Greatest Conservation Need on pages 2-8.

Lists of SGCN presented by taxa group and ranked by Species Priority Score are provided in Section 2. Species of Greatest Conservation Need on pages 9-23.

Each SGCN has an individual Species Report located on pages 44-1114. Refer to this for Species Priority Score. Species Priority Scores reflect the **abundance** and population trend of the SGCN.

Refer to Species Reports on pages 44-1114 for occurrence data mapping for SGCN. Occurrence Maps are located on the first page of each Species Report. Occurrence data mapping reflects the **distribution** of the SGCN.

Refer to Species Reports on pages 44-1114 for ecoregions, ecobasins, terrestrial and aquatic habitats associated with SGCN. The ecoregions and habitats associated with SGCN represent **distribution**.

The entire list of SGCN is listed by Species Priority Score in Appendix 2.1 (pages1660-1692).

Element 2: Descriptions of locations and relative condition of key habitats and community types essential to conservation of species identified in (1);

Locations: Refer to Section 3. The Ecoregions of Arkansas on pages 1115-1224. Within each ecoregion description is an **ecoregion map, description, associated SGCN and associated habitats**. Ecoregions are ranked by conservation priority based on overall importance to SGCN.

Section 4. Terrestrial Habitat, pages 1225-1541, has **descriptions, locations, key factors and indicators**, and, where available, **relative condition** of terrestrial habitats. Each terrestrial habitat is ranked according to its overall importance to SGCN associated with it.

Section 5. Aquatic Habitats, pages 1542-1582, has **descriptions, maps and indicators of aquatic condition**. Each aquatic habitat is ranked according to its overall importance to SGCN associated with it.

Descriptions of relative condition of key habitats and community types essential to conservation of species are discussed in Appendices 3.1, 3.2 and 3.3. (TNC's Ecoregional Assessments), pages 1705-1855.

Element 3: Descriptions of problems which may adversely affect species identified in (1) or their habitats, and priority research and survey efforts needed to identify factors which may assist in restoration and improved conservation of these species and habitats;

Locations: Refer to Section 2. Species of Greatest Conservation Need in the Species Reports, pages 44-1114, for data gaps or research needs associated with each SGCN. This is **research needed to identify factors which may assist in restoration and improved conservation of these species and habitats.**

Refer to the Species Reports, pages 44-1114. Each Species Report lists **problems (threats and sources) which may adversely affect each SGCN.**

Refer to Section 3. The Ecoregions of Arkansas, pages 1115-1224, for tables that summarize and rank the **problems faced**. Problems faced by SGCN are presented in each ecoregion section.

Element 4: Descriptions of conservation actions proposed to conserve the identified species and habitats and priorities for implementing such actions;

Locations: Refer to the Species Reports, pages 44-1114. Each Species Report has a section which lists **conservation actions associated with each SGCN**.

Refer to Section 3. The Ecoregions of Arkansas, pages 1115-1224, **Conservation Actions** ranked to provide guidance for prioritizing the implementation of such actions. Each ecoregion has a list of Conservation Action categories associated with it.

Element 5: Proposed plans for monitoring species identified in (1) and their habitats, for monitoring the effectiveness of the conservation actions proposed in (4), and for adapting these conservation actions to respond appropriately to new information or changing conditions;

Locations: Refer to Section 1. **Wildlife Action Plan** on pages xxxi - xxxv.

Refer to Section 2. Species Reports, pages 44-1114, for a list of **species-specific monitoring** actions.

Refer to Section 4. Terrestrial Habitats, page 1230, for **monitoring associated with conservation actions.**

Refer to Section 5. Aquatic Habitat, page 1575, for **monitoring associated with conservation actions.**

Element 6: Descriptions of procedures to review the plan at intervals not to exceed ten years;

Location: Refer to Section 1. **Wildlife Action Plan**, page xviii.

Element 7: Plans for coordinating the development, implementation, review, and revision of the plan with Federal, State, and local agencies and Indian tribes that manage significant land and water areas within the State or administer programs that significantly affect the conservation of identified species and habitats.

Location: Refer to "Major partners," page viii for a discussion of teams and partnerships involved in producing the AWAP.

Refer to Section 6. Informing and engaging the public on pages 1626-1627 for description of website.

Refer to Section 6. Reaching out to the scientific community, pages 1598-1602; 1635.

Refer to Section 6. Native American contact, page 1629.

Element 8: Congress also affirmed through this legislation, that broad public participation is an essential element of developing and implementing these plans, the projects that are carried out while these plans are developed, and the Species in Greatest Need of Conservation that Congress has indicated such programs and projects are intended to emphasize.

Location: Section 6. Informing and engaging the public (pages 1583-1637) documents outreach and public participation.

Section 1. Arkansas Wildlife Action Plan

Guiding Principles

From the outset, Arkansas' AWAP teams chose to focus on developing a living planning tool, rather than a static funding document, that could be useful to professional partners, citizen conservationists and land managers. At the core of Arkansas' plan are teams of scientists who have populated a database which stores and links information and makes possible the calculation of priorities. The result is a database that can be readily updated as data gaps are filled and conservation actions are accomplished. With every update, the status of species of greatest conservation need and the relationships between species, habitats and conservation actions can be reexamined in an efficient manner that will demonstrate progress over time.

Science-based decision making relies on making accurate information accessible and usable. In Arkansas, scientific teams, the general public, nonprofit groups, government agencies and land managers will rely on database-managed priorities communicated online at www.WildlifeArkansas.com.

Implementing Arkansas' Wildlife Action Plan

State Wildlife Grants support activities promoting the betterment of Arkansas' designated species of greatest conservation need (SGCN). Because there is much more to do to conserve SGCN than can be funded in a given year, Arkansas developed a science-based prioritization process to make the most efficient use of available funds. The process relies on a database framework for organizing, analyzing, storing and retrieving data. Each step in the process receives expert input from the plan's partners and stakeholders. Projects funded by State Wildlife Grants (SWG) will be chosen from a list of implementation needs that are generated from the database, coarse-filtered by Science Teams, then fine-filtered by the Steering Committee and the Implementation Team.

Given the current limits to available resources, doing our best for species of greatest conservation need means that funds must be targeted with an eye to optimizing results. The process will rely on a database framework for organizing, analyzing, storing and retrieving data, and it will rely on input from biologists, landowners, scientific teams, the general public, researchers, nonprofits, and the many partners whose involvement has contributed so much.

Monitoring and adaptive management are key elements of the conservation effort. Agencies and partners cannot afford to undertake large scale habitat protection, restoration or enhancement endeavors, only to discover after years of management that actions were ineffective or even counterproductive. Monitoring helps evaluate:

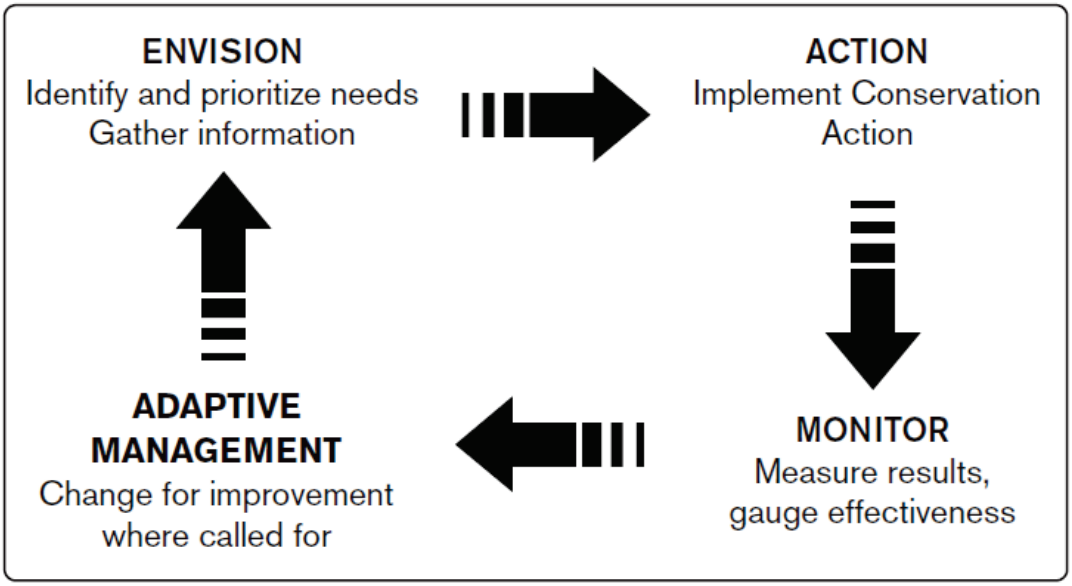
- assumptions made in species-habitat models and decision support tools;
- habitat responses to conservation actions;
- population responses to conservation actions; and
- progress toward habitat and population objectives.

New information generated from research and monitoring only becomes useful if it influences future conservation decisions and actions. These benefits are most pronounced when the elements are iterative

and ongoing, rather, than static or episodic. Thus, habitat conservation strategies are most appropriately viewed as living strategies that are continually developing in response to targeted research and monitoring results.

A continuous feedback loop is part of effective implementation. Successful application will depend upon sharing information and incorporating it into the overall body of knowledge held by the AWAP.

EFFECTIVE IMPLEMENTATION



A strategic approach for addressing and prioritizing multiple implementation needs

Assemble information

Implementation Step 1. As described in Sections 2, 3,4 and 5, the Science Teams (Taxa Association Teams and Habitat Teams) populated the AWAP database with information on species of greatest conservation need ranked by species priority score. The teams linked species to ecoregion, ecobasin and habitats and weighted the relative importance of those relationships. The spatial relationships between ecobasins, habitats and ecoregions were mapped. For each species, Science Teams described problems faced, threats and sources, and data gaps, then recommended conservation actions and monitoring strategies.

Generate implementation priorities

Implementation Step 2. The purpose of Step 2 is to use the information gathered and prioritized in Step 1 to promote efficient and scientific evaluation and to prioritize the allocation of resources, Arkansas uses a systematic approach to ranking implementation needs. Implementation needs are categorized into three groups:

- **Data Gaps**: Survey or basic research needs identified during the planning process as requiring attention before further action can be taken. Examples are additional biological information needed for understanding of life history, population ecology, or distribution of SGCN prior to developing a conservation action.

- **Conservation Actions:** the protection, management and restoration activities that directly affect SGCN, often at the habitat management level.

- **Monitoring Needs:** Measuring how SGCN and habitats change over time. Of particular interest are those changes affected by the implementation of conservation actions. Monitoring drives the adaptive management process, guiding improvements in procedure, along with the identification and prioritization of additional data gaps and conservation actions.

On a 10-year cycle, a list of implementation needs is generated from the AWAP database using these data sets:

- a ranked list of all data gaps,

- a ranked list of all conservation actions, and

- a ranked list of all monitoring needs.

Prior to generating the list of implementation needs, the database will be updated with information gathered since the last revision, including information about previously implemented and ongoing research, conservation actions, and monitoring activities. Priority rankings associated with database-generated lists will be derived from an automated computation of the weights and rankings associated

with SGCN, habitats, key factors, and indicator records. The information on this list is sorted and provided to teams representing these groupings: bird, mammal, fish, insect, crayfish, mussel, herpetofauna, other invertebrates, karst species, aquatic habitats, and terrestrial habitats.

Concurrently, a list of recent, current, and planned statewide monitoring, inventory and research actions affecting SGCN or habitats within Arkansas is solicited from partners, researchers and interested parties. This list has been reconciled with the database-generated list of monitoring needs to minimize duplication, to provide synergy and to identify coordination opportunities. Comparing these two lists assists the Science Teams in identifying species that need more information prior to recommending monitoring efforts.

Develop ten-year draft implementation schedule

Implementation Step 3. Each team will develop a ten-year implementation instrument to be used as a coarse-scale tool to help teams sort priorities and facilitate the creation of subsequent, finer-scale priority action lists.

This step will be repeated biennially. Science Teams will convene to review and synthesize implementation needs. The result is a draft of implementation for the next ten years based on urgency, feasibility and scale, cost, capacity and funding availability, partnership/leverage opportunities, and other factors as circumstances warrant.

Science Teams prioritize implementation needs

Implementation Step 4. Every two years, the continuously updated AWAP database will provide Science Teams with updated ranked lists for data gaps, conservation actions, and monitoring needs.

After comparing the ranked lists with the existing ten-year implementation plan, and taking into account new information that warrants consideration, each team will identify top priorities in each category.

Each team's task is to then narrow the list to a "Hot List" of the highest priority needs that should be funded in the next two years if a proposal is submitted. The Hot Lists from each team include a mix of data gaps, conservation actions and monitoring needs that reflect their best judgment for that point in time. A Hot List from each team is provided to the Steering Committee for further consideration.

Steering Committee recommends annual action items

Implementation Step 5. Each year, the Steering Committee reviews the Hot Lists provided from each Science Team. At this time, the Steering Committee considers any new information or opportunities to develop a set of Annual Action Items.

Priorities the Steering Committee uses to evaluate implementation needs are determined through a combination of factors: relevance to species of greatest conservation concern and/or habitat priorities identified in the AWAP, project design, feasibility and cost, and the amount of currently available funding. Members of the Steering Committee will rank project proposals using the above set of defined criteria.

The final list of data gaps, conservation actions and monitoring needs captured will vary from year to year as biological, ecological, and programmatic circumstances warrant. So too will the mix of species and habitats vary from year to year.

Pre-proposals requested to meet Annual Action Items

Implementation Step 6. With this list of needs selected, the State Wildlife Action Plan Coordinator will issue a Request For Pre-proposals, i.e. project descriptions including preliminary budgets, non-federal funding match opportunities and monitoring elements. Pre-proposals should address the implementation priorities selected by the Steering Committee.

Implementation Team selects projects for funding

Implementation Step 7. The Implementation Team is composed of decision makers who have considerable vision and influence in deciding how SWG funds, agency budgets and partner budgets can be used most effectively. Each January, they will select from an array of pre-proposals that were solicited in Implementation Step 6. After the projects are selected, the budget will be presented to the Commission Budget Committee for review and approval. Those projects that are selected will be submitted to the U. S. Fish and Wildlife Service for approval.

Monitoring and Performance Measures

Methodologies

Implementation Step 8. Monitoring is essential to making effective management decisions and evaluating the outcomes of those decisions.

Short-term performance measures

Performance measures to ensure the effectiveness of projects will be a requirement of each project selected for SWG funding. Performance measures are quantifiable results that relate to implementation actions and make it possible to revise conservation actions by responding to new information or changing conditions for species-specific actions. Each state wildlife grant funded project will include performance measures that will be incorporated into the Tracking and Reporting Actions for the Conservation of Species (TRACS). Wildlife TRACS is the tracking and reporting system for conservation and related actions funded by the US Fish and Wildlife Services (USFWS) and Wildlife and Sport Fish Restoration (WSFR) Program. Project results and performance measures will be reported to the Science Teams, Steering Committee, AWAP partners, and stakeholders annually, and compiled and presented at the biennial Wildlife Action Plan Symposium.

Examples of short-term performance measures:

- 65 acres of Arkansas Valley Prairie and Woodland were burned in spring for 3 years. This is an obligate habitat for Greater Prairie Chicken (*Tympanuchus cupido*) and the Prairie Mole Cricket (G*ryllotalpa major*).

- 122 acres of stream habitat sheltering the Arkansas darter was protected with a conservation easement.

• 2000 yards of instream and streambank habitat in the Eleven Point River was stabilized and restored. This is important habitat for the Ozark hellbender.

Long term Performance Measures

While short term performance measures quantify effort expended, to be adaptive, we need to tie efforts back to the effects on the status of SGCN. A long term view is required because effects on target species may be difficult to measure or may not be noticeable for years after the conservation action was taken.

Long term effects will be reflected in the:

• Priority Scores of each SGCN, which are reviewed and updated by the Science Teams,

• Lists of priority data gaps, conservation actions, and monitoring needs recommended by the Teams. (See Implementation Step 4).

For example, burning projects in the Ozark-Ouachita Prairie and Woodland have had a generally beneficial effect on SGCN, therefore, we would expect to see a lowering of priority score for species associated with this habitat type as restoration improves and expands available habitats over time.

	2008	2010
Greater Prairie Chicken (*Tympanuchus cupido*)	27	25
Prairie Mole Cricket (*Gryllotalpa major*)	31	8
Impact on statewide populations of SGCN associated with this habitat		
Henslow's Sparrow (*Ammodramus henslowii*)	33	33
Strecker's Chorus Frog (*Pseudacris streckeri*)	14	14
Northern Crawfish Frog (*Rana areolata circulosa*)	23	19
Hurter's Spadefoot (*Scaphiopus hurterii*)	19	14
Ornate Box Turtle (*Terrapene ornata ornata*)	6	6
Western Slender Glass Lizard (*Ophisaurus attenuatus*)	15	15
red milkweed beetle (*Tetraopes quinquemaculatus*)	21	15
Texas milkweed beetle (*Tetraopes texanus*)	21	15
Southern Prairie Skink (*Eumeces obtusirostris*)	17	15
Painted Bunting (*Passerina ciris*)	23	34
Le Conte's Sparrow (*Ammodramus leconteii*)	15	14
lace bug (*Acalypta lillianus*)	15	14

Note: A higher score indicates a greater degree of imperilment

A commitment to revision in 2025

Implementation Step 9. The steps of the implementation process incorporate consistency in managing changing priorities. AWAP teams and staff will continually update the AWAP database and communicate priorities with partners and stakeholders.

The first formal review and revision of the AWAP was completed and submitted to USFWS for approval in September 2015.

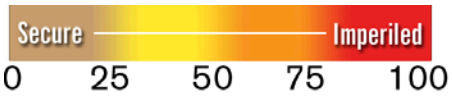
AGFC commits to completing a comprehensive review and revision of the AWAP process and plan by October 1, 2025. At that time, not only will the functional process be evaluated, but the database, protocols and fundamental logic behind assumptions will be reassessed.

Bouchardina robisoni

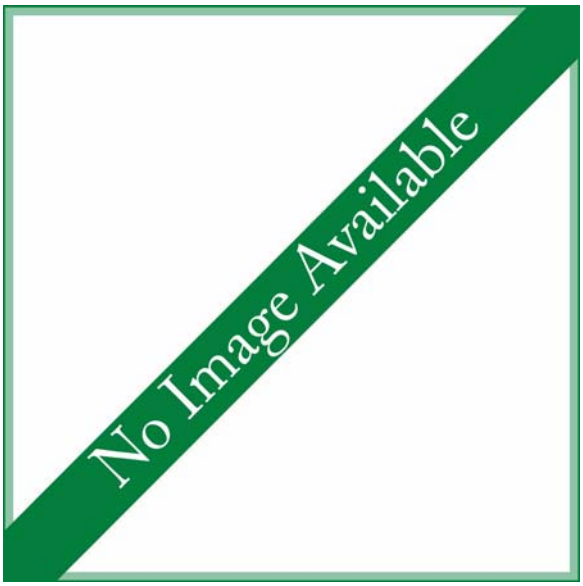
Bayou Bodcau Crayfish

Class: Malacostraca
Order: Decapoda
Family: Cambaridae

Priority Score: 50 out of 100



Population Trend: Unknown



Global Rank: G2 — Imperiled species

State Rank: S1 — Critically imperiled in Arkansas

Distribution

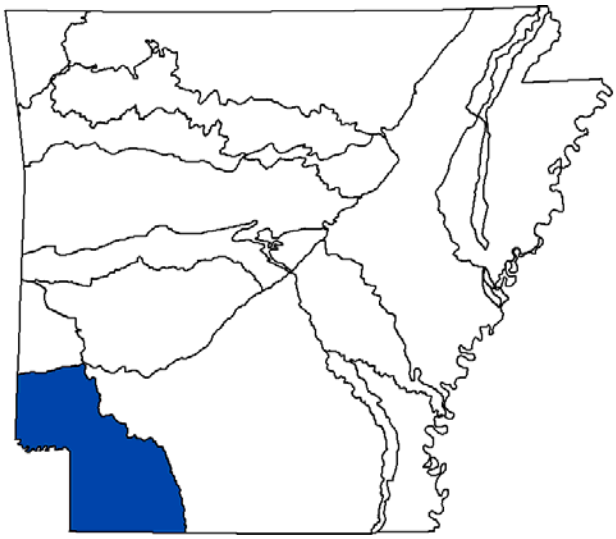
Element Occurrence Records

Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☐ Arkansas Valley
- ☐ Ouachita Mountains
- ☑ South Central Plains
- ☐ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

Taxa Team and Peer Reviewers

AGFC Mr. Brian Wagner, UA Dr. Daniel Magoulick



Ecobasins where this species occurs

Terrestrial Habitats

Ecobasins

South Central Plains - Red River

Terrestrial Habitats

West Gulf Coastal Plain Seepage Swamp and Baygall	Data Gap

Aquatic Habitats

Natural Pool: Headwater	Data Gap
Natural Riffle: Headwater	Data Gap
Natural Seep: Headwater - Small	Data Gap
Natural Swamp/Wetlands: Headwater - Small	Data Gap

Bouchardina robisoni
Bayou Bodcau Crayfish

Problems Faced

Threat: Habitat disturbance
Source: Road construction

Threat: Hydrological alteration
Source: Forestry activities

Threat: Toxins/contaminants
Source: Road construction

Data Gaps/Research Needs

Identify habitat requirements and threats.

Survey for additional populations.

Conservation Actions

	Importance	Category
	Medium	Threat Abatement
Protect known occurrences from construction activities and herbicide applications.	Medium	Habitat Protection

Monitoring Strategies

Monitor known occurrences.

Comment

Description: a small (approximately 1/2 inch carapace length), grayish-tan crayfish with reddish-tan carapace with U-shaped rust markings on the sides (Hobbs 1977).

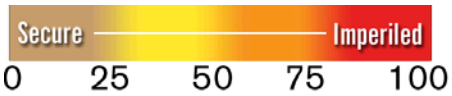
This species is an Arkansas endemic known from few sites. Robison (2006) found it to be localized, highly sporadic, and rarely abundant. He found it at 9 locations, but considered it to be more rare than previously thought.

Cambarus aculabrum

Benton County Cave Crayfish

Class: Malacostraca
Order: Decapoda
Family: Cambaridae

Priority Score: **80** out of 100



Population Trend: Stable

Global Rank: G1 — Critically imperiled species

State Rank: S1 — Critically imperiled in Arkansas

Distribution

Element Occurrence Records

Ecoregions where the species occurs:

- [x] Ozark Highlands
- [ ] Boston Mountains
- [ ] Arkansas Valley
- [ ] Ouachita Mountains
- [ ] South Central Plains
- [ ] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

Taxa Team and Peer Reviewers

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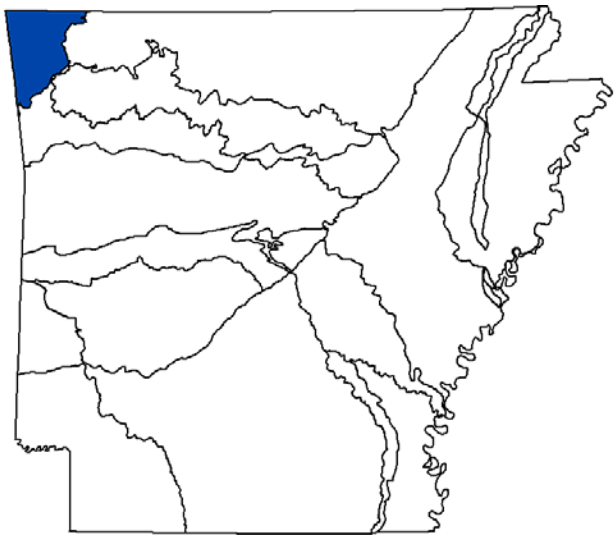
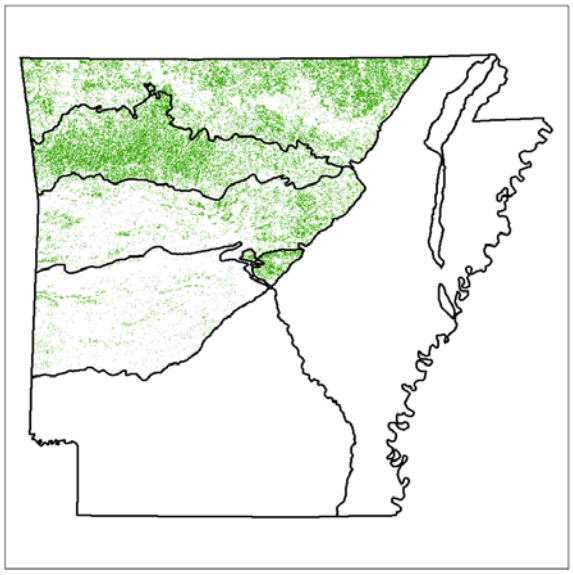


Ecobasins where this species occurs



Terrestrial Habitats

Ecobasins

Ozark Highlands - Arkansas River

Terrestrial Habitats

Caves, Mines, Sinkholes and other Karst Features	Obligate

Aquatic Habitats

Natural Cave Stream: - Small - Medium	Obligate
Natural Groundwater:	Obligate
Natural Spring Run: Headwater	Marginal

Cambarus aculabrum
Benton County Cave Crayfish

Problems Faced

Threat: Hydrological alteration
Source: Urban development

Threat: Nutrient loading
Source: Confined animal operations

Threat: Nutrient loading
Source: Urban development

Threat: Sedimentation
Source: Road construction

Threat: Toxins/contaminants
Source: Confined animal operations

Data Gaps/Research Needs

Determine life history information.

Determine taxonomic relationships.

Survey and model for additional populations.

Conservation Actions

	Importance	Category
Maintain groundwater quality.	High	Threat Abatement
Protect cave habitat and recharge zone from development or disturbance.	High	Habitat Protection

Monitoring Strategies

Monitor known occurrences using protocols developed by monitoring team of The Nature Conservancy, ANHC, AGFC, and the US Fish and Wildlife Service.

Comment

Description: a small (maximum 28mm carapace length), unpigmented troglobitic crayfish with reduced eyes. (Hobbs and Brown 1987).

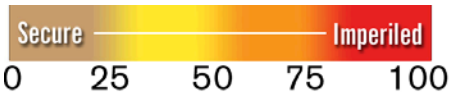
This crayfish is endemic to northwest Arkansas, known from very few caves, and has been listed as endangered (USFWS 1993). The species is threatened by water quality degradation, small population size, limited reproductive potential, and possible take by humans. (USFWS 1996). Recent discoveries have expanded the known distribution of this species to four sites. (Mike Slay, personal communication).

Cambarus causeyi

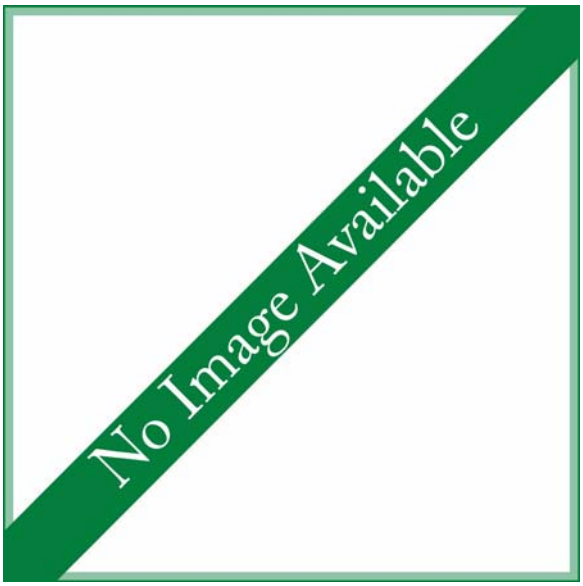
Boston Mountains Crayfish

Class: Malacostraca
Order: Decapoda
Family: Cambaridae

Priority Score: 62 out of 100



Population Trend: Decreasing

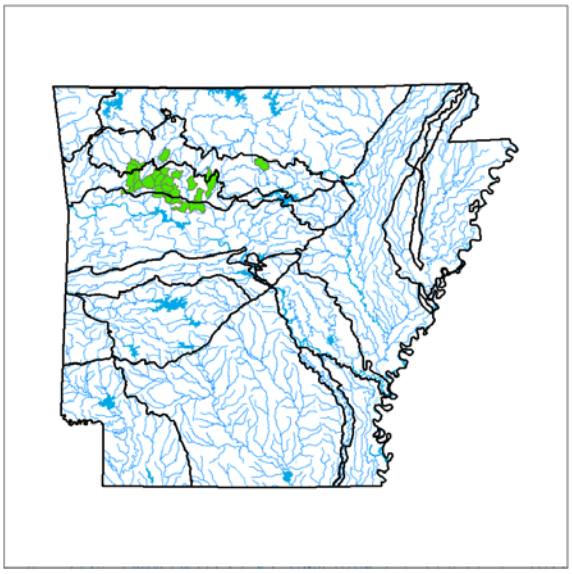


Global Rank: G2 — Imperiled species

State Rank: S1 — Critically imperiled in Arkansas

Distribution

Element Occurrence Records



Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☑ Boston Mountains
- ☑ Arkansas Valley
- ☐ Ouachita Mountains
- ☐ South Central Plains
- ☐ Mississippi Alluvial Plain
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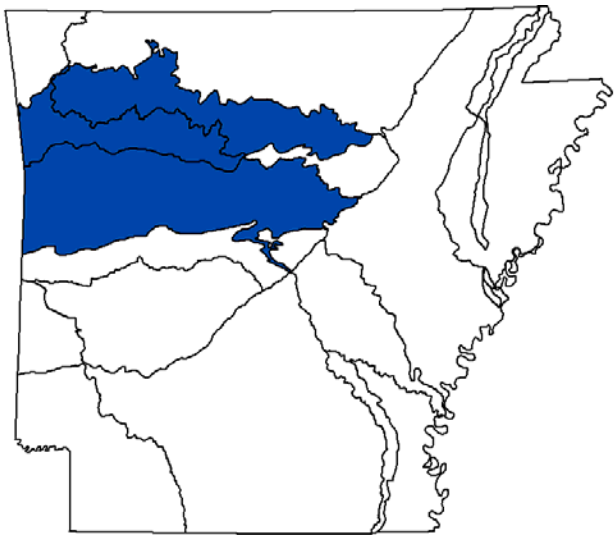
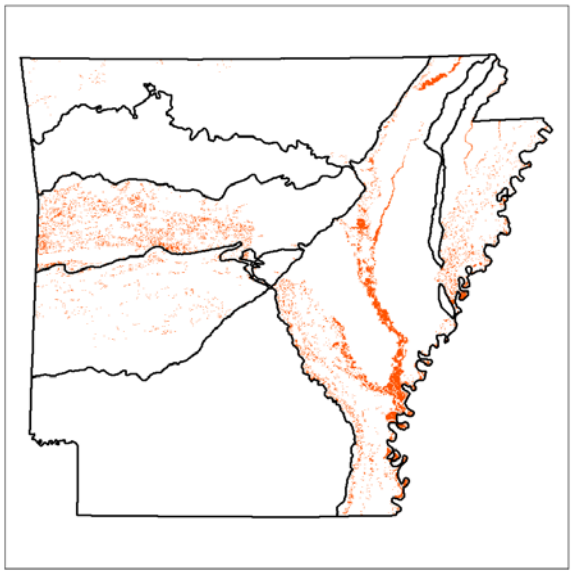


Ecobasins where this species occurs



Terrestrial Habitats

Ecobasins

Arkansas Valley - Arkansas River
Boston Mountains - Arkansas River
Boston Mountains - White River

Terrestrial Habitats

Ozark-Ouachita Riparian	Marginal

Aquatic Habitats

Natural Seep: Headwater	Obligate
Natural Spring Run: Headwater	Suitable

Cambarus causeyi
Boston Mountains Crayfish

Problems Faced

Threat: Groundwater depletion
Source: Excessive groundwater withdrawal

Threat: Habitat disturbance
Source: Resource extraction

Threat: Riparian Habitat Destruction
Source: Forestry activities

Data Gaps/Research Needs

Determine status of known populations.

Identify habitat requirements and threats.

Survey for additional populations.

Conservation Actions

	Importance	Category
	Medium	Habitat Restoration/Improvement
Maintain or, where necessary, restore water quality and stream habitat.	Medium	Habitat Protection

Monitoring Strategies

Monitor known occurrences.

Comment

Description: a strongly compressed, olive-colored crayfish that is poorly known. (Robison and Allen 1995).

This Arkansas endemic crayfish inhabits complex burrows on hillsides near springs in the Boston Mountains. (Bouchard and Robison 1980). It is most closely related to three troglobitic species. (Reimer 1966). Robison et al. (2009) suspected that the species may be declining after only locating specimens at 4 out of 39 sites examined.

Cambarus hubbsi

Hubbs' Crayfish

Class: Malacostraca
Order: Decapoda
Family: Cambaridae

Priority Score: 27 out of 100

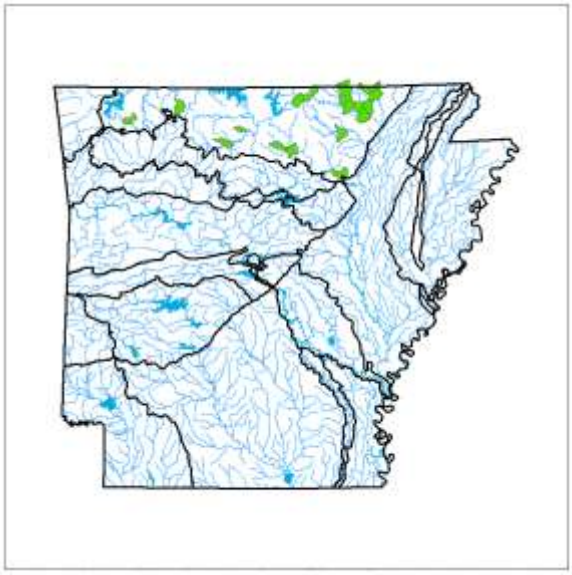
Population Trend: Unknown

Gobal Rank: G3? — Vulnerable (inexact numeric rank)

State Rank: S3 — Vulnerable in Arkansas

Distribution

Occurrence Records



Ecoregions where the species occurs:

- [x] Ozark Highlands
- [x] Boston Mountains
- [ ] Ouachita Mountains
- [ ] Arkansas Valley
- [ ] South Central Plains
- [ ] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

Taxa Association Team and Peer Reviewer

AGFC Mr. Brian Wagner, UA Dr. Daniel Magoulick

Ecobasins

Boston Mountains - White River
Ozark Highlands - White River

Habitats

	Weight
Natural Cave Stream: - Medium - Large	Marginal
Natural Glide: - Medium - Large	Suitable
Natural Pool: - Medium - Large	Marginal
Natural Riffle: - Medium - Large	Optimal
Natural Run: - Medium - Large	Optimal
Natural Shoal: - Medium - Large	Optimal

Problems Faced

Threat: Biological alteration Source: Exotic species
Threat: Habitat destruction Source: Grazing/Browsing

Data Gaps/Research Needs

Determine impact of introduced crayfish.
Determine taxonomic and genetic status of subpopulations.
Survey for additional populations.

Conservation Actions

	Importance	Category
Maintain healthy, upland streams.	Medium	Habitat Protection
Prevent introduction of non-native crayfishes.	Medium	Threat Abatement

Monitoring Strategies

Monitor incidental to stream crayfish survey.

Comments

This crayfish is endemic to the Ozarks. It is fairly common in Ozark streams of the Black River basin, but it is much less common in the remainder of the White River basin. Coloration and habitat use differences between the two areas also are curious, and warrant future attention (Brian Wagner, personal communication).

Interspecific competition with the invasive crayfish Orconectes neglectus is thought to be causing a reduction in the range of this species, in addition to changes in land use causing a decline in stream habitat quality (Magoulick and DiStefano 2007). The causes of this decline, however, have yet to be confirmed.

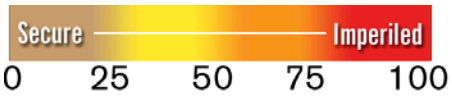
Cambarus hubbsi
Hubbs' Crayfish

Cambarus setosus

Bristly Cave Crayfish

Class: Malacostraca
Order: Decapoda
Family: Cambaridae

Priority Score: **34** out of 100



Population Trend: Unknown

Global Rank: G3 — Vulnerable species

State Rank: S1 — Critically imperiled in Arkansas

Distribution

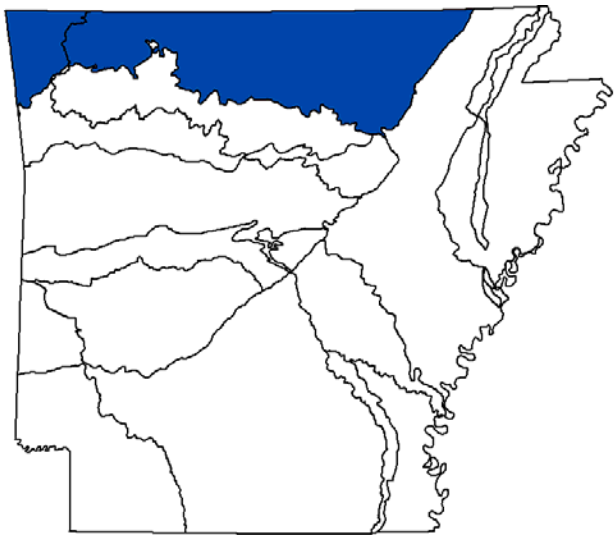
Element Occurrence Records

Ecoregions where the species occurs:

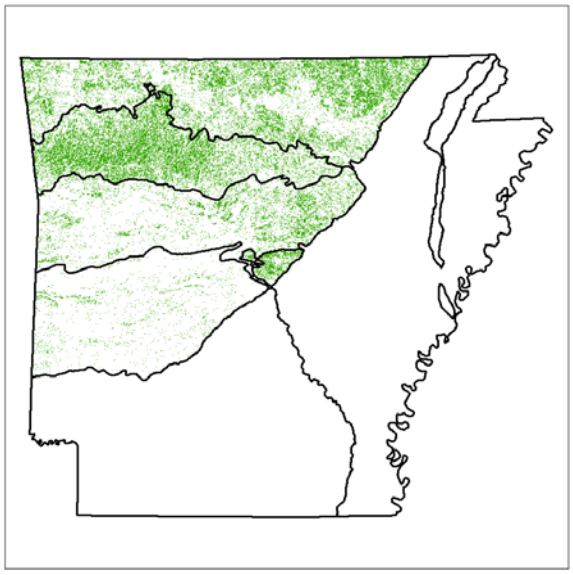
- [x] Ozark Highlands
- [ ] Boston Mountains
- [ ] Arkansas Valley
- [ ] Ouachita Mountains
- [ ] South Central Plains
- [ ] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

Taxa Team and Peer Reviewers

AGFC Mr. Brian Wagner, UA Dr. Daniel Magoulick



Ecobasins where this species occurs



Terrestrial Habitats

Ecobasins

Ozark Highlands - Arkansas River

Ozark Highlands - White River

Terrestrial Habitats

Caves, Mines, Sinkholes and other Karst Features	Obligate

Aquatic Habitats

Natural Cave Stream: - Small	Obligate
Natural Groundwater:	Obligate

Cambarus setosus
Bristly Cave Crayfish

Problems Faced

Threat: Hydrological alteration
Source: Urban development

Threat: Nutrient loading
Source: Confined animal operations

Threat: Sedimentation
Source: Road construction

Threat: Toxins/contaminants
Source: Road construction

Data Gaps/Research Needs

Conduct taxonomic and genetic analyses.

Determine life history characteristics.

Survey and model for additional populations.

Conservation Actions

	Importance	Category
Maintain groundwater quality.	Medium	Threat Abatement
Protect cave habitat and recharge zone from development or disturbance.	Medium	Habitat Protection

Monitoring Strategies

Monitor known occurrences.

Comment

Description: a small (maximum 4.7 inches total length), unpigmented troglobitic crayfish with reduced eyes. (Pflieger 1996).

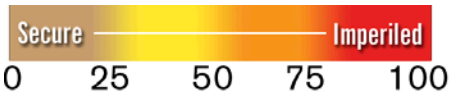
This crayfish is endemic to caves of the Ozarks in Missouri and Oklahoma. (Hobbs 1989). Recent unpublished discoveries have found this species in Arkansas as well. (Horton H. Hobbs III, personal communication). There is little known about the species in the state and based on the distribution of all cave crayfish populations in Arkansas, the identification of these populations is suspect and should be verified via genetic analyses.

Cambarus zophonastes

Hell Creek Cave Crayfish

Class: Malacostraca
Order: Decapoda
Family: Cambaridae

Priority Score: **80** out of 100



Population Trend: Stable

Global Rank: G1 — Critically imperiled species

State Rank: S1 — Critically imperiled in Arkansas

Distribution

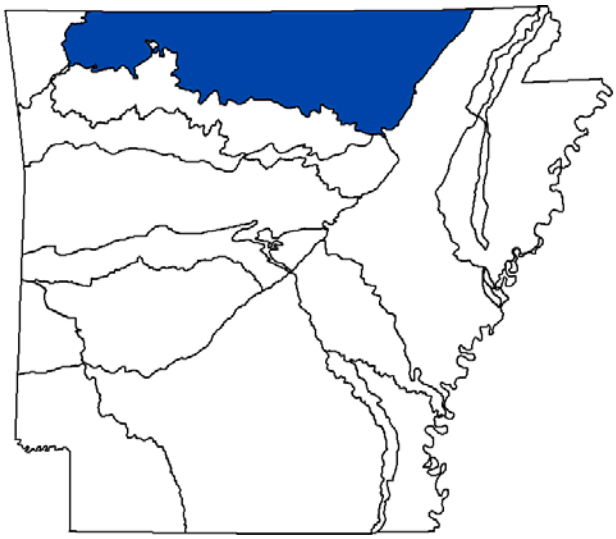
Element Occurrence Records

Ecoregions where the species occurs:

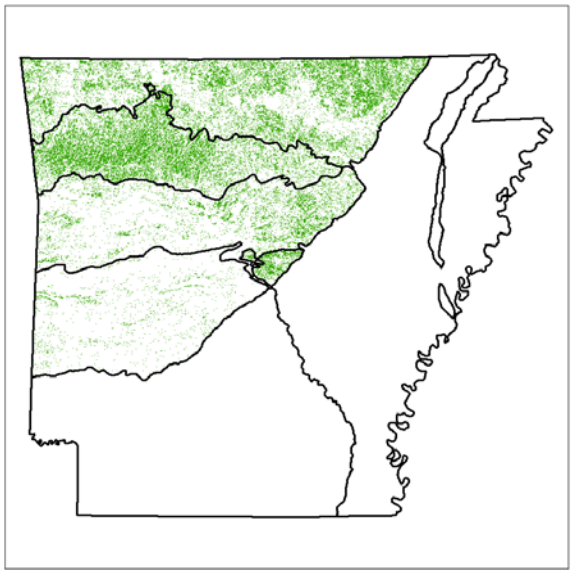
- [x] Ozark Highlands
- [ ] Boston Mountains
- [ ] Arkansas Valley
- [ ] Ouachita Mountains
- [ ] South Central Plains
- [ ] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

Taxa Team and Peer Reviewers

AGFC Mr. Brian Wagner, UA Dr. Daniel Magoulick



Ecobasins where this species occurs



Terrestrial Habitats

Ecobasins

Ozark Highlands - White River

Terrestrial Habitats

Caves, Mines, Sinkholes and other Karst Features	Obligate

Aquatic Habitats

Natural Cave Stream: - Small - Medium	Obligate
Natural Groundwater:	Obligate
Natural Spring Run: - Small - Medium	Marginal

Cambarus zophonastes
Hell Creek Cave Crayfish

Problems Faced

Threat: Habitat disturbance
Source: Forestry activities

Threat: Habitat disturbance
Source: Urban development

Threat: Sedimentation
Source: Road construction

Threat: Toxins/contaminants
Source: Road construction

Data Gaps/Research Needs

Refine delineation of vulnerable portions of recharge area and identify threats therein.

Survey and model for additional populations.

Conservation Actions

	Importance	Category
Maintain groundwater quality.	High	Threat Abatement
Protect cave habitat and recharge zone from development or disturbance.	Medium	Habitat Protection

Monitoring Strategies

Monitor known occurences using protocols determined by monitoring team of The Nature Conservancy, ANHC, AGFC, and the US Fish and Wildlife Service.

Comment

Description: an obligate cave dweller lacking pigment, with long thin appendages and reduced eyes. (Robison and Allen 1995).

An Arkansas endemic originally known only from a single cave in Stone county which is owned by the Arkansas Natural Heritage Commission. This species is found in and has recently expanded to Nesbitt Spring Cave, Stone County, Arkansas, USA (Graening et al. 2006). Surveys have been initiated at 170 other caves; no additional populations have been located.

Protection of Hell Creek Cave's recharge area is the primary focus of recovery (USFWS 1988). While populations persist at what is likely historic levels its limited distribution makes it vulnerable to impacts (Graening and others, in progress). Individuals of this species have been washed out of groundwater feeding Town Branch in Yellville, and recharge delineation for this location has been completed through a Section 6 study (Slay 2014). Genetic identification of crayfish of other caves in the eastern Ozarks may reveal additional populations.

Fallicambarus dissitus

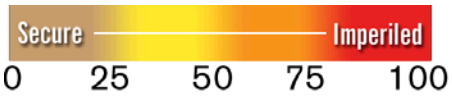
Pine Hills Digger

Class: Malacostraca

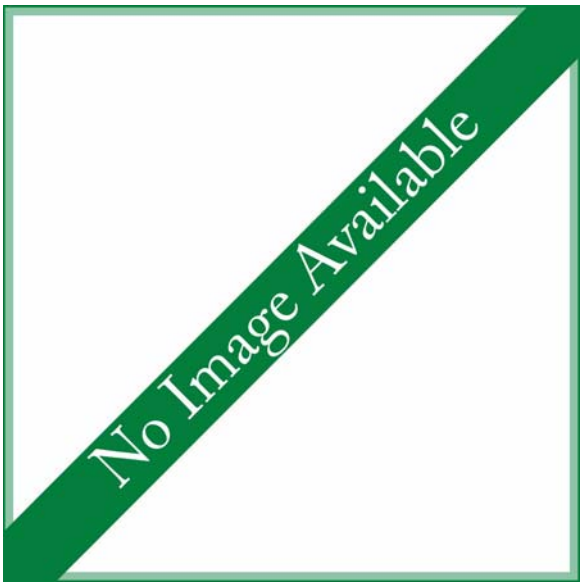
Order: Decapoda

Family: Cambaridae

Priority Score: 32 out of 100



Population Trend: Unknown



Global Rank: G3 — Vulnerable species

State Rank: S1S2? — Critically imperiled species in Arkansas (uncertain rank) (inexact numeric rank)

Distribution

Element Occurrence Records

Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☐ Arkansas Valley
- ☐ Ouachita Mountains
- ☑ South Central Plains
- ☐ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

Taxa Team and Peer Reviewers

AGFC Mr. Brian Wagner, UA Dr. Daniel Magoulick

No Ecobasin Map is available

Ecobasins where this species occurs

Terrestrial Habitats

Ecobasins

South Central Plains - Ouachita River

Terrestrial Habitats

West Gulf Coastal Plain Seepage Swamp and Baygall	Suitable

Aquatic Habitats

Natural Groundwater:	Suitable
Natural Seep: - Small	Suitable

Fallicambarus dissitus
Pine Hills Digger

Problems Faced

Threat: Habitat disturbance
Source: Road construction

Threat: Toxins/contaminants
Source: Road construction

Data Gaps/Research Needs

Determine habitat requirements and threats.

Survey for additional populations.

Conservation Actions

	Importance	Category
Protect known occurrences from construction activities and herbicide applications.	Medium	Habitat Protection

Monitoring Strategies

Monitor known occurrences.

Comment

A primary burrowing crayfish endemic to Louisiana and Arkansas. It is of conservation concern in Louisiana and there are very few records from Arkansas.

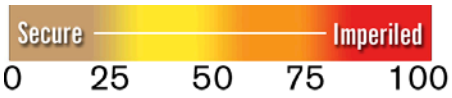
Fallicambarus dissitus
Pine Hills Digger

Fallicambarus gilpini

Jefferson County Crayfish

Class: Malacostraca
Order: Decapoda
Family: Cambaridae

Priority Score: **50** out of 100



Population Trend: Unknown

Global Rank: G2 — Imperiled species

State Rank: S1 — Critically imperiled in Arkansas

Distribution

Element Occurrence Records

Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☐ Arkansas Valley
- ☐ Ouachita Mountains
- ☑ South Central Plains
- ☐ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

Taxa Team and Peer Reviewers

AGFC Mr. Brian Wagner, UA Dr. Daniel Magoulick

Ecobasins where this species occurs

Terrestrial Habitats

Ecobasins

South Central Plains - Ouachita River

Terrestrial Habitats

West Gulf Coastal Plain Seepage Swamp and Baygall	Suitable

Aquatic Habitats

Natural Groundwater:	Data Gap
Natural Seep: - Small	Suitable

Fallicambarus gilpini
Jefferson County Crayfish

Problems Faced

Threat: Habitat disturbance
Source: Road construction

Threat: Toxins/contaminants
Source: Road construction

Data Gaps/Research Needs

Determine habitat requirements.

Survey for additional populations.

Conservation Actions

	Importance	Category
	Medium	Threat Abatement
Protect known occurrences from construction activities and herbicide applications.	Medium	Habitat Protection

Monitoring Strategies

Monitor known occurrences.

Comment

Description: a burrowing crayfish often blueish in color. (Hobbs and Robison 1989).

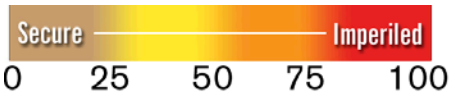
This Arkansas endemic crayfish is restricted to a small area southwest of Pine Bluff, Arkansas. It has been documented from six sites in Jefferson County and one site in Cleveland County. (Robison and Wagner, 2005). It prefers to burrow on seepage slopes away from standing water areas.

Fallicambarus harpi

Ouachita Burrowing Crayfish

Class: Malacostraca
Order: Decapoda
Family: Cambaridae

Priority Score: 46 out of 100



Population Trend: Stable

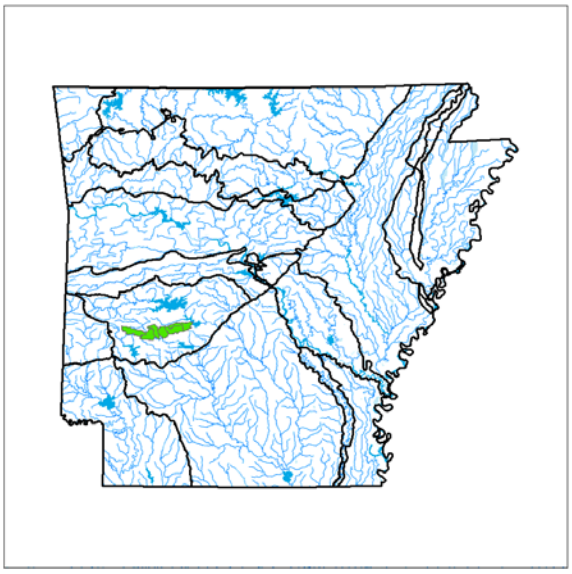

©Brian Wagner

Global Rank: G2 — Imperiled species

State Rank: S2 — Imperiled in Arkansas

Distribution

Element Occurrence Records



Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☐ Arkansas Valley
- ☑ Ouachita Mountains
- ☐ South Central Plains
- ☐ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

Taxa Team and Peer Reviewers

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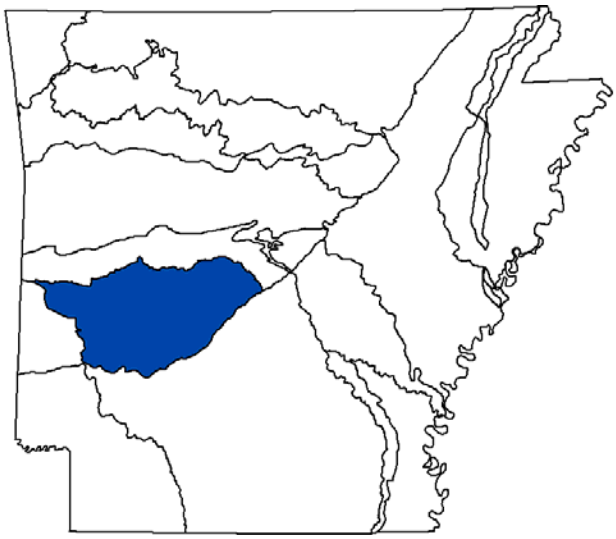
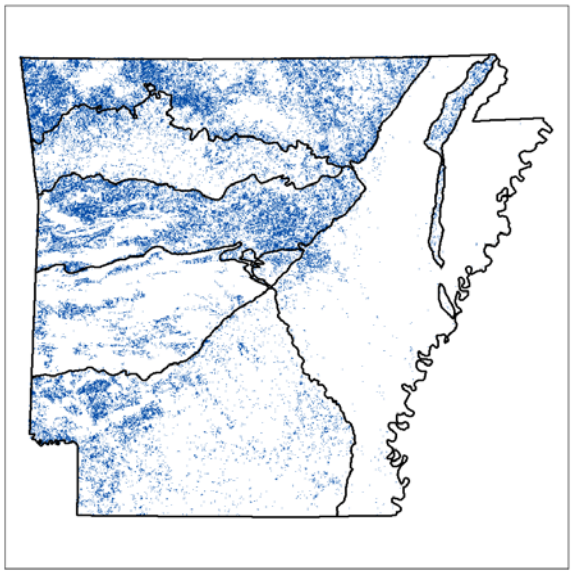


Ecobasins where this species occurs



Terrestrial Habitats

Ecobasins

Ouachita Mountains - Ouachita River

Terrestrial Habitats

Ozark-Ouachita Forested Seep	Suitable
Pasture Land	Suitable

Aquatic Habitats

Natural Groundwater:	Data Gap
Natural Seep: - Small	Suitable

Fallicambarus harpi
Ouachita Burrowing Crayfish

Problems Faced

Threat: Habitat disturbance
Source: Road construction

Threat: Toxins/contaminants
Source: Road construction

Data Gaps/Research Needs

Identify habitat requirements and threats.

Conservation Actions

	Importance	Category
	Medium	Threat Abatement
Protect known occurrences from construction activities and herbicide applications.	Medium	Habitat Protection

Monitoring Strategies

Monitor known occurrences.

Comment

Description: a burrowing crayfish, tan in color with highly variable patterning (Hobbs and Robison 1985).

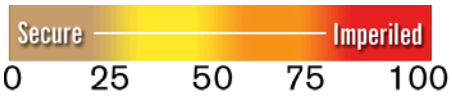
This crayfish is endemic to the southern Ouachitas and is known from 12 sites in Garland, Hot Spring, Montgomery, and Pike counties (Robison and Crump 2004). Rhoden et al. (Illinois Natural History Survey) are currently studying this species in an attempt to model distribution based on habitat characteristics.

Fallicambarus jeanae

Daisy Burrowing Crayfish

Class: Malacostraca
Order: Decapoda
Family: Cambaridae

Priority Score: 46 out of 100



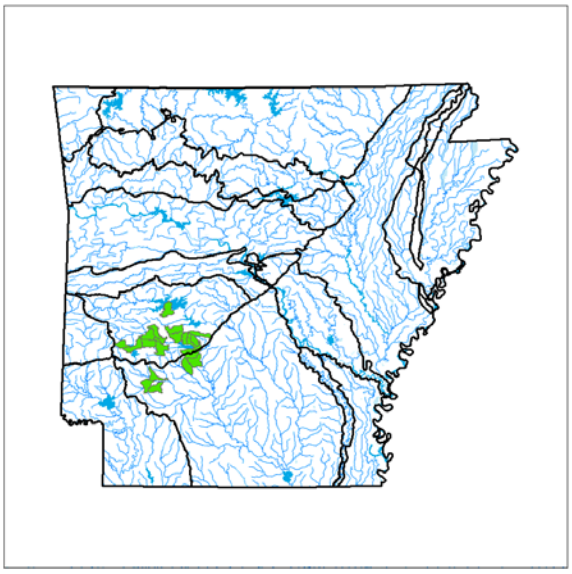
Population Trend: Unknown

Global Rank: G2 — Imperiled species

State Rank: S2 — Imperiled in Arkansas

Distribution

Element Occurrence Records

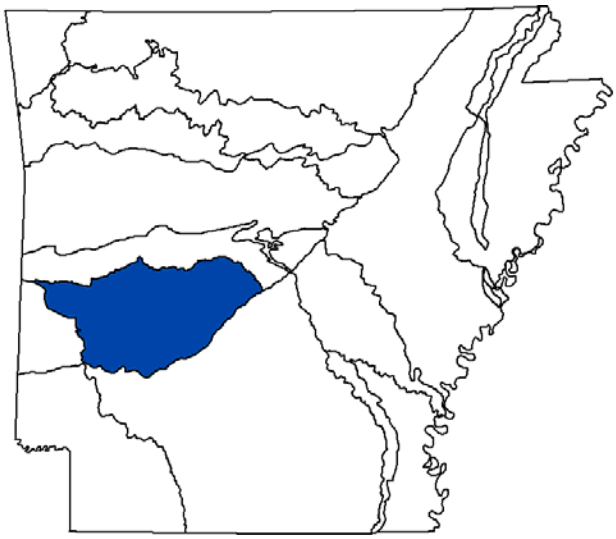


Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☐ Arkansas Valley
- ☑ Ouachita Mountains
- ☐ South Central Plains
- ☐ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

Taxa Team and Peer Reviewers

AGFC Mr. Brian Wagner, UA Dr. Daniel Magoulick



Ecobasins where this species occurs

Terrestrial Habitats

Ecobasins

Ouachita Mountains - Ouachita River

Terrestrial Habitats

Ozark-Ouachita Forested Seep	Optimal

Aquatic Habitats

Natural Groundwater: - Small	Data Gap
Natural Seep: - Small	Optimal

Fallicambarus jeanae
Daisy Burrowing Crayfish

Problems Faced

Threat: Habitat disturbance
Source: Road construction

Threat: Toxins/contaminants
Source: Road construction

Data Gaps/Research Needs

Identify habitat requirements and threats.

Survey for additional populations.

Conservation Actions

	Importance	Category
	Medium	Threat Abatement
Protect known occurrences from construction activities and herbicide applications.	Medium	Habitat Protection

Monitoring Strategies

Monitor known occurrences.

Comment

Description: a burrowing crayfish varying in color from tan to grey (Hobbs 1973, Robison and Allen 1995).

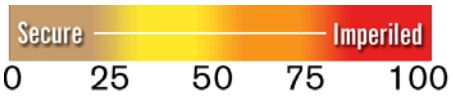
This endemic crayfish inhabits burrows in sandy clay soils in Hemptead, Pike, Clark and Hot Spring counties (Robison and Allen 1995).

Fallicambarus petilicarpus

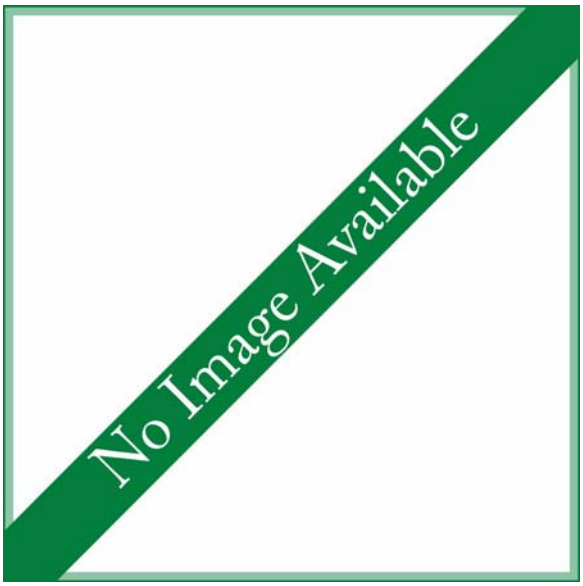
Slenderwrist Burrowing Crayfish

Class: Malacostraca
Order: Decapoda
Family: Cambaridae

Priority Score: **80** out of 100



Population Trend: Unknown



Global Rank: G1 — Critically imperiled species

State Rank: S1 — Critically imperiled in Arkansas

Distribution

Element Occurrence Records

Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☐ Arkansas Valley
- ☐ Ouachita Mountains
- ☑ South Central Plains
- ☐ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

Taxa Team and Peer Reviewers

AGFC Mr. Brian Wagner, UA Dr. Daniel Magoulick

Ecobasins where this species occurs

Terrestrial Habitats

Ecobasins

South Central Plains - Ouachita River

Terrestrial Habitats

West Gulf Coastal Plain Seepage Swamp and Baygall	Data Gap

Aquatic Habitats

Natural Groundwater:	Data Gap
Natural Seep: - Small	Suitable

Fallicambarus petilicarpus
Slenderwrist Burrowing Crayfish

Problems Faced

Threat: Habitat disturbance
Source: Road construction

Threat: Toxins/contaminants
Source: Road construction

Data Gaps/Research Needs

Identify habitat requirements and threats.

Survey for additional populations.

Conservation Actions

	Importance	Category
	Medium	Threat Abatement
Protect known occurrences from construction activities and herbicide applications.	Medium	Habitat Protection

Monitoring Strategies

Determine habitat requirements.

Monitor known occurrences.

Comment

Description: a burrowing crayfish, olive-brown and tan in color (Hobbs and Robison 1989).

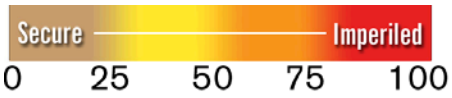
This endemic crayfish has been documented from 5 locations in Union and Columbia counties (Robison 2001, Robison et al. 2008). This species is at present known from only 18 specimens, from two collections at the type locality, and an undetermined number of specimens at a second locality in Columbia County (Robinson et al. 2008).

Fallicambarus strawni

Saline Burrowing Crayfish

Class: Malacostraca
Order: Decapoda
Family: Cambaridae

Priority Score: 65 out of 100



Population Trend: Unknown

Global Rank: G1G2 — Critically imperiled (uncertain rank)

State Rank: S1 — Critically imperiled in Arkansas

Distribution

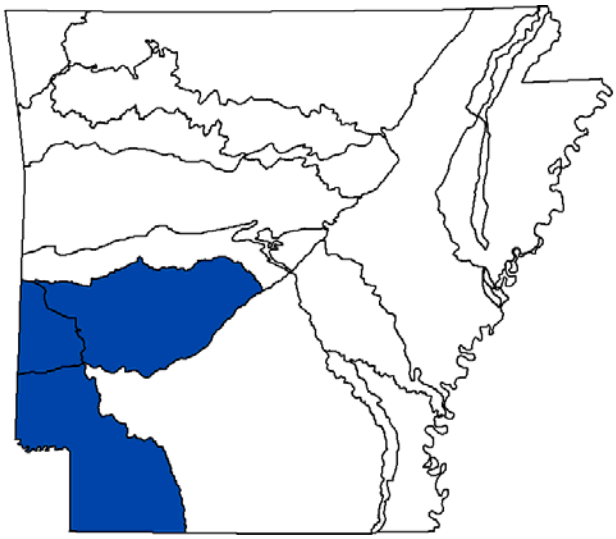
Element Occurrence Records

Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☐ Arkansas Valley
- ☑ Ouachita Mountains
- ☑ South Central Plains
- ☐ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

Taxa Team and Peer Reviewers

AGFC Mr. Brian Wagner, UA Dr. Daniel Magoulick



Ecobasins where this species occurs

Terrestrial Habitats

Ecobasins

Ouachita Mountains - Ouachita River
Ouachita Mountains - Red River
South Central Plains - Red River

Terrestrial Habitats

Ozark-Ouachita Forested Seep	Suitable

Aquatic Habitats

Natural Groundwater:	Data Gap
Natural Seep: Headwater - Small	Suitable

Fallicambarus strawni
Saline Burrowing Crayfish

Problems Faced

Threat: Habitat destruction or conversion
Source: Road construction

Threat: Habitat disturbance
Source: Road construction

Threat: Toxins/contaminants
Source: Management of/for certain species

Data Gaps/Research Needs

Identify habitat requirements and threats.

Survey for additional populations.

Conservation Actions

	Importance	Category
Protect known occurrences from construction activities and herbicide applications.	Medium	Habitat Protection

Monitoring Strategies

Monitor known occurrences.

Comment

Description: a pinkish cream to purplish tan crayfish that was originally described by Riemer (1966).

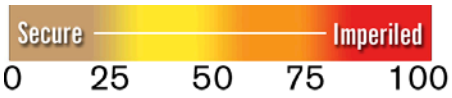
This endemic crayfish is known from Pike and Howard counties, where it is a primary burrower in marshy areas with sandy clay (Robison and Allen 1995). This species is found in marshes, and. Its preferred substrate is sandy-clay; nearby streams are clear, fast-running, shallow and with rocky substrate (Reimer 1966).

Faxonella blairi

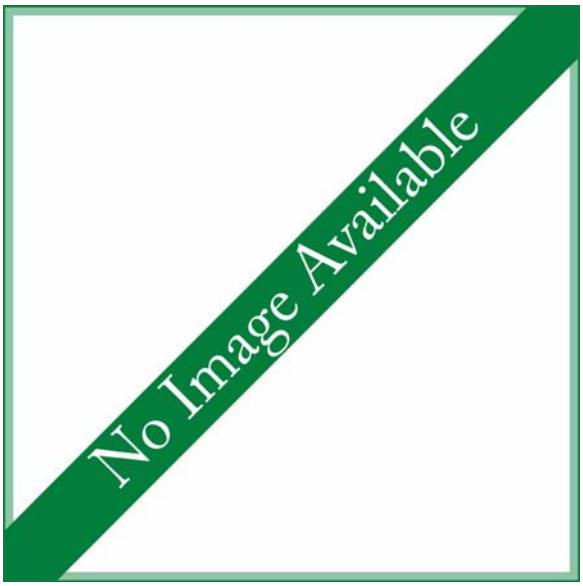
Blair's Fencing Crayfish

Class: Malacostraca
Order: Decapoda
Family: Cambaridae

Priority Score: 46 out of 100



Population Trend: Unknown



Global Rank: G2 — Imperiled species

State Rank: S2 — Imperiled in Arkansas

Distribution

Element Occurrence Records

Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☐ Arkansas Valley
- ☐ Ouachita Mountains
- ☑ South Central Plains
- ☐ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

Taxa Team and Peer Reviewers

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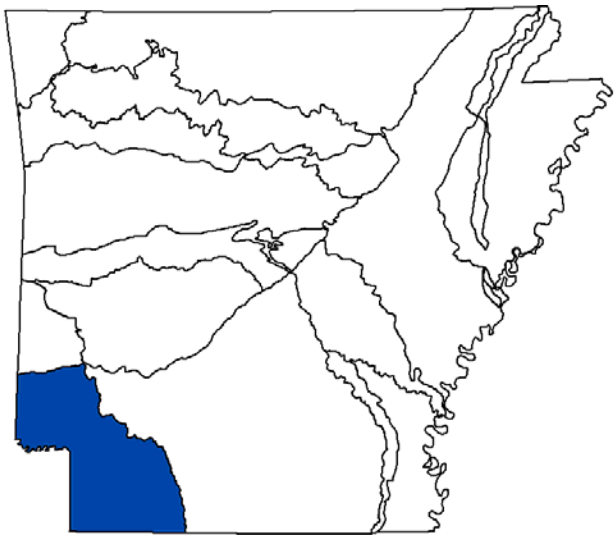

Ecobasins where this species occurs

Terrestrial Habitats

Ecobasins

South Central Plains - Red River

Terrestrial Habitats

West Gulf Coastal Plain Seepage Swamp and Baygall	Data Gap

Aquatic Habitats

Natural Swamp/Wetlands:	Data Gap

Faxonella blairi
Blair's Fencing Crayfish

Problems Faced

Threat: Habitat destruction
Source: Road construction

Threat: Habitat disturbance
Source: Forestry activities

Threat: Hydrological alteration
Source: Urban development

Threat: Toxins/contaminants
Source: Road construction

Data Gaps/Research Needs

Identify habitat requirements and threats.

Survey for additional populations.

Conservation Actions

	Importance	Category
Protect known occurrences from construction activities, herbicide applications and timber harvesting.	Medium	Habitat Protection

Monitoring Strategies

Monitor known occurrences.

Comment

Description: a small, wetland crayfish with maximum carapace length of 20mm (Hayes and Riemer 1977).
Occurs in southwest Arkansas and southeast Oklahoma (Hayes and Riemer 1977).

Robison and Crandall (2007) found it to be more common than previously thought, and considered it to be stable.

Orconectes acares

Redspotted Stream Crayfish

Class: Malacostraca
Order: Decapoda
Family: Cambaridae

Priority Score: **19** **out of 100**

Population Trend: Unknown

Gobal Rank: G4 — Apparently secure species

State Rank: S3 — Vulnerable in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☑ Ouachita Mountains
- ☐ Arkansas Valley
- ☐ South Central Plains
- ☐ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

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Ecobasins

Ouachita Mountains - Ouachita River

Habitats	Weight
Natural Littoral: - Small - Medium	Optimal
Natural Riffle: - Small - Medium	Optimal
Natural Run: - Small - Medium	Optimal
Natural Shoal: - Small - Medium	Optimal
Natural Spring Run: - Small	Optimal

Problems Faced

Threat: Habitat destruction
Source:

Threat: Hydrological alteration
Source:

Threat: Nutrient loading
Source:

Threat: Sedimentation
Source: Road construction

Data Gaps/Research Needs

Identify habitat requirements and threats.

Survey for additional populations.

Conservation Actions	Importance	Category
Maintain or, where necessary, restore water quality and stream habitat.	Medium	Habitat Protection

Monitoring Strategies

Monitor incidental to stream crayfish surveys.

Comments

Hobbs (1989) presented the range of Orconectes acares as the tributaries of the Ouachita River in Garland, Hot Springs, Montgomery, Perry, Pike, Polk, and Saline counties. Abundant and widely distributed in the Ouachita uplands of Arkansas - endemic to the state (McAllister and Robison 2010).

Orconectes eupunctus

Coldwater Crayfish

Class: Malacostraca
Order: Decapoda
Family: Cambaridae

Priority Score: **50** **out of 100**

Population Trend: Unknown

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Gobal Rank: G2 — Imperiled species

State Rank: S1 — Critically imperiled in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- [x] Ozark Highlands
- [ ] Boston Mountains
- [ ] Ouachita Mountains
- [ ] Arkansas Valley
- [ ] South Central Plains
- [ ] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

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Ecobasins

Ozark Highlands - White River

Habitats	Weight
Natural Riffle: - Medium	Optimal
Natural Run: - Medium	Optimal

Problems Faced

Threat: Biological alteration
Source: Exotic species

Threat: Habitat disturbance
Source: Resource extraction

Threat: Sedimentation
Source: Forestry activities

Threat: Sedimentation
Source: Road construction

Data Gaps/Research Needs

Confirm taxonomic status of potential related new species.

Determine threat from introduced species and mechanisms of displacement.

Identify habitat requirements and threats.

Survey for additional populations.

Conservation Actions	Importance	Category
Maintain or, where necessary, restore water quality and stream habitat.	Medium	Habitat Protection
Prevent introduction of non-native crayfishes.	Medium	Threat Abatement

Monitoring Strategies

Monitor known occurrences every 2-5 years.

Comments

Description: a rather small, stout crayfish with reddish brown thorax and abdomen (Pflieger 1996). Endemic to the Eleven Point and Spring River drainages of Arkansas and Missouri (Williams 1954). Also found in localized areas in Strawberry River (Wagner et al. 2008) and a tributary (Henry Robison, pers. Comm.).

Wagner et al. 2008 found limited ocurrences in random basin-wide surveys and inferred dependence on larger stream habitats. The species is the subject of a current range-wide study by Missouri Department of Conservation, University of Arkansas, USGS, AGFC, and Carnegie Museum of Natural History looking at status, hanitat use, life history, genetics, and thermal stress.

The range of this species is in decline due, predominantly due to inter-specific competition with the invasive crayfish Orconectes neglectus and changes in land use causing a decline in stream habitat quality (Magoulick and DiStefano 2007) where there has been a documented decline in at least one drainage (Magoulick and DiStefano 2007). The precise causes for the decline have not been confirmed (Rabalais and Magoulick 2006).

Orconectes leptogonopodus

Little River Creek Crayfish

Class: Malacostraca
Order: Decapoda
Family: Cambaridae

Priority Score: **19** **out of 100**

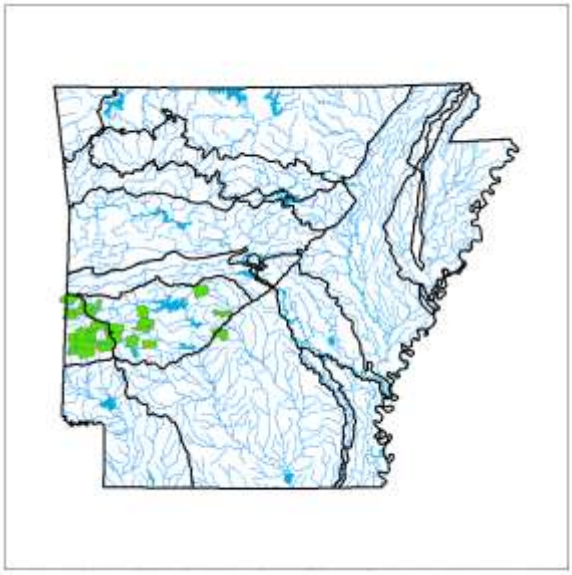
Population Trend: Unknown

Gobal Rank: G4 — Apparently secure species

State Rank: S3 — Vulnerable in Arkansas

Distribution

Occurrence Records



Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☑ Ouachita Mountains
- ☐ Arkansas Valley
- ☐ South Central Plains
- ☐ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

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Ecobasins

Ouachita Mountains - Red River

Habitats	Weight
Natural Glide: Headwater - Small - Medium	Data Gap
Natural Littoral: Headwater - Small - Medium	Data Gap
Natural Pool: Headwater - Small - Medium	Data Gap
Natural Riffle: Headwater - Small - Medium	Data Gap
Natural Run: Headwater - Small - Medium	Data Gap
Natural Shoal: Headwater - Small - Medium	Data Gap

Problems Faced

Threat: Habitat disturbance
Source: Resource extraction

Threat: Hydrological alteration
Source:

Threat: Nutrient loading
Source:

Threat: Sedimentation
Source: Forestry activities

Threat: Sedimentation
Source: Road construction

Data Gaps/Research Needs

Determine species distribution in Arkansas.

Identify habitat requirements and threats.

Conservation Actions	Importance	Category
More data are needed to determine conservation actions.	Medium	Data Gap

Monitoring Strategies

More information is needed before a monitoring strategy can be developed.

Comments

This species is restricted to Ouachita Mountain Province, to the tributaries of the Red River drainage in Arkansas and eastern Oklahoma, USA (Fitzpatrick 1965). Found in clear rocky streams of the upper Little River system in AR & OK (Hobbs 1989).

Orconectes leptogonopodus
Little River Creek Crayfish

Orconectes macrus

Neosho Midget Crayfish

Class: Malacostraca
Order: Decapoda
Family: Cambaridae

Priority Score: **23** **out of 100**

Population Trend: Unknown

Gobal Rank: G4 — Apparently secure species

State Rank: S2 — Imperiled in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- [x] Ozark Highlands
- [ ] Boston Mountains
- [ ] Ouachita Mountains
- [ ] Arkansas Valley
- [ ] South Central Plains
- [ ] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

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Ecobasins

Ozark Highlands - Arkansas River

Habitats	Weight
Natural Pool: Headwater - Small	Suitable
Natural Riffle: Headwater - Small	Optimal
Natural Run: Headwater - Small	Optimal
Natural Spring Run: Headwater	Suitable

Problems Faced

Threat: Habitat destruction
Source: Urban development

Threat: Habitat disturbance
Source: Resource extraction

Threat: Sedimentation
Source: Forestry activities

Threat: Sedimentation
Source: Road construction

Threat: Sedimentation
Source: Urban development

Data Gaps/Research Needs

Identify habitat requirements and threats.

Survey for additional populations.

Conservation Actions	Importance	Category
Encourage sediment control BMPs during development.	Medium	Habitat Protection
Maintain riparian vegetation.	Medium	Habitat Protection
Stabilize eroding streambanks.	Medium	Habitat Restoration/Improvement

Monitoring Strategies

More information is needed before a monitoring strategy can be developed.

Comments

Description: a diminutive crayfish (maximum 2 inch total length), tan with a black or olive saddle and sometimes dark brown or black speckles (Pflieger 1996, Brian K. Wagner, personal communication).

Inhabits clear gravelly streams of the Arkansas River drainage in extreme northwest Arkansas and adjacent states (Pflieger 1996). The separation between O. macrus and O. nana was studied by Dillman et al. 2010 and distinctness of the species was strongly supported.

Orconectes macrus
Neosho Midget Crayfish

Orconectes marchandi

Mammoth Spring Crayfish

Class: Malacostraca
Order: Decapoda
Family: Cambaridae

Priority Score: **46** **out of 100**

Population Trend: Unknown

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Gobal Rank: G2 — Imperiled species

State Rank: S2 — Imperiled in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- [x] Ozark Highlands
- [ ] Boston Mountains
- [ ] Ouachita Mountains
- [ ] Arkansas Valley
- [ ] South Central Plains
- [ ] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

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Ecobasins

Ozark Highlands - White River

Habitats	Weight
Natural Pool: - Small - Medium	Marginal
Natural Riffle: - Small - Medium	Optimal
Natural Run: - Small - Medium	Suitable

Problems Faced

Threat: Biological alteration
Source: Exotic species

Threat: Chemical alteration
Source: Recreation

Threat: Riparian Habitat Destruction
Source: Channel alteration

Threat: Sedimentation
Source: Recreation

Data Gaps/Research Needs

Assess risk from potential introduced species.

Examine population genetics and gene flow between potentially isolated populations.

Resurvey known populations.

Survey for additional populations.

Conservation Actions	Importance	Category
Maintain or, where necessary, restore water quality and stream habitat.	Medium	Habitat Restoration/Improvement
Prevent additional introductions of crayfishes.	High	Threat Abatement

Monitoring Strategies

Monitor known occurrences.

Monitor spread of introduced crayfish in Spring River basin.

Orconectes marchandi
Mammoth Spring Crayfish

Comments

Description: a medium-sized reddish brown crayfish (Pflieger 1996)

This crayfish occupies clear streams with gravel or rubble substrate (Pflieger 1996), but is also found in high numbers in pools and spring fed streams (Dukat and Magoulick 1999). In some parts areas it occurs in higher numbers in non-permanent habitats (Flinders and Magoulick 2003).

This crayfish has a very limited distribution in the Spring River and its tributaries in three counties of Arkansas and Missouri (Pflieger 1996). Introduced ringed crayfish may adversely affect the species (Dan Magoulick, personal communication). Flinders and Magoulick (2005) studied distribution, habitat use, and life history of the species.

Orconectes marchandi
Mammoth Spring Crayfish

Orconectes meeki brevis

Meek's Short Pointed Crayfish

Class: Malacostraca
Order: Decapoda
Family: Cambaridae

Priority Score: 30 out of 100

Population Trend: Unknown

Gobal Rank: G4T3 — Apparently secure (vulnerable subspecies)

State Rank: S2 — Imperiled in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- [x] Ozark Highlands
- [ ] Boston Mountains
- [ ] Ouachita Mountains
- [ ] Arkansas Valley
- [ ] South Central Plains
- [ ] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

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Ecobasins

Ozark Highlands - Arkansas River

Habitats	Weight
Natural Pool: Headwater - Small	Data Gap
Natural Riffle: Headwater - Small	Data Gap
Natural Run: Headwater - Small	Data Gap

Problems Faced

Threat: Habitat destruction
Source: Urban development

Threat: Nutrient loading
Source: Urban development

Threat: Sedimentation
Source: Road construction

Threat: Sedimentation
Source: Urban development

Data Gaps/Research Needs

Establish genetic status relative to other subspecies.

Identify habitat requirements and threats.

Information is needed on status and distribution rangewide, especially outside of Arkansas.

Survey for additional populations.

Conservation Actions	Importance	Category
	Medium	Habitat Restoration/Improvement
Maintain or, where necessary, restore water quality and stream habitat.	Medium	Habitat Protection

Monitoring Strategies

Monitor known occurrences.

Comments

Description: a rather plain brown, medium-sized crayfish (Pflieger 1996). Inhabits rocky streams in extreme northwest Arkansas and eastern Oklahoma (Hobbs 1989).

Robison et al. 2009 expanded AR range to 22 sites, prompting recommended change in S rank. Genetic analyses of the difference between this subspecies and the nominate subspecies were inconclusive in resolving the level of relationship between these two taxa.

Orconectes menae

Mena Crayfish

Class: Malacostraca
Order: Decapoda
Family: Cambaridae

Priority Score: **27** **out of 100**

Population Trend: Stable

Gobal Rank: G3 — Vulnerable species

State Rank: S3 — Vulnerable in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☑ Ouachita Mountains
- ☐ Arkansas Valley
- ☐ South Central Plains
- ☐ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

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Ecobasins

Ouachita Mountains - Ouachita River

Ouachita Mountains - Red River

Habitats	Weight
Natural Pool: - Small - Medium	Data Gap
Natural Riffle: - Small - Medium	Data Gap
Natural Run: - Small - Medium	Data Gap

Problems Faced

Threat: Habitat disturbance
Source: Forestry activities

Threat: Sedimentation
Source: Road construction

Data Gaps/Research Needs

Survey for additional populations.

Conservation Actions	Importance	Category
	Medium	Habitat Restoration/Improvement
Maintain or, where necessary, restore water quality and stream habitat.	Medium	Habitat Protection

Monitoring Strategies

Monitor known occurrences.

Comments

Description: a medium-sized olive to brown crayfish (Brian K. Wagner, personal communication). Restricted to four counties in the upper Ouachitas of extreme western Arkansas and eastern Oklahoma (Hobbs 1989).

Robison (2008) found good numbers of this crayfish. Populations persist in Lake DeGray (Brian K. Wagner, personal communication) and possibly other reservoirs. Robison (2008) found O. menae under rocks and rubble both in the swifter, shallow runs and the shallow pool margins where rocks had been deposited. Occasionally, they were located in burrows under the largest rocks or at the side of large rocks. It seems they prefer the more shallow pool margins and runs whereas Orconectes palmeri longimanus preferred the deeper pool regions.

Orconectes nana

Midget Crayfish

Class: Malacostraca
Order: Decapoda
Family: Cambaridae

Priority Score: **30** **out of 100**

Population Trend: Unknown

Gobal Rank: G3 — Vulnerable species

State Rank: S2 — Imperiled in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- [x] Ozark Highlands
- [x] Boston Mountains
- [ ] Ouachita Mountains
- [ ] Arkansas Valley
- [ ] South Central Plains
- [ ] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

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Ecobasins

Boston Mountains - Arkansas River

Boston Mountains - White River

Ozark Highlands - Arkansas River

Ozark Highlands - White River

Habitats

	Weight
Natural Pool: - Small - Medium	Data Gap
Natural Riffle: - Small - Medium	Data Gap
Natural Run: - Small - Medium	Data Gap

Problems Faced

Threat: Habitat destruction
Source: Urban development

Threat: Nutrient loading
Source: Urban development

Threat: Sedimentation
Source: Road construction

Threat: Sedimentation
Source: Urban development

Data Gaps/Research Needs

Identify habitat requirements and threats.

Conservation Actions

	Importance	Category
Maintain or, where necessary, restore water quality and stream habitat.	Medium	Habitat Protection

Monitoring Strategies

Monitor known occurrences.

Comments

Description: a diminutive crayfish (maximum 2 inches long), tan with a dark saddle and may have brown speckles (Chris Taylor, personal communication). Inhabits clear gravelly streams of the Arkansas River drainage in northwest Arkansas and northeast Oklahoma (Williams 1954). The separation between O. macrus and O. nana was studied by Dillman et al. 2010 and distinctness of the species was strongly supported. Widespread within Illinois River basin small, gravelly streams (Brian K. Wagner, personal communication).

Orconectes nana
Midget Crayfish

Orconectes neglectus chaenodactylus

Gapped Ringed Crayfish

Class: Malacostraca
Order: Decapoda
Family: Cambaridae

Priority Score: **20** **out of 100**

Population Trend: Increasing

Gobal Rank: G5T3 — Secure (vulnerable subspecies)

State Rank: S3 — Vulnerable in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- [x] Ozark Highlands
- [ ] Boston Mountains
- [ ] Ouachita Mountains
- [ ] Arkansas Valley
- [ ] South Central Plains
- [ ] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

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Ecobasins

Ozark Highlands - White River

Habitats

	Weight
Natural Pool: Headwater - Small - Medium	Suitable
Natural Riffle: Headwater - Small - Medium	Suitable
Natural Run: Headwater - Small - Medium	Suitable

Problems Faced

Threat: Habitat disturbance
Source: Resource extraction

Threat: Riparian Habitat Destruction
Source: Road construction

Threat: Sedimentation
Source: Forestry activities

Threat: Sedimentation
Source: Road construction

Data Gaps/Research Needs

Expand genetic work in order to define taxa within Orconectes neglectus group.

Conservation Actions

	Importance	Category
Maintain or, where necessary, restore water quality and stream habitat.	Medium	Habitat Restoration/Improvement

Monitoring Strategies

Monitor known occurrences.

Monitor spread on introduced populations.

Comments

Description: a medium to large, brown crayfish with a dark saddle, a pale band on lower side of abdomen, red-tipped claws with brown or black ring around tip (Pflieger 1996).

This subspecies is restricted to the area from the North Fork White River Basin to Sylamore Creek (Hobbs 1989). This range was examined in more detail by Wagner and others 2010, finding it to be locally abundant. It has recently appeared in the Spring River basin (Dan Magoulick, personal communication) and Eleven Point River Basin (Bob DiStefano, personal communication).

Dillman et al. (2007) examined genetics using the Cytochrome Oxidase I locus and suggested a good deal of unrecognized taxonomic diversity within O. neglectus. Further genetic and morphological evidence is needed to corroborate this indication, and descriptions are needed for the possible new species indicated.

Orconectes williamsi

Williams' Crayfish

Class: Malacostraca
Order: Decapoda
Family: Cambaridae

Priority Score: **34** **out of 100**

Population Trend: Unknown

Gobal Rank: G3 — Vulnerable species

State Rank: S1 — Critically imperiled in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- [x] Ozark Highlands
- [x] Boston Mountains
- [ ] Ouachita Mountains
- [ ] Arkansas Valley
- [ ] South Central Plains
- [ ] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

Taxa Association Team and Peer Reviewer

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Ecobasins

Boston Mountains - White River
Ozark Highlands - Arkansas River
Ozark Highlands - White River

Habitats

	Weight
Natural Pool: Headwater - Small	Suitable
Natural Riffle: Headwater - Small	Suitable
Natural Run: Headwater - Small	Optimal
Natural Spring Run: Headwater - Small	Optimal

Problems Faced

Threat: Habitat destruction Source: Urban development
Threat: Habitat disturbance Source: Resource extraction
Threat: Habitat disturbance Source: Road construction
Threat: Nutrient loading Source: Urban development

Data Gaps/Research Needs

Examine population genetics, particularly any differences between Boston Mountain and Ozark Plateau populations.
Survey for additional populations.

Conservation Actions

	Importance	Category
Maintain or, where necessary, restore water quality and stream habitat.	Medium	Habitat Protection

Monitoring Strategies

Monitor known occurrences.

Comments

Description: a small crayfish (shorter than 2 inches long) that is gray to tan in color with a vase shaped pale zone on the carapace (Plieger 1996).

This species has localized occurrences in small headwater creeks of the upper White River basin. The number of known populations has been significantly increased through recent work (Wagner et al. 2010, Westhoff et al. 2006) but populations remain localized.

This species has become fragmented in recent years due to the development of reservoirs (Westhoff et al. 2006). In the White River portion of its range in Missouri, lead and gravel mining and urbanization continue to threaten species that inhabit this river system (Westhoff et al. 2006).

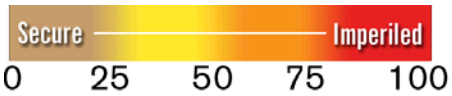
Orconectes williamsi
Williams' Crayfish

Procambarus parasimulans

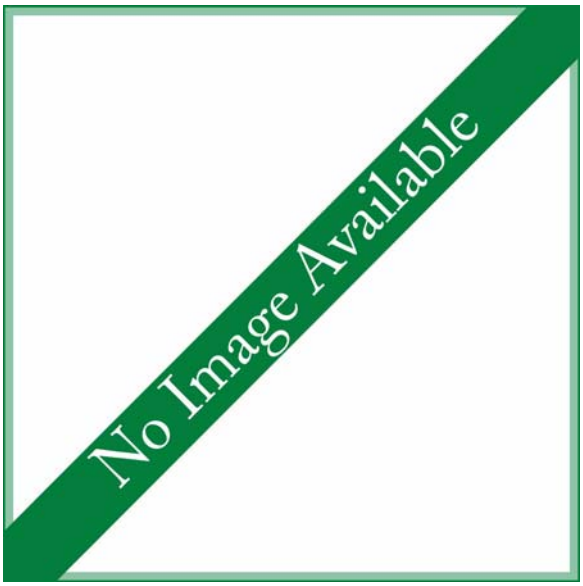
Bismark Burrowing Crayfish

Class: Malacostraca
Order: Decapoda
Family: Cambaridae

Priority Score: 19 out of 100



Population Trend: Unknown

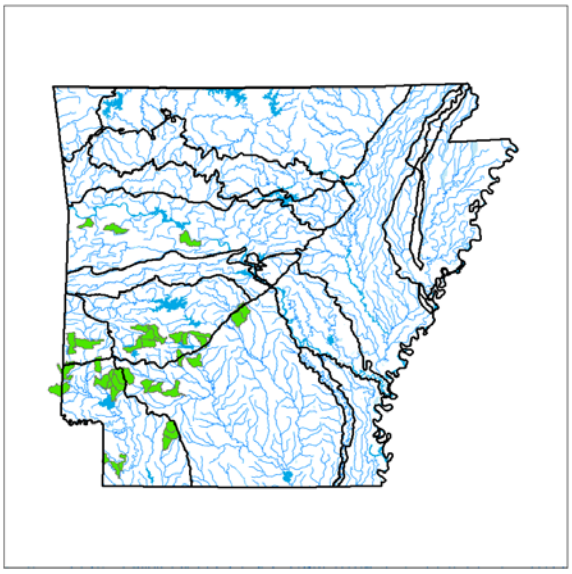


Global Rank: G4 — Apparently secure species

State Rank: S3 — Vulnerable in Arkansas

Distribution

Element Occurrence Records



Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☑ Arkansas Valley
- ☑ Ouachita Mountains
- ☑ South Central Plains
- ☐ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

Taxa Team and Peer Reviewers

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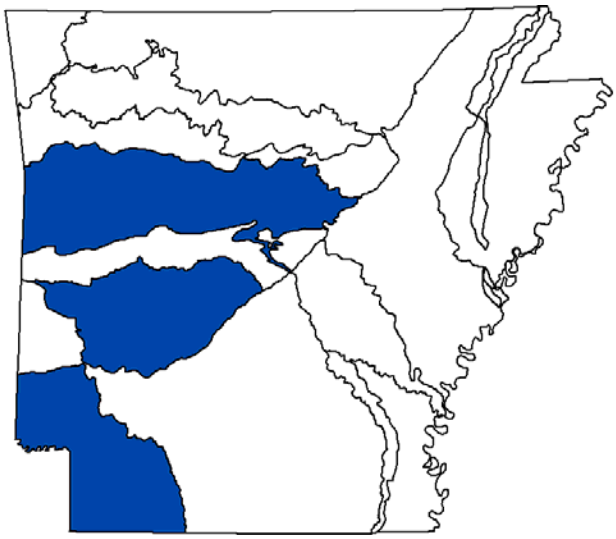


Ecobasins where this species occurs

Terrestrial Habitats

Ecobasins

Arkansas Valley - Arkansas River
Ouachita Mountains - Ouachita River
South Central Plains - Ouachita River
South Central Plains - Red River

Aquatic Habitats

Natural Groundwater: - Small	Suitable
Natural Pool: - Small	Data Gap
Natural Riffle: - Small	Data Gap

Procambarus parasimulans
Bismark Burrowing Crayfish

Problems Faced

Threat: Groundwater depletion
Source: Excessive groundwater withdrawal

Threat: Habitat destruction
Source: Road construction

Threat: Toxins/contaminants
Source: Agricultural practices

Data Gaps/Research Needs

Determine habitat requirements and threats

Survey for additional populations.

Conservation Actions

	Importance	Category
Protect known occurrences from construction activities and herbicide applications	Medium	Habitat Protection

Monitoring Strategies

Monitor known occurrences.

Comment

Description: a tan crayfish, 30 to 40mm in carapace length (Hobbs and Robison 1982).

Robison et al. (2009) reported the species from 41 localities, including 9 new locations, in 14 counties. The species is widespread, but uncommonly encountered due to its sporadic distribution and burrowing habit.

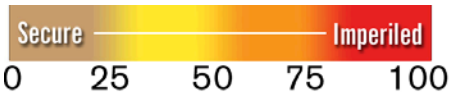
Robison et al. (2009) state that “Procambarus parasimulans is a primary burrower, i.e. it burrows all year long in one place and rarely exits except during the breeding season when males search for females. This species was never collected in static open water in fields or in ditches with standing water, but rather normally inhabits only burrows. Burrowers tended to be simple in construction and depths of capture ranged from 1-2.5 feet. Soils where burrows were found tended to be of a sandy clay without standing water. Very infrequently, adults wander out into floodplain areas and into temporary pools and backwater pools of small pools.”

Procambarus regalis

Regal Burrowing Crayfish

Class: Malacostraca
Order: Decapoda
Family: Cambaridae

Priority Score: **36** out of 100



Population Trend: Unknown

Global Rank: G2G3 — Imperiled (uncertain rank)

State Rank: S2S3 — Imperiled species in Arkansas (uncertain rank)

Distribution

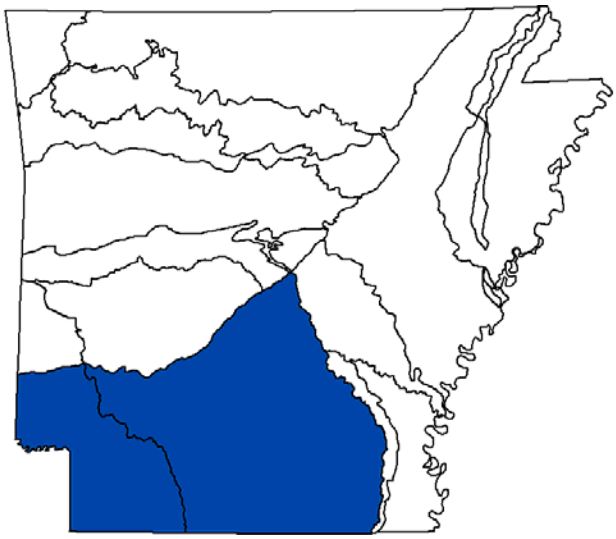
Element Occurrence Records

Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☐ Arkansas Valley
- ☐ Ouachita Mountains
- ☑ South Central Plains
- ☐ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

Taxa Team and Peer Reviewers

AGFC Mr. Brian Wagner, UA Dr. Daniel Magoulick



Ecobasins where this species occurs

Terrestrial Habitats

Ecobasins

South Central Plains - Red River

Terrestrial Habitats

West Gulf Coastal Plain Seepage Swamp and Baygall	Suitable

Aquatic Habitats

Natural Groundwater:	Data Gap
Natural Seep: Headwater - Small	Suitable

Procambarus regalis
Regal Burrowing Crayfish

Problems Faced

Threat: Chemical alteration
Source: Road construction

Threat: Habitat destruction or conversion
Source: Road construction

Data Gaps/Research Needs

Assess sensitivity to environmental stresses.

Conduct distribution surveys and life history studies.

Determine taxonomic status.

Conservation Actions

	Importance	Category
Protect known occurrences from construction activities and herbicide applications.	Medium	Habitat Protection

Monitoring Strategies

Monitor known occurrences.

Comment

Description: a medium-sized brownish red and orange burrowing crayfish (Robison and Allen 1995).

Inhabits simple burrows in colonies that may be extremely large, in southwestern Arkansas (Hobbs and Robison 1988). Robison and Crandall (2007) found the species to occupy 14 locations confined to 2 counties in the state.

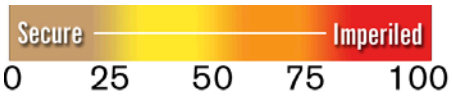
This species may in fact be synonymous with Procambarus steigmani, in which case the range of this species would be increased significantly and would make this species of Least Concern (Crandall and Johnson 2010). Further research on the taxonomy of this species is needed to clarify taxonomic status before a more accurate assessment of conservation status can be made.

Procambarus reimeri

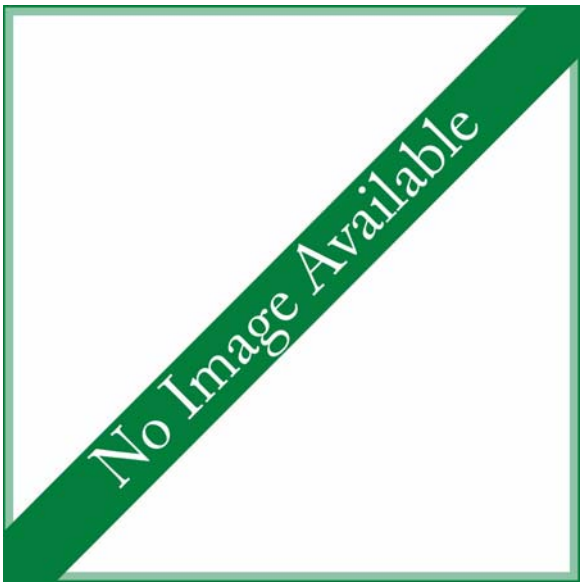
Irons Fork Burrowing Crayfish

Class: Malacostraca
Order: Decapoda
Family: Cambaridae

Priority Score: **80** out of 100



Population Trend: Stable



Global Rank: G1 — Critically imperiled species

State Rank: S1 — Critically imperiled in Arkansas

Distribution

Element Occurrence Records

Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☐ Arkansas Valley
- ☑ Ouachita Mountains
- ☐ South Central Plains
- ☐ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

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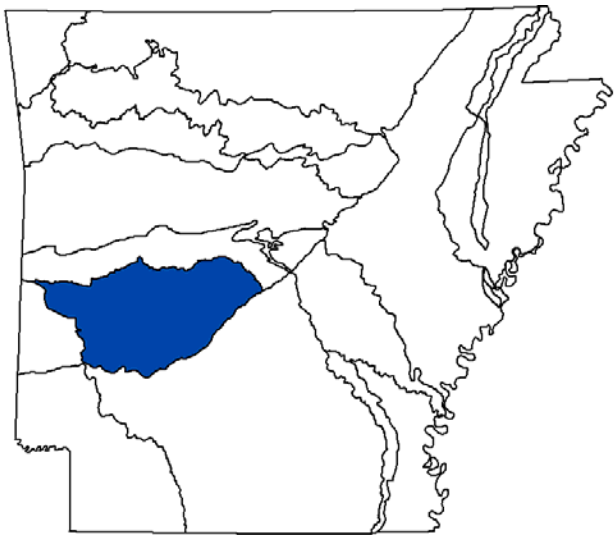
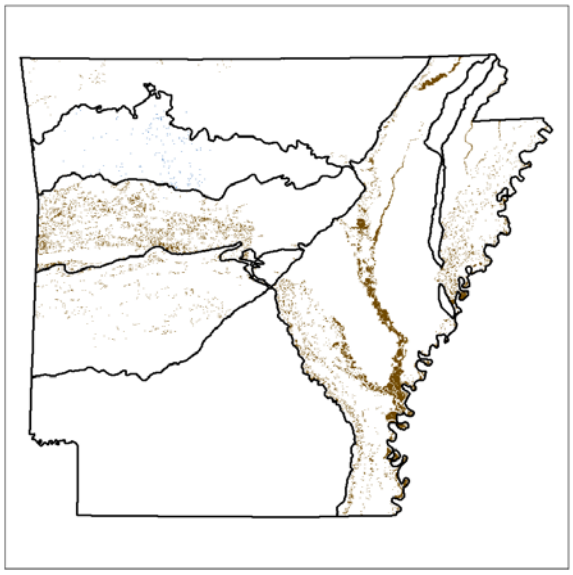


Ecobasins where this species occurs



Terrestrial Habitats

Ecobasins

Ouachita Mountains - Ouachita River

Terrestrial Habitats

Ozark-Ouachita Forested Seep	Suitable
Ozark-Ouachita Riparian	Data Gap

Aquatic Habitats

Natural Groundwater:	Suitable
Natural Seep: Headwater - Small	Suitable

Procambarus reimeri
Irons Fork Burrowing Crayfish

Problems Faced

Threat: Habitat destruction or conversion
Source: Forestry activities

Threat: Habitat destruction or conversion
Source: Urban development

Threat: Habitat destruction
Source: Road construction

Threat: Toxins/contaminants
Source: Forestry activities

Data Gaps/Research Needs

Identify habitat requirements and threats.

Survey for additional populations.

Conservation Actions

	Importance	Category
	Medium	Threat Abatement
Protect known occurrences from construction activities and herbicide applications.	Medium	Habitat Protection

Monitoring Strategies

Monitor known occurrences.

Comment

Description: a pinkish cream-colored burrowing crayfish (Robison and Allen 1995).

Known from six localities in the Ouachita River basin of Polk county (Hobbs and Robison 1988).Robison (2008) found this species to be stable, but restricted to a limited localized area in Polk County. Rhoden et al. (Illinois Natural History Survey) are currently studying this species in an attempt to model distribution based on habitat characteristics.

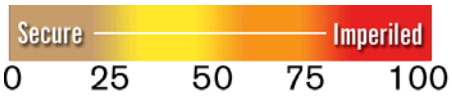
Robison (2008) found this species in wet seepage areas and roadside ditches with a sandy clay soil substrate. Specimens of P. reimeri were found in burrows from one-half meter to a meter and a half adjacent to the road or highway. Juveniles were collected in standing water at the edge of a gravel road.

Procambarus tenuis

Ouachita Mountain Crayfish

Class: Malacostraca
Order: Decapoda
Family: Cambaridae

Priority Score: **31** out of 100



Population Trend: Unknown

©Brian Wagner

Global Rank: G3 — Vulnerable species

State Rank: S2 — Imperiled in Arkansas

Distribution

Element Occurrence Records

Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☐ Arkansas Valley
- ☑ Ouachita Mountains
- ☐ South Central Plains
- ☐ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

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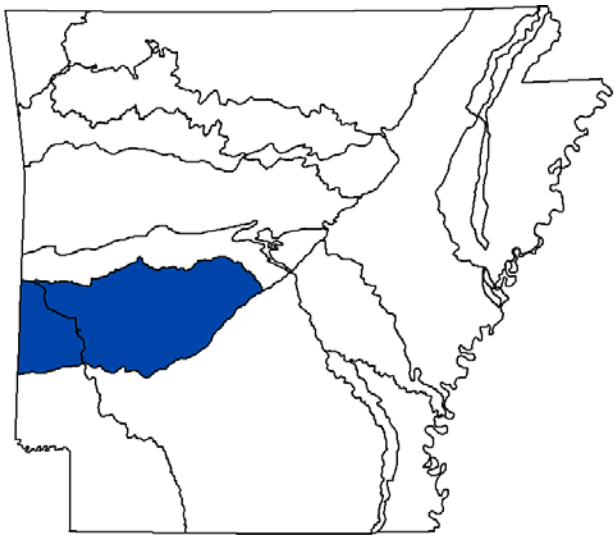

Ecobasins where this species occurs

Terrestrial Habitats

Ecobasins

Ouachita Mountains - Ouachita River

Ouachita Mountains - Red River

Terrestrial Habitats

Ozark-Ouachita Forested Seep	Data Gap

Procambarus tenuis
Ouachita Mountain Crayfish

Aquatic Habitats

Natural Groundwater:	Data Gap
Natural Pool: - Small	Suitable
Natural Riffle: - Small	Suitable
Natural Run: - Small	Suitable
Natural Seep:	Data Gap

Problems Faced

Threat: Habitat destruction
Source: Resource extraction

Threat: Habitat disturbance
Source: Road construction

Threat: Riparian Habitat Destruction
Source: Forestry activities

Threat: Toxins/contaminants
Source: Forestry activities

Data Gaps/Research Needs

Identify habitat requirements and threats.

Survey for additional populations.

Conservation Actions

	Importance	Category
Protect known occurrences from construction activities and herbicide applications.	Medium	Habitat Protection

Monitoring Strategies

Monitor known occurrences.

Comment

Occurs in and adjacent to springs and clear cool streams in the Ouachitas of extreme western Arkansas and eastern Oklahoma (Hobbs 1989). Robison (2008) confirmed that this is an uncommon Ouachita mountain endemic with small populations.

Robison (2008) found this crayfish to be a species of small first and second order streams which primarily lived beneath rocks. It was also found in springs and spring run-off in several localities in the Ouachita Mountains. Oftentimes, P. tenuis was the only crayfish species living in the smaller spring-fed, first order and second order streams.

Acipenser fulvescens

Lake Sturgeon

Class: Actinopterygii
Order: Acipenseriformes
Family: Acipenseridae

Priority Score: 27 out of 100

Population Trend: Unknown

Gobal Rank: G3G4 — Vulnerable (uncertain rank)

State Rank: S2 — Imperiled in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☐ Ouachita Mountains
- ☐ Arkansas Valley
- ☐ South Central Plains
- ☑ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

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Ecobasins

Mississippi River Alluvial Plain - Arkansas River
Mississippi River Alluvial Plain - St. Francis River
Mississippi River Alluvial Plain - White River
Mississippi River Alluvial Plain (Lake Chicot) - Mississippi River

Habitats

	Weight
Natural Littoral: - Large	Suitable
Natural Pool: - Medium - Large	Optimal
Natural Shoal: - Medium - Large	Obligate

Problems Faced

Threat: Biological alteration Source: Commercial harvest
Threat: Biological alteration Source: Incidental take
Threat: Habitat destruction Source: Channel alteration
Threat: Hydrological alteration Source: Dam

Data Gaps/Research Needs

Continue to track incidental catches.

Conservation Actions

	Importance	Category
Restore fish passage in dammed rivers.	High	Habitat Restoration/Improvement
Restrict commercial harvest (Mississippi River closed to harvest).	High	Population Management

Monitoring Strategies

Monitor population distribution and abundance in large river faunal surveys in cooperation with adjacent states.

Comments

Description: A large sturgeon (maximum size 8 feet long), with a pointed, short, conical snout, and robust body (Robison and Buchanan 1988). A primarily northern species only known from Arkansas from a few records (Robison and Buchanan 1988).Lake sturgeon were not detected in a three-year faunal survey of Arkansas' large rivers (Layher, Crabb, and Spurlock 2005) or by multiple studies performed to capture pallid sturgeon in the lower Mississippi River (Kilgore et al. 2007; Herrala et al. 2014). AGFC does not recognize historical reports of the species from the Ouachita River basin. It is unclear if a breeding population of this species has ever occurred in Arkansas.

Alosa alabamae

Alabama Shad

Class: Actinopterygii
Order: Clupeiformes
Family: Clupeidae

Priority Score: **52** **out of 100**

Population Trend: Decreasing

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Gobal Rank: G2G3 — Imperiled (uncertain rank)

State Rank: S1 — Critically imperiled in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☑ Ouachita Mountains
- ☑ Arkansas Valley
- ☑ South Central Plains
- ☑ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

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Ecobasins

Arkansas Valley - Arkansas River
Mississippi River Alluvial Plain - White River
Mississippi River Alluvial Plain (Lake Chicot) - Mississippi River
Ouachita Mountains - Ouachita River
South Central Plains - Ouachita River

Habitats

	Weight
Natural Pool: - Medium - Large	Optimal
Natural Riffle: - Medium - Large	Obligate
Natural Run: - Medium - Large	Suitable
Natural Shoal: - Large	Obligate

Problems Faced

Threat: Habitat destruction Source: Dam
Threat: Hydrological alteration Source: Channel maintenance
Threat: Hydrological alteration Source: Dam
Threat: Sedimentation Source: unknown
Threat: Temperature alteration Source: Dam

Data Gaps/Research Needs

Conduct status and distribution surveys.
Study migration, fish passage, and mortality at hydropower dams.

Conservation Actions

	Importance	Category
Assure minimum flow requirements are met below Remmel Dam.	Medium	Threat Abatement
Restore Ouachita and Little Missouri rivers to natural flow regime.	High	Habitat Restoration/Improvement
Work across political boundaries to manage an interjurisdictional fish.	High	Public Relations/Education

Monitoring Strategies

Monitor presence through general stream faunal surveys.
Monitor stream flow.
Monitor water quality on a regular basis.

Comments

Description: A streamlined, slab-sided, silvery fish, growing to a maximum size of 18 inches (Robison and Buchanan 1988).

An anadromous fish that travels from the Gulf of Mexico upstream into freshwater rivers to spawn. It has been designated by the National Marine Fisheries Service as a candidate for listing under the Endangered Species Act (Federal Register 1999), and a 90-day finding indicated there is substantial scientific evidence that listing may be warranted (Federal Register 2013). Rigsby (2009) captured 26 specimens from 4 locations in the Ouachita River. Three juvenile Alabama shad were collected in the White River near Newport during 2006 (Layher and others 2005; Buchanan and others 2012).

Ameiurus nebulosus

Brown Bullhead

Class: Actinopterygii
Order: Siluriformes
Family: Ictaluridae

Priority Score: 19 out of 100

Population Trend: Unknown

Gobal Rank: G5 — Secure

State Rank: S2 — Imperiled in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- [ ] Ozark Highlands
- [ ] Boston Mountains
- [x] Ouachita Mountains
- [x] Arkansas Valley
- [x] South Central Plains
- [x] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

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Ecobasins

Arkansas Valley - Arkansas River
Mississippi River Alluvial Plain - Arkansas River
Mississippi River Alluvial Plain - White River
Mississippi River Alluvial Plain (Bayou Bartholomew) - Ouachita River
Ouachita Mountains - Ouachita River
South Central Plains - Ouachita River
South Central Plains - Red River

Habitats

	Weight
Natural Pool: - Medium	Suitable

Problems Faced

Threat: Habitat destruction Source: Agricultural practices
Threat: Hydrological alteration Source: Dam
Threat: Hydrological alteration Source: Water diversion

Data Gaps/Research Needs

Determine distribution and habitat requirements.

Conservation Actions

	Importance	Category
Implement best management practices in conjunction with agriculture.	Medium	Threat Abatement
Maintain riparian habitats.	High	Habitat Restoration/Improvement

Monitoring Strategies

Ensure location/occurrence records are compiled into the Arkansas Fish Database.
Monitor population distribution and abundance in stream faunal surveys.

Comments

This species has a sporadic distribution within Arkansas (Robison and Buchanan 1988). Brown bullheads are often associated with quiet streams that have aquatic vegetation.

Ammocrypta clara

Western Sand Darter

Class: Actinopterygii
Order: Perciformes
Family: Percidae

Priority Score: **33** out of 100

Population Trend: Decreasing

©Konrad P. Schmidt

Gobal Rank: G3 — Vulnerable species

State Rank: S3 — Vulnerable in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- [x] Ozark Highlands
- [ ] Boston Mountains
- [ ] Ouachita Mountains
- [ ] Arkansas Valley
- [x] South Central Plains
- [x] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

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Ecobasins

Mississippi River Alluvial Plain - St. Francis River
Mississippi River Alluvial Plain - White River
Ozark Highlands - White River
South Central Plains - Ouachita River
South Central Plains - Red River

Habitats

	Weight
Natural Littoral: - Large	Data Gap
Natural Run: - Medium - Large	Data Gap
Natural Shoal: - Medium - Large	Suitable

Problems Faced

Threat: Habitat destruction Source: Channel maintenance
Threat: Hydrological alteration Source: Dam
Threat: Sedimentation Source: Unknown

Data Gaps/Research Needs

Conduct genetic study.
Conduct status survey.

Conservation Actions

	Importance	Category
Implement best management practices during road construction.	High	Threat Abatement
Maintain riparian habitats.	High	Habitat Restoration/Improvement

Monitoring Strategies

Monitor population distribution and abundance in large river faunal surveys.
Monitor water quality in darter habitats on a regular basis.

Comments

Description: A pale, very slender darter that is largely unscaled and translucent (Robison and Buchanan 1988).

Inhabits moderate size rivers with sandy bottoms and is intolerant of excessive siltation and turbidity (Pflieger 1997). Kuehne and Barbour (1983) reported a trend of decreasing abundance over much of its range. Rigsby (2009) caught 202 individuals from 36 locations in the Black, Current, Eleven Point and Strawberry Rivers. In addition, he captured 17 individuals from 8 locations in the Ouachita and Saline rivers. Driver and Adams (2013) studied the life-history of the species from 379 individuals in northeast Arkansas rivers.

Ammocrypta clara
Western Sand Darter

Anguilla rostrata

American Eel

Class: Actinopterygii
Order: Anguilliformes
Family: Anguillidae

Priority Score: **24** **out of 100**

Population Trend: Decreasing

Gobal Rank: G4 — Apparently secure species

State Rank: S3 — Vulnerable in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- [x] Ozark Highlands
- [x] Boston Mountains
- [x] Ouachita Mountains
- [x] Arkansas Valley
- [x] South Central Plains
- [x] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

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Ecobasins

Arkansas Valley - Arkansas River
Boston Mountains - Arkansas River
Boston Mountains - White River
Mississippi River Alluvial Plain - Arkansas River
Mississippi River Alluvial Plain - St. Francis River
Mississippi River Alluvial Plain - White River
Mississippi River Alluvial Plain (Bayou Bartholomew) - Ouachita River
Mississippi River Alluvial Plain (Lake Chicot) - Mississippi River
Ouachita Mountains - Arkansas River
Ouachita Mountains - Ouachita River
Ouachita Mountains - Red River
Ozark Highlands - Arkansas River
Ozark Highlands - White River
South Central Plains - Ouachita River
South Central Plains - Red River

Problems Faced

Threat: Habitat fragmentation Source: Dam

Data Gaps/Research Needs

Conduct status surveys, especially for the St. Francis River.
Determine downstream eel mortality through turbines at Arkansas and Ouachita River system dams.
Determine the timing and magnitude of out-migration of eels to spawning grounds.

Conservation Actions

	Importance	Category
Create fish passage at Ouachita and Arkansas River navigation systems dams.	High	Habitat Restoration/Improvement
Provide fish passage on the White River at the following dams: Montgomery Point, Dam 1 at Batesville, Dam 2 at Martin, and Dam 3 at Younger.	Medium	

Monitoring Strategies

Establish eel counters and photography installations at newly installed fish ladders for eels.
Targeted monitoring below Ouachita River system dams every 5 years.

Anguilla rostrata
American Eel

Comments

Description: A long, slightly compressed snakelike fish without pelvic fins, not resembling any other Arkansas fishes except lampreys, and then only superficially (Robison and Buchanan 1988). American eels are a pandemic and catadromous species that have declined at multiple locations, and the species is currently under review by the U.S. Fish and Wildlife Service for possible listing under the Endangered Species Act (Federal Register 2011).

Cox (2014) collected 293 American eels from three river systems in Arkansas. Tumlison and Robison (2010) captured 35 eels in the Caddo River below Lake DeGray.

Atractosteus spatula

Alligator Gar

Class: Actinopterygii
Order: Lepisosteiformes
Family: Lepisosteidae

Priority Score: 27 out of 100

Population Trend: Stable

Gobal Rank: G3G4 — Vulnerable (uncertain rank)

State Rank: S2 — Imperiled in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☐ Ouachita Mountains
- ☑ Arkansas Valley
- ☑ South Central Plains
- ☑ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

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Ecobasins

Arkansas Valley - Arkansas River
Mississippi River Alluvial Plain - Arkansas River
Mississippi River Alluvial Plain - St. Francis River
Mississippi River Alluvial Plain - White River
Mississippi River Alluvial Plain (Bayou Bartholomew) - Ouachita River
Mississippi River Alluvial Plain (Lake Chicot) - Mississippi River
South Central Plains - Ouachita River
South Central Plains - Red River

Habitats

	Weight
Man-made Pelagic: - Medium - Large	Marginal
Natural Oxbow - connected: - Medium - Large	Optimal
Natural Oxbow - disconnected: - Medium - Large	Suitable
Natural Pelagic: - Medium - Large	Suitable
Natural Pool: - Medium - Large	Optimal
Natural Side channel: - Medium - Large	Suitable
Natural Slough: - Medium - Large	Suitable
Natural Swamp/Wetlands: - Medium - Large	Obligate

Problems Faced

Threat: Biological alteration Source: Commercial harvest
Threat: Biological alteration Source: Recreation
Threat: Habitat destruction Source: Channel alteration
Threat: Hydrological alteration Source: Channel alteration
Threat: Hydrological alteration Source: Channel maintenance
Threat: Hydrological alteration Source: Dam
Threat: Hydrological alteration Source: Water diversion

Data Gaps/Research Needs

Conduct baseline population survey.
Conduct genetic and taxonomic studies.
Conduct life history study.

Conservation Actions

	Importance	Category
Augment natural populations.	Low	Population Management
Restore connectivity to wetland ecosystems.	High	Habitat Restoration/Improvement
Restore natural hydrologic and thermal regimes.	High	Habitat Restoration/Improvement
Restore sinuousity and channel morphology to river systems.	Medium	Habitat Restoration/Improvement

Monitoring Strategies

Ensure location/occurrence records are compiled into the Arkansas Fish Database.
Monitor population distribution and abundance in large river faunal surveys in cooperation with adjacent states.

Comments

Description: Large, heavy bodied gar with a short, broad snout similar to that of its namesake (Robison and Buchanan 1988).

These large, slow growing fish were heavily harvested in the past. While quite rare, it is evident that they still occur in most of the large rivers of Arkansas (Layher and Phillips 2000).The Fourche La Fave River breeding population has been studied by Inebnit (2009) and Adams and others (2013). The Arkansas Game and Fish Commission developed an independent, species specific management plan for alligator gar (Barnett and others 2011). In 2010, recreational anglers were restricted to 1 fish per day, with a closed the season during the normal spawning season. Commercial harvest is still unrestricted, but annual reporting of the catch is mandatory as of January 2013. Studies to evaluate genetic diversity of Arkansas populations are underway.

Carpiodes velifer

Highfin carpsucker

Class: Actinopterygii
Order: Cypriniformes
Family: Catostomidae

Priority Score: 17 out of 100

Population Trend: Unknown

Gobal Rank: G4G5 — Apparently secure (uncertain rank)

State Rank: S3 — Vulnerable in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- [x] Ozark Highlands
- [ ] Boston Mountains
- [ ] Ouachita Mountains
- [x] Arkansas Valley
- [x] South Central Plains
- [x] Mississippi Alluvial Plain
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Ecobasins

Arkansas Valley - Arkansas River
Arkansas Valley - White River
Mississippi River Alluvial Plain - Arkansas River
Mississippi River Alluvial Plain - White River
Mississippi River Alluvial Plain (Lake Chicot) - Mississippi River
Ozark Highlands - Arkansas River
Ozark Highlands - White River
South Central Plains - Ouachita River
South Central Plains - Red River

Habitats

	Weight
Natural Pool: - Medium - Large	Suitable
Natural Shoal: - Medium - Large	Suitable

Problems Faced

Threat: Hydrological alteration Source: Dam
Threat: Sedimentation Source: Agricultural practices

Data Gaps/Research Needs

Conduct baseline population surveys.
Conduct life-history studies.

Conservation Actions

	Importance	Category
Establish and enhance riparian corridors.	High	Habitat Restoration/Improvement
Implement best management practices in conjunction with agriculture.	Medium	Threat Abatement

Monitoring Strategies

Ensure location/occurrence records are compiled into the Arkansas Fish Database.
Monitor population distribution and abundance in stream faunal surveys.

Comments

Robison and Buchanan (1988) noted the species is rare. McAllister and others (2010) reported collecting an individual in the Red River, a range extension for the species.

Crystallaria asprella

Crystal Darter

Class: Actinopterygii
Order: Perciformes
Family: Percidae

Priority Score: **38** **out of 100**

Population Trend: Decreasing

Gobal Rank: G3 — Vulnerable species

State Rank: S2 — Imperiled in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- [x] Ozark Highlands
- [ ] Boston Mountains
- [x] Ouachita Mountains
- [ ] Arkansas Valley
- [x] South Central Plains
- [x] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

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Ecobasins

Mississippi River Alluvial Plain - White River
Mississippi River Alluvial Plain (Bayou Bartholomew) - Ouachita River
Ouachita Mountains - Ouachita River
Ozark Highlands - White River
South Central Plains - Ouachita River
South Central Plains - Red River

Habitats

	Weight
Natural Pool: - Medium - Large	Suitable
Natural Run: - Medium - Large	Obligate
Natural Shoal: - Medium - Large	Optimal

Problems Faced

Threat: Habitat destruction or conversion Source: Channel alteration
Threat: Habitat destruction Source: Channel maintenance
Threat: Habitat destruction Source: Dam
Threat: Sedimentation Source: Agricultural practices
Threat: Sedimentation Source: Confined animal operations
Threat: Sedimentation Source: Grazing/Browsing

Data Gaps/Research Needs

Conduct status & distribution survey.

Conservation Actions

	Importance	Category
Maintain or, where necessary, restore water quality to state standards.	High	Habitat Restoration/Improvement
Protect river corridors using appropriate buffer widths relative to stream size.	High	Habitat Protection

Monitoring Strategies

Ensure location/occurrence records are compiled into the Arkansas Fish Database.
Monitor population distribution and abundance in ongoing stream faunal surveys.
Monitor water quality on a regular basis.

Comments

Description: A slender darter with four wide brown saddles on its back and a silver belly (Robison and Buchanan 1988).

This fish is the sole member of its genus and was once distributed throughout much of the eastern United States, but today persists only in isolated populations (Wood and Raley 2000). It is potentially threatened by impoundment, channelization, dredging, sedimentation, and gravel mining (Grandmaison, Mayasich, and Etnier 2003).

Layher and others (2005) captured 5 individuals in the Ouachita River and 1 individual in the White River. McAllister and others (2010) reported collection of the species in the mainstem Black River. Rigsby (2009) captured 5 individuals from 5 locations in the Black and Strawberry rivers, and he captured 6 individuals from 4 locations in the Ouachita and Saline rivers.

Cycleptus elongatus

Blue Sucker

Class: Actinopterygii
Order: Cypriniformes
Family: Catostomidae

Priority Score: **23** **out of 100**

Population Trend: Stable

©John Harris

Gobal Rank: G3G4 — Vulnerable (uncertain rank)

State Rank: S3 — Vulnerable in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- [x] Ozark Highlands
- [ ] Boston Mountains
- [x] Ouachita Mountains
- [x] Arkansas Valley
- [x] South Central Plains
- [x] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

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Ecobasins

Arkansas Valley - Arkansas River
Mississippi River Alluvial Plain - Arkansas River
Mississippi River Alluvial Plain - St. Francis River
Mississippi River Alluvial Plain - White River
Mississippi River Alluvial Plain (Lake Chicot) - Mississippi River
Ouachita Mountains - Arkansas River
South Central Plains - Ouachita River
South Central Plains - Red River

Habitats

	Weight
Natural Oxbow - connected: - Large	Suitable
Natural Pool: - Medium - Large	Suitable
Natural Riffle: - Medium - Large	Obligate
Natural Run: - Medium - Large	Obligate
Natural Shoal: - Medium - Large	Suitable

Problems Faced

Threat: Habitat destruction Source: Channel alteration
Threat: Hydrological alteration Source: Dam
Threat: Hydrological alteration Source: Water diversion

Data Gaps/Research Needs

Conduct genetic/ taxonomic studies.
Conduct life history studies.
Conduct population surveys.

Conservation Actions

	Importance	Category
Coordinate with U.S. Army Corps of Engineers regarding channel alteration and maintenance.	Medium	Threat Abatement
Coordinate with Water Districts and Arkansas Soil and Water Conservation Commission regarding irrigation projects.	Medium	Threat Abatement

Monitoring Strategies

Ensure location/occurrence records are compiled into the Arkansas Fish Database.
Monitor population distribution and abundance in large river faunal surveys.

Comments

Description: A large streamlined sucker having a long dorsal fin and growing to a maximum size of 40 inches (Robison and Buchanan 1988).

Restricted to large river environment, blue suckers use habitats that are relatively deep with fast current (Layher 1998).
Blue suckers are abundant in the Red River (Buchanan and others 2003; Layher and others 2005).

Cyprinella camura

Bluntface Shiner

Class: Actinopterygii
Order: Cypriniformes
Family: Cyprinidae

Priority Score: **23** **out of 100**

Population Trend: Unknown

Gobal Rank: G5 — Secure

State Rank: SH — Historic record. Possibly extirpated in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- [x] Ozark Highlands
- [x] Boston Mountains
- [ ] Ouachita Mountains
- [x] Arkansas Valley
- [ ] South Central Plains
- [ ] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

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Ecobasins

Arkansas Valley - Arkansas River

Boston Mountains - Arkansas River

Ozark Highlands - Arkansas River

Habitats	Weight
Natural Glide: - Small - Medium	Optimal
Natural Pool: - Small - Medium	Suitable
Natural Riffle: - Small - Medium	Suitable
Natural Run: - Small - Medium	Optimal

Problems Faced

Threat: Unknown
Source:

Data Gaps/Research Needs

Conduct baseline population survey.

Conduct genetic/ taxonomic studies.

Determine current status in Arkansas.

Conservation Actions	Importance	Category
More data are needed to determine conservation actions.	Medium	Data Gap

Monitoring Strategies

Monitor population distribution and abundance in ongoing stream faunal surveys.

Comments

Description: A bluish silver, flattened shiner with a pale area at the base of the tail fin (Cross and Collins 1995).

This species is rare in Arkansas, having been found only in four, pre-1960 collections from northwest Arkansas (Robison and Buchanan 1988).

Cyprinella spiloptera

Spotfin Shiner

Class: Actinopterygii
Order: Cypriniformes
Family: Cyprinidae

Priority Score: **23** **out of 100**

Population Trend: Unknown

©Konrad P. Schmidt

Gobal Rank: G5 — Secure

State Rank: S1 — Critically imperiled in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- [x] Ozark Highlands
- [ ] Boston Mountains
- [ ] Ouachita Mountains
- [ ] Arkansas Valley
- [ ] South Central Plains
- [ ] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

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Ecobasins

Ozark Highlands - Arkansas River

Ozark Highlands - White River

Problems Faced

Threat: Unknown
Source:

Data Gaps/Research Needs

Conduct baseline population survey.

Conduct genetic/ taxonomic studies.

Determine status in Arkansas.

Determine threats.

Conservation Actions

	Importance	Category
More data are needed to determine conservation actions.	Medium	Data Gap

Monitoring Strategies

Monitor population distribution and abundance in ongoing stream faunal surveys.

Comments

Description: A compressed, bluish silvery shiner with a dusky lateral band and a black blotch on the dorsal fin (Smith 1979).

This northeastern species is very rare in Arkansas having been collected only twice, from widely separated localities (Robison and Buchanan 1988).

Erimyzon sucetta

Lake Chubsucker

Class: Actinopterygii
Order: Cypriniformes
Family: Catostomidae

Priority Score: **15** out of 100

Population Trend: Unknown

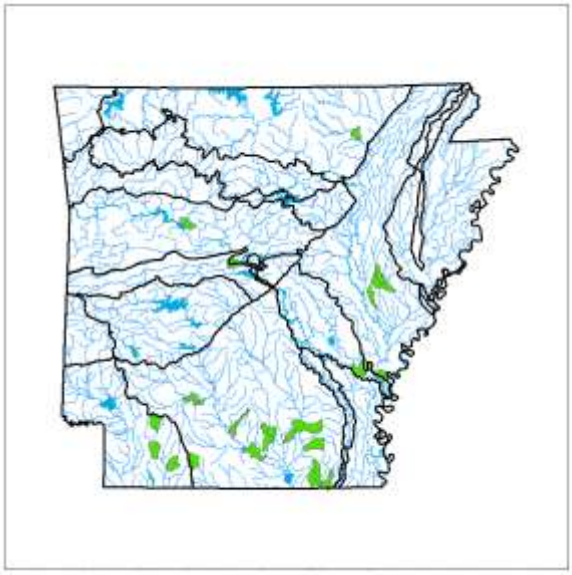

©G. W. Sneegas

Gobal Rank: G5 — Secure

State Rank: S3 — Vulnerable in Arkansas

Distribution

Occurrence Records



Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☐ Ouachita Mountains
- ☑ Arkansas Valley
- ☑ South Central Plains
- ☑ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

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Ecobasins

Arkansas Valley - Arkansas River
Mississippi River Alluvial Plain - Arkansas River
Mississippi River Alluvial Plain - St. Francis River
Mississippi River Alluvial Plain - White River
Mississippi River Alluvial Plain (Bayou Bartholomew) - Ouachita River
Mississippi River Alluvial Plain (Lake Chicot) - Mississippi River
South Central Plains - Ouachita River
South Central Plains - Red River

Habitats

	Weight
Natural Oxbow - connected: - Medium - Large	Optimal
Natural Oxbow - disconnected: - Medium - Large	Marginal
Natural Side channel: - Medium - Large	Suitable
Natural Slough: - Medium - Large	Optimal
Natural Swamp/Wetlands: - Medium - Large	Suitable

Problems Faced

Threat: Habitat destruction Source: Agricultural practices
Threat: Habitat destruction Source: Channel maintenance

Data Gaps/Research Needs

Conduct baseline population survey.
Conduct genetic/ taxonomic studies.
Conduct life history studies.

Conservation Actions

	Importance	Category
Restore connectivity to wetlands and riverine backwaters.	Medium	Habitat Restoration/Improvement

Monitoring Strategies

Monitor population distribution and abundance in ongoing stream and river faunal surveys.

Comments

Description: A small, deep bodied, slightly compressed, olive colored sucker, lacking a lateral line (Robison and Buchanan 1988).A lowland species occurring in quite heavily vegetated areas of oxbow lakes, sloughs, and backwaters (Robison and Buchanan 1988).

Only one single individual was captured out of 220,116 fish in 49 riparian wetlands and backwaters of the Arkansas River (Adams and others 2007). Clark (2006) captured only 6 specimens out of approximately 45,000 fish from 41 White River oxbow lakes.

Etheostoma autumnale

Autumn Darter

Class: Actinopterygii
Order: Perciformes
Family: Percidae

Priority Score: 19 out of 100

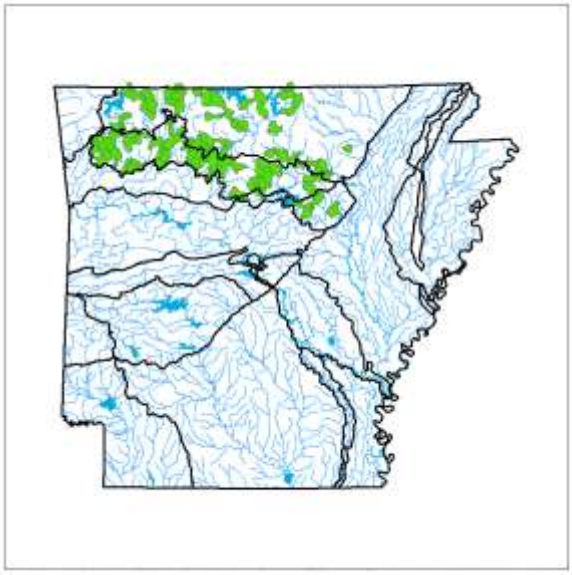
Population Trend: Stable

Gobal Rank: G4 — Apparently secure species

State Rank: S3 — Vulnerable in Arkansas

Distribution

Occurrence Records



Ecoregions where the species occurs:

- [x] Ozark Highlands
- [x] Boston Mountains
- [ ] Ouachita Mountains
- [ ] Arkansas Valley
- [ ] South Central Plains
- [ ] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

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Ecobasins

Boston Mountains - White River
Ozark Highlands - White River

Habitats	Weight
Natural Glide: - Small - Medium	Suitable
Natural Pool: - Small - Medium	Suitable
Natural Riffle: - Small - Medium	Suitable

Problems Faced

Threat: Habitat destruction Source: Resource extraction
Threat: Habitat disturbance Source: Agricultural practices
Threat: Hydrological alteration Source: Dam
Threat: Hydrological alteration Source: Excessive groundwater withdrawal
Threat: Nutrient loading Source: Agricultural practices
Threat: Riparian habitat destruction Source: Agricultural practices
Threat: Sedimentation Source: Road construction

Data Gaps/Research Needs

Conduct baseline population surveys.
Conduct life history study.
Refine range delineation.

Conservation Actions	Importance	Category
Establish and enhance riparian corridors.	High	Habitat Restoration/Improvement
Implement best management practices in conjunction with agriculture and silviculture.	Medium	Threat Abatement

Monitoring Strategies

Ensure location/occurrence records are compiled into the Arkansas Fish Database.
Monitor population distribution and abundance in stream faunal surveys.

Comments

Description: This species was elevated from Etheostoma punctulatum by Mayden (2010). Autumn Darters are often found in small streams with clear, cool water, coarse stream substrates and with vegetation (Mayden 2010). This species occurs in the White River drainage, upper Current River, and the Eleven Point River. The Autumn Darter is rare in the Little Red, Current, and Eleven Point rivers (Mayden 2010). Life-history information appears to be lacking for this species.

Etheostoma clinton

Beaded Darter

Class: Actinopterygii
Order: Perciformes
Family: Percidae

Priority Score: **15** **out of 100**

Population Trend: Stable

Gobal Rank: G? — Uncertain global ranking

State Rank: S3 — Vulnerable in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☑ Ouachita Mountains
- ☐ Arkansas Valley
- ☐ South Central Plains
- ☐ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

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Ecobasins

Ouachita Mountains - Ouachita River

Habitats	Weight
Natural Glide: - Small - Medium	Suitable
Natural Pool: - Small - Medium	Optimal
Natural Riffle: - Small - Medium	Suitable

Problems Faced

Threat: Habitat destruction
Source: Resource extraction

Threat: Habitat disturbance
Source: Agricultural practices

Threat: Hydrological alteration
Source: Dam

Threat: Nutrient loading
Source: Agricultural practices

Threat: Riparian habitat destruction
Source: Agricultural practices

Threat: Sedimentation
Source: Road construction

Data Gaps/Research Needs

Conduct baseline population surveys.

Refine range delineation.

Conservation Actions	Importance	Category
Establish and enhance riparian corridors.	High	Habitat Restoration/Improvement
Implement best management practices in conjunction with agriculture and silviculture.	Medium	Threat Abatement

Monitoring Strategies

Monitor population distribution and abundance in stream faunal surveys.

Comments

Description: This species was elevated from Etheostoma stigmaeum by Layman and Mayden (2012). In Arkansas, this species is found in Prairie Creek in Polk County, Mill Creek in Polk County, Ouachita River in Montgomery County, and South Fork Mazarn Creek in Garland County. Layman and Mayden (2012) indicated a status survey was needed to clearly define the distribution of the species. Habitat for this species includes clear, sandy and rock pools of small to medium sized rivers with moderate gradient and swift current.

This species does not have a numerical G-rank, so the priority score on this endemic fish with limited range is greatly underestimated. It has a distribution similar to Noturus taylori (Layman and Mayden 2012), which is a G1 ranked species. The beaded darter appears to be scare or uncommon across its limited range (Layman and Mayden 2012).

Etheostoma cragini

Arkansas Darter

Class: Actinopterygii
Order: Perciformes
Family: Percidae

Priority Score: **43** **out of 100**

Population Trend: Decreasing


©Doyle Crosswhite

Gobal Rank: G3 — Vulnerable species

State Rank: S1 — Critically imperiled in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- [x] Ozark Highlands
- [ ] Boston Mountains
- [ ] Ouachita Mountains
- [ ] Arkansas Valley
- [ ] South Central Plains
- [ ] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

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Ecobasins

Ozark Highlands - Arkansas River

Habitats	Weight
Natural Spring Run: Headwater - Small	Obligate

Problems Faced

Threat: Habitat destruction
Source: Channel alteration

Threat: Habitat destruction
Source: Grazing/Browsing

Threat: Habitat destruction
Source: Resource extraction

Threat: Habitat destruction
Source: Road construction

Threat: Habitat destruction
Source: Urban development

Threat: Hydrological alteration
Source: Urban development

Threat: Nutrient loading
Source: Municipal/Industrial point source

Data Gaps/Research Needs

Conduct range-wide genetic study.

Conservation Actions	Importance	Category
Cooperatively develop a management plan for species with local input.	Medium	Public Relations/Education
Maintain and enhance adequate riparian buffers.	Medium	Habitat Restoration/Improvement
Protect recharge area.	Medium	Habitat Protection
Protect water quality from point and non-point pollution. Maintain or, where necessary, restore water quality to state standards.	Medium	Habitat Protection
Provide education and outreach to local citizens and governments concerning this species and its habitat.	Medium	Public Relations/Education

Monitoring Strategies

Monitor known populations every 5 years, with more frequent monitoring if impacts are suspected.

Monitor potential impacts to species' habitat annually

Comments

Description: A stout, bluntnosed darter, the males of which develop a bright orange abdomen in breeding condition (Robison and Buchanan 1988).

This darter is endemic to the Arkansas River basin and inhabits small spring runs, often with an abundance of water cress and other aquatic plants, and substrates of fine gravel, sand, and silt. It has been found historically at five locations in the Illinois River basin in Arkansas, three of which yielded specimens in a recent study (Hargrave 1998).

Wagner and others (2011) provide the most recent summary of the species status. Recent monitoring of populations has revealed that some newly discovered populations reported in Wagner 2011 may no longer persist (B. Wagner, pers. Com.).

Etheostoma fragi

Strawberry River Darter

Class: Actinopterygii
Order: Perciformes
Family: Percidae

Priority Score: 29 **out of 100**

Population Trend: Decreasing

Gobal Rank: G4 — Apparently secure species

State Rank: S2 — Imperiled in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- [x] Ozark Highlands
- [ ] Boston Mountains
- [ ] Ouachita Mountains
- [ ] Arkansas Valley
- [ ] South Central Plains
- [ ] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

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Ecobasins

Ozark Highlands - White River

Habitats	Weight
Natural Pool: - Small - Medium	Suitable
Natural Riffle: - Small - Medium	Optimal
Natural Run: - Small - Medium	Suitable

Problems Faced

Threat: Habitat destruction
Source: Dam

Threat: Habitat destruction
Source: Grazing/Browsing

Threat: Habitat destruction
Source: Road construction

Threat: Nutrient loading
Source: Confined animal operations

Threat: Nutrient loading
Source: Grazing/Browsing

Threat: Sedimentation
Source: Grazing/Browsing

Threat: Sedimentation
Source: Road construction

Data Gaps/Research Needs

Determine abundance.

Conservation Actions	Importance	Category
Improve riparian corridor.	High	Habitat Restoration/Improvement
Protect water quality from non-point sources. Maintain or, where necessary, restore water quality to state standards.	Medium	Threat Abatement
Provide education and outreach to local citizens and governments concerning this species and its habitat.	Medium	Public Relations/Education

Monitoring Strategies

Monitor population distribution and abundance in ongoing stream and river faunal surveys.

Comments

Description: A yellowish brown darter with dark brown saddles. Breeding males have a red throat, turquoise bars on the sides, and orange between some of the bars and on the belly (Robison and Buchanan 1988).

This member of the orangethroat darter group was elevated to species status by Ceas and Page (1997). The species is restricted to the Strawberry River basin and, while it remains locally abundant throughout this range, abundance seems to have declined over the past twenty years (Robison 1998).

The status of the species is currently being evaluated by Kyler Hecke and Dr. Steve Lochmann. The consensus of the Fish Taxa Team is that G-rank calculator should be used to re-evaluate the G4 rank of the species, because the species in only found in Arkansas and the state rank calculator scored the species S2.

Etheostoma fusiforme

Swamp Darter

Class: Actinopterygii
Order: Perciformes
Family: Percidae


©G. W. Sneegas

Priority Score: 15 out of 100

Population Trend: Unknown

Gobal Rank: G5 — Secure

State Rank: S3 — Vulnerable in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☐ Ouachita Mountains
- ☐ Arkansas Valley
- ☑ South Central Plains
- ☑ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

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Ecobasins

Mississippi River Alluvial Plain - Arkansas River
Mississippi River Alluvial Plain - St. Francis River
Mississippi River Alluvial Plain - White River
Mississippi River Alluvial Plain (Lake Chicot) - Mississippi River
South Central Plains - Ouachita River
South Central Plains - Red River

Habitats

	Weight
Natural Oxbow - connected: - Small - Medium - Large	Suitable
Natural Oxbow - disconnected: - Small - Medium - Large	Suitable
Natural Slough: - Small - Medium - Large	Suitable
Natural Swamp/Wetlands: - Small - Medium - Large	Suitable

Problems Faced

Threat: Biological alteration Source: Exotic species
Threat: Habitat destruction Source: Agricultural practices
Threat: Habitat destruction Source: Channel alteration
Threat: Habitat destruction Source: Water diversion

Data Gaps/Research Needs

Conduct distribution surveys.

Conservation Actions

	Importance	Category
Optimize aquatic vegetation management within species' habitat.	Medium	Habitat Protection
Protect and improve riparian buffer.	Medium	Habitat Restoration/Improvement
Protect and improve wetlands.	Medium	Habitat Restoration/Improvement
Use Best Management Practices for agriculture.	Medium	Threat Abatement

Monitoring Strategies

Ensure location/occurrence records are compiled into the Arkansas Fish Database.
Monitor population distribution and abundance in ongoing faunal surveys.

Comments

Description: A small bluntnose, dark mottled darter (Robison and Buchanan 1988).

This darter has a widely scattered distribution in the lowlands of Arkansas, but is never abundant in any one locality (Robison and Buchanan 1988). It is almost always associated with dense aquatic vegetation and can tolerate low pH levels (Kuehne and Barbour 1983). Adams and others (2007) captured 53 individuals from 5 Arkansas River backwaters and wetlands. Clark (2006) captured 47 individuals in White River oxbow lakes.

Etheostoma microperca

Least Darter

Class: Actinopterygii
Order: Perciformes
Family: Percidae

Priority Score: **29** **out of 100**

Population Trend: Decreasing


©Doyle Crosswhite

Gobal Rank: G5 — Secure

State Rank: S1 — Critically imperiled in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- [x] Ozark Highlands
- [ ] Boston Mountains
- [ ] Ouachita Mountains
- [ ] Arkansas Valley
- [ ] South Central Plains
- [ ] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

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Ecobasins

Ozark Highlands - Arkansas River

Habitats	Weight
Natural Pool: Headwater - Small	Suitable
Natural Spring Run: Headwater - Small	Obligate

Problems Faced

Threat: Habitat destruction Source: Channel alteration
Threat: Habitat destruction Source: Grazing/Browsing
Threat: Habitat destruction Source: Resource extraction
Threat: Habitat destruction Source: Road construction
Threat: Habitat destruction Source: Urban development
Threat: Hydrological alteration Source: Urban development
Threat: Nutrient loading Source: Municipal/Industrial point source

Data Gaps/Research Needs

Formally describe this species.

Conservation Actions	Importance	Category
Cooperatively develop a management plan for species with local input.	Medium	Public Relations/Education
Maintain and improve riparian buffers.	Medium	Habitat Restoration/Improvement
Protect core habitat areas.	Medium	Land Acquisition
Protect existing habitat and stream corridors.	High	Habitat Protection
Protect recharge area.	Medium	Habitat Protection
Protect water quality from point and non-point sources. Maintain or, where necessary, restore water quality to state standards/stormwater turbidity standards.	High	Threat Abatement
Provide education and outreach to local citizens and governments concerning this species and its habitat.	Medium	Public Relations/Education

Monitoring Strategies

Monitor known populations every 5 years, with more frequent monitoring if impacts are suspected.
Monitor potential impacts to species' habitat annually,

Comments

Description: Arkansas' smallest darter, reaching a maximum length of 1.5 inches. It has no lateral line, is tan and brown in color, with some red in the fins (Robison and Buchanan 1988).

While more common in the Great Lakes region, this darter is found in the Arkansas River basin of northwest Arkansas and inhabits small spring runs, often with an abundance of water cress and other aquatic plants, and substrates of fine gravel, sand, and silt. It has been found historically at five locations in the Illinois River basin in Arkansas, two of which yielded specimens in a recent study (Hargrave 1998).

A genetics study of the species indicates that the least darter in Arkansas represents an undescribed cryptic species with a very limited range (Echelle and others 2015). Wagner and others (2012) reported extirpation of the species at three historic sites, so this species appears to be declining. The G-rank of this species does not currently reflect new genetic information. Thus, the Fish Taxa Team recommends that new genetic information be used with the G-rank calculator to re-evaluate this species.

Etheostoma mihileze

Sunburst Darter

Class: Actinopterygii
Order: Perciformes
Family: Percidae

Priority Score: 19 out of 100

Population Trend: Stable

Gobal Rank: G4 — Apparently secure species

State Rank: S3 — Vulnerable in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- [x] Ozark Highlands
- [x] Boston Mountains
- [ ] Ouachita Mountains
- [x] Arkansas Valley
- [ ] South Central Plains
- [ ] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

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Ecobasins

Arkansas Valley - Arkansas River
Boston Mountains - Arkansas River
Ozark Highlands - Arkansas River

Habitats

	Weight
Natural Glide: - Small - Medium	Suitable
Natural Pool: - Small - Medium	Suitable
Natural Riffle: - Small - Medium	Suitable

Problems Faced

Threat: Habitat destruction Source: Dam
Threat: Habitat destruction Source: Resource extraction
Threat: Habitat destruction Source: Urban development
Threat: Habitat disturbance Source: Agricultural practices
Threat: Hydrological alteration Source: Dam
Threat: Hydrological alteration Source: Excessive groundwater withdrawal
Threat: Nutrient loading Source: Agricultural practices
Threat: Riparian habitat destruction Source: Agricultural practices
Threat: Sedimentation Source: Road construction

Data Gaps/Research Needs

Conduct baseline population surveys.
Refine range delineation.

Conservation Actions

	Importance	Category
Establish and enhance riparian corridors	High	Habitat Restoration/Improvement
Implement best management practices in conjunction with agriculture and silviculture.	Medium	Threat Abatement

Monitoring Strategies

Ensure location/occurrence records are compiled into the Arkansas Fish Database.
Monitor population distribution and abundance in stream faunal surveys.

Etheostoma mihileze
Sunburst Darter

Comments

Description: This species was elevated from Etheostoma punctulatum by Mayden (2010). This species is found in small tributatries to the Arkansas River in the northwest portion of the state. It occurs in Benton, Crawford, and Franklin counties. Life history has been studied by two investigations (Mayden 2010). This species inhabits small, clear, cool streams with good water quality over gravel and cobble substrates. They are regularly found in association with aquatic vegetation and organic debris.

Etheostoma moorei

Yellowcheek Darter

Class: Actinopterygii
Order: Perciformes
Family: Percidae

Priority Score: 100 out of 100

Population Trend: Decreasing

Gobal Rank: G1 — Critically imperiled species

State Rank: S1 — Critically imperiled in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☑ Boston Mountains
- ☐ Ouachita Mountains
- ☐ Arkansas Valley
- ☐ South Central Plains
- ☐ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

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Ecobasins

Boston Mountains - White River

Habitats

	Weight
Natural Riffle: - Small - Medium	Optimal
Natural Run: - Small - Medium	Optimal

Problems Faced

Threat: Habitat destruction
Source: Channel maintenance

Threat: Habitat destruction
Source: Dam

Threat: Habitat destruction
Source: Grazing/Browsing

Threat: Hydrological alteration
Source: Channel alteration

Threat: Hydrological alteration
Source: Dam

Threat: Sedimentation
Source: Forestry activities

Threat: Sedimentation
Source: Grazing/Browsing

Threat: Sedimentation
Source: Resource extraction

Threat: Sedimentation
Source: Road construction

Data Gaps/Research Needs

Assess population response to dewatering of riffles.

Conduct genetic study.

Conservation Actions

	Importance	Category
Cooperate with U.S. Fish and Wildlife Service to implement Candidate Conservation Agreement for the yellowcheek darter.	Medium	Other
Coordinate research to reduce disturbance by scientists.	Medium	Threat Abatement
Provide education and outreach to local citizens and governments concerning the yellowcheek darter and its habitat.	Medium	Public Relations/Education
Restore and improve riparian buffers.	Medium	Habitat Restoration/Improvement

Monitoring Strategies

Coordinate AGFC and USFWS monitoring to reduce stress on populations.

Comments

Description: A small brown darter reaching a maximum length of 2.5 inches (Robison and Buchanan 1988).

This Arkansas endemic is restricted to tributaries of the upper Little Red River system. The species was listed by the U.S. Fish and Wildlife Service as endangered during 2011.

Etheostoma pallididorsum

Paleback Darter

Class: Actinopterygii
Order: Perciformes
Family: Percidae

Priority Score: **46** **out of 100**

Population Trend: Stable


©John Harris

Gobal Rank: G2 — Imperiled species

State Rank: S2 — Imperiled in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☑ Ouachita Mountains
- ☐ Arkansas Valley
- ☐ South Central Plains
- ☐ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

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Ecobasins

Ouachita Mountains - Ouachita River

Habitats	Weight
Natural Pool: Headwater - Small	Obligate
Natural Riffle: Headwater - Small	Suitable
Natural Run: Headwater - Small	Suitable
Natural Spring Run:	Obligate

Problems Faced

Threat: Biological alteration
Source: Predation

Threat: Chemical alteration
Source: Resource extraction

Threat: Habitat destruction
Source: Dam

Threat: Habitat destruction
Source: Resource extraction

Threat: Sedimentation
Source: Channel alteration

Threat: Sedimentation
Source: Forestry activities

Threat: Sedimentation
Source: Road construction

Data Gaps/Research Needs

Survey for additional spawning habitat.

Conservation Actions	Importance	Category
Maintain or, where necessary, restore the quality and quantity of groundwater to state water quality standards.	Medium	Habitat Restoration/Improvement
Protect spawning habitat.	High	Habitat Protection

Monitoring Strategies

Continue stream surveys by partner agencies annually or biennually.

Comments

Description: A stout, bluntnosed darter, the males of which develop a bright orange abdomen in breeding condition (Robison and Buchanan 1988).

This Arkansas endemic inhabits small tributaries of the upper Caddo and Ouachita River systems. It is threatened by loss of habitat through channelization, which eliminates much of the shallow backwater areas which are preferred by the species (Robison 2004).

Etheostoma pallididorsum
Paleback Darter

Etheostoma parvipinne

Goldstripe Darter

Class: Actinopterygii
Order: Perciformes
Family: Percidae

Priority Score: 17 out of 100

Population Trend: Stable

©G. W. Sneegas

Gobal Rank: G4G5 — Apparently secure (uncertain rank)

State Rank: S3 — Vulnerable in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☐ Ouachita Mountains
- ☐ Arkansas Valley
- ☑ South Central Plains
- ☑ Mississippi Alluvial Plain
- ☑ Mississippi Valley Loess Plains

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Ecobasins

Mississippi River Alluvial Plain - White River
Mississippi River Alluvial Plain (Bayou Bartholomew) - Ouachita River
Mississippi Valley Loess Plains - St. Francis River
South Central Plains - Ouachita River
South Central Plains - Red River

Habitats

	Weight
Natural Pool: Headwater - Small	Suitable
Natural Spring Run: Headwater - Small	Data Gap

Problems Faced

Threat:
Source:

Data Gaps/Research Needs

Conduct distribution survey.
Conduct life history study.

Conservation Actions

	Importance	Category
More data is needed to determine conservation actions.	High	Data Gap

Monitoring Strategies

Monitor population distribution and abundance in ongoing stream faunal surveys.

Comments

Description: A small slender darter with a short, round snout, and a pale stripe down its side (Robison and Buchanan 1988).

Fairly widespread in southern Arkansas but not normally abundant (Robison and Buchanan 1988).

Etheostoma teddyroosevelt

Highland Darter

Class: Actinopterygii
Order: Perciformes
Family: Percidae

Priority Score: 15 out of 100

Population Trend: Unknown

Gobal Rank: G? — Uncertain global ranking

State Rank: S3 — Vulnerable in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- [x] Ozark Highlands
- [x] Boston Mountains
- [ ] Ouachita Mountains
- [x] Arkansas Valley
- [ ] South Central Plains
- [ ] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

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Ecobasins

Arkansas Valley - Arkansas River
Boston Mountains - Arkansas River
Ouachita Mountains - Arkansas River
Ozark Highlands - Arkansas River

Habitats

	Weight
Natural Glide: - Small - Medium	Suitable
Natural Pool: - Small - Medium	Optimal
Natural Riffle: - Small - Medium	Suitable

Problems Faced

Threat: Habitat destruction Source: Dam
Threat: Habitat destruction Source: Resource extraction
Threat: Habitat destruction Source: Urban development
Threat: Habitat disturbance Source: Agricultural practices
Threat: Hydrological alteration Source: Dam
Threat: Nutrient loading Source: Agricultural practices
Threat: Riparian habitat destruction Source: Agricultural practices
Threat: Sedimentation Source: Road construction

Data Gaps/Research Needs

Conduct baseline population surveys.
Refine range delineation.

Conservation Actions

	Importance	Category
Establish and enhance riparian corridors.	High	Habitat Restoration/Improvement
Implement best management practices in conjunction with agriculture and silviculture.	Medium	Threat Abatement

Monitoring Strategies

Ensure location/occurrence records are compiled into the Arkansas Fish Database.
Monitor population distribution and abundance in stream faunal surveys.

Etheostoma teddyroosevelt
Highland Darter

Comments

Description: This species was elevated from Etheostoma stigmaeum by Layman and Mayden (2012). They are found in Ozark Highland, Boston Mountain,and Ouachita Mountain tributaries of the Arkansas River in Northwest Arkansas and the upper White River. Habitat for this species includes clear, sandy and rocky pools of small to medium sized river with swift current. This species does not have a numerical G-rank, so the priority score on this fish with limited range is underestimated.

Etheostoma uniporum

Current Darter

Class: Actinopterygii
Order: Perciformes
Family: Percidae

Priority Score: 19 out of 100

Population Trend: Unknown

Gobal Rank: G4 — Apparently secure species

State Rank: S3 — Vulnerable in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- [x] Ozark Highlands
- [ ] Boston Mountains
- [ ] Ouachita Mountains
- [ ] Arkansas Valley
- [ ] South Central Plains
- [ ] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

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Ecobasins

Ozark Highlands - White River

Habitats	Weight
Natural Pool: - Small - Medium	Suitable
Natural Riffle: - Small - Medium	Optimal
Natural Run: - Small - Medium	Suitable

Problems Faced

Threat: Habitat destruction
Source: Grazing/Browsing

Threat: Habitat destruction
Source: Road construction

Threat: Nutrient loading
Source: Confined animal operations

Threat: Nutrient loading
Source: Grazing/Browsing

Threat: Sedimentation
Source: Grazing/Browsing

Threat: Sedimentation
Source: Road construction

Data Gaps/Research Needs

Determine numerical abundance and distribution.

Conservation Actions	Importance	Category
Improve riparian corridors.	Medium	Habitat Restoration/Improvement
Provide education and outreach to local citizens and governments concerning this species and its habitat.	Medium	Public Relations/Education
Use non-point source Best Management Practices.	Medium	Threat Abatement

Monitoring Strategies

Monitor population distribution and abundance in ongoing stream faunal surveys.

Comments

Description: A yellowish brown darter with dark brown saddles. Breeding males have predominately blue dorsal fins an orange throat, and forward slanting turquoise bars on the sides, (Robison and Buchanan 1988).

This member of the orangethroat darter group was elevated to species status by Ceas and Page (1997). The species is restricted to the Current, Eleven Point, and Spring River basins (Robison and Buchanan 1988).

Fundulus blairae

Lowland Topminnow

Class: Actinopterygii
Order: Cyprinodontiformes
Family: Fundulidae

Priority Score: **23** **out of 100**

Population Trend: Unknown

Gobal Rank: G4 — Apparently secure species

State Rank: S2 — Imperiled in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☑ Ouachita Mountains
- ☐ Arkansas Valley
- ☑ South Central Plains
- ☐ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

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Ecobasins

Ouachita Mountains - Red River

South Central Plains - Red River

Habitats

	Weight
Natural Littoral:	Suitable
Natural Pool:	Suitable
Natural Swamp/Wetlands:	Suitable

Problems Faced

Threat: Chemical alteration
Source: Forestry activities

Threat: Hydrological alteration
Source: Dam

Threat: Hydrological alteration
Source: Water diversion

Threat: Nutrient loading
Source: Agricultural practices

Threat: Sedimentation
Source: Road construction

Data Gaps/Research Needs

Conduct baseline population surveys.

Conservation Actions

	Importance	Category
Establish and enhance riparian corridors.	High	Habitat Restoration/Improvement
Implement best management practices in conjunction with agriculture and silviculture.	Medium	Threat Abatement

Monitoring Strategies

Monitor population distribution and abundance in stream faunal surveys.

Comments

The lowland topminnow is only found in Ouachita Mountain streams that drain into the Red River. The species is found in small, clear creeks and swampy backwaters over mud substrate near vegetation (Robison and Buchanan 1988). Buchanan (1985) collected 50 individuals from Millwood Lake.

Hiodon alosoides

Goldeye

Class: Actinopterygii
Order: Osteoglossiformes
Family: Hiodontidae

Priority Score: 19 **out of 100**

Population Trend: Unknown

Gobal Rank: G5 — Secure

State Rank: S2 — Imperiled in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☐ Ouachita Mountains
- ☑ Arkansas Valley
- ☑ South Central Plains
- ☑ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

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Ecobasins

Arkansas Valley - Arkansas River
Mississippi River Alluvial Plain - Arkansas River
Mississippi River Alluvial Plain - St. Francis River
Mississippi River Alluvial Plain - White River
Mississippi River Alluvial Plain (Bayou Bartholomew) - Ouachita River
Mississippi River Alluvial Plain (Lake Chicot) - Mississippi River
South Central Plains - Ouachita River
South Central Plains - Red River

Habitats

	Weight
Man-made Pelagic: - Medium - Large	Data Gap
Natural Pool: - Medium - Large	Obligate
Natural Side channel: - Medium - Large	Suitable

Problems Faced

Threat: Habitat destruction Source: Channel alteration
Threat: Habitat destruction Source: Channel maintenance
Threat: Habitat fragmentation Source: Dam
Threat: Hydrological alteration Source: Dam

Data Gaps/Research Needs

Conduct distribution and abundance survey.

Conservation Actions

	Importance	Category
More data are needed to determine conservation actions.	Medium	Data Gap
Notch dikes and restore navigation channel.	Low	Habitat Restoration/Improvement

Monitoring Strategies

Monitor population distribution and abundance in large river faunal surveys.

Comments

Description: A deep-bodied, compressed, silvery, shad-like with a large eye (Robison and Buchanan 1988). An inhabitant of medium to large rivers, abundant nowhere in state (Robison and Buchanan 1988). During high flows, the species is captured in moderate numbers by anglers with cast nets at the Arkansas River below Dam 2. Goldeye comprised 0.1% of fish captured in the White River by Vaught 2013.

Hiodon tergisus

Mooneye

Class: Actinopterygii
Order: Hiodontiformes
Family: Hiodontidae

Priority Score: 19 out of 100

Population Trend: Unknown

Gobal Rank: G5 — Secure

State Rank: S2 — Imperiled in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- [x] Ozark Highlands
- [ ] Boston Mountains
- [ ] Ouachita Mountains
- [x] Arkansas Valley
- [x] South Central Plains
- [x] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

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Ecobasins

Arkansas Valley - Arkansas River

Mississippi River Alluvial Plain - White River

Mississippi River Alluvial Plain (Lake Chicot) - Mississippi River

Ozark Highlands - White River

South Central Plains - Ouachita River

Habitats

	Weight
Natural Riffle: - Large	Obligate
Natural Shoal: - Large	Suitable

Problems Faced

Threat: Hydrological alteration
Source: Dam

Data Gaps/Research Needs

Conduct baseline population surveys.

Conduct life history study.

Conservation Actions

	Importance	Category
More data are needed to determine conservation actions.	Medium	Data Gap

Monitoring Strategies

Ensure location/occurrence records are compiled into the Arkansas Fish Database.

Monitor population distribution and abundance in large river surveys.

Comments

Mooneye inhabit the large rivers of the state including the Arkansas, White, Black, Little Red, Strawberry, Spring, Current, and Ouachita Rivers. The species is found in swift current over firm substrate. Buchanan (2003) did not report the species from the Red River. Vogt (2013) reported that mooneye represented 2% of fish captured with boat electrofishing in the lower White River during 2010, and CPUE was 0.14 and 0.17 fish/hr in the warm and transitional areas of the river.

Hybognathus placitus

Plains Minnow

Class: Actinopterygii
Order: Cypriniformes
Family: Cyprinidae

Priority Score: 27 out of 100

Population Trend: Unknown

Gobal Rank: G4 — Apparently secure species

State Rank: SH — Historic record. Possibly extirpated in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☐ Ouachita Mountains
- ☑ Arkansas Valley
- ☑ South Central Plains
- ☑ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

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Ecobasins

Arkansas Valley - Arkansas River

Mississippi River Alluvial Plain (Lake Chicot) - Mississippi River

South Central Plains - Red River

Problems Faced

Threat: Biological alteration
Source: Dam

Threat: Habitat destruction
Source: Dam

Threat: Hydrological alteration
Source: Dam

Data Gaps/Research Needs

Conduct baseline population surveys.

Conservation Actions

	Importance	Category
More data are needed to determine conservation actions.	Medium	Data Gap

Monitoring Strategies

Monitor population distribution and abundance in large river surveys.

Comments

Description: a large minnow with a short head, blunt snout, sub-terminal mouth, and very small eye (Robison and Buchanan 1988). The species has been collected in the Mississippi, Arkansas, and Red rivers, and no breeding populations are known to occur in the state.

Lampetra aepyptera

Least Brook Lamprey

Class: Petromyzontida
Order: Petromyzontiformes
Family: Petromyzontidae

Priority Score: **15** **out of 100**

Population Trend: Unknown

Gobal Rank: G5 — Secure

State Rank: S3 — Vulnerable in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- [x] Ozark Highlands
- [ ] Boston Mountains
- [ ] Ouachita Mountains
- [ ] Arkansas Valley
- [ ] South Central Plains
- [ ] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

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Ecobasins

Ozark Highlands - White River

Habitats	Weight
Natural Pool: - Medium	Suitable

Problems Faced

Threat: Hydrological alteration
Source: Dam

Threat: Riparian habitat destruction
Source: Conversion of riparian forest

Threat: Sedimentation
Source: Agricultural practices

Data Gaps/Research Needs

Conduct baseline population surveys.

Conduct life history study.

Conservation Actions	Importance	Category
Establish and enhance riparian corridors.	High	Habitat Restoration/Improvement
Implement best management practices in conjunction with agriculture and silviculture.	Medium	Threat Abatement

Monitoring Strategies

Ensure location/occurrence records are compiled into the Arkansas Fish Database.

Monitor population distribution and abundance in stream faunal surveys.

Comments

This species typically inhabits headwater to medium-sized streams with clean gravel riffles, and the species inhabits smaller streams than other Arkansas lampreys (Robison and Buchanan 1988).

Lethenteron appendix

American Brook Lamprey

Class: Petromyzontida
Order: Petromyzontiformes
Family: Petromyzontidae

Priority Score: 19 out of 100

Population Trend: Unknown

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Gobal Rank: G4 — Apparently secure species

State Rank: S3 — Vulnerable in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- [x] Ozark Highlands
- [x] Boston Mountains
- [ ] Ouachita Mountains
- [ ] Arkansas Valley
- [x] South Central Plains
- [x] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

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Ecobasins

Boston Mountains - White River
Mississippi River Alluvial Plain - White River
Ozark Highlands - White River
South Central Plains - Ouachita River

Habitats

	Weight
Natural Pool: - Small - Medium	Suitable
Natural Riffle: - Small - Medium	Obligate

Problems Faced

Threat: Hydrological alteration Source: Dam
Threat: Riparian habitat destruction Source: Conversion of riparian forest
Threat: Sedimentation Source: Agricultural practices

Data Gaps/Research Needs

Conduct targeted baseline population surveys.
Determine spawning sites.

Conservation Actions

	Importance	Category
Establish and enhance riparian corridors.	High	Habitat Restoration/Improvement
Implement best management practices in conjunction with agriculture and silviculture.	Medium	Threat Abatement

Monitoring Strategies

Ensure location/occurrence records are compiled into the Arkansas Fish Database.
Monitor population distribution and abundance in stream faunal surveys.

Comments

Description: This species name was changed from Lamptera appendix. It inhabits cool, clear, small to medium sized streams in gravel bottom runs and flowing pools.

Lythrurus snelsoni

Ouachita Mountain Shiner

Class: Actinopterygii
Order: Cypriniformes
Family: Cyprinidae

Priority Score: 27 out of 100

Population Trend: Unknown

©Daniel Fenner

Gobal Rank: G3G4 — Vulnerable (uncertain rank)

State Rank: S2 — Imperiled in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☑ Ouachita Mountains
- ☐ Arkansas Valley
- ☑ South Central Plains
- ☐ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

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Ecobasins

Ouachita Mountains - Red River
South Central Plains - Red River

Habitats

	Weight
Natural Glide: - Medium	Suitable
Natural Pool: - Medium	Obligate

Problems Faced

Threat: Chemical alteration Source: Forestry activities
Threat: Hydrological alteration Source: Dam
Threat: Hydrological alteration Source: Water diversion
Threat: Nutrient loading Source: Agricultural practices
Threat: Sedimentation Source: Conversion of riparian forest
Threat: Sedimentation Source: Road construction

Data Gaps/Research Needs

Conduct baseline population surveys.
Conduct life history study.

Conservation Actions

	Importance	Category
Establish and enhance riparian corridors.	High	Habitat Restoration/Improvement
Implement best management practices in conjunction with agriculture and silviculture.	Medium	Threat Abatement

Monitoring Strategies

Monitor population distribution and abundance in stream faunal surveys.

Comments

The species lives in pools of clear, high-gradient streams of the Mountain Fork and Cossatot river basins (Robison and Buchanan 1988). Buchanan (2005) collected 8 specimens from Gillham Lake.

Macrhybopsis hyostoma

Shoal Chub

Class: Actinopterygii
Order: Cypriniformes
Family: Cyprinidae

Priority Score: 15 out of 100

Population Trend: Stable

Gobal Rank: G5 — Secure

State Rank: S3 — Vulnerable in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☐ Ouachita Mountains
- ☑ Arkansas Valley
- ☑ South Central Plains
- ☑ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

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Ecobasins

Mississippi River Alluvial Plain - Arkansas River
Mississippi River Alluvial Plain - White River
Mississippi River Alluvial Plain (Lake Chicot) - Mississippi River
Mississippi Valley Loess Plains - St. Francis River
South Central Plains - Ouachita River
South Central Plains - Red River

Habitats

	Weight
Natural Pool: - Large	Suitable
Natural Shoal: - Large	Optimal
Natural Side channel: - Large	Suitable

Problems Faced

Threat: Habitat destruction Source: Channel alteration
Threat: Habitat fragmentation Source: Dam
Threat: Hydrological alteration Source: Dam
Threat: Sedimentation Source: Non-point source pollution

Data Gaps/Research Needs

Conduct baseline population surveys.

Conservation Actions

	Importance	Category
More data are needed to determine conservation actions.	Medium	Data Gap

Monitoring Strategies

Ensure location/occurrence records are compiled into the Arkansas Fish Database.
Monitor population distribution and abundance in large river surveys.

Comments

The Shoal Chub is one of the species that used to be included in M. aestivalis (McAllister and others 2010, 2012). Layher and others (2005) captured 995 individuals from 7 large rivers in Arkansas. The Fish Taxa Team recommends using the S-rank calculator to re-evaluate the species once distributional records are entered into the fish database.

Macrhybopsis meeki

Sicklefin Chub

Class: Actinopterygii
Order: Cypriniformes
Family: Cyprinidae

Priority Score: **43** **out of 100**

Population Trend: Decreasing

Gobal Rank: G3 — Vulnerable species

State Rank: S1 — Critically imperiled in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☐ Ouachita Mountains
- ☐ Arkansas Valley
- ☐ South Central Plains
- ☑ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

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Ecobasins

Mississippi River Alluvial Plain - Arkansas River
Mississippi River Alluvial Plain - St. Francis River
Mississippi River Alluvial Plain - White River
Mississippi River Alluvial Plain (Lake Chicot) - Mississippi River

Habitats

	Weight
Natural Run: - Large	Obligate
Natural Shoal: - Large	Obligate

Problems Faced

Threat: Habitat destruction Source: Channel alteration
Threat: Habitat destruction Source: Channel maintenance
Threat: Habitat destruction Source: Resource extraction

Data Gaps/Research Needs

Conduct distribution study.

Conservation Actions

	Importance	Category
Coordinate with other agencies and entities for conservation measures.	Medium	Public Relations/Education

Monitoring Strategies

More information is needed before a monitoring strategy can be developed.

Comments

Description: A pale, silvery, barbeled minnow with a round snout and small eyes (Robison and Buchanan 1988). Only one historical Arkansas record, which is from the Mississippi River (Robison and Buchanan 1988). Recent collections of three individuals (2006, 2008) have been made by the U.S. Army Corps of Engineers at Mhoon Bend and Island 63 (Dr. Todd Slack, personal communication). This species has declined in the Missouri portion of the Mississippi River (Robert Hrabik, personal communication).

Moxostoma anisurum

Silver Redhorse

Class: Actinopterygii
Order: Cypriniformes
Family: Catostomidae

Priority Score: **29** **out of 100**

Population Trend: Decreasing

©Konrad P. Schmidt

Gobal Rank: G5 — Secure

State Rank: S1 — Critically imperiled in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- [x] Ozark Highlands
- [ ] Boston Mountains
- [ ] Ouachita Mountains
- [ ] Arkansas Valley
- [ ] South Central Plains
- [ ] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

Taxa Association Team and Peer Reviewer

Ecobasins

Ozark Highlands - White River

Habitats	Weight
Natural Pool: - Medium - Large	Optimal
Natural Riffle: - Medium - Large	Obligate

Problems Faced

Threat: Habitat destruction
Source: Resource extraction

Threat: Nutrient loading
Source: Confined animal operations

Threat: Sedimentation
Source: Confined animal operations

Threat: Sedimentation
Source: Grazing/Browsing

Threat: Sedimentation
Source: Resource extraction

Threat: Sedimentation
Source: Road construction

Data Gaps/Research Needs

Assess abundance in the middle White River and the Current River.

Conduct distribution survey.

Conservation Actions	Importance	Category
Establish or improve riparian buffers.	Medium	Habitat Restoration/Improvement
Reduce or eliminate resource extraction.	Medium	Threat Abatement
Reduce sedimentation using Best Management Practices.	Medium	Threat Abatement

Monitoring Strategies

Ensure location/occurrence records are compiled into the Arkansas Fish Database.

Monitor distribution and abundance with general river surveys.

Comments

Description: A robust, pale yellow or silvery sucker growing to a maximum of 20 inches (Robison and Buchanan 1988).

The silver redhorse is rare in Arkansas (Robison and Buchanan 1988), and only 23 specimens have been collected from five rivers (McAllister and others 2009).

Moxostoma anisurum
Silver Redhorse

Moxostoma pisolabrum

Pealip Redhorse

Class: Actinopterygii
Order: Cypriniformes
Family: Catostomidae

Priority Score: 19 out of 100

Population Trend: Unknown

Gobal Rank: G5 — Secure

State Rank: S2 — Imperiled in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- [x] Ozark Highlands
- [ ] Boston Mountains
- [ ] Ouachita Mountains
- [x] Arkansas Valley
- [ ] South Central Plains
- [x] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

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Ecobasins

Arkansas Valley - Arkansas River
Mississippi River Alluvial Plain - Arkansas River
Mississippi River Alluvial Plain - St. Francis River
Mississippi River Alluvial Plain - White River
Ozark Highlands - Arkansas River
Ozark Highlands - White River

Habitats

	Weight
Natural Other: - Small - Medium - Large	Suitable
Natural Pool: - Small - Medium - Large	Optimal
Natural Riffle: - Small - Medium - Large	Obligate
Natural Run: - Small - Medium - Large	Obligate

Problems Faced

Threat: Habitat destruction Source: Channel alteration
Threat: Habitat destruction Source: Dam
Threat: Habitat destruction Source: Resource extraction
Threat: Hydrological alteration Source: Dam

Data Gaps/Research Needs

Conduct distribution surveys.

Conservation Actions

	Importance	Category
Establish or improve riparian buffers.	Medium	Habitat Restoration/Improvement
Minimize migration barriers.	Medium	Threat Abatement
Reduce or eliminate resource extraction.	Medium	Threat Abatement

Monitoring Strategies

Monitor distribution and abundance with general large river surveys.

Comments

Description: A slender sucker with a red tail, growing to 24 inches (Robison and Buchanan 1988). This species was elevated from the shorthead redhorse by Nelson and others (2004).

Sparse records for this species are likely due to limited sampling of large rivers instead of rarity (Robison and Buchanan 1988; McAllister and others 2010).

Moxostoma pisolabrum
Pealip Redhorse

Mugil cephalus

Striped Mullet

Class: Actinopterygii
Order: Mugiliformes
Family: Mugilidae

Priority Score: 19 out of 100

Population Trend: Stable

Gobal Rank: G5 — Secure

State Rank: S2 — Imperiled in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- [x] Ozark Highlands
- [ ] Boston Mountains
- [ ] Ouachita Mountains
- [x] Arkansas Valley
- [x] South Central Plains
- [x] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

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Ecobasins

Arkansas Valley - Arkansas River
Mississippi River Alluvial Plain - Arkansas River
Mississippi River Alluvial Plain - White River
Mississippi River Alluvial Plain (Lake Chicot) - Mississippi River
Ozark Highlands - White River
South Central Plains - Ouachita River

Habitats

	Weight
Natural Pool: - Large	Suitable
Natural Riffle: - Large	Suitable

Problems Faced

Threat: Habitat destruction Source: Dam
Threat: Hydrological alteration Source: Dam

Data Gaps/Research Needs

Determine abundance in large river surveys.

Conservation Actions

	Importance	Category
Improve fish passage.	Medium	Threat Abatement

Monitoring Strategies

Ensure location/occurrence records are compiled into the Arkansas Fish Database.
Monitor population distribution and abundance in stream faunal surveys.

Comments

Marine and estuarine, often ascending coastal rivers for considerable distances. Grimes (2015) captured 817 individuals in the lower Arkansas River downstream of Wilber D. Mills Dam. Vogt (2013) reported that striped mullet electrofishing CPUE was 0.07 and 0.17 fish/hour in the warm and transitional areas of the lower White River.

Nocomis asper

Redspot Chub

Class: Actinopterygii
Order: Cypriniformes
Family: Cyprinidae

Priority Score: **19** **out of 100**

Population Trend: Unknown

Gobal Rank: G4 — Apparently secure species

State Rank: S3 — Vulnerable in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- [x] Ozark Highlands
- [ ] Boston Mountains
- [x] Ouachita Mountains
- [ ] Arkansas Valley
- [ ] South Central Plains
- [ ] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

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Ecobasins

Ouachita Mountains - Ouachita River
Ozark Highlands - Arkansas River

Habitats	Weight
Natural Glide: - Small - Medium	Suitable
Natural Pool: - Small - Medium	Suitable
Natural Riffle: - Small - Medium	Obligate
Natural Run: - Small - Medium	Obligate

Problems Faced

Threat: Habitat destruction Source: Channel alteration
Threat: Habitat destruction Source: Resource extraction
Threat: Habitat destruction Source: Urban development
Threat: Hydrological alteration Source: Dam
Threat: Hydrological alteration Source: Urban development
Threat: Nutrient loading Source: Confined animal operations
Threat: Nutrient loading Source: Grazing/Browsing
Threat: Nutrient loading Source: Municipal/Industrial point source
Threat: Sedimentation Source: Grazing/Browsing
Threat: Sedimentation Source: Road construction
Threat: Sedimentation Source: Urban development

Data Gaps/Research Needs

Conduct abundance and distribution surveys.

Conservation Actions	Importance	Category
Maintain or, where necessary, restore groundwater quality to state standards.	Low	Habitat Restoration/Improvement
Maintain or, where necessary, restore instream aquatic habitat, substrate and flow regime.	Medium	Habitat Restoration/Improvement
Protect river corridors using appropriate buffer widths relative to stream size.	High	Habitat Protection

Nocomis asper
Redspot Chub

Monitoring Strategies

Monitor population distribution and abundance in stream faunal surveys.

Comments

Description: A large (10 inches max), robust, cylindrical minnow with a red spot behind the eye of adults (Robison and Buchanan 1988).

Inhabits upland, clear, gravelly, spring-fed streams, mostly in the Arkansas River drainage in northwest Arkansas, with a couple of disjunct populations in the Ouachita River system (Robison and Buchanan 1988). Echelle et al. (2014) indicated genetic structure is weak among the disjunct populations, indicating they are likely the same species.

Notropis atrocaudalis

Blackspot Shiner

Class: Actinopterygii
Order: Cypriniformes
Family: Cyprinidae

Priority Score: **19** **out of 100**

Population Trend: Unknown

©G. W. Sneegas

Gobal Rank: G4 — Apparently secure species

State Rank: S3 — Vulnerable in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☐ Ouachita Mountains
- ☐ Arkansas Valley
- ☑ South Central Plains
- ☐ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

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Ecobasins

South Central Plains - Red River

Habitats	Weight
Natural Pool: - Small	Suitable
Natural Riffle: - Small	Suitable
Natural Run: - Small	Optimal
Natural Spring Run: - Small	Optimal

Problems Faced

Threat: Habitat destruction
Source: Channel alteration

Threat: Habitat destruction
Source: Dam

Threat: Hydrological alteration
Source: Channel alteration

Threat: Hydrological alteration
Source: Dam

Threat: Sedimentation
Source: Grazing/Browsing

Threat: Sedimentation
Source: Urban development

Data Gaps/Research Needs

Conduct distribution surveys.

Conservation Actions	Importance	Category
Conserve the water quality and habitat integrity of small stream tributaries and spring runs in the Little River and Red River systems.	High	Habitat Protection
Promote and implement measures to reduce sedimentation and turbidity in stream habitat.	Medium	Habitat Restoration/Improvement

Monitoring Strategies

Monitor presence through general stream faunal surveys.

Comments

Description: A robust, blunt-nosed, small-headed shiner with a fairly large eye and a black stripe down its side (Robison and Buchanan 1988).

The Blackspot shiner is a a rare fish in small, clear streams of the Red River basin (Robison and Buchanan 1988). Bean and others (2010) described habitat use, life history, and diet of the species.

Notropis bairdi

Red River Shiner

Class: Actinopterygii
Order: Cypriniformes
Family: Cyprinidae

Priority Score: 27 out of 100

Population Trend: Unknown

©G. W. Sneegas

Gobal Rank: G4 — Apparently secure species

State Rank: SH — Historic record. Possibly extirpated in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☐ Ouachita Mountains
- ☐ Arkansas Valley
- ☑ South Central Plains
- ☐ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

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Ecobasins

South Central Plains - Red River

Habitats	Weight
Natural Pool: - Large	Suitable
Natural Shoal: - Large	Suitable

Problems Faced

Threat: Habitat destruction
Source: Channel alteration

Threat: Habitat destruction
Source: Dam

Threat: Habitat destruction
Source: Resource extraction

Threat: Hydrological alteration
Source: Water diversion

Data Gaps/Research Needs

Conduct distribution surveys.

Conservation Actions	Importance	Category
Restore natural flow regime.	High	Habitat Protection
Work across political boundaries to conserve and enhance populations.	Medium	Population Management
Work with USACOE to minimize impacts from proposed Southwest Arkansas Navigation Project.	High	Threat Abatement

Monitoring Strategies

Survey for this species in the Red River.

Comments

Description: A small, tan to gray, compressed shiner (Robison and Buchanan 1988).

Species is locally abundant in Oklahoma/Texas, occurs in Arkansas only on periphery of its range. Only known in Arkansas from 2 pre-1950 records from the Red River (Robison and Buchanan 1988). The species has been collected 18-km upstream of the Arkansas state line as recently as 1995, so future sampling of the Red River could possibly detect the species (Buchanan and others 2003).

Notropis girardi

Arkansas River Shiner

Class: Actinopterygii
Order: Cypriniformes
Family: Cyprinidae

Priority Score: **50** **out of 100**

Population Trend: Unknown

Gobal Rank: G2 — Imperiled species

State Rank: SX — Presumed extinct

Distribution

Occurrence Records

Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☐ Ouachita Mountains
- ☑ Arkansas Valley
- ☐ South Central Plains
- ☐ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

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Ecobasins

Arkansas Valley - Arkansas River

Habitats	Weight
Natural Pool: - Large	Data Gap
Natural Shoal: - Large	Data Gap
Natural Side channel: - Large	Data Gap

Problems Faced

Threat: Habitat fragmentation
Source: Dam

Threat: Hydrological alteration
Source: Dam

Data Gaps/Research Needs

It is unclear if this species was ever a regular part of the Arkansas fauna, or if it only was found as waifs from upstream.

Conservation Actions	Importance	Category
More data is needed to determine conservation actions.	Medium	Data Gap

Monitoring Strategies

Be alert for species presence in any sampling on the Arkansas River in western Arkansas.

Comments

Description: A small, compressed, tan shiner (Robison and Buchanan 1988).

Great Plains endemic of the Arkansas River, taken only once in Arkansas and likely extirpated today (Robison and Buchanan 1988). It has declined greatly across its range (Larson 1991) and has been listed as threatened under the Endangered Species Act (Federal Register 1998).

This species is believed extirpated from Arkansas. The only record of its occurrence dates from 1939. If populations are discovered in Arkansas, this information will be included in future iterations of this report.

Notropis ortenburgeri

Kiamichi Shiner

Class: Actinopterygii
Order: Cypriniformes
Family: Cyprinidae

Priority Score: **33** out of 100

Population Trend: Decreasing

Gobal Rank: G3 — Vulnerable species

State Rank: S3 — Vulnerable in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☑ Ouachita Mountains
- ☐ Arkansas Valley
- ☐ South Central Plains
- ☐ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

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Ecobasins

Ouachita Mountains - Arkansas River

Ouachita Mountains - Ouachita River

Ouachita Mountains - Red River

Habitats

	Weight
Natural Pool: - Small - Medium	Obligate

Problems Faced

Threat: Habitat destruction
Source: Dam

Threat: Sedimentation
Source: Forestry activities

Threat: Sedimentation
Source: Grazing/Browsing

Threat: Sedimentation
Source: Road construction

Data Gaps/Research Needs

Conduct distribution and abundance survey.

Conduct life history study.

Conservation Actions

	Importance	Category
More data are needed to determine conservation actions.	High	Data Gap

Monitoring Strategies

Monitor population distribution and abundance in ongoing stream faunal surveys.

Comments

Description: A slim, silvery shiner with a large eye (Robison and Buchanan 1988).

Good populations are present in in the Little Missouri and Ouachita river basins, but recent surveys did not locate any specimens in several other basins where they were historically found (Robison 2001a). Robison (2005) indicated this is a widespread, locally abundant minnow that has not greatly decreased in abundance or range.

Notropis ozarcanus

Ozark Shiner

Class: Actinopterygii
Order: Cypriniformes
Family: Cyprinidae

Priority Score: **33** **out of 100**

Population Trend: Decreasing


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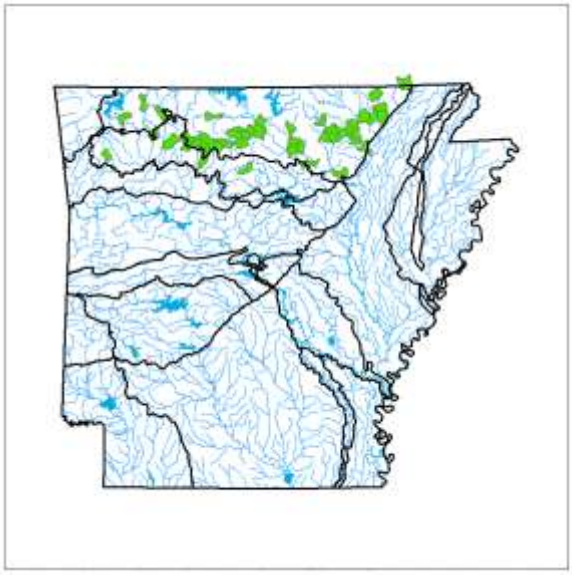
Gobal Rank: G3 — Vulnerable species

State Rank: S3 — Vulnerable in Arkansas

Distribution

Occurrence Records



Ecoregions where the species occurs:

- [x] Ozark Highlands
- [x] Boston Mountains
- [ ] Ouachita Mountains
- [ ] Arkansas Valley
- [ ] South Central Plains
- [ ] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

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Ecobasins

Boston Mountains - White River
Ozark Highlands - Arkansas River
Ozark Highlands - White River

Habitats	Weight
Natural Pool: - Small - Medium - Large	Suitable
Natural Run: - Small - Medium - Large	Optimal

Problems Faced

Threat: Habitat destruction Source: Dam
Threat: Habitat destruction Source: Resource extraction
Threat: Habitat destruction Source: Road construction
Threat: Hydrological alteration Source: Dam
Threat: Sedimentation Source: Forestry activities
Threat: Sedimentation Source: Grazing/Browsing
Threat: Sedimentation Source: Resource extraction

Data Gaps/Research Needs

Conduct distribution and status survey.
Conduct life history study.

Conservation Actions	Importance	Category
Enhance riparian zone.	Medium	Habitat Restoration/Improvement
Preserve habitat.	Medium	Habitat Protection
Promote alternative livestock water source.	Medium	Threat Abatement
Reduce sedimetation.	Medium	Habitat Restoration/Improvement

Monitoring Strategies

Conduct comprehensive aquatic community sampling.
Share data with other agencies and organizations.

Comments

Description: A pale yellow and silvery shiner with a blunt nose and large eye (Robison and Buchanan 1988).

Recent surveys revealed healthy populations of this fish in the Buffalo and Spring rivers. Numbers were low or absent in several rivers where the species historically was found (Robison 1995). Rigsby (2009) reported collecting 7 individuals from 2 locations in the Eleven Point River.

Notropis perpallidus

Peppered Shiner

Class: Actinopterygii
Order: Cypriniformes
Family: Cyprinidae

Priority Score: **33** **out of 100**

Population Trend: Decreasing

Gobal Rank: G3 — Vulnerable species

State Rank: S3 — Vulnerable in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- [ ] Ozark Highlands
- [ ] Boston Mountains
- [x] Ouachita Mountains
- [ ] Arkansas Valley
- [x] South Central Plains
- [ ] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

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Ecobasins

Ouachita Mountains - Ouachita River

South Central Plains - Ouachita River

Habitats	Weight
Natural Pool: - Medium	Obligate

Problems Faced

Threat: Habitat destruction
Source: Dam

Threat: Habitat destruction
Source: Urban development

Threat: Sedimentation
Source: Forestry activities

Data Gaps/Research Needs

Conduct distribution and abundance surveys.

Conduct life history study.

Identify threats and sources.

Conservation Actions	Importance	Category
More data are needed to determine conservation actions.	High	Data Gap

Monitoring Strategies

Monitor population distribution and abundance in ongoing stream faunal surveys.

Comments

Description: A small, pale shiner sprinkled randomly with black speckles (Robison and Buchanan 1988).

Wagner, Echelle, and Maughan (1987) found significant niche overlap with N. snelsoni and N. volucellus. Robison (2006) recommended a vulnerable status for this rare fish. He collected only 17 specimens from 81 collections. He suggested the species has declined in Arkansas, only occurring in the Ouachita and Saline rivers.

Notropis potteri

Chub Shiner

Class: Actinopterygii
Order: Cypriniformes
Family: Cyprinidae

Priority Score: **23** **out of 100**

Population Trend: Stable

Gobal Rank: G4 — Apparently secure species

State Rank: S2 — Imperiled in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☐ Ouachita Mountains
- ☐ Arkansas Valley
- ☑ South Central Plains
- ☐ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

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Ecobasins

South Central Plains - Red River

Habitats

	Weight
Natural Pool: - Large	Suitable
Natural Shoal: - Large	Suitable

Problems Faced

Threat: Hydrological alteration
Source: Dam

Data Gaps/Research Needs

Conduct baseline surveys.

Conduct life history study.

Conservation Actions

	Importance	Category
More data are needed to determine conservation actions.	Medium	Data Gap

Monitoring Strategies

Monitor population distribution and abundance in the Red River.

Comments

This species is restricted to the Red River, where it was the second most abundant species captured (Buchanan et al. 2003).

Notropis sabinae

Sabine Shiner

Class: Actinopterygii
Order: Cypriniformes
Family: Cyprinidae

Priority Score: **23** **out of 100**

Population Trend: Unknown


©Bill Roston

Gobal Rank: G4 — Apparently secure species

State Rank: S2 — Imperiled in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- [x] Ozark Highlands
- [ ] Boston Mountains
- [ ] Ouachita Mountains
- [ ] Arkansas Valley
- [ ] South Central Plains
- [x] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

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Ecobasins

Mississippi River Alluvial Plain - St. Francis River
Mississippi River Alluvial Plain - White River
Ozark Highlands - White River

Habitats

	Weight
Natural Glide: - Small - Medium	Data Gap
Natural Pool: - Small - Medium	Data Gap

Problems Faced

Threat: Chemical alteration Source: Non-point source pollution
Threat: Habitat destruction Source: Channel alteration
Threat: Habitat destruction Source: Resource extraction
Threat: Habitat destruction Source: Road construction
Threat: Sedimentation Source: Agricultural practices
Threat: Sedimentation Source: Channel alteration
Threat: Sedimentation Source: Road construction

Data Gaps/Research Needs

Conduct distribution and abundance surveys.
Conduct genetic analysis of similar, allopatric populations.

Conservation Actions

	Importance	Category
Protect habitat.	High	Habitat Protection
Reduce sediment.	Medium	Habitat Restoration/Improvement

Monitoring Strategies

Monitor population distribution and abundance in ongoing stream faunal surveys.

Comments

Description: A small, silver-sided shiner with a small eye (Robison and Buchanan 1988).

Populations in rivers of the eastern Ozarks are widely disjunct from range in the coastal plain of east Texas and west Louisiana (Robison and Buchanan 1988).

Notropis suttkusi

Rocky Shiner

Class: Actinopterygii
Order: Cypriniformes
Family: Cyprinidae

Priority Score: 27 out of 100

Population Trend: Unknown

Gobal Rank: G3G4 — Vulnerable (uncertain rank)

State Rank: S2 — Imperiled in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☑ Ouachita Mountains
- ☐ Arkansas Valley
- ☐ South Central Plains
- ☐ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

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Ecobasins

Ouachita Mountains - Red River

Habitats

	Weight
Natural Glide:	Suitable
Natural Pool:	Suitable
Natural Riffle:	Suitable

Problems Faced

Threat: Chemical alteration
Source: Forestry activities

Threat: Hydrological alteration
Source: Dam

Threat: Hydrological alteration
Source: Water diversion

Threat: Nutrient loading
Source: Agricultural practices

Threat: Sedimentation
Source: Conversion of riparian forest

Threat: Sedimentation
Source: Road construction

Data Gaps/Research Needs

Conduct baseline population surveys.

Conduct life history study.

Conservation Actions

	Importance	Category
Establish and enhance riparian corridors.	High	Habitat Restoration/Improvement
Implement best management practices for road construction.	High	Threat Abatement
Implement best management practices in conjunction with agriculture and silviculture.	High	Threat Abatement

Monitoring Strategies

Monitor population distribution and abundance in stream faunal surveys.

Comments

This species was elevated from Notropis rubellus (Humphries and Cashner 1994) and appears to be abundant within its limited range (Schwemm 2013). The rocky shiner inhabits clear water streams of moderate to high gradient with gravel and rubble substrates.

Notropis wickliffi

Channel Shiner

Class: Actinopterygii
Order: Cypriniformes
Family: Cyprinidae

Priority Score: **19** **out of 100**

Population Trend: Unknown

Gobal Rank: G5 — Secure

State Rank: S2 — Imperiled in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- [x] Ozark Highlands
- [ ] Boston Mountains
- [ ] Ouachita Mountains
- [ ] Arkansas Valley
- [ ] South Central Plains
- [x] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

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Ecobasins

Mississippi River Alluvial Plain - Arkansas River
Mississippi River Alluvial Plain - White River
Mississippi River Alluvial Plain (Lake Chicot) - Mississippi River
Ozark Highlands - White River

Habitats

	Weight
Natural Shoal: - Medium - Large	Optimal

Problems Faced

Threat: Habitat destruction Source: Channel alteration
Threat: Hydrological alteration Source: Dam

Data Gaps/Research Needs

Conduct life history study.
Determine distribution and abundance.
Determine genetics of the Current River form.

Conservation Actions

	Importance	Category
More data are needed to determine conservation actions.	Medium	Data Gap

Monitoring Strategies

Ensure location/occurrence records are compiled into the Arkansas Fish Database.
Monitor population distribution and abundance in large river surveys.

Comments

Description: This species was long regarded as a subspecies of the mimic shiner, N. volucellus (McAllister et al. 2009). McAllister et al. (2009) reported collecting 211 channel shiners from the lower Arkansas and Mississippi rivers. Robison and Buchanan (1994) provided historical localities and noted the taxonomic status of the Current River form is unresolved. Distribution of the species is poorly understood.

Noturus flavus

Stonecat

Class: Actinopterygii
Order: Siluriformes
Family: Ictaluridae

Priority Score: **29** **out of 100**

Population Trend: Decreasing

Gobal Rank: G5 — Secure

State Rank: S1 — Critically imperiled in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☐ Ouachita Mountains
- ☐ Arkansas Valley
- ☐ South Central Plains
- ☑ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

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Ecobasins

Mississippi River Alluvial Plain (Lake Chicot) - Mississippi River

Habitats

	Weight
Natural Shoal:	Optimal
Natural Side channel:	Suitable

Problems Faced

Threat: Biological alteration
Source: Exotic species

Threat: Chemical alteration
Source: Urban development

Threat: Habitat destruction
Source: Channel alteration

Threat: Toxins/contaminants
Source: Agricultural practices

Data Gaps/Research Needs

Determine distribution and abundance in the Mississippi River.

Determine habitat requirements.

Conservation Actions

	Importance	Category
More data are needed to determine conservation actions.	Medium	Data Gap

Monitoring Strategies

Ensure location/occurrence records are compiled into the Arkansas Fish Database.

Monitor population distribution and abundance in large river surveys. Be aware that the species could possibly be discovered in clear streams in far Northwest Arkansas.

Comments

This primarily northern species inhabits the Mississippi River in Arkansas, but clear gravel-bed streams elsewhere. McAllister and others (2012) provided recent records for the Noturus flavus in Arkansas, which have all been collected using rotenone. This species has been collected from large rip rap dike habitat in the Mississippi River.

Noturus lachneri

Ouachita Madtom

Class: Actinopterygii
Order: Siluriformes
Family: Ictaluridae

Priority Score: 46 out of 100

Population Trend: Unknown

Gobal Rank: G2 — Imperiled species

State Rank: S2 — Imperiled in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☑ Ouachita Mountains
- ☐ Arkansas Valley
- ☐ South Central Plains
- ☐ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

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Ecobasins

Ouachita Mountains - Ouachita River

Habitats	Weight
Natural Glide: - Small - Medium	Obligate
Natural Pool: - Small - Medium	Marginal
Natural Riffle: - Small - Medium	Suitable

Problems Faced

Threat: Habitat destruction
Source: Dam

Threat: Habitat destruction
Source: Resource extraction

Threat: Hydrological alteration
Source: Water diversion

Threat: Sedimentation
Source: Forestry activities

Threat: Sedimentation
Source: Resource extraction

Data Gaps/Research Needs

Conduct distribution surveys.

Conservation Actions	Importance	Category
Maintain or, where necessary, restore instream aquatic habitat and substrate.	Medium	Habitat Restoration/Improvement

Monitoring Strategies

Monitor population distribution and abundance in ongoing stream faunal surveys.

Comments

Description: A slender, elongate, brown to gray, uniformly colored, small catfish - maximum size 2.7 inches (Robison and Buchanan 1988).

This Ouachita endemic is found in the upper Saline River basin and one tributary of the Ouachita River (Robison and Harp 1985). Gagen and Stoeckel (1994) reported that madtoms in riffles die when the riffles dry and these areas are recolonized from pools the following season. Buchanan (2005) collected 329 specimens from 6 Saline River basin reservoirs (Balboa, Coronado, Cortez, DeSoto, Pineda, Winona). Stoeckel and others (2011) studied feeding and reproductive biology of the species.

Noturus phaeus

Brown Madtom

Class: Actinopterygii
Order: Siluriformes
Family: Ictaluridae

Priority Score: 27 out of 100

Population Trend: Unknown

Gobal Rank: G4 — Apparently secure species

State Rank: S1? — Critically imperiled in Arkansas (inexact numeric rank)

Distribution

Occurrence Records

Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☐ Ouachita Mountains
- ☐ Arkansas Valley
- ☑ South Central Plains
- ☐ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

Taxa Association Team and Peer Reviewer

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Ecobasins

South Central Plains - Red River

Habitats	Weight
Natural Pool: - Small - Medium	Marginal
Natural Riffle: - Small - Medium	Optimal
Natural Run: - Small - Medium	Optimal
Natural Spring Run: - Small	Suitable

Problems Faced

Threat: Chemical alteration
Source: Forestry activities

Threat: Chemical alteration
Source: Resource extraction

Threat: Habitat destruction
Source: Dam

Threat: Habitat destruction
Source: Forestry activities

Threat: Sedimentation
Source: Forestry activities

Threat: Sedimentation
Source: Resource extraction

Data Gaps/Research Needs

Conduct distribution surveys.

Conservation Actions	Importance	Category
Enhance and conserve the riparian corridor.	Medium	Habitat Restoration/Improvement
Use Best Management Practices for resource extraction.	Medium	Threat Abatement

Monitoring Strategies

More information is needed before a monitoring strategy can be developed.

Comments

Description: A heavy-bodied, brown, small catfish (Robison and Buchanan 1988).

This species has been reported from Bayou Dorcheat and a tributary to Horsehead Creek. The Bayou Dorcheat occurrence is the only one that is post-1972.

Noturus taylori

Caddo Madtom

Class: Actinopterygii
Order: Siluriformes
Family: Ictaluridae

Priority Score: 80 out of 100

Population Trend: Stable

Gobal Rank: G1 — Critically imperiled species

State Rank: S1 — Critically imperiled in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☑ Ouachita Mountains
- ☐ Arkansas Valley
- ☐ South Central Plains
- ☐ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

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Ecobasins

Ouachita Mountains - Ouachita River

Habitats	Weight
Natural Glide: - Small - Medium	Optimal
Natural Pool: - Small - Medium	Suitable
Natural Riffle: - Small - Medium	Marginal
Natural Run: - Small - Medium	Optimal

Problems Faced

Threat: Hydrological alteration
Source: Dam

Threat: Hydrological alteration
Source: Resource extraction

Threat: Sedimentation
Source: Conversion of riparian forest

Threat: Sedimentation
Source: Forestry activities

Threat: Sedimentation
Source: Resource extraction

Threat: Sedimentation
Source: Road construction

Data Gaps/Research Needs

Conduct distribution surveys.

Conduct life history study.

Conduct survey to identify spawning sites.

Conservation Actions	Importance	Category
Maintain or, where necessary, restore instream aquatic habitat and substrate.	Medium	Habitat Protection
Maintain or, where necessary, restore riparian habitat using appropriate river corridor management techniques.	High	Habitat Restoration/Improvement
Reduce sedimentation through Best Management Practices.	Medium	Threat Abatement

Monitoring Strategies

Monitor population distribution and abundance in ongoing stream faunal surveys.

Comments

Description: An elongate, slender, small catfish with black dorsal saddles and a black tip on the dorsal fin (Robison and Buchanan 1988).

This species was described in 1972 form the upper Caddo River (Douglas 1972). The most recent work indicated that populations are stable (Robison 1993). Endemic to the south-central Ouachita Mountains (Upper Caddo, Little Missouri and Ouachita rivers). Relatively abundant in the Caddo, but uncommon in the Little Misouri and Ouachita rivers. Turner and Robison (2006) found high genetic divergence for the Caddo madtom between Ouachita and Caddo river systems (Fst = 0.71) with a fixed allelic difference. Buchanan (2005) observed 612 madtoms in the Lake Ouachita that shared characteristics of both N. miurus and N. taylori.

Percina brucethompsoni

Ouachita Darter

Class: Actinopterygii
Order: Perciformes
Family: Percidae

Priority Score: 46 out of 100

Population Trend: Stable


©Richard Standage

Gobal Rank: G2? — Imperiled (inexact numeric rank)

State Rank: S2 — Imperiled in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☑ Ouachita Mountains
- ☐ Arkansas Valley
- ☑ South Central Plains
- ☐ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

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Ecobasins

Ouachita Mountains - Ouachita River

South Central Plains - Ouachita River

Habitats	Weight
Natural Glide: - Medium	Obligate
Natural Pool: - Medium	Obligate
Natural Riffle: - Medium	Suitable
Natural Run: - Medium	Suitable

Problems Faced

Threat: Chemical alteration
Source: Non-point source pollution

Threat: Habitat destruction
Source: Dam

Threat: Hydrological alteration
Source: Dam

Threat: Sedimentation
Source: Road construction

Data Gaps/Research Needs

Study population abundance and distribution.

Conservation Actions	Importance	Category
More data are needed to determine conservation actions.	Medium	Data Gap

Monitoring Strategies

Ensure location/occurrence records are compiled into the Arkansas Fish Database.

Monitor population distribution and abundance in ongoing stream faunal surveys.

Comments

Description: A slender darter with a long head and pointed snout and dark blotches or bars on its sides (Robison and Buchanan 1988). This Ouachita River drainage endemic was recently described by Robison and others (2014), and they noted the species is never abundant at a locality. Caldwell (2011) reported density of the Ouachita darter was higher in transition areas flooded by Lake Ouachita (1.36 fish/100 m2) than in the upstream Ouachita River (0.24 fish/100 m2).

Present at all historic localities and no apparent decline overall (Robison 1992b).

Percina evides

Gilt Darter

Class: Actinopterygii
Order: Perciformes
Family: Percidae

Priority Score: 19 out of 100

Population Trend: Unknown

Gobal Rank: G4 — Apparently secure species

State Rank: S3 — Vulnerable in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- [x] Ozark Highlands
- [x] Boston Mountains
- [ ] Ouachita Mountains
- [ ] Arkansas Valley
- [ ] South Central Plains
- [x] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

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Ecobasins

Boston Mountains - White River
Mississippi River Alluvial Plain - White River
Ozark Highlands - White River

Habitats	Weight
Natural Glide: - Medium	Suitable
Natural Pool: - Medium	Suitable
Natural Riffle: - Medium	Obligate

Problems Faced

Threat: Habitat destruction Source: Resource extraction
Threat: Hydrological alteration Source: Dam
Threat: Nutrient loading Source: Agricultural practices
Threat: Riparian habitat destruction Source: Agricultural practices
Threat: Sedimentation Source: Agricultural practices
Threat: Sedimentation Source: Road construction

Data Gaps/Research Needs

Conduct baseline population surveys.
Conduct life history study.

Conservation Actions	Importance	Category
Establish and enhance riparian corridors.	High	Habitat Restoration/Improvement

Monitoring Strategies

Ensure location/occurrence records are compiled into the Arkansas Fish Database.
Monitor population distribution and abundance in stream faunal surveys.

Comments

Robison and Buchanan (1988) noted the species has been eliminated from areas impacted by the construction of Beaver Dam. Gilt darter was among the top 4 species collected by trawling in the Current, Eleven Point, Spring and Strawberry rivers (Rigsby 2009).

Percina nasuta

Longnose Darter

Class: Actinopterygii
Order: Perciformes
Family: Percidae

Priority Score: 27 out of 100

Population Trend: Stable

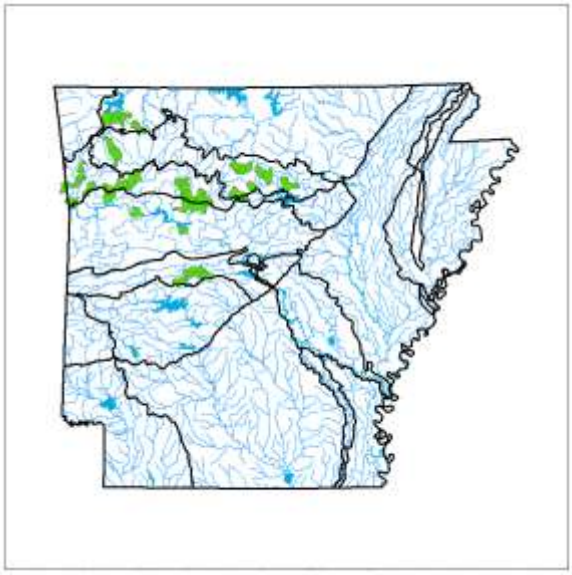

©David Ostendorf

Gobal Rank: G3 — Vulnerable species

State Rank: S3 — Vulnerable in Arkansas

Distribution

Occurrence Records



Ecoregions where the species occurs:

- [x] Ozark Highlands
- [x] Boston Mountains
- [x] Ouachita Mountains
- [x] Arkansas Valley
- [ ] South Central Plains
- [ ] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

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Ecobasins

Arkansas Valley - Arkansas River
Boston Mountains - Arkansas River
Boston Mountains - White River
Ouachita Mountains - Arkansas River
Ozark Highlands - White River

Habitats

	Weight
Man-made Littoral: - Large	Suitable
Natural Glide: - Medium	Obligate
Natural Pool: - Medium	Obligate
Natural Riffle: - Medium	Suitable
Natural Run: - Medium	Suitable

Problems Faced

Threat: Hydrological alteration Source: Channel alteration
Threat: Hydrological alteration Source: Dam
Threat: Sedimentation Source: Grazing/Browsing
Threat: Sedimentation Source: Resource extraction
Threat: Sedimentation Source: Road construction

Data Gaps/Research Needs

Assess distribution and abundance in lakes and large stream pools.

Conservation Actions

	Importance	Category
Maintain watershed condition by enforcing Best Management Practices for highway construction, urban development, agriculture and silviculture.	High	Threat Abatement

Monitoring Strategies

Ensure location/occurrence records are compiled into the Arkansas Fish Database.
Monitor population distribution and abundance in ongoing stream faunal surveys.

Comments

Description: A slender darter with a long head and pointed snout and dark blotches or bars on its sides (Robison and Buchanan 1988).

While rare, this darter persists throughout its historical distribution (Robison 1992a). Arkansas Department of Environmental Quality biologists captured 99 specimens from nine Boston Mountain streams during 2014 (Tate Wentz, personal communication). Buchanan (2005) captured 7 specimens from Greers Ferry Lake, where the species was regularly captured by AGFC biologists during rotenone sampling.

Percina pantherina

Leopard Darter

Class: Actinopterygii
Order: Perciformes
Family: Percidae

Priority Score: **62** **out of 100**

Population Trend: Decreasing


©Richard Standage

Gobal Rank: G2 — Imperiled species

State Rank: S1 — Critically imperiled in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☑ Ouachita Mountains
- ☐ Arkansas Valley
- ☐ South Central Plains
- ☐ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

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Ecobasins

Ouachita Mountains - Red River

Habitats	Weight
Natural Pool: - Medium	Obligate
Natural Riffle: - Medium	Optimal
Natural Run: - Medium	Suitable

Problems Faced

Threat: Chemical alteration
Source: Conversion of riparian forest

Threat: Habitat destruction
Source: Dam

Threat: Hydrological alteration
Source: Dam

Threat: Nutrient loading
Source: Municipal/Industrial point source

Threat: Sedimentation
Source: Forestry activities

Threat: Sedimentation
Source: Road construction

Data Gaps/Research Needs

Conduct spawning site survey.

Determine if the Robinson Fork population has been extirpated.

Determine the amount of thermally suitable habitat for the species.

Conservation Actions	Importance	Category
Protect, enhance and restore habitat.	High	Habitat Restoration/Improvement
Support Cossatot River State Park educational program.	Medium	Public Relations/Education

Monitoring Strategies

Monitor results of annual joint surveys by USFS, FWS and AGFC.

Comments

Description: A medium-sized, greenish darter with 10-14 distinct spots along the side (Robison and Buchanan 1988).

This species is listed as threatened under the Endangered Species Act due to impoundments, silviculture, agriculture, industry, and gravel removal (USFWS 1984). USFWS and Ouachita National Forest monitoring indicates declining populations in the Cossatot and Robinson Fork rivers (Richard Standage, USFS, personal communication). Schwemm (2013) noted extremely small genetic effective population sizes, and Arkansas populations appear highly susceptible to extinction. Population monitoring using snorkeling and eDNA techniques is planned for 2015-2017. The Arkansas fish Taxa Team recommends that the G-rank calculator be used with new genetics and trend data to revise the score for this species. This species priority score appears low considering the low genetically effective population size for the species.

Percina phoxocephala

Slenderhead Darter

Class: Actinopterygii
Order: Perciformes
Family: Percidae

Priority Score: 19 out of 100

Population Trend: Unknown

©Konrad P. Schmidt

Gobal Rank: G5 — Secure

State Rank: S2 — Imperiled in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- [x] Ozark Highlands
- [ ] Boston Mountains
- [ ] Ouachita Mountains
- [x] Arkansas Valley
- [x] South Central Plains
- [ ] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

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Ecobasins

Arkansas Valley - Arkansas River
Ozark Highlands - Arkansas River
Ozark Highlands - White River
South Central Plains - Red River

Habitats

	Weight
Man-made Littoral: - Large	Marginal
Natural Pool: - Small - Medium	Suitable
Natural Riffle: - Small - Medium	Optimal
Natural Side channel: - Large	Suitable

Problems Faced

Threat: Habitat destruction Source: Channel alteration
Threat: Habitat destruction Source: Grazing/Browsing
Threat: Sedimentation Source: Channel maintenance
Threat: Sedimentation Source: Grazing/Browsing
Threat: Sedimentation Source: Road construction

Data Gaps/Research Needs

Conduct distribution study.
Conduct genetic relationship study with morphologically similar but disjunct populations.
Conduct habitat preference study.

Conservation Actions

	Importance	Category
More data is needed are determine other conservation actions.	Medium	Data Gap
Use Best Management Practices in applicable watersheds.	Medium	Threat Abatement

Monitoring Strategies

More information is needed before a monitoring strategy can be developed.

Comments

Description: A medium-sized, yellow-brown darter with 10-15 indistinct blotches along the side (Robison and Buchanan 1988).

Rarely occurs in the Arkansas River drainage of northwest Arkansas (Robison and Buchanan 1988). This is the most widely distributed member of its subgenus, Swainia, ranging from Oklahoma east to Pennsylvania and north to Wisconsin (Page and Smith 1971).

The taxonomic status of specimens from the White River, Ozark Mountains Ecoregion is uncertain at this time (Robison and Buchanan 1988). Buchanan (2005) captured 4 specimens in two Arkansas River reservoirs (Lake Dardanelle, Ozark Lake).

Percina uranidea

Stargazing Darter

Class: Actinopterygii
Order: Perciformes
Family: Percidae

Priority Score: **38** **out of 100**

Population Trend: Decreasing

Gobal Rank: G3 — Vulnerable species

State Rank: S2 — Imperiled in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- [x] Ozark Highlands
- [ ] Boston Mountains
- [x] Ouachita Mountains
- [ ] Arkansas Valley
- [x] South Central Plains
- [x] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

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Ecobasins

Mississippi River Alluvial Plain - White River
Ouachita Mountains - Ouachita River
Ozark Highlands - White River
South Central Plains - Ouachita River

Habitats

	Weight
Natural Riffle: - Medium	Optimal
Natural Run: - Medium	Optimal

Problems Faced

Threat: Habitat destruction Source: Dam
Threat: Habitat destruction Source: Resource extraction
Threat: Sedimentation Source: Forestry activities
Threat: Sedimentation Source: Grazing/Browsing
Threat: Sedimentation Source: Road construction

Data Gaps/Research Needs

Conduct distribution and abundance study.
Conduct genetic study of disjunct populations.
Conduct life history study of Black River drainage population.

Conservation Actions

	Importance	Category
Reduce sediment through Best Management Practices.	Medium	Threat Abatement

Monitoring Strategies

More information is needed before a monitoring strategy can be developed.

Comments

Description: A robust darter with 4 dark saddles and eyes closely set high on the head (Robison and Buchanan 1988). Prefers clear water and is intolerant of silt - extirpated in Illinois and Indiana (Robison and Buchanan 1988).

Rigsby (2009) used mitochondrial DNA to conclude that disjunct populations in the Ouachita and Black river drainages are divergent and should be considered separate management units.

Populations in the Black River drainage are large and stable (Rigsby 2009; Stroman 2014). Populations in the Ouachita River drainage have declined. Rigsby (2009) did not detect the species in the Saline River, and Stroman (2014) collected only 4 specimens at two lower Saline River sites and one Ouachita River site. Caldwell (2011) only captured stargazing darters (0.26 fish/100 m2) in the transition area of the Ouachita River that is flooded by Lake Ouachita.

Percina vigil

Saddleback Darter

Class: Actinopterygii
Order: Perciformes
Family: Percidae

Priority Score: **15** **out of 100**

Population Trend: Stable

Gobal Rank: G5 — Secure

State Rank: S3 — Vulnerable in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- [x] Ozark Highlands
- [ ] Boston Mountains
- [x] Ouachita Mountains
- [x] Arkansas Valley
- [x] South Central Plains
- [ ] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

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Ecobasins

Arkansas Valley - Arkansas River
Ouachita Mountains - Ouachita River
Ozark Highlands - White River
South Central Plains - Ouachita River

Habitats

	Weight
Natural Glide: - Medium	Suitable
Natural Pool: - Medium	Suitable
Natural Riffle: - Medium	Optimal

Problems Faced

Threat: Habitat destruction Source: Resource extraction
Threat: Habitat destruction Source: Urban development
Threat: Habitat disturbance Source: Agricultural practices
Threat: Hydrological alteration Source: Dam
Threat: Nutrient loading Source: Agricultural practices
Threat: Riparian habitat destruction Source: Agricultural practices
Threat: Sedimentation Source: Road construction

Data Gaps/Research Needs

Conduct baseline population surveys.
Conduct life history study.

Conservation Actions

	Importance	Category
Establish and enhance riparian corridors.	High	Habitat Restoration/Improvement

Monitoring Strategies

Ensure location/occurrence records are compiled into the Arkansas Fish Database.
Monitor population distribution and abundance in stream faunal surveys.

Comments

The saddleback darter is often collected in shallow riffle habitat. Rigsby (2009) collected 503 individuals from 53 of 186 sites sampled from 2006-2008.

Percina vigil
Saddleback Darter

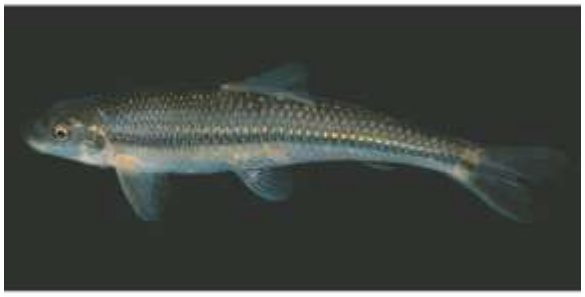
Phenacobius mirabilis

Suckermouth Minnow

Class: Actinopterygii
Order: Cypriniformes
Family: Cyprinidae

Priority Score: **23** **out of 100**

Population Trend: Unknown



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Gobal Rank: G5 — Secure

State Rank: S1? — Critically imperiled in Arkansas (inexact numeric rank)

Distribution

Occurrence Records

Ecoregions where the species occurs:

- [ ] Ozark Highlands
- [ ] Boston Mountains
- [x] Ouachita Mountains
- [x] Arkansas Valley
- [ ] South Central Plains
- [x] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

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Ecobasins

Arkansas Valley - Arkansas River

Mississippi River Alluvial Plain - St. Francis River

Ouachita Mountains - Arkansas River

Habitats	Weight
Natural Riffle: - Small - Medium	Obligate
Natural Run: - Small - Medium	Optimal

Problems Faced

Threat: Habitat destruction
Source: Channel alteration

Threat: Habitat destruction
Source: Dam

Threat: Habitat destruction
Source: Resource extraction

Threat: Habitat destruction
Source: Urban development

Data Gaps/Research Needs

Conduct distribution surveys with emphasis on Red River tributaries and Mississippi Alluvial Plain streams.

Conservation Actions	Importance	Category
Maintain or, where necessary, restore habitat.	Medium	Habitat Restoration/Improvement

Monitoring Strategies

More information is needed before a monitoring strategy can be developed.

Comments

Description: A fairly large, streamlined minnow with a blunt snout and sucker-like mouth (Robison and Buchanan 1988).

Rare in Arkansas, with only one collection since 1940 (Robison and Buchanan 1988).

Platygobio gracilis

Flathead Chub

Class: Actinopterygii
Order: Cypriniformes
Family: Cyprinidae

Priority Score: **23** **out of 100**

Population Trend: Unknown

©G. W. Sneegas

Gobal Rank: G5 — Secure

State Rank: SH — Historic record. Possibly extirpated in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☐ Ouachita Mountains
- ☐ Arkansas Valley
- ☐ South Central Plains
- ☑ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

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Ecobasins

Mississippi River Alluvial Plain - Arkansas River
Mississippi River Alluvial Plain - St. Francis River
Mississippi River Alluvial Plain - White River
Mississippi River Alluvial Plain (Lake Chicot) - Mississippi River

Habitats

	Weight
Natural Pool: - Large	Suitable
Natural Shoal: - Large	Optimal

Problems Faced

Threat: Habitat destruction Source: Channel alteration
Threat: Hydrological alteration Source: Dam
Threat: Sedimentation Source: Channel maintenance

Data Gaps/Research Needs

Conduct distribution study.

Conservation Actions

	Importance	Category
Additional conservation actions will be determined based on distributional surveys.	Medium	Data Gap
Maintain or restore natural flow, sediment and temperature regimes.	Medium	Habitat Restoration/Improvement

Monitoring Strategies

Monitor distribution and abundance with general large river surveys.

Comments

Description: A large, silvery chub reaching 9 inches maximum length (Robison and Buchanan 1988).

Known in Arkansas from only 3 collections on the Mississippi River (Robison and Buchanan 1988). It inhabits turbid, alkaline waters with shifting sand substrate (Tibbs 1998).

Polyodon spathula

Paddlefish

Class: Actinopterygii
Order: Acipenseriformes
Family: Polyodontidae

Priority Score: **24** **out of 100**

Population Trend: Decreasing

©G. W. Sneegas

Gobal Rank: G4 — Apparently secure species

State Rank: S3 — Vulnerable in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- [x] Ozark Highlands
- [x] Boston Mountains
- [x] Ouachita Mountains
- [x] Arkansas Valley
- [x] South Central Plains
- [x] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

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Ecobasins

Arkansas Valley - Arkansas River
Boston Mountains - White River
Mississippi River Alluvial Plain - Arkansas River
Mississippi River Alluvial Plain - St. Francis River
Mississippi River Alluvial Plain - White River
Mississippi River Alluvial Plain (Lake Chicot) - Mississippi River
Ouachita Mountains - Ouachita River
Ozark Highlands - White River
South Central Plains - Ouachita River
South Central Plains - Red River

Habitats

	Weight
Man-made Pelagic: - Large	Optimal
Man-made Pool: - Large	Optimal
Natural Oxbow - connected: - Large	Suitable
Natural Oxbow - disconnected: - Large	Suitable
Natural Pelagic: - Large	Optimal
Natural Pool: - Medium - Large	Optimal
Natural Shoal: - Large	Obligate
Natural Side channel: - Large	Suitable
Natural Slough: - Medium - Large	Suitable

Problems Faced

Threat: Biological alteration Source: Commercial harvest
Threat: Biological alteration Source: Exotic species
Threat: Habitat destruction Source: Channel alteration
Threat: Habitat destruction Source: Channel maintenance
Threat: Habitat destruction Source: Dam
Threat: Habitat destruction Source: Resource extraction
Threat: Hydrological alteration Source: Dam
Threat: Hydrological alteration Source: Water diversion
Threat: Sedimentation Source: Channel maintenance
Threat: Sedimentation Source: Dam

Data Gaps/Research Needs

Conduct spawning sites survey.
Determine the impacts of introduced Asian carp on paddlefish populations.

Conservation Actions

	Importance	Category
Implement the Arkansas Game and Fish Commission paddlefish and sturgeon management plan.	Medium	Population Management
Maintain adequate instream flow and natural flow regime.	High	Habitat Protection
Manage and monitor a conservative commercial harvest.	Medium	Population Management
Schedule channel maintenance to accommodate spawning.	Medium	Threat Abatement
Work across political boundaries to manage an inter-jurisdictional fish.	Medium	Public Relations/Education

Monitoring Strategies

Monitor commercial harvest.
Monitor export of this species through Convention on International Trade of Endangered Species (CITES).
Monitor population distribution and abundance in ongoing large river faunal surveys.

Comments

Description: A very large (maximum length 60 inches), scaleless, cartilaginous fish with an elongated paddle-like nose or rostrum (Robison and Buchanan 1988).

Found in most of the large rivers in Arkansas; harvest for the caviar industry is impacting size structure and recruitment in some areas (Quinn and others 2009; Leone and others 2012; Sharov and others 2014). Paddlefish habitat use and spawning areas were determined for Ozark Lake (Donabauer and others 2009), and studies are underway to evaluate habitat use on Lake Dardanelle.

Pteronotropis hubbsi

Bluehead Shiner

Class: Actinopterygii
Order: Cypriniformes
Family: Cyprinidae

Priority Score: **33** **out of 100**

Population Trend: Decreasing


©G. W. Sneegas

Gobal Rank: G3 — Vulnerable species

State Rank: S3 — Vulnerable in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☐ Ouachita Mountains
- ☐ Arkansas Valley
- ☑ South Central Plains
- ☑ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

Taxa Association Team and Peer Reviewer

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Ecobasins

Mississippi River Alluvial Plain (Bayou Bartholomew) - Ouachita River
South Central Plains - Ouachita River
South Central Plains - Red River

Habitats

	Weight
Natural Other: Headwater	Suitable
Natural Oxbow - disconnected: - Small	Suitable
Natural Pool: Headwater	Optimal

Problems Faced

Threat: Chemical alteration Source: Resource extraction
Threat: Habitat destruction Source: Channel alteration
Threat: Habitat destruction Source: Forestry activities
Threat: Habitat destruction Source: Resource extraction
Threat: Sedimentation Source: Forestry activities
Threat: Sedimentation Source: Resource extraction

Data Gaps/Research Needs

Determine population fluctuations.
Determine populations for monitoring.
Determine spawning migration patterns.

Conservation Actions

	Importance	Category
Conserve and enhance habitat. Implement non-point source Best Management Practices.	Medium	Habitat Restoration/Improvement
Conserve and enhance riparian buffer zones.	Medium	Habitat Restoration/Improvement
Minimize migration barriers.	Medium	Habitat Protection

Monitoring Strategies

Monitor known populations every 3-5 years.

Comments

Description: A small (2.5 inches maximum length), slab-sided minnow with a broad black lateral stripe and iridescent blue on top of head (Robison and Buchanan 1988).

The species typically inhabits quiet backwaters of sluggish streams and oxbow lakes and spawns in association with sunfish nests (Ranvestel and Burr 2002).

Scaphirhynchus albus

Pallid Sturgeon

Class: Actinopterygii
Order: Acipenseriformes
Family: Acipenseridae

Priority Score: **48** **out of 100**

Population Trend: Unknown

©U.S. Army Corps of Engineers

Gobal Rank: G2 — Imperiled species

State Rank: S1S2 — Critically imperiled in Arkansas (uncertain rank)

Distribution

Occurrence Records

Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☐ Ouachita Mountains
- ☐ Arkansas Valley
- ☐ South Central Plains
- ☑ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

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Ecobasins

Mississippi River Alluvial Plain - Arkansas River
Mississippi River Alluvial Plain - St. Francis River
Mississippi River Alluvial Plain - White River

Habitats	Weight
Natural Pool: - Large	Obligate

Problems Faced

Threat: Biological alteration Source: Crossbreeding
Threat: Habitat destruction Source: Channel maintenance
Threat: Habitat destruction Source: Dam
Threat: Habitat destruction Source: Resource extraction
Threat: Hydrological alteration Source: Dam

Data Gaps/Research Needs

Conduct spawning sites survey.
Determine catch rates for pallid sturgeon in the lower Arkansas and St. Francis rivers during winter.
Determine use and importance of tributaries like the St. Francis and Arkansas rivers to the life history of the species.
Further genetic study is needed to understand the hybridization issue with shovelnose sturgeon.

Conservation Actions	Importance	Category
Attempt to restore the Mississippi River's hydrologic integrity.	Medium	Habitat Restoration/Improvement
Work with the lower basin pallid sturgeon work group to implement the pallid sturgeon recovery plan.	High	Population Management

Monitoring Strategies

Work with the Lower Mississippi River Conservation Committee and Mississippi Interstate Cooperative Resource Association to share information on the distribution, habitat preferences and abundance of the species across its range.

Comments

Description: A pale sturgeon with a flattened, shovel-shaped snout and a long, slender caudal peduncle (Robison and Buchanan 1988).

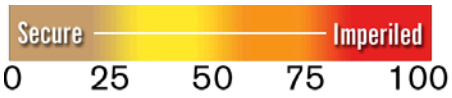
This species was listed as endangered under the Endangered Species Act, due to impacts on its large river habitats (USFWS 1993). A large research program has greatly increased understanding of this Mississippi River species, and over 500 pallid sturgeon have been captured during the past 10 years (e.g., Kilgore and others 2007). Habitat selection was documented by Herrala and others (2014), and the species was detected using the lower Arkansas River during two consecutive winters. Shovelnose sturgeon were listed based on similarity of appearance with pallid sturgeon to eliminate the threat of accidental and illegal commercial harvest (Federal Register 2010). The U.S. Army Corps of Engineers (2013) recently developed a 7(a)(1) conservation plan for pallid sturgeon.

Troglichthys rosae

Ozark Cavefish

Class: Actinopterygii
Order: Percopsiformes
Family: Amblyopsidae

Priority Score: 43 out of 100



Population Trend: Decreasing

Global Rank: G3 — Vulnerable species

State Rank: S1 — Critically imperiled in Arkansas

Distribution

Element Occurrence Records

Ecoregions where the species occurs:

- [x] Ozark Highlands
- [ ] Boston Mountains
- [ ] Arkansas Valley
- [ ] Ouachita Mountains
- [ ] South Central Plains
- [ ] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

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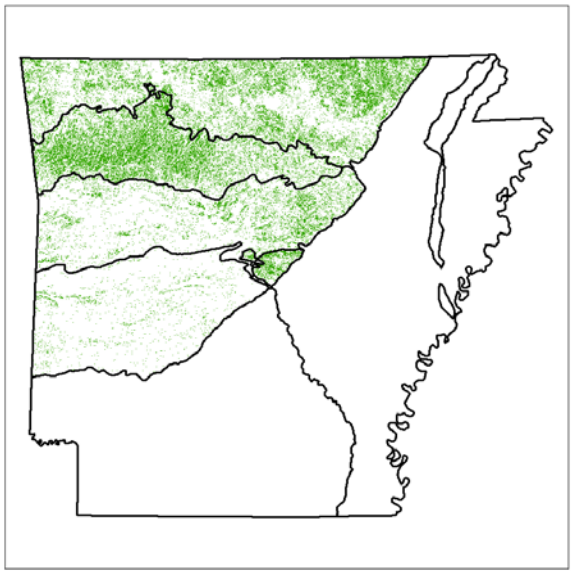
No Ecobasin Map is available

Ecobasins where this species occurs



Terrestrial Habitats

Ecobasins

Ozark Highlands - Arkansas River

Ozark Highlands - White River

Terrestrial Habitats

Caves, Mines, Sinkholes and other Karst Features	Obligate

Aquatic Habitats

Natural Cave Stream: Headwater - Small	Obligate
Natural Groundwater: Headwater - Small	Obligate
Natural Spring Run: Headwater - Small	Marginal

Troglichthys rosae
Ozark Cavefish

Problems Faced

Threat: Biological alteration
Source: Recreation

Threat: Chemical alteration
Source: Confined animal operations

Threat: Chemical alteration
Source: Urban development

Threat: Hydrological alteration
Source: Urban development

Threat: Hydrological alteration
Source: Water diversion

Threat: Nutrient loading
Source: Confined animal operations

Threat: Nutrient loading
Source: Urban development

Data Gaps/Research Needs

Search for new populations.

Conservation Actions

	Importance	Category
Protect karst habitats and cave recharge zones.	High	Habitat Protection
Restrict access to caves with sensitive species.	High	Threat Abatement

Monitoring Strategies

Conduct visual surveys of known populations biannually.

Comment

Description: A small, eyeless, unpigmented fish with an elongated, flattened head and a rounded tail fin (Robison and Buchanan 1988).

This species was listed as threatened under the Endangered Species Act, due to habitat destruction, collection, and disturbance (USFWS 1988). Joint surveys are conducted biennially by a survey team from AGFC, USFWS, Arkansas Natural Heritage Commission, and The Nature Conservancy. The team is also actively working with developers in the rapidly growing northwest Arkansas portion of this species' range to minimize impacts on its habitat (David Kampwerth, personal communication).Graening and others (2010) indicated the species appears to be stable. The locations with the largest observable populations are under conservation ownership, with USFWS protecting Logan Cave and ANHC protecting Cave Springs Cave. The Illinois River Watershed Partnership development of educational facilities adjacent to Cave Springs Cave provides good opportunities for education, but may also increase illegal human entry to the cave.

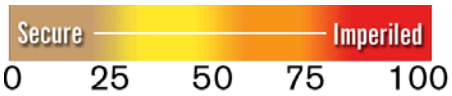
Arkansas has the large majority of observed individuals and ranks the species as an S1, Oklahoma also ranks it as S1, and Missouri ranks it as S2 based on based on a larger number of locations with rare sightings. In light of this, the global rank of G3 may be too high. The USFWS categorizes the population trend for this species as <30% to relatively stable, citing that 10 populations are stable, 6 have declined and 25 are undetermined. The long-term trend is a decline of 10-70% (USFWS 2011).

Typhlichthys subterraneus

Southern Cavefish

Class: Actinopterygii
Order: Percopsiformes
Family: Amblyopsidae

Priority Score: 27 out of 100



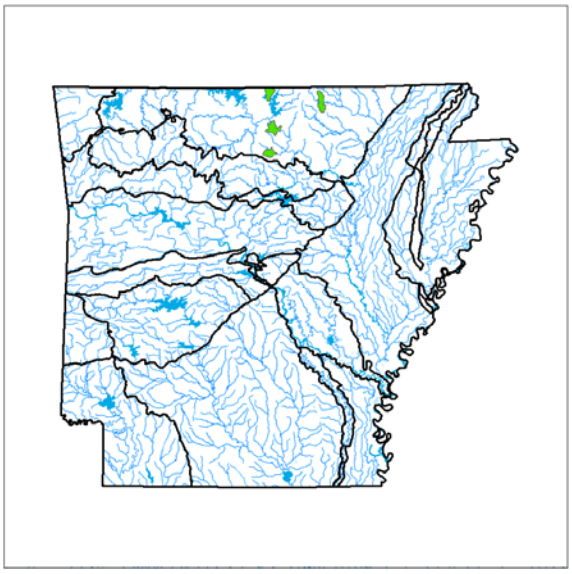
Population Trend: Unknown

Global Rank: G4 — Apparently secure species

State Rank: S1 — Critically imperiled in Arkansas

Distribution

Element Occurrence Records



Ecoregions where the species occurs:

- [x] Ozark Highlands
- [ ] Boston Mountains
- [ ] Arkansas Valley
- [ ] Ouachita Mountains
- [ ] South Central Plains
- [ ] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

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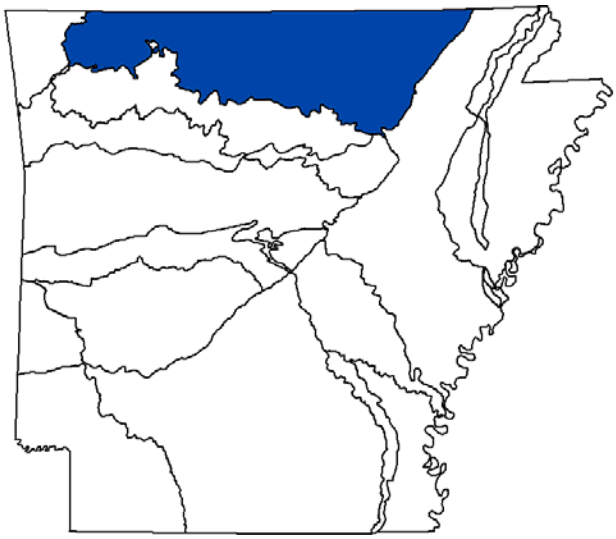
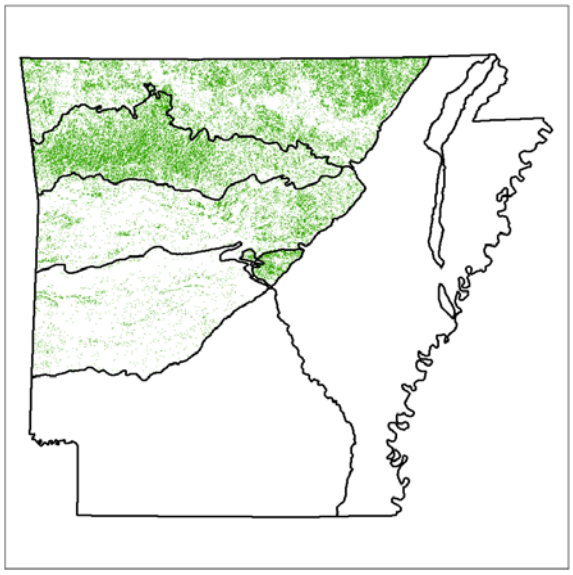


Ecobasins where this species occurs



Terrestrial Habitats

Ecobasins

Ozark Highlands - White River

Terrestrial Habitats

Caves, Mines, Sinkholes and other Karst Features	Obligate

Aquatic Habitats

Natural Cave Stream: Headwater - Small	Obligate
Natural Groundwater: Headwater - Small	Obligate
Natural Spring Run: Headwater - Small	Marginal

Typhlichthys subterraneus
Southern Cavefish

Problems Faced

Threat: Habitat destruction Source: Dam
Threat: Habitat destruction Source: Recreation
Threat: Hydrological alteration Source: Water diversion
Threat: Nutrient loading Source: Confined animal operations
Threat: Nutrient loading Source: Grazing/Browsing
Threat: Toxins/contaminants Source: Non-point source pollution

Data Gaps/Research Needs

Conduct distribution surveys.
Conduct genetic studies of this and other cavefish species in Arkansas.
Delineate and monitor recharge areas.
Describe new Ozark species.

Conservation Actions

	Importance	Category
Limit cave access for recreational uses.	Medium	Threat Abatement
Limit take by scientific investigators.	Medium	Threat Abatement
Protect karst habitats and cave recharge zones.	High	Habitat Protection
Public outreach and education with local landowners and rural communities.	Medium	Public Relations/Education
Restrict access to caves with sensitive species.	High	Threat Abatement
Use of Best Management Practices within cave recharge zone.	High	Threat Abatement

Monitoring Strategies

Coordinate sampling with other scientific efforts and monitor no more than once every two years.

Comment

Description: A small, eyeless, unpigmented fish with an elongated, flattened head and a rounded tail fin (Robison and Buchanan 1988).

There are a small number of historic records of this species from wells and caves in the eastern Ozarks of Arkansas (Robison and Buchanan 1988). Ozark populations of the species appear to be a new species (Romero and Conner 2007; Niemiller and others 2011), thus the G-score and priority score for this species are functionally too low and need revision.

Umbra limi

Central mudminnow

Class: Actinopterygii
Order: Esociformes
Family: Esocidae

Priority Score: **23** **out of 100**

Population Trend: Unknown

Gobal Rank: G5 — Secure

State Rank: SH — Historic record. Possibly extirpated in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☐ Ouachita Mountains
- ☐ Arkansas Valley
- ☐ South Central Plains
- ☑ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

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Ecobasins

Mississippi River Alluvial Plain - St. Francis River

Habitats	Weight
Natural Pool:	Suitable
Natural Swamp/Wetlands:	Suitable

Problems Faced

Threat: Habitat destruction
Source: Agricultural practices

Threat: Habitat destruction
Source: Channel alteration

Data Gaps/Research Needs

Determine distribution and abundance.

Conservation Actions	Importance	Category
More data are needed to determine conservation actions.	Medium	Data Gap

Comments

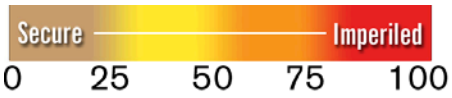
This northern species has only been collected once in Arkansas during 1894 in Clay County. Evidently, a large population occurs in Reelfoot Lake, Tennessee (Pflieger 1997). This species is highly tolerant of low dissolved oxygen and often lives in swamps.

Abacion wilhelminae

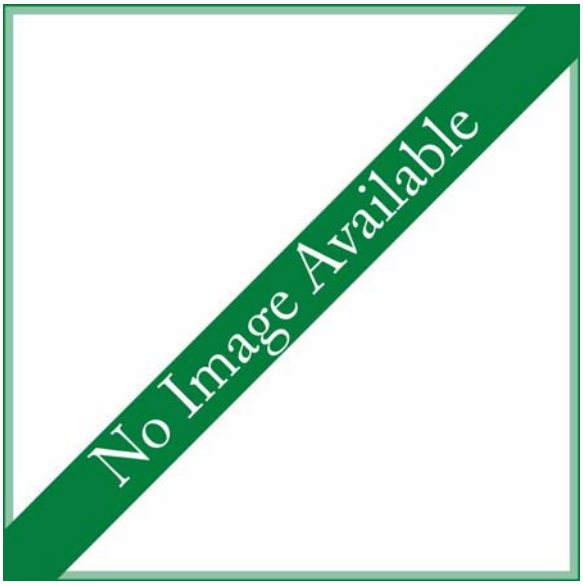
millipede

Class: Diplopoda
Order: Callipodida
Family: Abacionidae

Priority Score: 23 out of 100



Population Trend: Unknown



Global Rank: G? — Uncertain global ranking

State Rank: S1 — Critically imperiled in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- Ozark Highlands ☐
- Boston Mountains ☐
- Arkansas Valley ☐
- Ouachita Mountains ☑
- South Central Plains ☐
- Mississippi Alluvial Plain ☐
- Mississippi Valley Loess Plain ☐

Taxa Association Team and Peer Reviewers

ANHC Mr. Michael Warriner, AGFC Mr. Brian Wagner

Habitat Map

Problems Faced

Threat: Habitat destruction
Source:

Data Gaps/Research Needs

Life history, status surveys and basic biological information needs to be obtained.

Conservation Actions

	Importance	Category
More data are needed to determine conservation actions.	Medium	Data Gap

Comments

Endemic millipede of the Ouachita Mountains of Arkansas (Robison and Allen 1995).

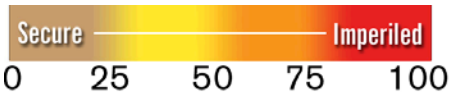
Abacion wilhelminae
millipede

Allocrangonyx hubrichti

Hubricht's Long-tailed Amphipod

Class: Malacostraca
Order: Amphipoda
Family: Crangonyctidae

Priority Score: 42 out of 100



Population Trend: Unknown

Global Rank: G2G3 — Imperiled (uncertain rank)

State Rank: S1 — Critically imperiled in Arkansas

Distribution

Element Occurrence Records

Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☑ Arkansas Valley
- ☐ Ouachita Mountains
- ☐ South Central Plains
- ☐ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

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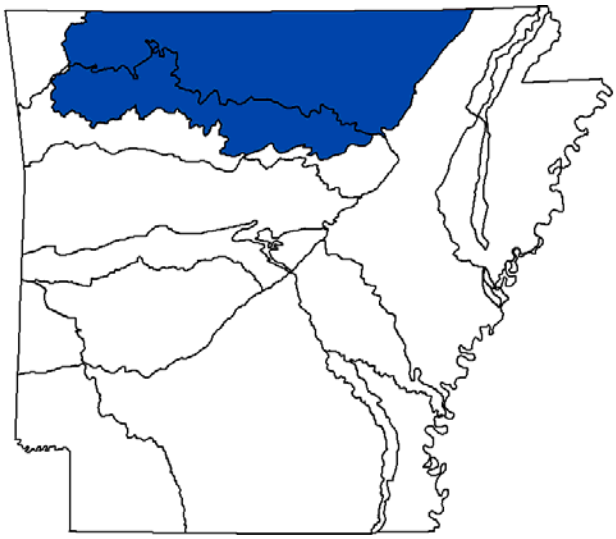
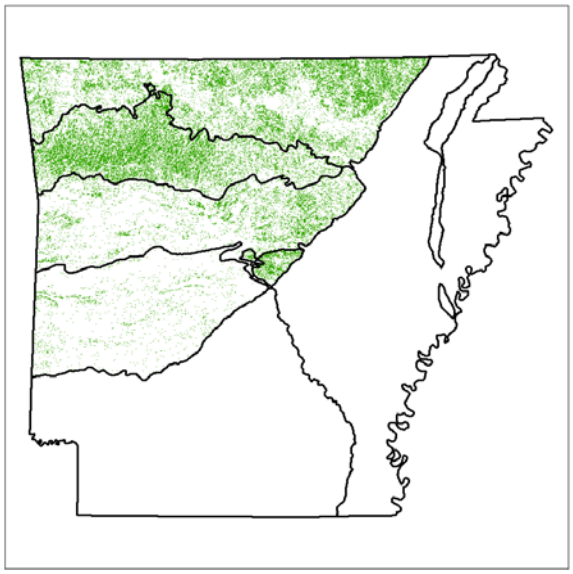


Ecobasins where this species occurs



Terrestrial Habitats

Ecobasins

Arkansas Valley - White River

Terrestrial Habitats

Caves, Mines, Sinkholes and other Karst Features	Obligate

Aquatic Habitats

Natural Cave Stream: Headwater - Small	Suitable
Natural Groundwater:	Optimal
Natural Seep: Headwater - Small	Suitable
Natural Spring Run: Headwater - Small	Marginal

Allocrangonyx hubrichti
Hubricht's Long-tailed Amphipod

Problems Faced

Threat: Sedimentation
Source: Urban development

Threat: Toxins/contaminants
Source: Urban development

Data Gaps/Research Needs

Obtain baseline information on distribution and population status, and confirm validity of occurrence record in Arkansas Valley.

Conservation Actions

	Importance	Category
Maintain groundwater quality.	Medium	Habitat Protection
Protect cave habitat and recharge zone from development or disturbance.	Medium	Habitat Protection

Monitoring Strategies

Additional information is needed before a monitoring strategy can be developed.

Comment

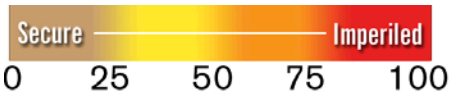
Crustacean.This species' distribution may not be resticted to caves. In Missouri, it has been documented from benthic stream habitats (personal communication, Mike E. Slay).

Amnicola cora

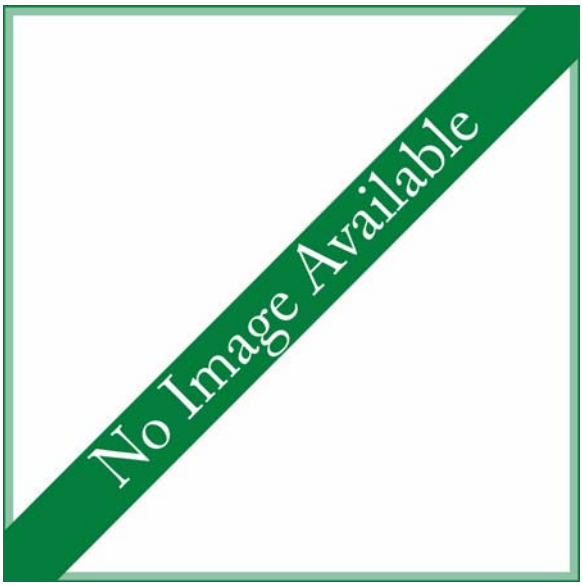
Foushee Cavesnail

Class: Gastropoda
Order: Neotaenioglossa
Family: Hydrobiidae

Priority Score: 65 out of 100



Population Trend: Unknown



Global Rank: G1G2 — Critically imperiled (uncertain rank)

State Rank: S1 — Critically imperiled in Arkansas

Distribution

Element Occurrence Records

Ecoregions where the species occurs:

- [x] Ozark Highlands
- [ ] Boston Mountains
- [ ] Arkansas Valley
- [ ] Ouachita Mountains
- [ ] South Central Plains
- [ ] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

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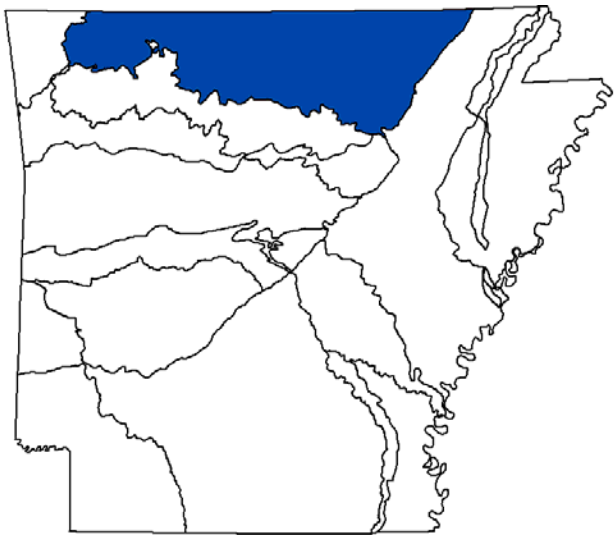
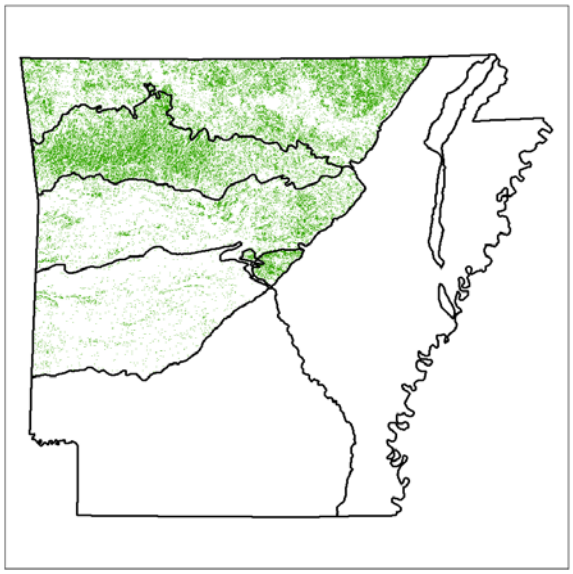


Ecobasins where this species occurs



Terrestrial Habitats

Ecobasins

Ozark Highlands - White River

Terrestrial Habitats

Caves, Mines, Sinkholes and other Karst Features	Obligate

Aquatic Habitats

Natural Cave Stream: Headwater - Small	Obligate

Amnicola cora
Foushee Cavesnail

Problems Faced

Threat: Habitat disturbance
Source: Recreation

Threat: Sedimentation
Source: Urban development

Threat: Toxins/contaminants
Source: Municipal/Industrial point source

Data Gaps/Research Needs

Determine life history information.

Obtain baseline information on distribution and population status.

Conservation Actions

	Importance	Category
More data are needed to determine conservation actions.	Medium	Data Gap

Monitoring Strategies

More data are needed before a monitoring strategy can be developed.

Comment

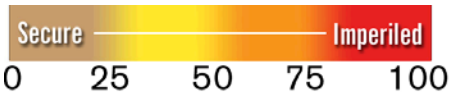
A cave-obligate snail only known from Foushee Cave in Independence County (Hubricht 1979).

Apochthonius diabolus

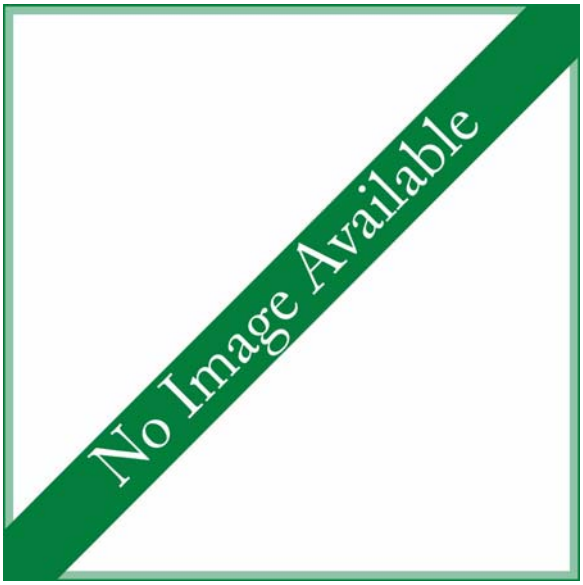
cave obligate pseudoscorpion

Class: Arachnida
Order: Pseudoscorpiones
Family: Chthoniidae

Priority Score: 65 out of 100



Population Trend: Unknown



Global Rank: G1G2 — Critically imperiled (uncertain rank)

State Rank: S1 — Critically imperiled in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- Ozark Highlands ☐
- Boston Mountains ☑
- Arkansas Valley ☐
- Ouachita Mountains ☐
- South Central Plains ☐
- Mississippi Alluvial Plain ☐
- Mississippi Valley Loess Plain ☐

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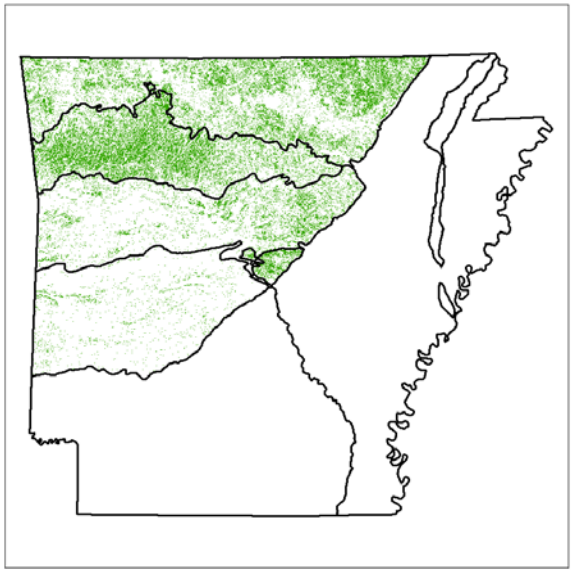


Habitat Map

Habitats

	Weight
Caves, Mines, Sinkholes and other Karst Features	Obligate

Problems Faced

Development/disturbance of cave habitat and recharge zone.	Threat: Habitat destruction or conversion Source: Urban development
Groundwater contamination.	Threat: Toxins/contaminants Source: Urban development

Conservation Actions

	Importance	Category
Maintain groundwater quality.	Medium	Habitat Protection
Protect cave habitat and recharge zone from development or disturbance.	Medium	Habitat Protection

Monitoring Strategies

Survey for additional populations and monitor known occurrences

Comments

Pseudoscorpion. No information available.

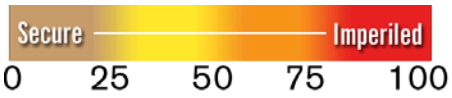
Apochthonius diabolus
cave obligate pseudoscorpion

Apochthonius titanicus

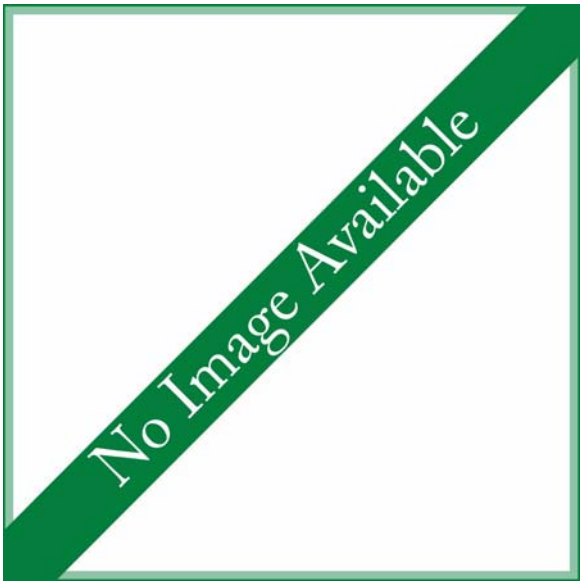
cave obligate pseudoscorpion

Class: Arachnida
Order: Pseudoscorpiones
Family: Chthoniidae

Priority Score: 65 out of 100



Population Trend: Unknown



Global Rank: G1G2 — Critically imperiled (uncertain rank)

State Rank: S1 — Critically imperiled in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- [x] Ozark Highlands
- [ ] Boston Mountains
- [ ] Arkansas Valley
- [ ] Ouachita Mountains
- [ ] South Central Plains
- [ ] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plain

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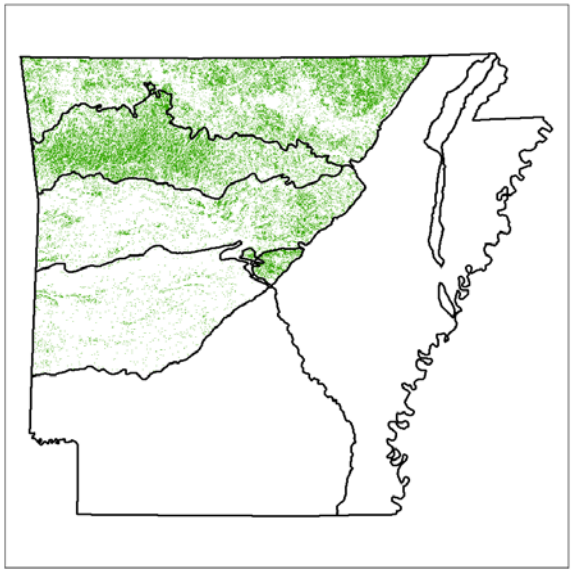


Habitat Map

Habitats

	Weight
Caves, Mines, Sinkholes and other Karst Features	Obligate

Problems Faced

Development/disturbance of cave habitat and recharge zone.	Threat: Habitat destruction or conversion Source: Urban development
Groundwater contamination.	Threat: Toxins/contaminants Source: Urban development

Data Gaps/Research Needs

No data gaps or research needs were identified.

Conservation Actions

	Importance	Category
Maintain groundwater quality.	Medium	Habitat Protection
Protect cave habitat and recharge zone from development or disturbance.	Medium	Habitat Protection

Monitoring Strategies

Survey for additional populations and monitor known occurrences.

Comments

Pseudoscorpion.

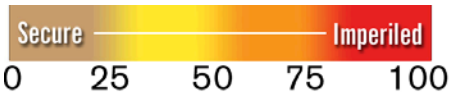
Apochthonius titanicus
cave obligate pseudoscorpion

Arrhopalites clarus

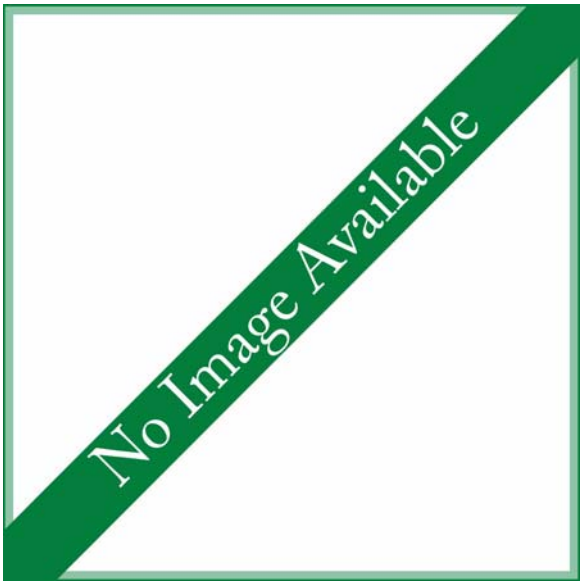
springtail

Class: Elliplura
Order: Collembola
Family: Sminthuridae

Priority Score: 25 out of 100



Population Trend: Unknown

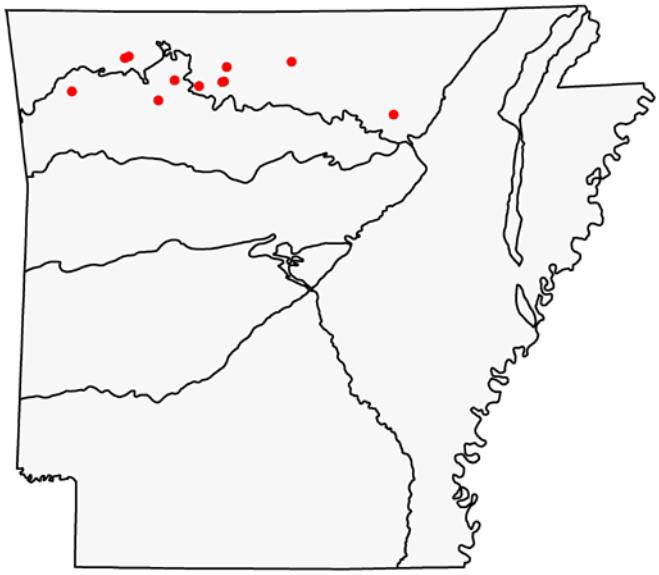


Global Rank: G4 — Apparently secure species

State Rank: S1S2 — Critically imperiled in Arkansas (uncertain rank)

Distribution

Occurrence Records



Ecoregions where the species occurs:

- Ozark Highlands ☑
- Boston Mountains ☑
- Arkansas Valley ☐
- Ouachita Mountains ☐
- South Central Plains ☐
- Mississippi Alluvial Plain ☐
- Mississippi Valley Loess Plain ☐

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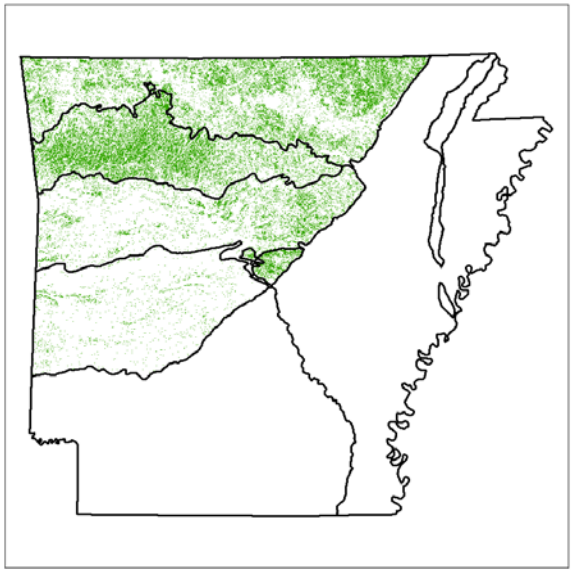


Habitat Map

Habitats

	Weight
Caves, Mines, Sinkholes and other Karst Features	Obligate

Problems Faced

Development/disturbance of cave habitat and recharge zone.	Threat: Habitat destruction or conversion Source: Urban development
Groundwater contamination.	Threat: Toxins/contaminants Source: Urban development

Data Gaps/Research Needs

Determine life history information.

Survey for baseline information on distribution and population status.

Conservation Actions

	Importance	Category
Maintain groundwater quality.	Medium	Habitat Protection
Protect cave habitat and recharge zone from development or disturbance.	Medium	Habitat Protection

Monitoring Strategies

More data is needed before a monitoring strategy can be developed.

Arrhopalites clarus
springtail

Comments

Collembola. This is a terrestrial cave adapted springtail that is only known from caves in the Ozarks (personal communication, Mike E. Slay).

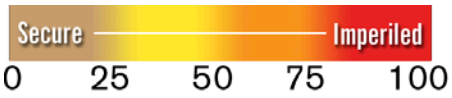
Arrhopalites clarus
springtail

Bactrurus pseudomucronatus

amphipod

Class: Malacostraca
Order: Amphipoda
Family: Crangonyctidae

Priority Score: 42 out of 100



Population Trend: Unknown

Global Rank: G2G3 — Imperiled (uncertain rank)

State Rank: S1 — Critically imperiled in Arkansas

Distribution

Element Occurrence Records

Ecoregions where the species occurs:

- [x] Ozark Highlands
- [ ] Boston Mountains
- [ ] Arkansas Valley
- [ ] Ouachita Mountains
- [ ] South Central Plains
- [ ] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

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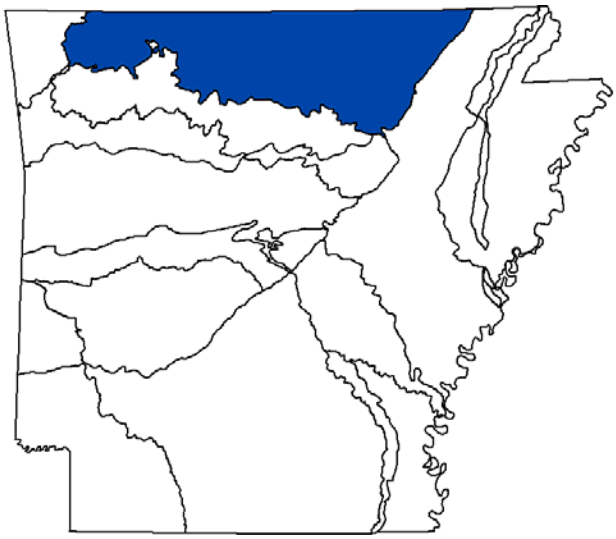
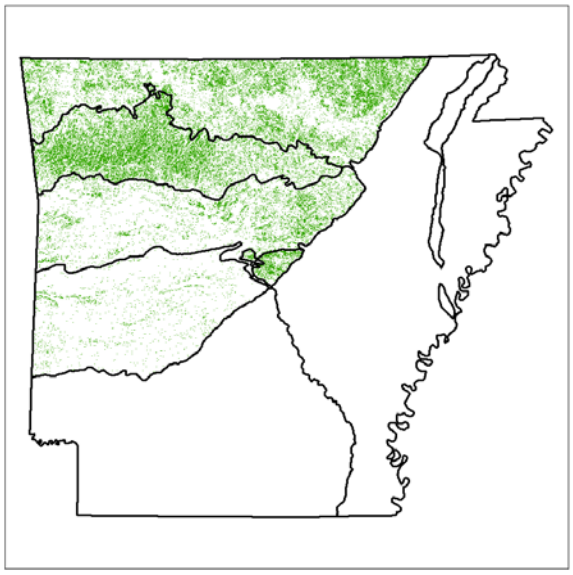


Ecobasins where this species occurs



Terrestrial Habitats

Ecobasins

Ozark Highlands - White River

Terrestrial Habitats

Caves, Mines, Sinkholes and other Karst Features	Obligate

Aquatic Habitats

Natural Cave Stream: Headwater - Small	Obligate
Natural Groundwater:	Obligate

Bactrurus pseudomucronatus
amphipod

Problems Faced

Threat: Sedimentation
Source: Urban development

Threat: Toxins/contaminants
Source: Urban development

Data Gaps/Research Needs

Determine life history information.

Evaluate taxonomic relationships.

Survey for additional populations.

Conservation Actions

	Importance	Category
Maintain groundwater quality.	Medium	Habitat Protection
Protect cave habitat and recharge zone from development or disturbance.	Medium	Habitat Protection

Monitoring Strategies

Additional information is needed before a monitoring strategy can be developed.

Comment

This crustacean species is one of the largest groundwater amphipods in North America (personal communication, Mike E. Slay).

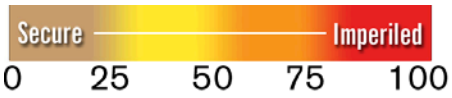
Bactrurus pseudomucronatus
amphipod

Caecidotea ancyla

isopod

Class: Malacostraca
Order: Isopoda
Family: Asellidae

Priority Score: 31 out of 100



Population Trend: Unknown

Caecidotea spp.

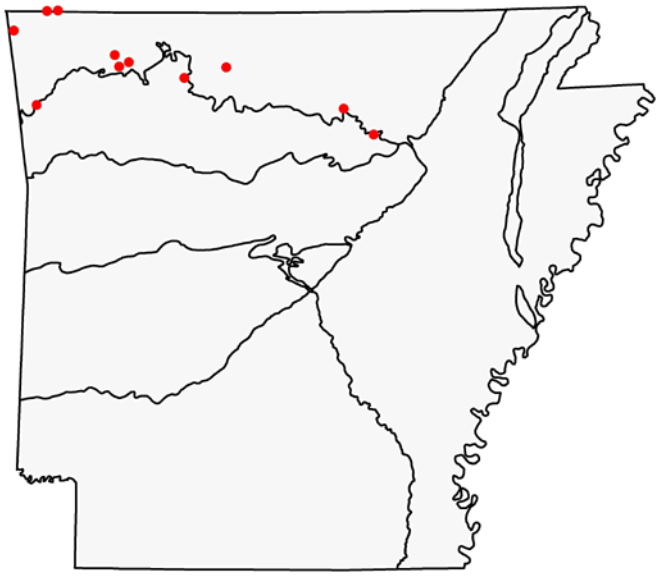
©Dante B. Fenolio

Global Rank: G3G4 — Vulnerable (uncertain rank)

State Rank: S1? — Critically imperiled in Arkansas (inexact numeric rank)

Distribution

Element Occurrence Records



Ecoregions where the species occurs:

- [x] Ozark Highlands
- [x] Boston Mountains
- [ ] Arkansas Valley
- [ ] Ouachita Mountains
- [ ] South Central Plains
- [ ] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

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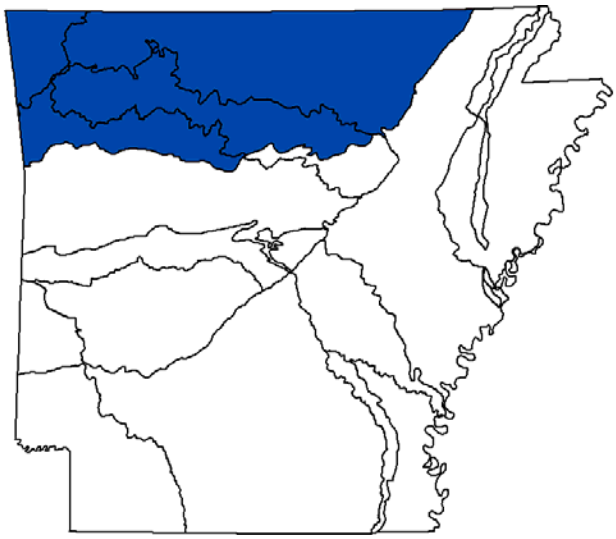
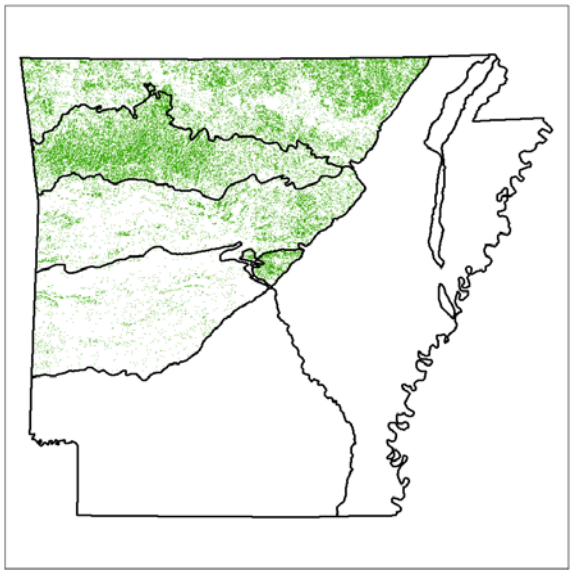


Ecobasins where this species occurs



Terrestrial Habitats

Ecobasins

Boston Mountains - Arkansas River
Boston Mountains - White River
Ozark Highlands - Arkansas River
Ozark Highlands - White River

Terrestrial Habitats

Caves, Mines, Sinkholes and other Karst Features	Obligate

Caecidotea ancyla
isopod

Aquatic Habitats

Natural Cave Stream: Headwater - Small	Optimal
Natural Groundwater:	Optimal
Natural Seep: Headwater - Small	Suitable
Natural Spring Run: Headwater - Small	Marginal

Problems Faced

Threat: Habitat disturbance
Source: Urban development

Threat: Nutrient loading
Source: Urban development

Threat: Sedimentation
Source: Urban development

Data Gaps/Research Needs

Determine life history information.

Survey for baseline information on distribution and population status.

Conservation Actions

	Importance	Category
More data are needed to determine conservation actions.	Medium	Data Gap

Monitoring Strategies

More data are needed before a monitoring strategy can be developed.

Comment

Crustacean. This species is a cave-adapted aquatic isopod.

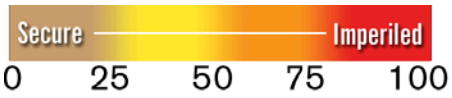
Caecidotea ancyla
isopod

Caecidotea dimorpha

isopod

Class: Malacostraca
Order: Isopoda
Family: Asellidae

Priority Score: 42 out of 100



Population Trend: Unknown

Caecidotea spp.

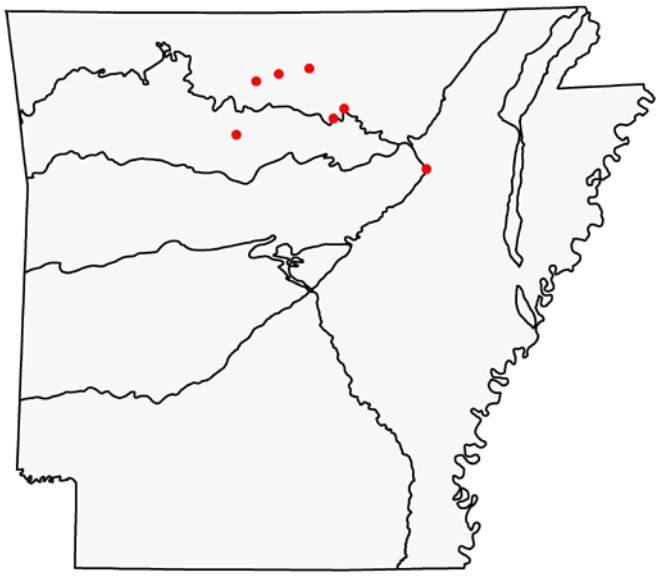
©Dante B. Fenolio

Global Rank: G2G3 — Imperiled (uncertain rank)

State Rank: S1? — Critically imperiled in Arkansas (inexact numeric rank)

Distribution

Element Occurrence Records



Ecoregions where the species occurs:

- [x] Ozark Highlands
- [x] Boston Mountains
- [x] Arkansas Valley
- [ ] Ouachita Mountains
- [ ] South Central Plains
- [ ] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

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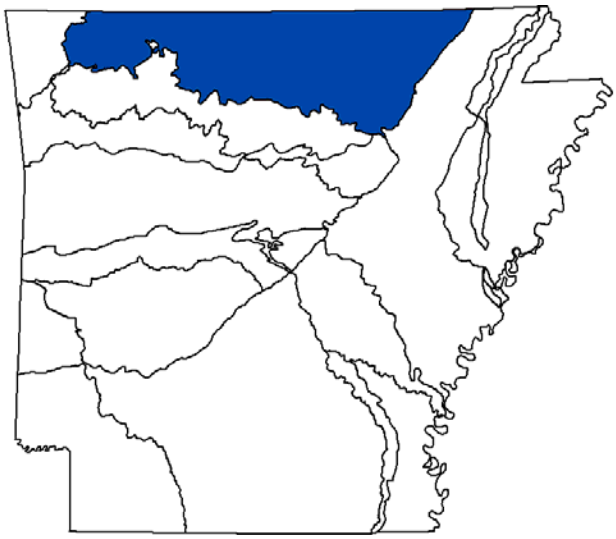
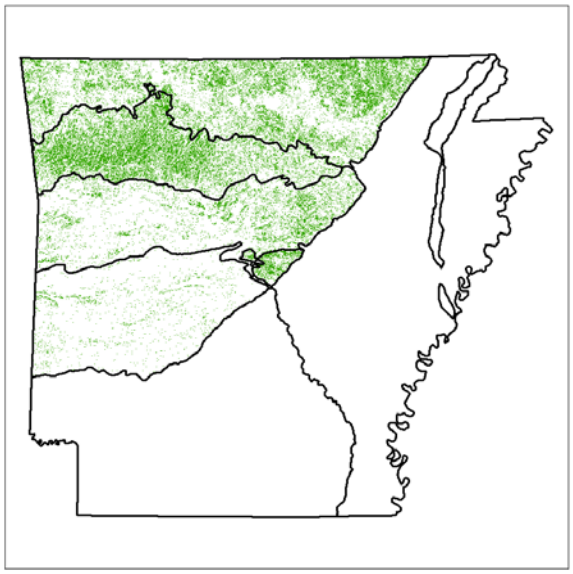


Ecobasins where this species occurs



Terrestrial Habitats

Ecobasins

Arkansas Valley - White River
Boston Mountains - White River
Ozark Highlands - White River

Terrestrial Habitats

Caves, Mines, Sinkholes and other Karst Features	Obligate

Caecidotea dimorpha
isopod

Aquatic Habitats

Natural Cave Stream: Headwater - Small	Optimal
Natural Groundwater: Headwater - Small	Optimal
Natural Seep: Headwater - Small	Suitable
Natural Spring Run: Headwater - Small	Marginal

Problems Faced

Threat: Habitat disturbance
Source: Urban development

Threat: Nutrient loading
Source: Urban development

Threat: Sedimentation
Source: Urban development

Data Gaps/Research Needs

Determine life history information.

Survey for baseline information on distribution and population status.

Conservation Actions

	Importance	Category
More data are needed to determine conservation actions.	Medium	Data Gap

Monitoring Strategies

More data are needed before a monitoring strategy can be developed.

Comment

Crustacean. This species is a cave-adapted aquatic isopod.

Caecidotea dimorpha
isopod

Caecidotea fonticulus

isopod

Class: Malacostraca
Order: Isopoda
Family: Asellidae

Priority Score: **23** **out of 100**

Population Trend: Unknown

Caecidotea spp.

©Dante B. Fenolio

Gobal Rank: G? — Uncertain global ranking

State Rank: S1 — Critically imperiled in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☑ Ouachita Mountains
- ☐ Arkansas Valley
- ☐ South Central Plains
- ☐ Mississippi Alluvial Plain
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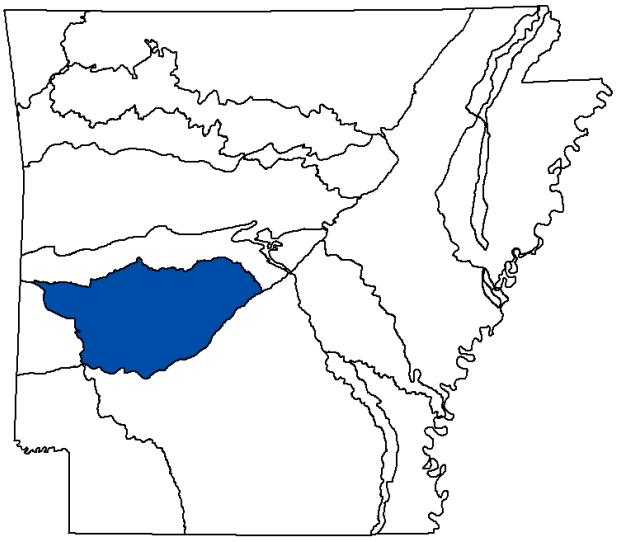


Ecobasins where the species occurs

Ecobasins

Ouachita Mountains - Ouachita River

Habitats	Weight
Natural Groundwater: Headwater - Small	Data Gap
Natural Seep: Headwater - Small	Data Gap
Natural Spring Run: Headwater - Small	Obligate

Problems Faced

Threat: Habitat destruction or conversion
Source: Forestry activities

Threat: Toxins/contaminants
Source: Municipal/Industrial point source

Data Gaps/Research Needs

Need to obtain baseline information on distribution and population status.

Conservation Actions	Importance	Category
More data are needed to determine conservation actions.	Medium	Data Gap

Monitoring Strategies

Surveys to locate additional populations and protection of stream habitats

Comments

An Arkansas endemic isopod known only from Abernathy Spring in Polk County (Lewis 1983).

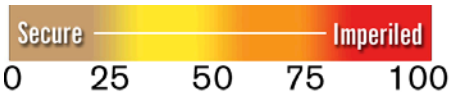
Caecidotea fonticulus
isopod

Caecidotea macropropoda

bat cave isopod

Class: Malacostraca
Order: Isopoda
Family: Asellidae

Priority Score: **57** out of 100



Population Trend: Unknown

Caecidotea spp.

©Dante B. Fenolio

Global Rank: G1G3 — Critically imperiled (uncertain rank)

State Rank: S1 — Critically imperiled in Arkansas

Distribution

Element Occurrence Records

Ecoregions where the species occurs:

- [x] Ozark Highlands
- [x] Boston Mountains
- [ ] Arkansas Valley
- [ ] Ouachita Mountains
- [ ] South Central Plains
- [ ] Mississippi Alluvial Plain
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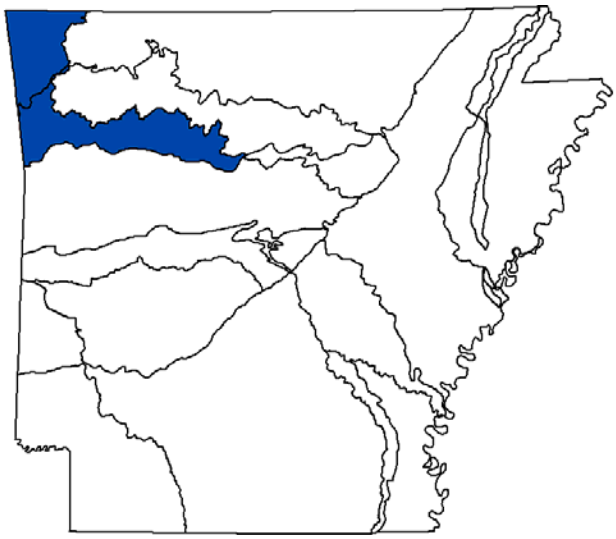
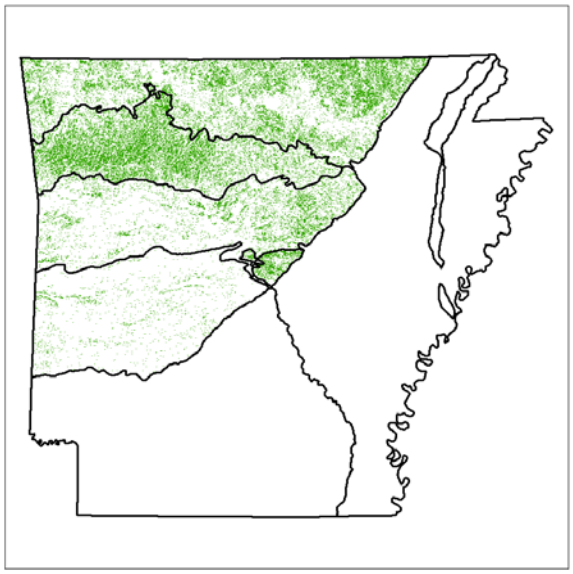


Ecobasins where this species occurs



Terrestrial Habitats

Ecobasins

Boston Mountains - Arkansas River

Ozark Highlands - Arkansas River

Terrestrial Habitats

Caves, Mines, Sinkholes and other Karst Features	Obligate

Caecidotea macropropoda
bat cave isopod

Aquatic Habitats

Natural Cave Stream: Headwater - Small	Optimal
Natural Groundwater:	Optimal
Natural Seep: Headwater - Small	Suitable
Natural Spring Run: Headwater - Small	Marginal

Problems Faced

Threat: Habitat disturbance
Source: Urban development

Threat: Nutrient loading
Source: Urban development

Threat: Sedimentation
Source: Urban development

Data Gaps/Research Needs

Determine life history information.

Survey for baseline information on distribution and population status.

Conservation Actions

	Importance	Category
More data are needed to determine conservation actions.	Medium	Data Gap

Monitoring Strategies

More data are needed before a monitoring strategy can be developed.

Comment

Crustacean.

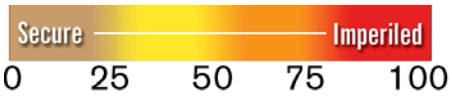
Caecidotea macropropoda
bat cave isopod

Caecidotea oculata

isopod

Class: Malacostraca
Order: Isopoda
Family: Asellidae

Priority Score: 42 out of 100



Population Trend: Unknown

Caecidotea spp.

©Dante B. Fenolio

Global Rank: G2G3 — Imperiled (uncertain rank)

State Rank: S1? — Critically imperiled in Arkansas (inexact numeric rank)

Distribution

Element Occurrence Records

Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☑ Boston Mountains
- ☐ Arkansas Valley
- ☐ Ouachita Mountains
- ☐ South Central Plains
- ☐ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

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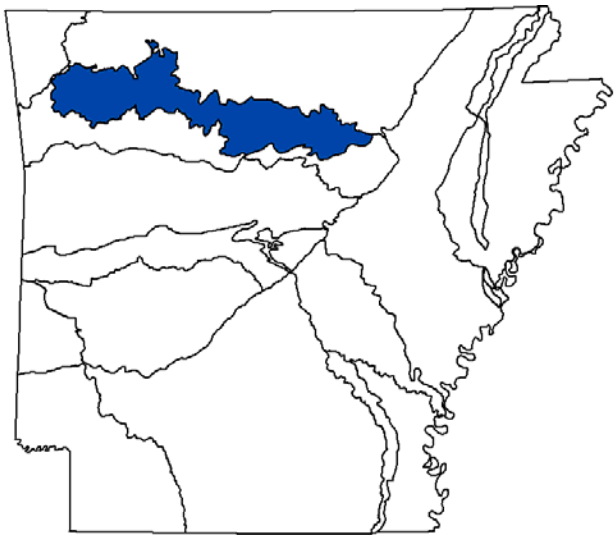
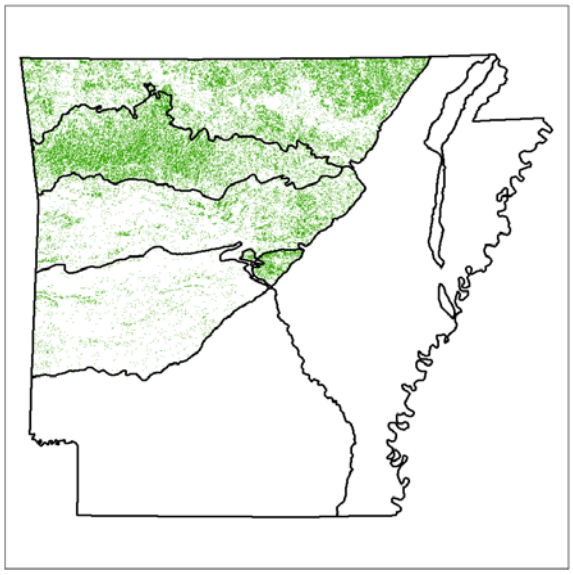


Ecobasins where this species occurs



Terrestrial Habitats

Ecobasins

Boston Mountains - White River

Terrestrial Habitats

Caves, Mines, Sinkholes and other Karst Features	Obligate

Aquatic Habitats

Natural Cave Stream: Headwater - Small	Data Gap
Natural Groundwater:	Data Gap
Natural Seep: Headwater - Small	Data Gap
Natural Spring Run: Headwater - Small	Obligate

Caecidotea oculata
isopod

Problems Faced

Threat: Habitat disturbance
Source: Urban development

Threat: Nutrient loading
Source: Urban development

Threat: Sedimentation
Source: Urban development

Data Gaps/Research Needs

Determine life history information.

Survey for baseline information on distribution and population status.

Conservation Actions

	Importance	Category
More data are needed to determine conservation actions.	Medium	Data Gap

Monitoring Strategies

More data are needed before a monitoring strategy can be developed.

Comment

Crustacean.

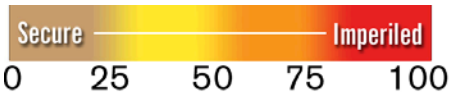
Caecidotea oculata
isopod

Caecidotea salamensis

isopod

Class: Malacostraca
Order: Isopoda
Family: Asellidae

Priority Score: 8 **out of 100**



Population Trend: Unknown

Caecidotea spp.

©Dante B. Fenolio

Global Rank: G? — Uncertain global ranking

State Rank: S? — Uncertain ranking in Arkansas

Distribution

Element Occurrence Records

Ecoregions where the species occurs:

- [x] Ozark Highlands
- [ ] Boston Mountains
- [ ] Arkansas Valley
- [ ] Ouachita Mountains
- [ ] South Central Plains
- [ ] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

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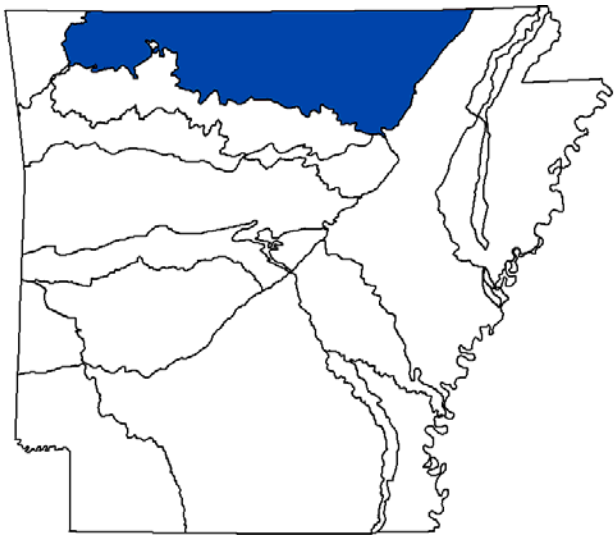
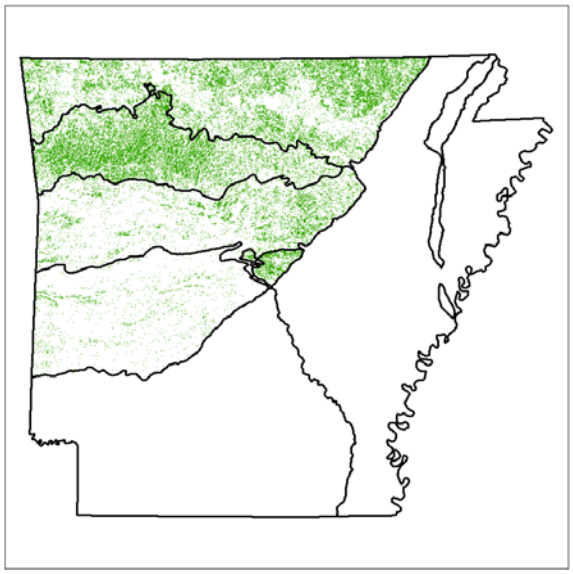


Ecobasins where this species occurs



Terrestrial Habitats

Ecobasins

Ozark Highlands - White River

Terrestrial Habitats

Caves, Mines, Sinkholes and other Karst Features	Obligate

Aquatic Habitats

Natural Cave Stream: Headwater - Small	Optimal
Natural Groundwater:	Optimal
Natural Seep: Headwater - Small	Suitable
Natural Spring Run: Headwater - Small	Marginal

Caecidotea salamensis
isopod

Problems Faced

Threat: Habitat disturbance
Source: Urban development

Threat: Nutrient loading
Source: Urban development

Threat: Sedimentation
Source: Urban development

Data Gaps/Research Needs

Determine life history information.

Survey for baseline information on distribution and population status.

Conservation Actions

	Importance	Category
More data are needed to determine conservation actions.	Medium	Data Gap

Monitoring Strategies

More data are needed before a monitoring strategy can be developed.

Comment

Crustacean.

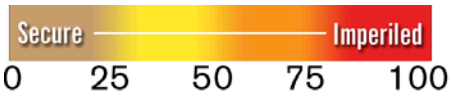
Caecidotea salamensis
isopod

Caecidotea simulator

cave obligate isopod

Class: Malacostraca
Order: Isopoda
Family: Asellidae

Priority Score: 42 out of 100



Population Trend: Unknown

Caecidotea spp.

©Dante B. Fenolio

Global Rank: G2G3 — Imperiled (uncertain rank)

State Rank: S1 — Critically imperiled in Arkansas

Distribution

Element Occurrence Records

Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☑ Boston Mountains
- ☐ Arkansas Valley
- ☐ Ouachita Mountains
- ☐ South Central Plains
- ☐ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

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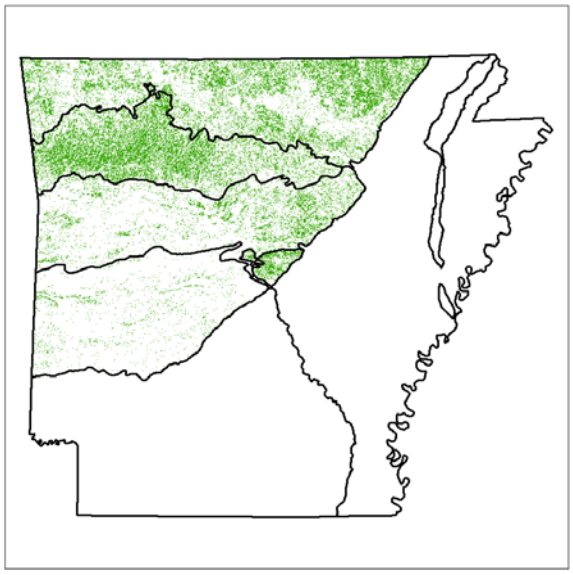
Ecobasins where this species occurs



Terrestrial Habitats

Ecobasins

Boston Mountains - Arkansas River

Terrestrial Habitats

Caves, Mines, Sinkholes and other Karst Features	Obligate

Aquatic Habitats

Natural Cave Stream: Headwater - Small	Data Gap
Natural Groundwater:	Obligate
Natural Seep: Headwater - Small	Data Gap
Natural Spring Run: Headwater - Small	Data Gap

Caecidotea simulator
cave obligate isopod

Problems Faced

Threat: Habitat disturbance
Source: Urban development

Threat: Sedimentation
Source: Urban development

Threat: Toxins/contaminants
Source: Urban development

Data Gaps/Research Needs

Determine life history information.

Survey for baseline information on distribution and population status.

Conservation Actions

	Importance	Category
Maintain groundwater quality.	Medium	Habitat Protection
Protect cave habitat and recharge zone from development or disturbance.	Medium	Habitat Protection

Monitoring Strategies

More data are needed before a monitoring strategy can be developed.

Comment

This crustacean species is one of the rarest aquatic cave-adapted isopods in Arkansas.

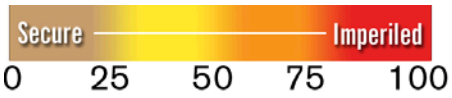
Caecidotea simulator
cave obligate isopod

Caecidotea steevesi

isopod

Class: Malacostraca
Order: Isopoda
Family: Asellidae

Priority Score: 31 out of 100



Population Trend: Unknown

Caecidotea spp.

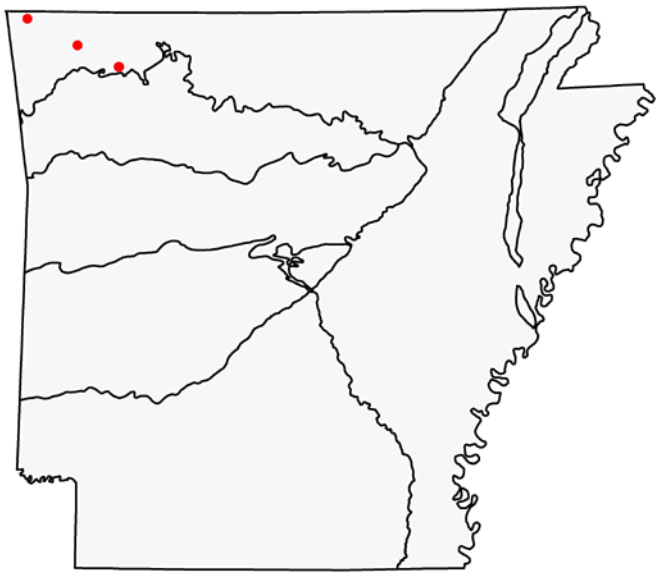
©Dante B. Fenolio

Global Rank: G3G4 — Vulnerable (uncertain rank)

State Rank: S1? — Critically imperiled in Arkansas (inexact numeric rank)

Distribution

Element Occurrence Records



Ecoregions where the species occurs:

- [x] Ozark Highlands
- [ ] Boston Mountains
- [ ] Arkansas Valley
- [ ] Ouachita Mountains
- [ ] South Central Plains
- [ ] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

Taxa Team and Peer Reviewers

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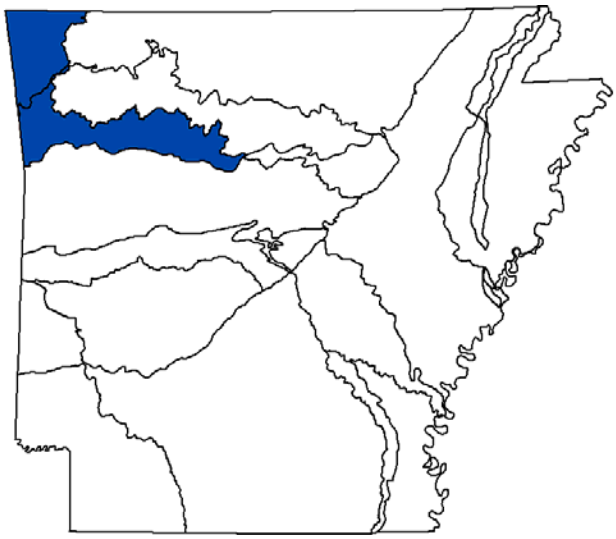
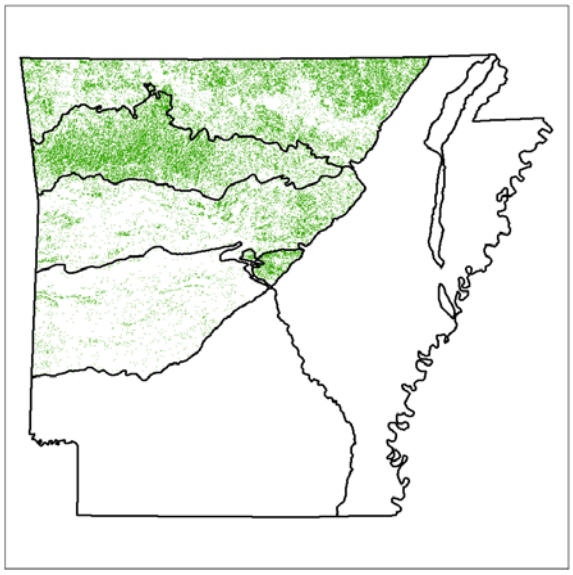


Ecobasins where this species occurs



Terrestrial Habitats

Ecobasins

Ozark Highlands - Arkansas River

Ozark Highlands - White River

Terrestrial Habitats

Caves, Mines, Sinkholes and other Karst Features	Obligate

Caecidotea steevesi
isopod

Aquatic Habitats

Natural Cave Stream: Headwater - Small	Optimal
Natural Groundwater:	Optimal
Natural Seep: Headwater - Small	Suitable
Natural Spring Run: Headwater - Small	Marginal

Problems Faced

Threat: Habitat disturbance
Source: Urban development

Threat: Nutrient loading
Source: Urban development

Threat: Sedimentation
Source: Urban development

Data Gaps/Research Needs

Determine life history information.

Survey for baseline information on distribution and population status.

Conservation Actions

	Importance	Category
More data are needed to determine conservation actions.	Medium	Data Gap

Monitoring Strategies

More data are needed before a monitoring strategy can be developed.

Comment

This crustacean species is a cave-adapted aquatic isopod.

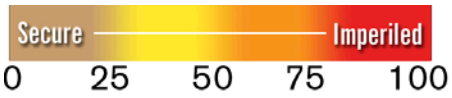
Caecidotea steevesi
isopod

Caecidotea stiladactyla

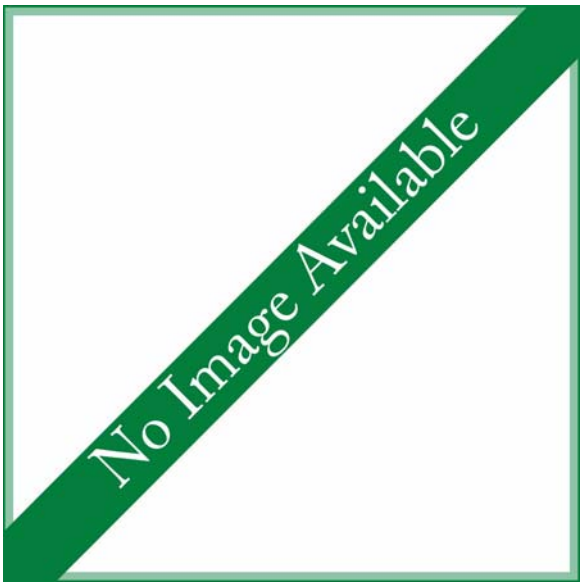
isopod

Class: Malacostraca
Order: Isopoda
Family: Asellidae

Priority Score: 31 out of 100



Population Trend: Unknown

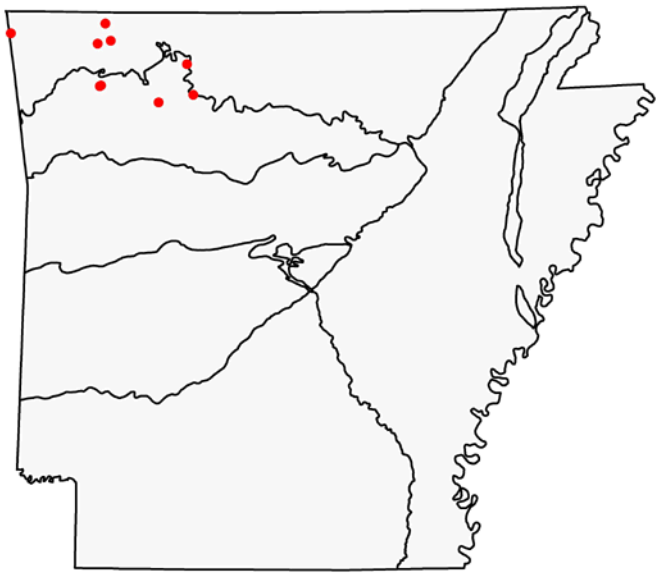


Global Rank: G3G4 — Vulnerable (uncertain rank)

State Rank: S1? — Critically imperiled in Arkansas (inexact numeric rank)

Distribution

Element Occurrence Records



Ecoregions where the species occurs:

- [x] Ozark Highlands
- [x] Boston Mountains
- [ ] Arkansas Valley
- [ ] Ouachita Mountains
- [ ] South Central Plains
- [ ] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

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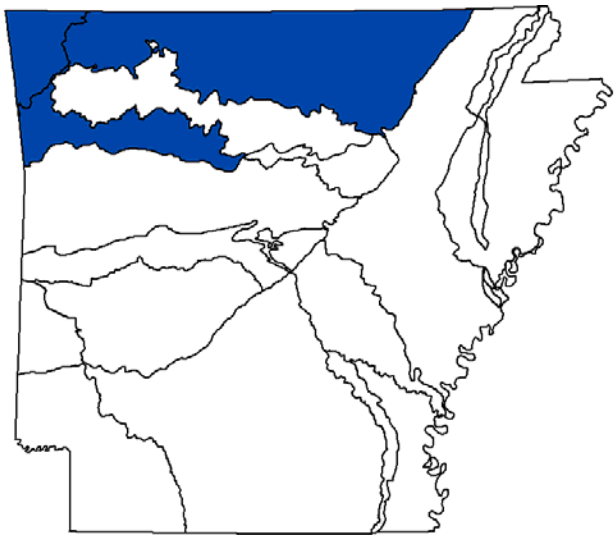
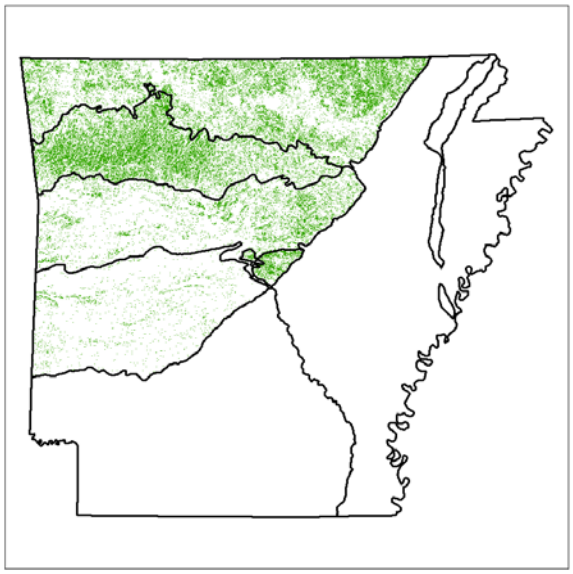


Ecobasins where this species occurs



Terrestrial Habitats

Ecobasins

Boston Mountains - White River
Ozark Highlands - Arkansas River
Ozark Highlands - White River

Terrestrial Habitats

Caves, Mines, Sinkholes and other Karst Features	Obligate

Caecidotea stiladactyla
isopod

Aquatic Habitats

Natural Cave Stream: Headwater - Small	Optimal
Natural Groundwater: Headwater - Small	Optimal
Natural Seep: Headwater - Small	Suitable
Natural Spring Run: Headwater - Small	Marginal

Problems Faced

Threat: Habitat disturbance
Source: Urban development

Threat: Nutrient loading
Source: Urban development

Threat: Sedimentation
Source: Urban development

Data Gaps/Research Needs

Determine life history information.

Survey for baseline information on distribution and population status.

Conservation Actions

	Importance	Category
More data are needed to determine conservation actions.	Medium	Data Gap

Monitoring Strategies

More data are needed before a monitoring strategy can be developed.

Comment

This crustacean species is a cave-adapted aquatic isopod.

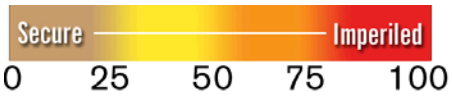
Caecidotea stiladactyla
isopod

Crosbyella distincta

cave obligate harvestman

Class: Arachnida
Order: Opiliones
Family: Phalangodidae

Priority Score: 65 out of 100



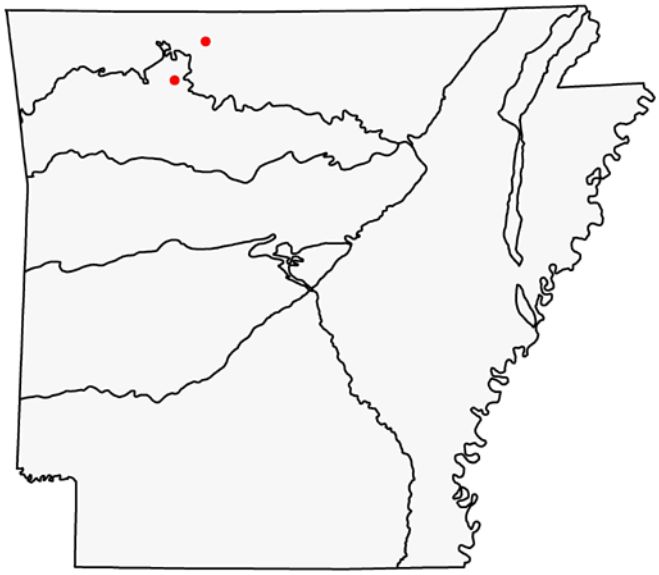
Population Trend: Unknown

Global Rank: G1G2 — Critically imperiled (uncertain rank)

State Rank: S1 — Critically imperiled in Arkansas

Distribution

Occurrence Records



Ecoregions where the species occurs:

- Ozark Highlands ☑
- Boston Mountains ☑
- Arkansas Valley ☐
- Ouachita Mountains ☐
- South Central Plains ☐
- Mississippi Alluvial Plain ☐
- Mississippi Valley Loess Plain ☐

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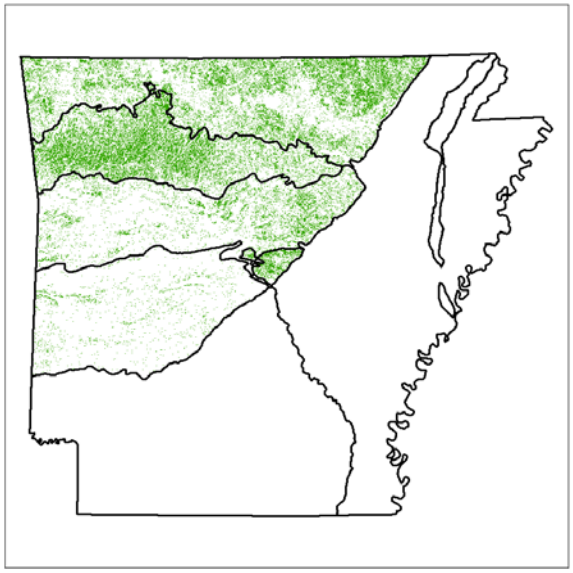


Habitat Map

Habitats

	Weight
Caves, Mines, Sinkholes and other Karst Features	Obligate

Problems Faced

Development/disturbance of cave habitat and recharge zone.	Threat: Habitat destruction or conversion Source: Urban development
Groundwater contamination.	Threat: Toxins/contaminants Source: Urban development

Conservation Actions

	Importance	Category
Maintain groundwater quality.	Medium	Habitat Protection
Protect cave habitat and recharge zone from development or disturbance.	Medium	Habitat Protection

Monitoring Strategies

Survey for additional populations and monitor known occurrences

Comments

Arachnid.

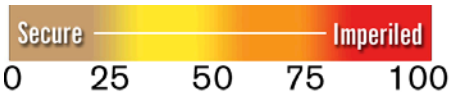
Crosbyella distincta
cave obligate harvestman

Crosbyella roeweri

cave obligate harvestman

Class: Arachnida
Order: Opiliones
Family: Phalangodidae

Priority Score: 65 out of 100



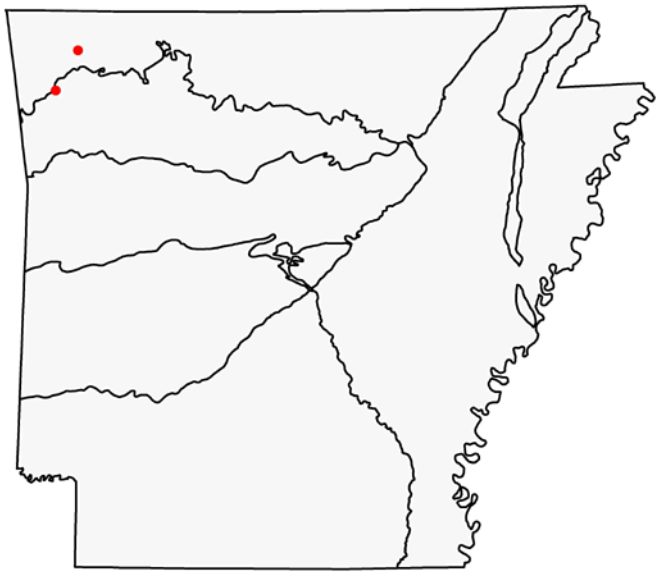
Population Trend: Unknown

Global Rank: G1G2 — Critically imperiled (uncertain rank)

State Rank: S1 — Critically imperiled in Arkansas

Distribution

Occurrence Records



Ecoregions where the species occurs:

- Ozark Highlands ☑
- Boston Mountains ☑
- Arkansas Valley ☐
- Ouachita Mountains ☐
- South Central Plains ☐
- Mississippi Alluvial Plain ☐
- Mississippi Valley Loess Plain ☐

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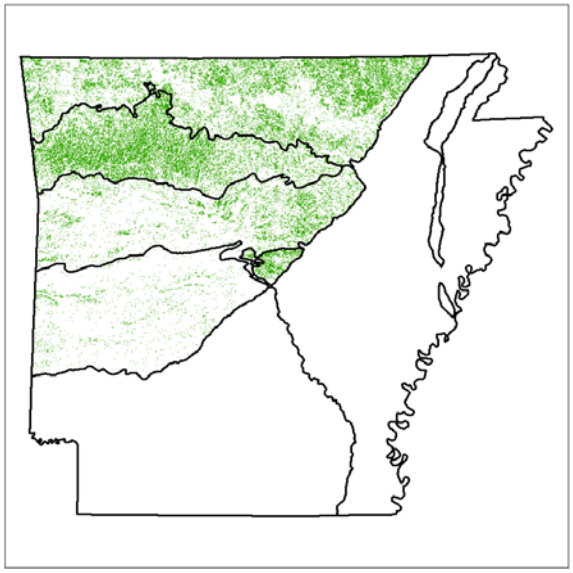


Habitat Map

Habitats

	Weight
Caves, Mines, Sinkholes and other Karst Features	Obligate

Problems Faced

Development/disturbance of cave habitat and recharge zone.	Threat: Habitat destruction or conversion Source: Urban development
Groundwater contamination.	Threat: Toxins/contaminants Source: Urban development

Conservation Actions

	Importance	Category
Maintain groundwater quality.	Medium	Habitat Protection
Protect cave habitat and recharge zone from development or disturbance.	Medium	Habitat Protection

Monitoring Strategies

Survey for additional populations and monitor known occurrences

Comments

Arachnid.

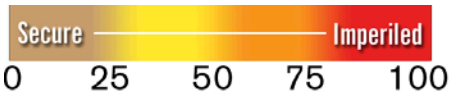
Crosbyella roeweri
cave obligate harvestman

Diplocardia meansi

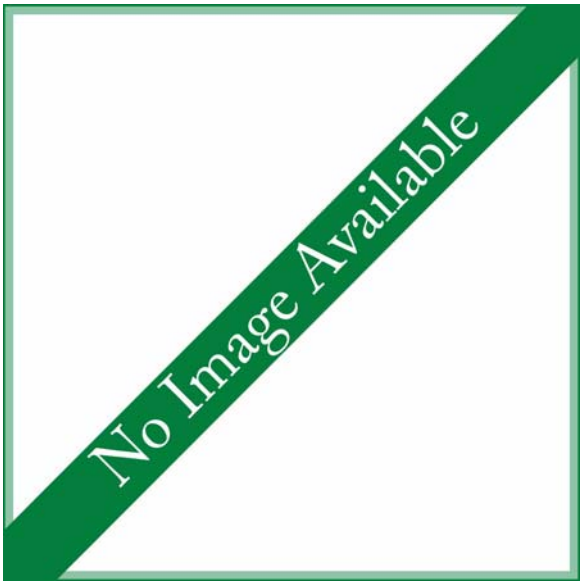
earthworm

Class: Oligochaeta
Order: Opisthopora
Family: Acanthodrilidae

Priority Score: 17 out of 100



Population Trend: Unknown



Global Rank: G? — Uncertain global ranking

State Rank: S2S3 — Imperiled species in Arkansas (uncertain rank)

Distribution

Occurrence Records

Ecoregions where the species occurs:

- Ozark Highlands ☐
- Boston Mountains ☐
- Arkansas Valley ☐
- Ouachita Mountains ☑
- South Central Plains ☐
- Mississippi Alluvial Plain ☐
- Mississippi Valley Loess Plain ☐

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Habitat Map

Habitats

	Weight
Ozark-Ouachita Mesic Hardwood Forest	Suitable

Problems Faced

Habitat degradation/disturbance.	Threat: Habitat disturbance Source: Forestry activities

Data Gaps/Research Needs

Need to obtain baseline information on distribution and population status.

Conservation Actions

	Importance	Category
Limit soil disturbance.	High	Habitat Protection
Suspend application of herbicides where this species occurs.	Medium	Habitat Protection

Monitoring Strategies

Survey for additional populations and monitor known occurrences.

Comments

The second largest earthworm in the United States, D. meansi is an Arkansas endemic only known from the slopes of Rich Mountain (Gates 1977).

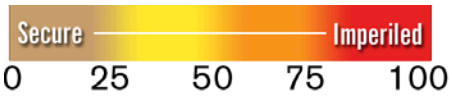
Diplocardia meansi
earthworm

Dendrocoelopsis americana

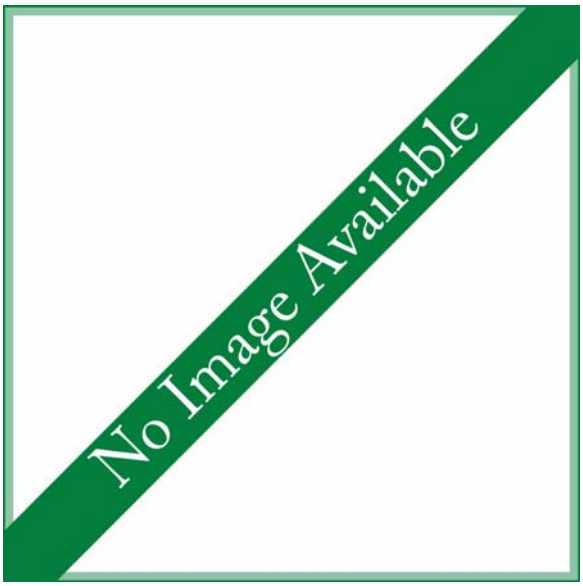
cave obligate planarian

Class: Turbellaria
Order: Tricladida
Family: Dendrocoelidae

Priority Score: 42 out of 100



Population Trend: Unknown

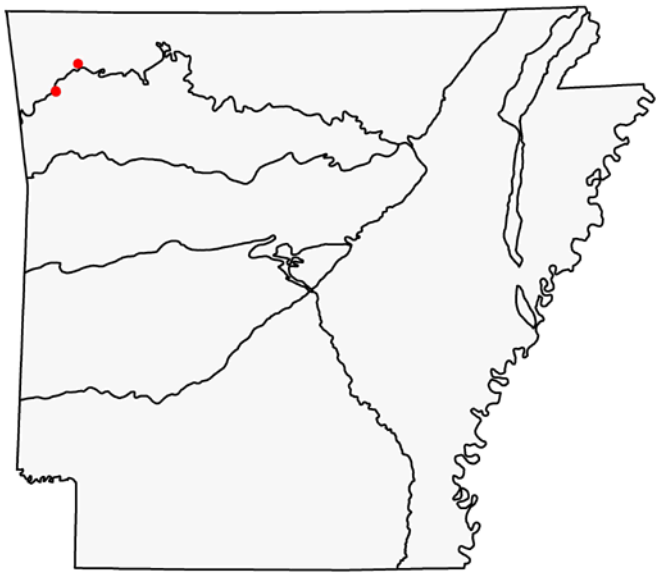


Global Rank: G2G3 — Imperiled (uncertain rank)

State Rank: S1 — Critically imperiled in Arkansas

Distribution

Element Occurrence Records



Ecoregions where the species occurs:

- [x] Ozark Highlands
- [x] Boston Mountains
- [ ] Arkansas Valley
- [ ] Ouachita Mountains
- [ ] South Central Plains
- [ ] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

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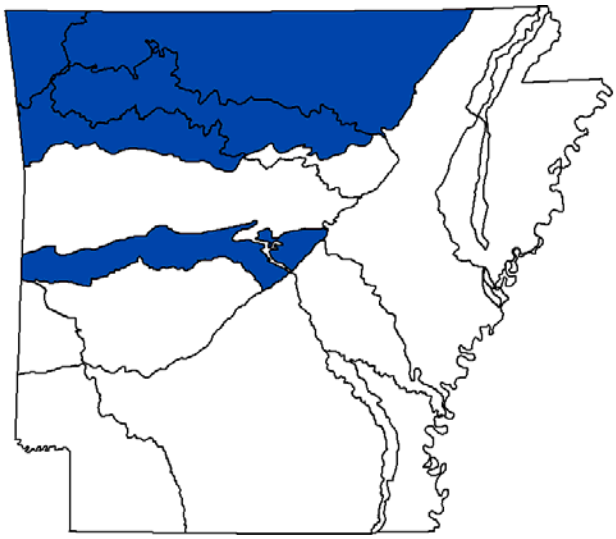
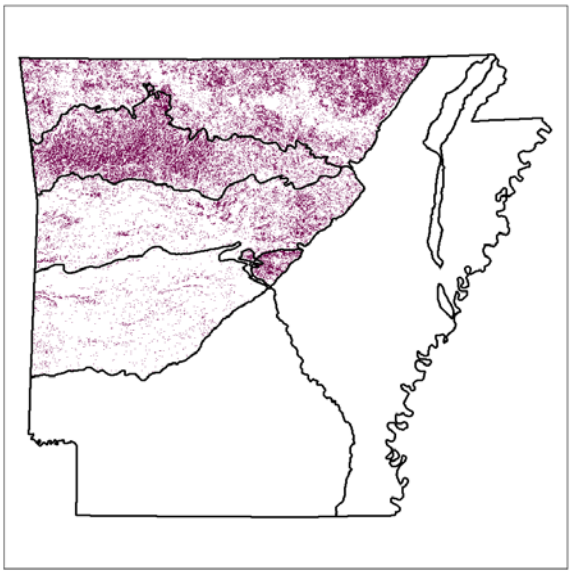


Ecobasins where this species occurs



Terrestrial Habitats

Ecobasins

Boston Mountains - Arkansas River
Boston Mountains - White River
Ozark Highlands - Arkansas River
Ozark Highlands - White River

Terrestrial Habitats

Caves, Mines, Sinkholes and other Karst Features	Optimal

Dendrocoelopsis americana
cave obligate planarian

Aquatic Habitats

Natural Cave Stream: Headwater - Small	Optimal
Natural Groundwater:	Optimal
Natural Seep: Headwater - Small	Optimal
Natural Spring Run: Headwater - Small	Optimal

Problems Faced

Threat: Habitat disturbance
Source: Urban development

Threat: Sedimentation
Source: Urban development

Threat: Toxins/contaminants
Source: Urban development

Data Gaps/Research Needs

Determine life history information.

Survey for baseline information on distribution and population status.

Conservation Actions

	Importance	Category
Maintain groundwater quality.	Medium	Habitat Restoration/Improvement
Protect cave habitat and recharge zone from development or disturbance.	Medium	Habitat Protection

Monitoring Strategies

More data are needed before a monitoring strategy can be developed.

Comment

Flatworm.

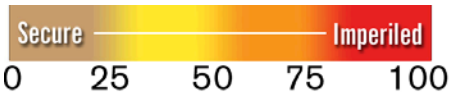
Dendrocoelopsis americana
cave obligate planarian

Gastrocopta rogersensis

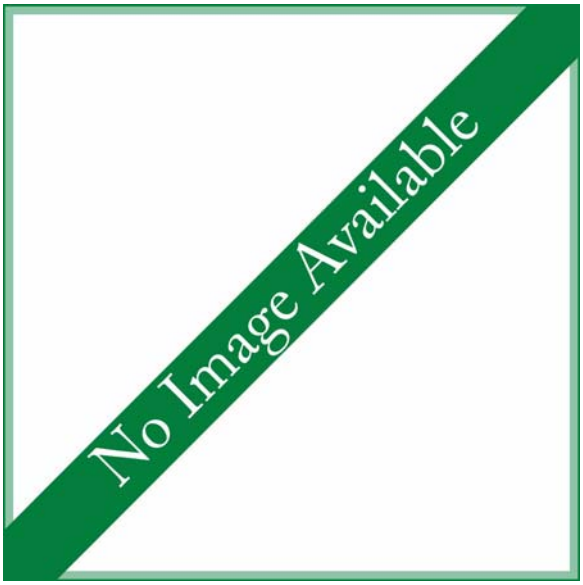
land snail

Class: Gastropoda
Order: Stylommatophora
Family: Pupillidae

Priority Score: 27 out of 100



Population Trend: Unknown

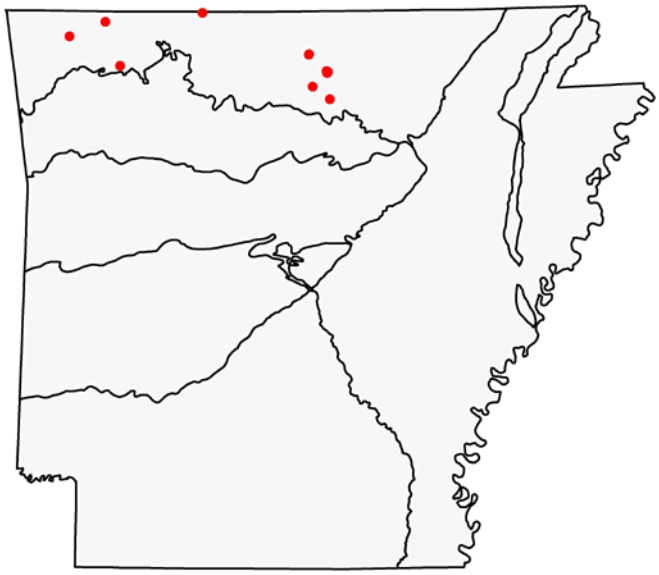


Global Rank: G3G4 — Vulnerable (uncertain rank)

State Rank: S2 — Imperiled in Arkansas

Distribution

Occurrence Records



Ecoregions where the species occurs:

- Ozark Highlands ☑
- Boston Mountains ☐
- Arkansas Valley ☐
- Ouachita Mountains ☐
- South Central Plains ☐
- Mississippi Alluvial Plain ☐
- Mississippi Valley Loess Plain ☐

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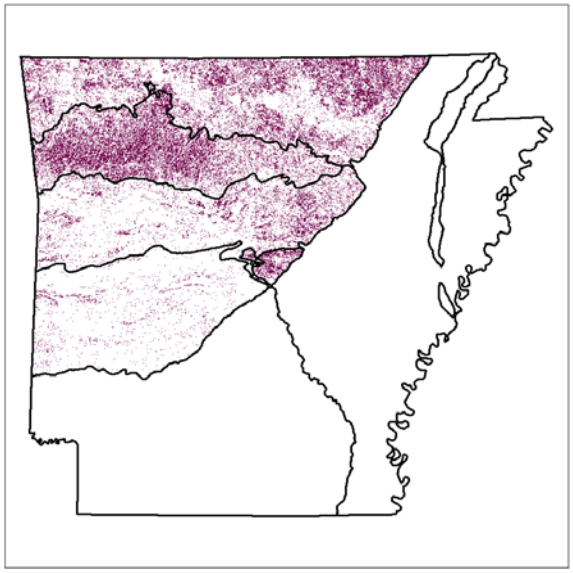


Habitat Map

Habitats

	Weight
Ozark-Ouachita Cliff and Talus	Optimal

Problems Faced

Forestry practices that disturb litter layer and create xeric conditions.	Threat: Habitat disturbance Source: Forestry activities

Data Gaps/Research Needs

Need to assess population status of known occurrences.

Conservation Actions

	Importance	Category
More data are needed to determine conservation actions.	Medium	Data Gap

Monitoring Strategies

Survey areas near known occurrences to locate additional populations.

Comments

A regionally endemic (Arkansas, Missouri) terrestrial snail that occupies habitat in and along bluff lines (Nekola and Coles 2001).

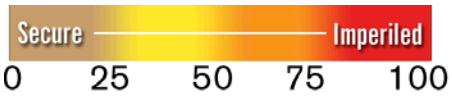
Gastrocopta rogersensis
land snail

Inflectarius magazinensis

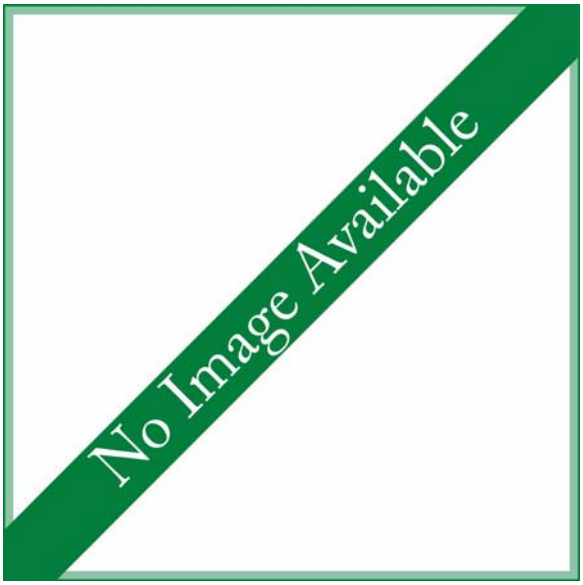
Magazine Mountain Shagreen

Class: Gastropoda
Order: Stylommatophora
Family: Polygyridae

Priority Score: **80** out of 100



Population Trend: Unknown



Global Rank: G1 — Critically imperiled species

State Rank: S1 — Critically imperiled in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- Ozark Highlands ☐
- Boston Mountains ☐
- Arkansas Valley ☑
- Ouachita Mountains ☐
- South Central Plains ☐
- Mississippi Alluvial Plain ☐
- Mississippi Valley Loess Plain ☐

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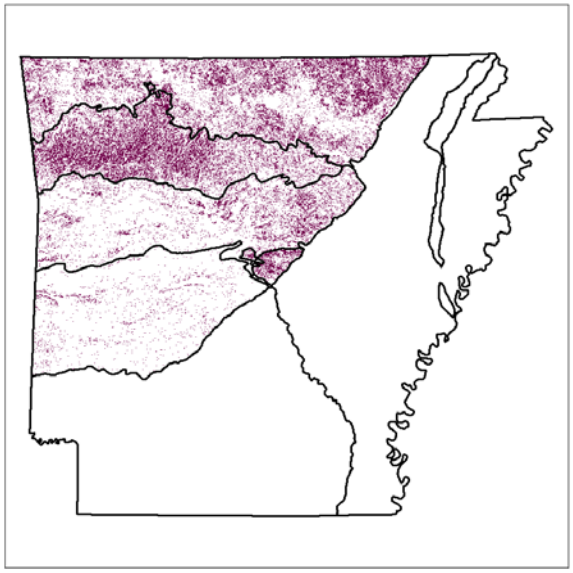


Habitat Map

Habitats

	Weight
Ozark-Ouachita Cliff and Talus	Optimal

Problems Faced

Development or activities that alter talus slopes where this species occurs.	Threat: Habitat disturbance Source: Forestry activities
Development or activities that alter talus slopes where this species occurs.	Threat: Habitat disturbance Source: Recreation

Data Gaps/Research Needs

Need to assess population status of known occurrences.

Conservation Actions

	Importance	Category
Protect known occurrences from development or activities that could alter talus slopes.	High	Habitat Protection

Monitoring Strategies

Survey for additional populations and monitor known occurrences.

Comments

An Arkansas endemic species only known from sites on Magazine Mountain in Logan County (Pilsbry and Ferris 1906).

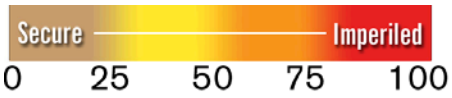
Inflectarius magazinensis
Magazine Mountain Shagreen

Lirceus bicuspidatus

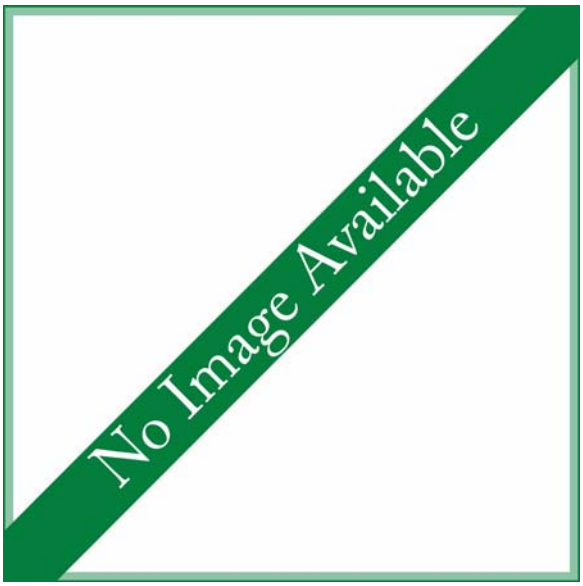
isopod

Class: Malacostraca
Order: Isopoda
Family: Asellidae

Priority Score: 27 out of 100



Population Trend: Unknown

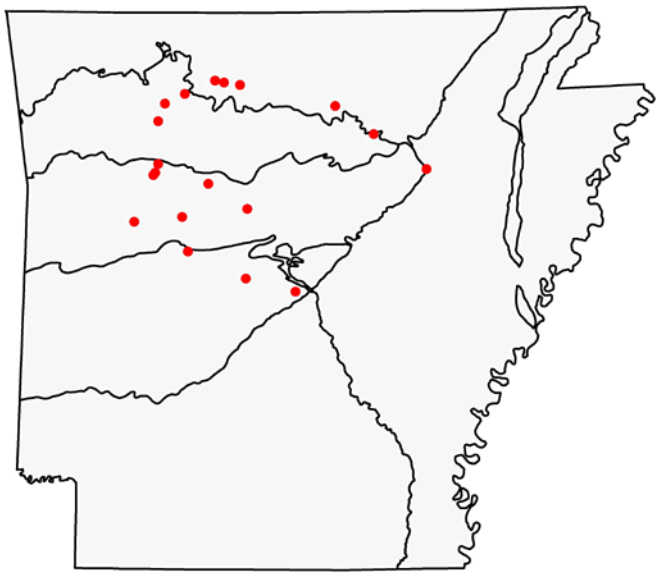


Global Rank: G3Q — Vulnerable (questionable taxonomy)

State Rank: S3 — Vulnerable in Arkansas

Distribution

Element Occurrence Records

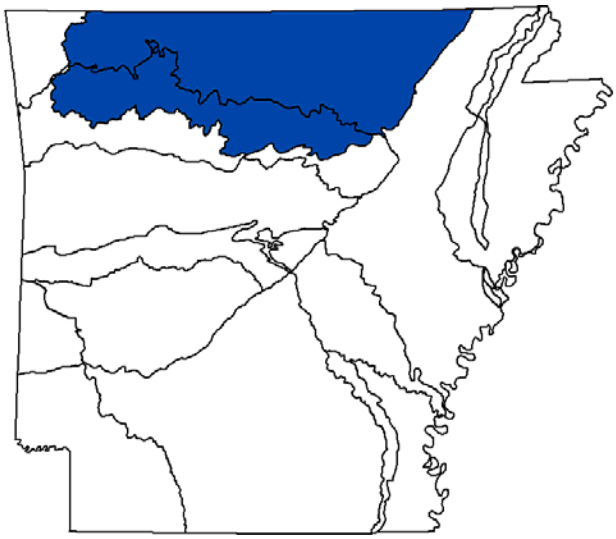


Ecoregions where the species occurs:

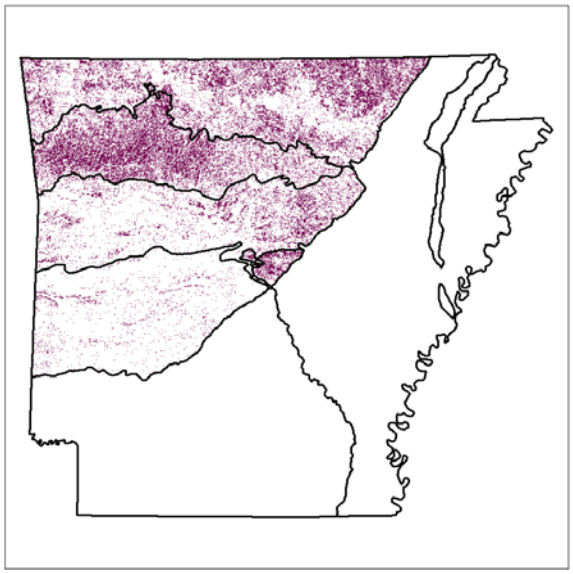
- [x] Ozark Highlands
- [x] Boston Mountains
- [x] Arkansas Valley
- [x] Ouachita Mountains
- [ ] South Central Plains
- [ ] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

Taxa Team and Peer Reviewers

ANHC Mr. Michael Warriner, AGFC Mr. Brian Wagner



Ecobasins where this species occurs



Terrestrial Habitats

Ecobasins

Arkansas Valley - Arkansas River
Arkansas Valley - White River
Boston Mountains - White River
Ouachita Mountains - Arkansas River
Ozark Highlands - White River

Terrestrial Habitats

Caves, Mines, Sinkholes and other Karst Features	Optimal

Lirceus bicuspidatus
isopod

Aquatic Habitats

Natural Cave Stream: Headwater - Small	Suitable
Natural Seep: Headwater - Small	Suitable
Natural Spring Run: Headwater - Small	Optimal

Problems Faced

Threat: Sedimentation
Source: Resource extraction

Threat: Toxins/contaminants
Source: Municipal/Industrial point source

Data Gaps/Research Needs

Determine life history information.

Determine validity of location data for records in Arkansas Valley and Ouachita Mountains.

Surveys to locate additional populations.

Conservation Actions

	Importance	Category
More data are needed to determine conservation actions.	Medium	Data Gap

Monitoring Strategies

Additional information is needed before a monitoring strategy can be developed.

Comment

This isopod inhabits a variety of biotopes including small seep/springs and streams, and cave streams. Nothing more is known about the biology of this species, except that it is widely known from the mountainous region of Arkansas. (ANHI 2003, Robison and Allen, 1995)

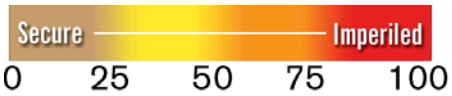
Lirceus bicuspidatus
isopod

Lirceus bidentatus

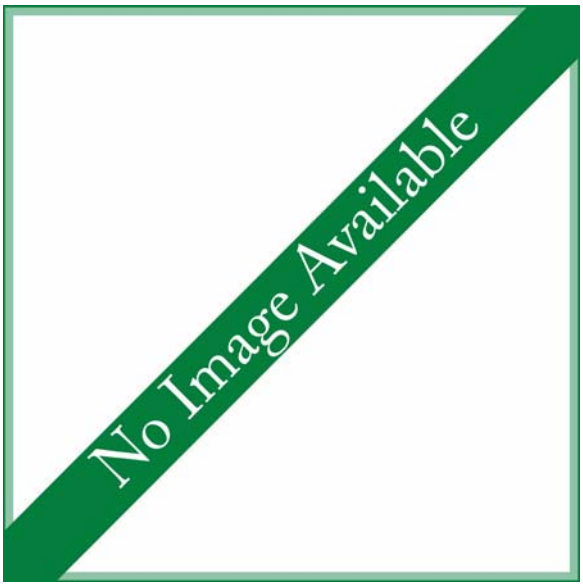
isopod

Class: Malacostraca
Order: Isopoda
Family: Asellidae

Priority Score: 80 out of 100



Population Trend: Unknown



Global Rank: G1? — Critically imperiled (inexact numeric rank)

State Rank: S1? — Critically imperiled in Arkansas (inexact numeric rank)

Distribution

Element Occurrence Records

Ecoregions where the species occurs:

- [x] Ozark Highlands
- [ ] Boston Mountains
- [ ] Arkansas Valley
- [ ] Ouachita Mountains
- [ ] South Central Plains
- [ ] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

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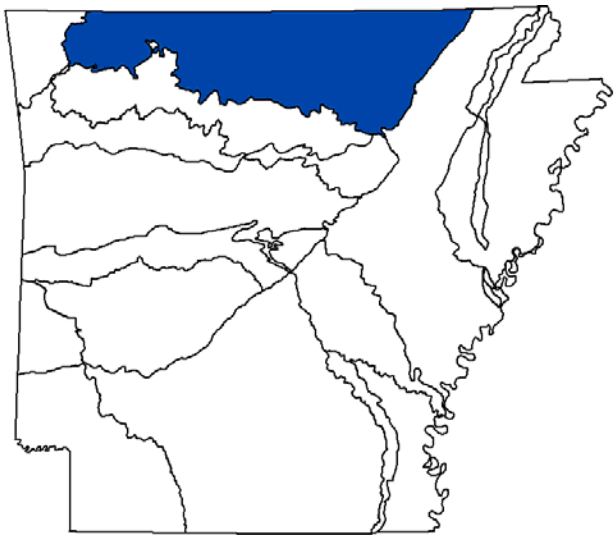
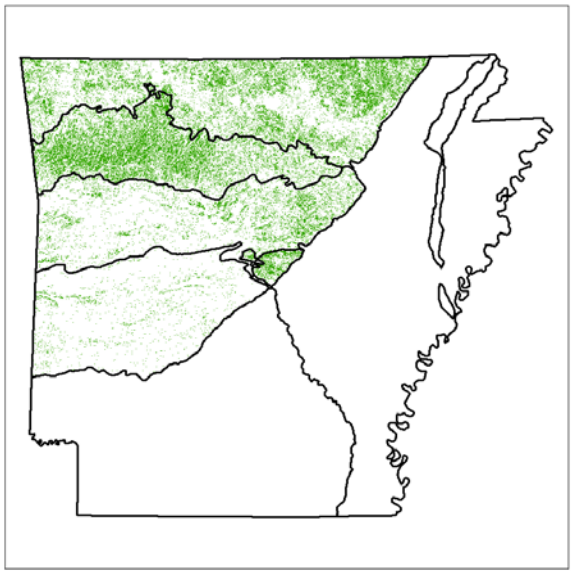


Ecobasins where this species occurs



Terrestrial Habitats

Ecobasins

Ozark Highlands - White River

Terrestrial Habitats

Caves, Mines, Sinkholes and other Karst Features	Obligate

Aquatic Habitats

Natural Cave Stream: Headwater - Small	Obligate
Natural Groundwater:	Data Gap
Natural Seep: Headwater - Small	Data Gap
Natural Spring Run: Headwater - Small	Data Gap

Lirceus bidentatus
isopod

Problems Faced

Threat: Sedimentation
Source: Forestry activities

Threat: Toxins/contaminants
Source: Municipal/Industrial point source

Data Gaps/Research Needs

Determine life history information.

Determine taxonomic status. Validity of this species is in question.

Survey for baseline information on distribution and population status.

Conservation Actions

	Importance	Category
More data are needed to determine conservation actions.	Medium	Data Gap

Monitoring Strategies

More data are needed before a monitoring strategy can be developed.

Comment

This Arkansas endemic isopod is only known from a seep in the Ozark Mountains of Boone County (Hubricht and Mackin 1949).

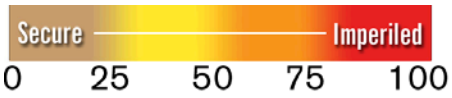
Lirceus bidentatus
isopod

Microcreagris ozarkensis

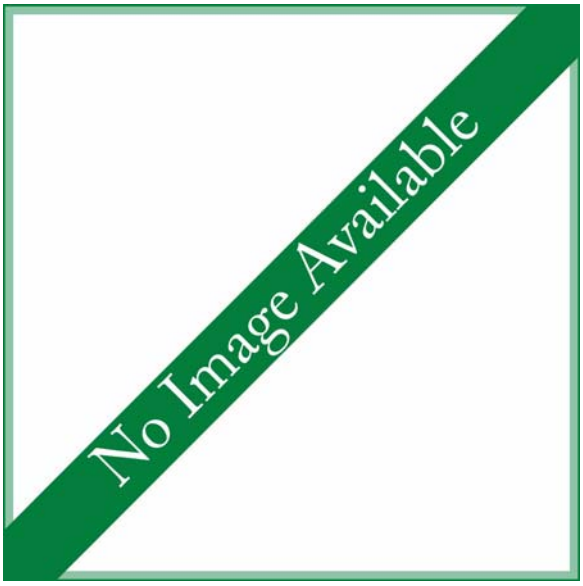
pseudoscorpion

Class: Arachnida
Order: Pseudoscorpiones
Family: Neobisiidae

Priority Score: 23 out of 100



Population Trend: Unknown

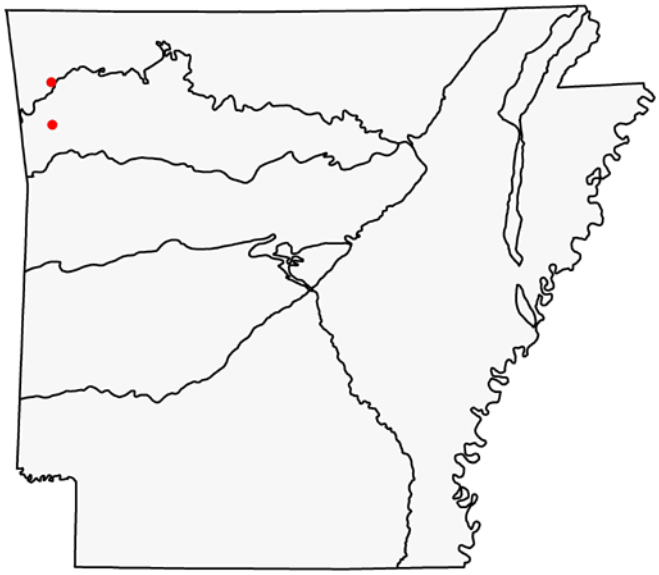


Global Rank: G? — Uncertain global ranking

State Rank: S1 — Critically imperiled in Arkansas

Distribution

Occurrence Records



Ecoregions where the species occurs:

- Ozark Highlands ☑
- Boston Mountains ☑
- Arkansas Valley ☐
- Ouachita Mountains ☐
- South Central Plains ☐
- Mississippi Alluvial Plain ☐
- Mississippi Valley Loess Plain ☐

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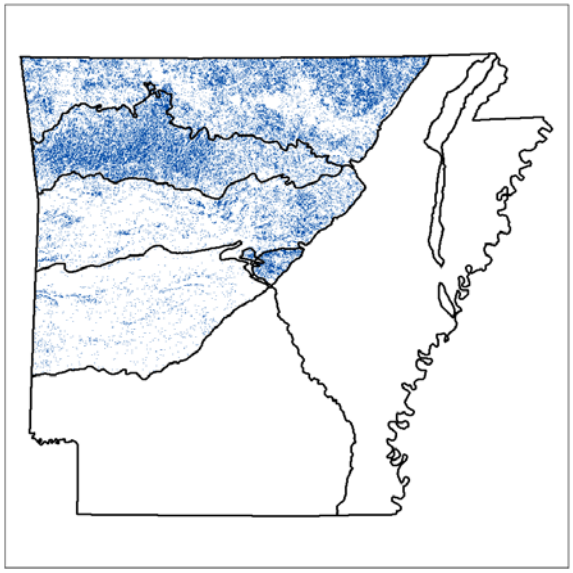


Habitat Map

Habitats

	Weight
Ozark-Ouachita Dry-Mesic Oak Forest	Suitable
Ozark-Ouachita Mesic Hardwood Forest	Suitable

Problems Faced

Timber harvesting that decreases available dead wood and leads to more xeric forest conditions.	Threat: Habitat disturbance Source: Forestry activities

Data Gaps/Research Needs

Need to obtain baseline information on distribution and population status.

Conservation Actions

	Importance	Category
Limit timber harvesting in areas where this species is known to occur.	Medium	Habitat Protection

Monitoring Strategies

Survey for additional populations and monitor known occurrences.

Comments

An Arkansas endemic pseudoscorpion that has been collected only from Washington County (Hoff 1945).

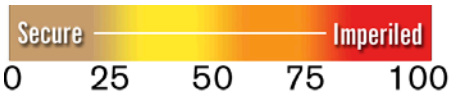
Microcreagris ozarkensis
pseudoscorpion

Millerelix peregrina

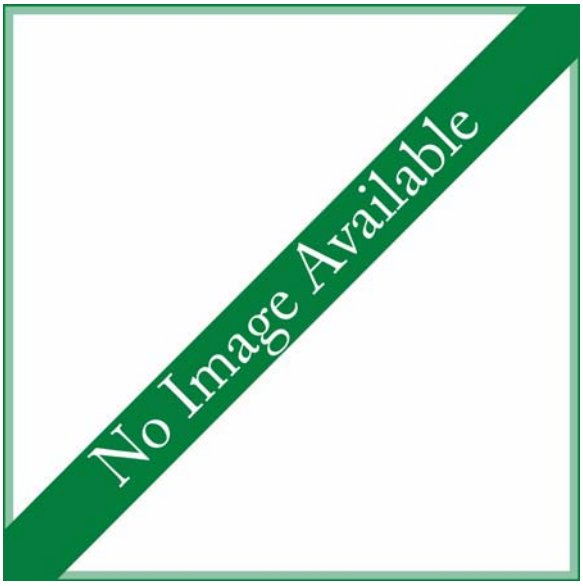
White Liptooth

Class: Gastropoda
Order: Stylommatophora
Family: Polygyridae

Priority Score: **34** out of 100



Population Trend: Unknown

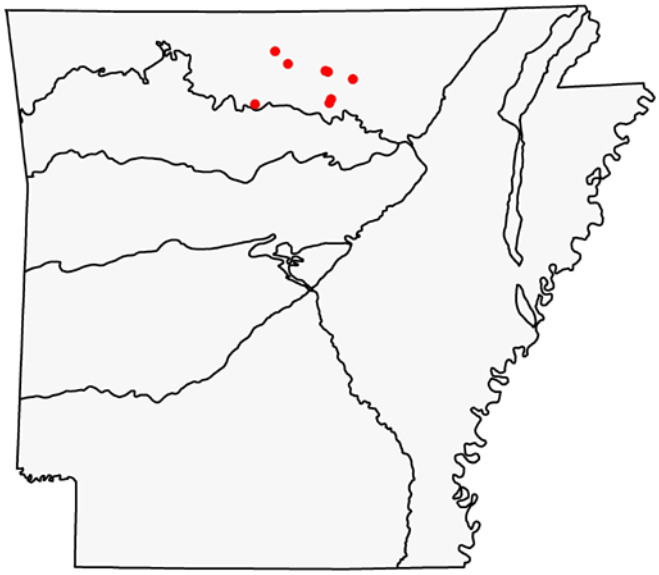


Global Rank: G2 — Imperiled species

State Rank: S? — Uncertain ranking in Arkansas

Distribution

Occurrence Records



Ecoregions where the species occurs:

- Ozark Highlands ☑
- Boston Mountains ☐
- Arkansas Valley ☐
- Ouachita Mountains ☐
- South Central Plains ☐
- Mississippi Alluvial Plain ☐
- Mississippi Valley Loess Plain ☐

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Habitat Map

Habitats

Ozark-Ouachita Mesic Hardwood Forest

Weight

Data Gap

Conservation Actions

More data are needed to determine conservation actions.

Importance Medium

Category Data Gap

Monitoring Strategies

Surveys to locate additional populations and protection of stream habitats.

Comments

Terrestrial snail. (Turgeon and others 1998).

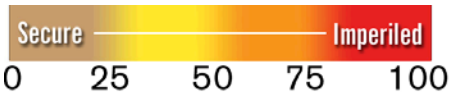
Millerelix peregrina
White Liptooth

Paravitrea aulacogyra

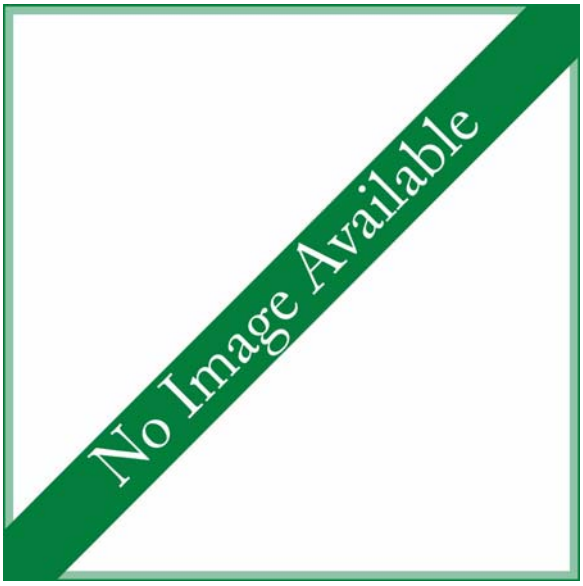
Striate Supercoil

Class: Gastropoda
Order: Stylommatophora
Family: Zonitidae

Priority Score: **80** out of 100



Population Trend: Unknown



Global Rank: GHQ — Historic record of questionable taxonomy

State Rank: SH — Historic record. Possibly extirpated in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- Ozark Highlands ☐
- Boston Mountains ☐
- Arkansas Valley ☑
- Ouachita Mountains ☐
- South Central Plains ☐
- Mississippi Alluvial Plain ☐
- Mississippi Valley Loess Plain ☐

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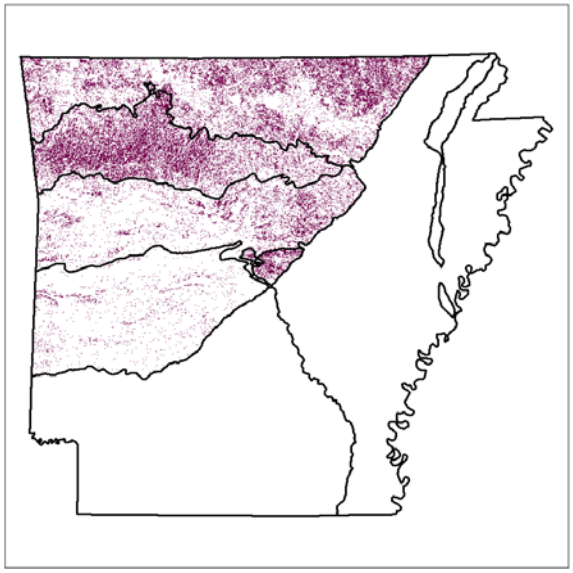


Habitat Map

Habitats

	Weight
Ozark-Ouachita Cliff and Talus	Optimal

Problems Faced

Forestry practices that disturb litter layer and create xeric conditions.	Threat: Habitat disturbance Source: Forestry activities
Loss of habitat to development.	Threat: Habitat destruction or conversion Source: Recreation

Data Gaps/Research Needs

Need to obtain baseline information on distribution and population status.

Conservation Actions

	Importance	Category
More data are needed to determine conservation actions.	Medium	Data Gap

Monitoring Strategies

Survey areas near known occurrences to locate additional populations.

Comments

An Arkansas endemic species, this terrestrial snail is known only from a site on the northern summit of Magazine Mountain in Logan County (Pislbry and Ferris 1906).

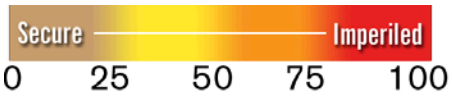
Paravitrea aulacogyra
Striate Supercoil

Patera clenchi

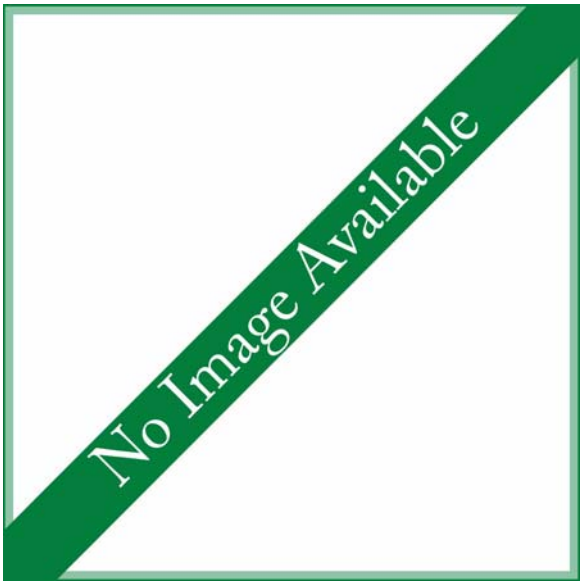
Calico Rock Oval

Class: Gastropoda
Order: Stylommatophora
Family: Polygyridae

Priority Score: 65 out of 100



Population Trend: Unknown

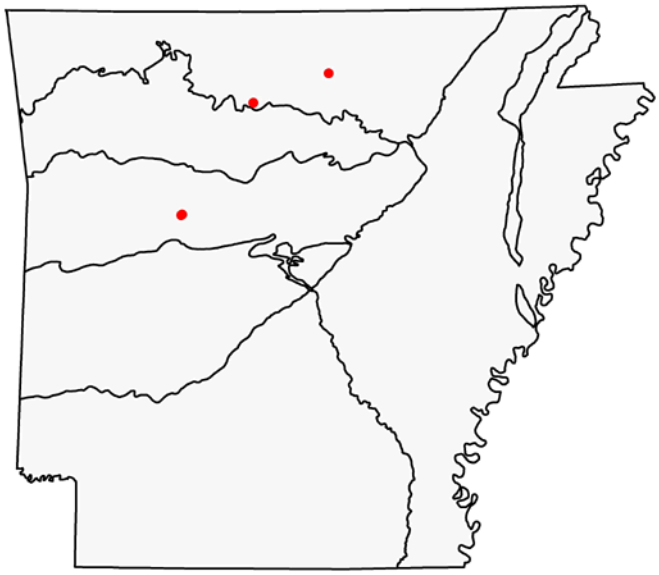


Global Rank: G1 — Critically imperiled species

State Rank: S? — Uncertain ranking in Arkansas

Distribution

Occurrence Records



Ecoregions where the species occurs:

- Ozark Highlands ☑
- Boston Mountains ☐
- Arkansas Valley ☑
- Ouachita Mountains ☐
- South Central Plains ☐
- Mississippi Alluvial Plain ☐
- Mississippi Valley Loess Plain ☐

Taxa Association Team and Peer Reviewers

ANHC Mr. Michael Warriner, AGFC Mr. Brian Wagner

Habitat Map

Conservation Actions

	Importance	Category
More data are needed to determine conservation actions.	Medium	Data Gap

Monitoring Strategies

Surveys to locate additional populations.

Comments

Terrestrial snail. (Turgeon and others 1998).

Patera clenchi
Calico Rock Oval

Pyrgulopsis ozarkensis

Ozark Pyrg

Class: Gastropoda
Order: Neotaenioglossa
Family: Hydrobiidae

Priority Score: 80 out of 100

Population Trend: Unknown

Gobal Rank: G1 — Critically imperiled species

State Rank: S1? — Critically imperiled in Arkansas (inexact numeric rank)

Distribution

Occurrence Records

Ecoregions where the species occurs:

- [x] Ozark Highlands
- [ ] Boston Mountains
- [ ] Ouachita Mountains
- [ ] Arkansas Valley
- [ ] South Central Plains
- [ ] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

Taxa Association Team and Peer Reviewer

ANHC Mr. Michael Warriner, AGFC Mr. Brian Wagner

Ecobasins where the species occurs

Problems Faced

Threat:
Source:

Data Gaps/Research Needs

Conduct distribution and abundance studies.

Conservation Actions

	Importance	Category
More data are needed to determine conservation actions.	Medium	Data Gap

Monitoring Strategies

Surveys to locate additional populations and protection of stream habitats.

Comments

Freshwater snail reclassified as Marstonia ozarkensis (Hershler and Thompson 1987, Thompson and Hershler 2002, Turgeon and others 1998).

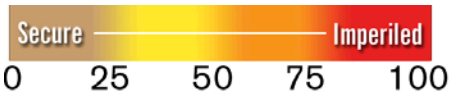
Pyrgulopsis ozarkensis
Ozark Pyrg

Pseudosinella dubia

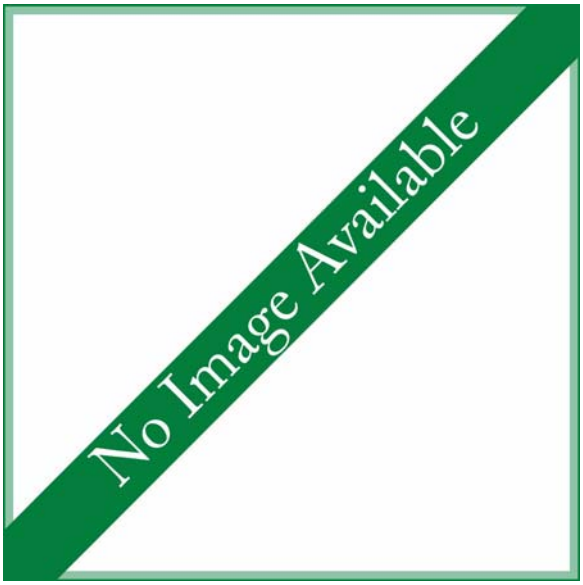
springtail

Class: Elliplura
Order: Collembola
Family: Entomobryidae

Priority Score: 50 out of 100



Population Trend: Unknown

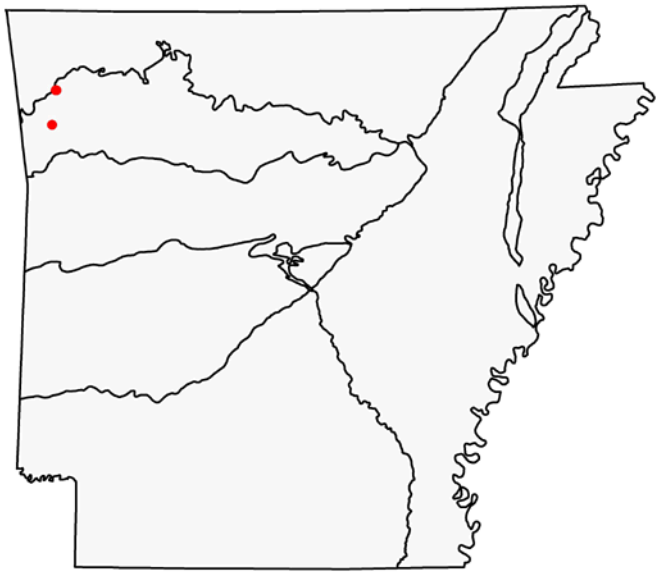


Global Rank: G1G2 — Critically imperiled (uncertain rank)

State Rank: S? — Uncertain ranking in Arkansas

Distribution

Occurrence Records



Ecoregions where the species occurs:

- Ozark Highlands ☐
- Boston Mountains ☑
- Arkansas Valley ☐
- Ouachita Mountains ☐
- South Central Plains ☐
- Mississippi Alluvial Plain ☐
- Mississippi Valley Loess Plain ☐

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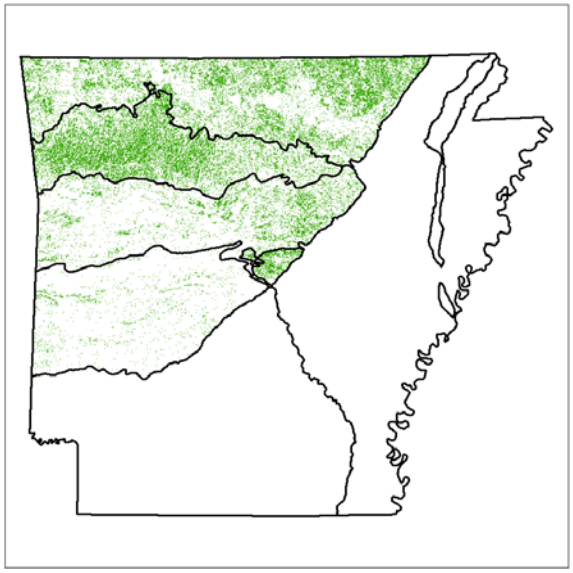


Habitat Map

Habitats

	Weight
Caves, Mines, Sinkholes and other Karst Features	Obligate

Problems Faced

Disturbed litter layer creates xeric conditions.	Threat: Habitat disturbance Source: Forestry activities
Loss of habitat to development.	Threat: Habitat destruction or conversion Source: Urban development

Data Gaps/Research Needs

Determine life history information.

Evaluate taxonomic relationships.

Survey for additional populations.

Conservation Actions

	Importance	Category
More data are needed to determine conservation actions.	Medium	Data Gap

Monitoring Strategies

Additional information is needed before a monitoring strategy can be developed.

Pseudosinella dubia
springtail

Comments

Collembola.

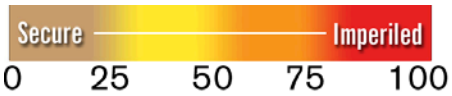
Pseudosinella dubia
springtail

Pseudosinella testa

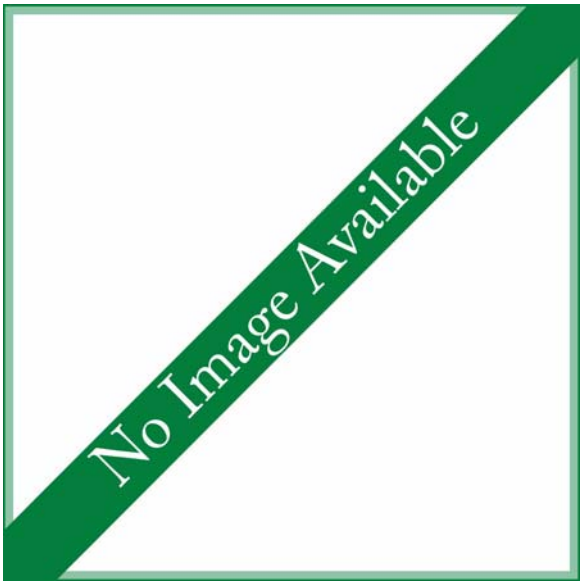
Shelled Cave Springtail

Class: Elliplura
Order: Collembola
Family: Entomobryidae

Priority Score: 42 out of 100



Population Trend: Unknown



Global Rank: G2G3 — Imperiled (uncertain rank)

State Rank: S1 — Critically imperiled in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- Ozark Highlands ☑
- Boston Mountains ☑
- Arkansas Valley ☐
- Ouachita Mountains ☐
- South Central Plains ☐
- Mississippi Alluvial Plain ☐
- Mississippi Valley Loess Plain ☐

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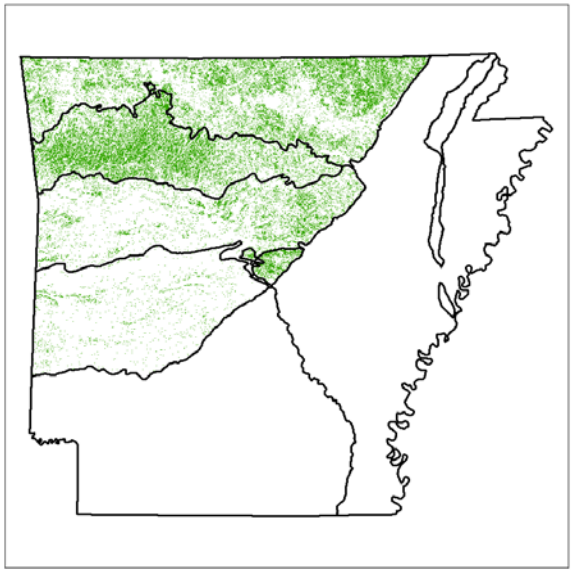


Habitat Map

Habitats

	Weight
Caves, Mines, Sinkholes and other Karst Features	Obligate

Problems Faced

Development/disturbance of cave habitat and recharge zone.	Threat: Habitat disturbance Source: Urban development
Groundwater contamination.	Threat: Habitat disturbance Source: Urban development

Data Gaps/Research Needs

Determine life history information.

Obtain baseline information on distribution and population status.

Conservation Actions

	Importance	Category
Maintain groundwater quality.	Medium	Habitat Protection
Protect cave habitat and recharge zone from development or disturbance.	Medium	Habitat Protection

Monitoring Strategies

More data are needed before a monitoring strategy can be developed.

Comments

Collembola.

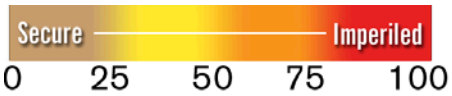
Pseudosinella testa
Shelled Cave Springtail

Pseudozaona occidentalis

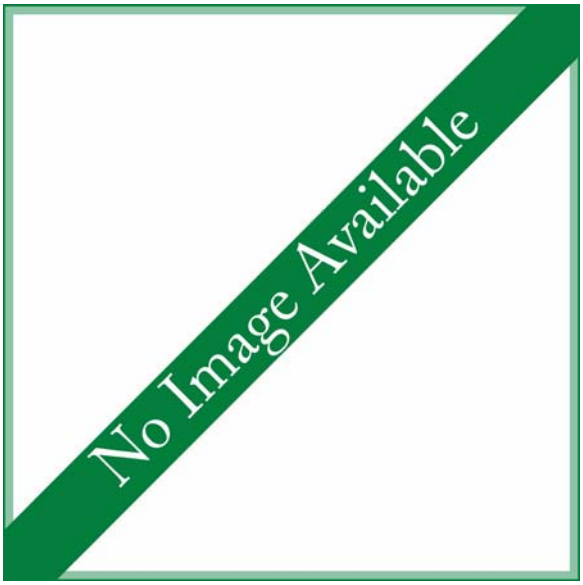
pseudoscorpion

Class: Arachnida
Order: Pseudoscorpiones
Family: Chernetidae

Priority Score: 23 out of 100



Population Trend: Unknown



Global Rank: G? — Uncertain global ranking

State Rank: S1 — Critically imperiled in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- Ozark Highlands ☐
- Boston Mountains ☑
- Arkansas Valley ☐
- Ouachita Mountains ☐
- South Central Plains ☐
- Mississippi Alluvial Plain ☐
- Mississippi Valley Loess Plain ☐

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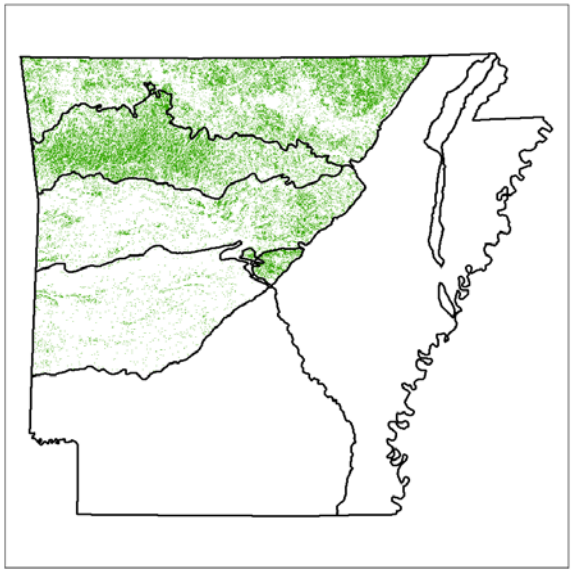


Habitat Map

Habitats

	Weight
Caves, Mines, Sinkholes and other Karst Features	Obligate

Problems Faced

Disturbance of cave habitat and recharge zone.	Threat: Habitat disturbance Source: Recreation
Groundwater contamination.	Threat: Toxins/contaminants Source: Municipal/Industrial point source

Data Gaps/Research Needs

Need to obtain baseline information on distribution and population status.

Conservation Actions

	Importance	Category
Maintain groundwater quality.	Medium	Habitat Protection
Protect cave habitat and recharge zone from development or disturbance.	Medium	Habitat Protection

Monitoring Strategies

Survey for additional populations and monitor known occurrences.

Comments

An Arkansas endemic species, this pseudoscorpion is only known from Fincher and Carrol Caves in Washington County (Hoff and Bolsterti 1956).

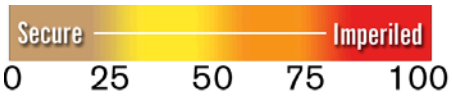
Pseudozaona occidentalis
pseudoscorpion

Schaefferia alabamensis

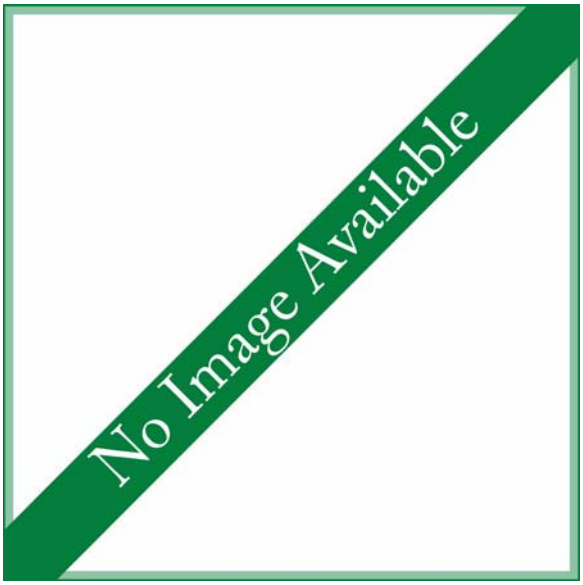
cave obligate springtail

Class: Elliplura
Order: Collembola
Family: Hypogastruridae

Priority Score: 65 out of 100



Population Trend: Unknown



Global Rank: G1G2 — Critically imperiled (uncertain rank)

State Rank: S1 — Critically imperiled in Arkansas

Distribution

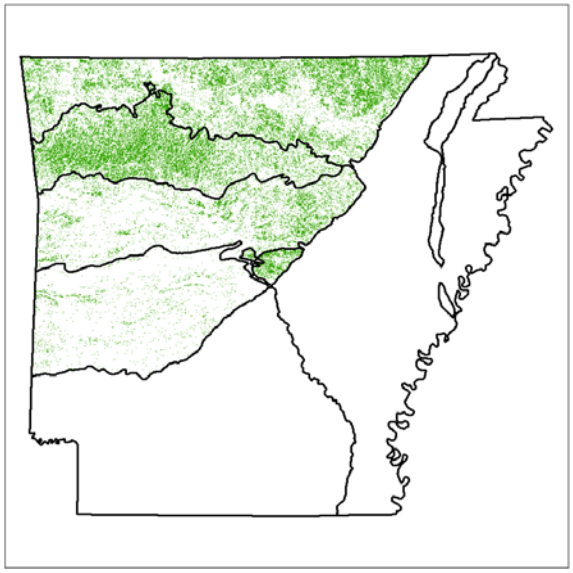
Occurrence Records

Ecoregions where the species occurs:

- Ozark Highlands ☑
- Boston Mountains ☑
- Arkansas Valley ☐
- Ouachita Mountains ☐
- South Central Plains ☐
- Mississippi Alluvial Plain ☐
- Mississippi Valley Loess Plain ☐

Taxa Association Team and Peer Reviewers

ANHC Mr. Michael Warriner, AGFC Mr. Brian Wagner



Habitat Map

Habitats

	Weight
Caves, Mines, Sinkholes and other Karst Features	Obligate

Problems Faced

Development/disturbance of cave habitat and recharge zone.	Threat: Habitat disturbance Source: Urban development
Groundwater contamination.	Threat: Toxins/contaminants Source: Urban development

Data Gaps/Research Needs

Determine life history information.

Survey for baseline information on distribution and population status.

Conservation Actions

	Importance	Category
Maintain groundwater quality.	Medium	Habitat Protection
Protect cave habitat and recharge zone from development or disturbance.	Medium	Habitat Protection

Monitoring Strategies

More data are needed before a monitoring strategy can be developed.

Schaefferia alabamensis
cave obligate springtail

Comments

Collembola. The Arkansas specimens that have been called this species are currently being redescribed as a new species (pers comm., Mike E. Slay).

Schaefferia alabamensis
cave obligate springtail

Somatogyrus crassilabris

Thicklipped Pebblesnail

Class: Gastropoda
Order: Neotaenioglossa
Family: Hydrobiidae

Priority Score: 80 out of 100

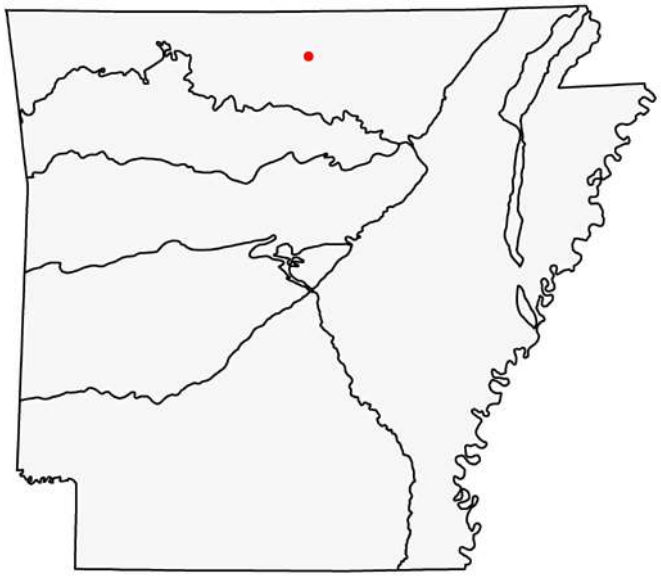
Population Trend: Unknown

Gobal Rank: GX — Presumed extinct

State Rank: SX — Presumed extinct

Distribution

Occurrence Records



Ecoregions where the species occurs:

- [x] Ozark Highlands
- [ ] Boston Mountains
- [ ] Ouachita Mountains
- [ ] Arkansas Valley
- [ ] South Central Plains
- [ ] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

Taxa Association Team and Peer Reviewer

ANHC Mr. Michael Warriner, AGFC Mr. Brian Wagner

Ecobasins where the species occurs

Problems Faced

Threat: Hydrological alteration
Source: Dam

Data Gaps/Research Needs

Need to obtain baseline information on distribution and population status.

Conservation Actions

	Importance	Category
More data are needed to determine conservation actions.	Medium	Data Gap

Monitoring Strategies

Surveys to locate additional populations.

Comments

This freshwater snail species is also known as the Thick-lip Pebblesnail. It is known only from the North Fork of the White River in Baxter County, Arkansas (Robison and Allen 1995). Presumed extinct from the North Fork of the White River, Norfolk, Arkansas (Burch and Tottenham 1980).

Somatogyrus wheeleri

Channelled Pebblesnail

Class: Gastropoda
Order: Neotaenioglossa
Family: Hydrobiidae

Priority Score: 80 out of 100

Population Trend: Unknown

Gobal Rank: GX — Presumed extinct

State Rank: SX — Presumed extinct

Distribution

Occurrence Records

Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☐ Ouachita Mountains
- ☐ Arkansas Valley
- ☑ South Central Plains
- ☐ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

Taxa Association Team and Peer Reviewer

ANHC Mr. Michael Warriner, AGFC Mr. Brian Wagner

Ecobasins where the species occurs

Problems Faced

Threat: Hydrological alteration
Source: Dam

Data Gaps/Research Needs

Need to obtain baseline information on distribution and population status.

Conservation Actions

	Importance	Category
More data are needed to determine conservation actions.	Medium	Data Gap

Monitoring Strategies

Comments

This freshwater snail species is extirpated in the subnation. Habitat probably destroyed by reservoirs. Known only from the Ouachita River in Clark County, AR (Robison and Allen 1995, Turgeon and others 1998).

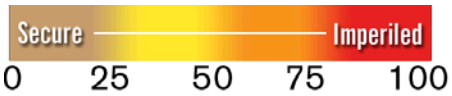
Somatogyrus wheeleri
Channelled Pebblesnail

Stenotrema pilsbryi

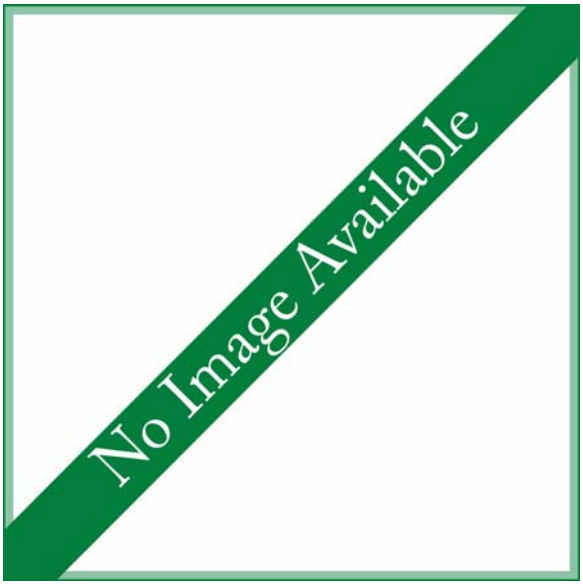
Rich Mountain Slitmouth

Class: Gastropoda
Order: Stylommatophora
Family: Polygyridae

Priority Score: 46 out of 100



Population Trend: Unknown



Global Rank: G2 — Imperiled species

State Rank: S2 — Imperiled in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- Ozark Highlands ☐
- Boston Mountains ☐
- Arkansas Valley ☐
- Ouachita Mountains ☑
- South Central Plains ☐
- Mississippi Alluvial Plain ☐
- Mississippi Valley Loess Plain ☐

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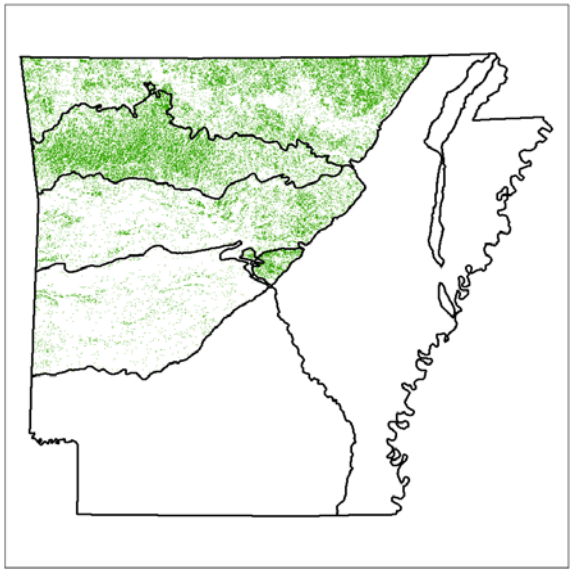


Habitat Map

Habitats

	Weight
Ozark-Ouachita Cliff and Talus	Obligate

Problems Faced

Road construction maintenance.	Threat: Habitat destruction or conversion Source: Road construction

Data Gaps/Research Needs

Need to obtain baseline information on distribution and population status.

Conservation Actions

	Importance	Category
More data are needed to determine conservation actions.	Medium	Data Gap

Monitoring Strategies

Surveys to locate additional populations and protection of stream habitats.

Stenotrema pilsbryi
Rich Mountain Slitmouth

Comments

Terrestrial snail. It is known from numerous locations associated with rock glaciers usually above the 1600 ft. contour, and usually under hardwood forest cover, on Rich and Black Fork Mountains in AR and OK, and on Winding Stair Mountain, OK. There are no major threats to any of the populations. However, there are some activities that could conceivably impact snail habitat, including mowing, paving and repaving of the Talimena Scenic Drive, maintenance of vistas involving periodic localized vegetation management, and maintenance of hiking trails, electronic transmission sites, and one power line right-of way. Population trends are assumed to be steady (ANHI 2003, Rich Mountain Slitmouth Snail MOU 2001, Robison and Allen 1995).

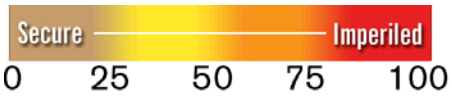
Stenotrema pilsbryi
Rich Mountain Slitmouth

Stenotrema unciferum

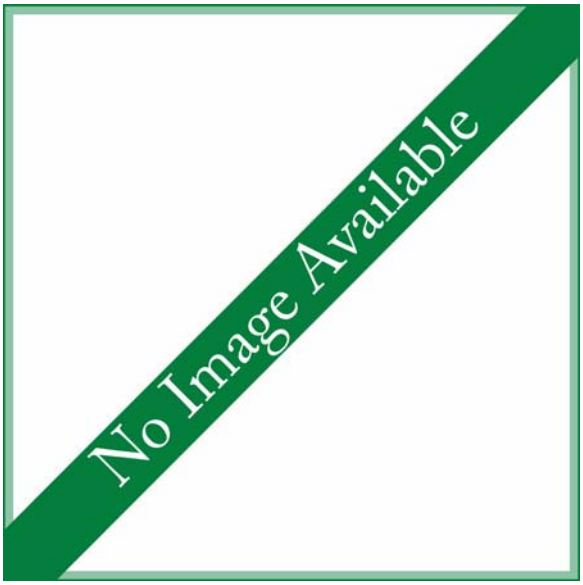
Ouachita Slitmouth

Class: Gastropoda
Order: Stylommatophora
Family: Polygyridae

Priority Score: **34** out of 100



Population Trend: Unknown

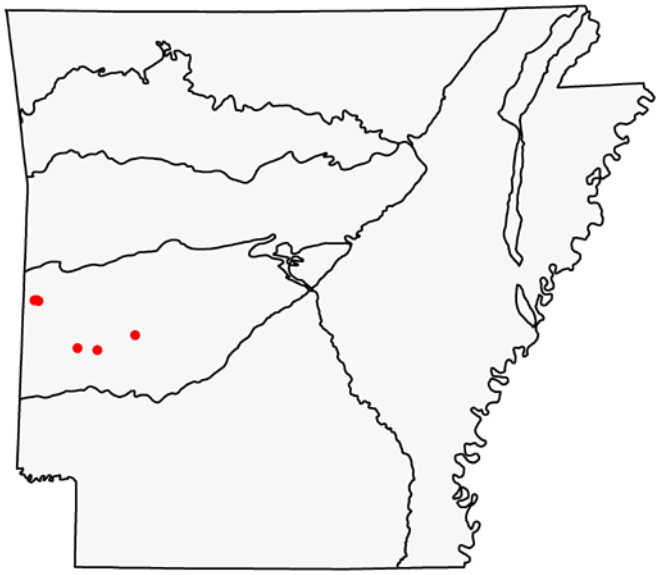


Global Rank: G2 — Imperiled species

State Rank: S? — Uncertain ranking in Arkansas

Distribution

Occurrence Records



Ecoregions where the species occurs:

- Ozark Highlands ☐
- Boston Mountains ☐
- Arkansas Valley ☐
- Ouachita Mountains ☑
- South Central Plains ☐
- Mississippi Alluvial Plain ☐
- Mississippi Valley Loess Plain ☐

Taxa Association Team and Peer Reviewers

ANHC Mr. Michael Warriner, AGFC Mr. Brian Wagner

Habitat Map

Habitats

	Weight
Ozark-Ouachita Mesic Hardwood Forest	Obligate

Problems Faced

Habitat disturbance that limits access to dead wood and creates xeric conditions.	Threat: Habitat disturbance Source: Forestry activities

Data Gaps/Research Needs

Need to obtain baseline information on distribution and population status.

Conservation Actions

	Importance	Category
More data are needed to determine conservation actions.	Medium	Data Gap

Monitoring Strategies

Surveys to locate additional populations and protection of stream habitats.

Comments

Terrestrial snail. Found to occur on moist slopes in rotting timbers, but most particularly under small talus (Brian Coles, pers. Comm.).

Stenotrema unciferum
Ouachita Slitmouth

Stygobromus elatus

Elevated Spring Amphipod

Class: Malacostraca
Order: Amphipoda
Family: Crangonyctidae

Priority Score: 50 out of 100

Population Trend: Unknown

Gobal Rank: G1G2 — Critically imperiled (uncertain rank)

State Rank: SU — Presumed extirpated in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☐ Ouachita Mountains
- ☑ Arkansas Valley
- ☐ South Central Plains
- ☐ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

Taxa Association Team and Peer Reviewer

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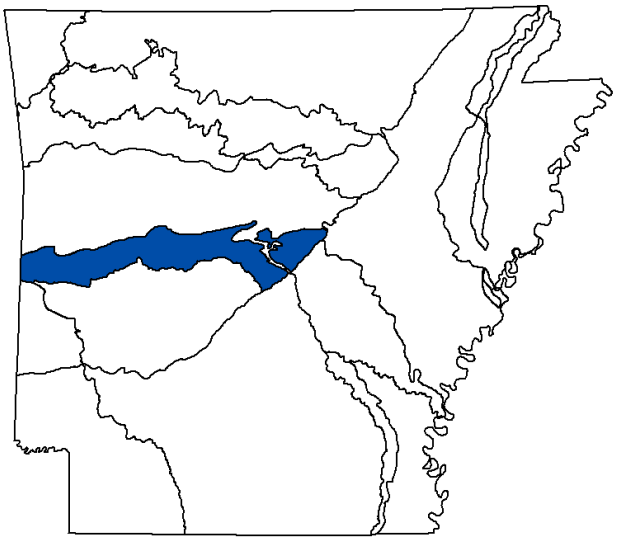


Ecobasins where the species occurs

Ecobasins

Arkansas Valley - Arkansas River

Habitats	Weight
Natural Groundwater:	Data Gap
Natural Seep: Headwater - Small	Obligate
Natural Spring Run: Headwater - Small	Data Gap

Problems Faced

Threat: Habitat destruction or conversion
Source: Recreation

Data Gaps/Research Needs

Determine life history information.

Survey for baseline information on distribution and population status.

Conservation Actions	Importance	Category
More data are needed to determine conservation actions.	Medium	Data Gap

Monitoring Strategies

More data are needed before a monitoring strategy can be developed.

Comments

An Arkansas endemic amphipod, this species has only been collected from a seep on Magazine Mountain in Logan County (Holsinger 1967).

Stygobromus elatus
Elevated Spring Amphipod

Stygobromus montanus

Mountain Cave Amphipod

Class: Malacostraca
Order: Amphipoda
Family: Crangonyctidae

Priority Score: **65** **out of 100**

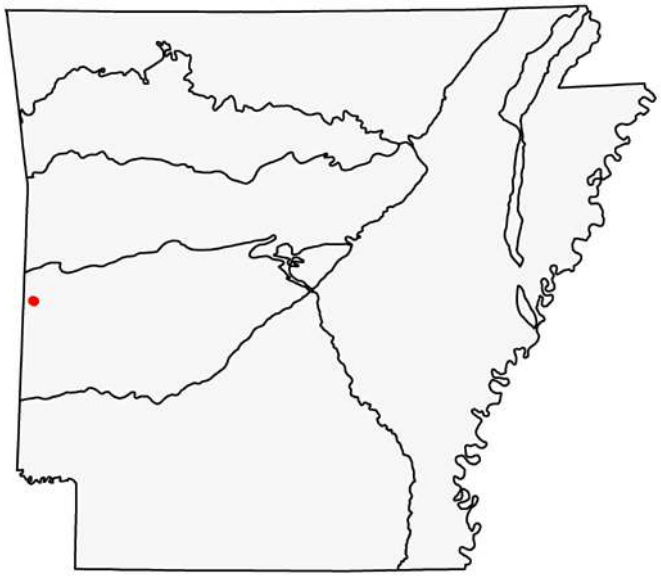
Population Trend: Unknown

Gobal Rank: G1G2 — Critically imperiled (uncertain rank)

State Rank: S1 — Critically imperiled in Arkansas

Distribution

Occurrence Records



Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☑ Ouachita Mountains
- ☐ Arkansas Valley
- ☐ South Central Plains
- ☐ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

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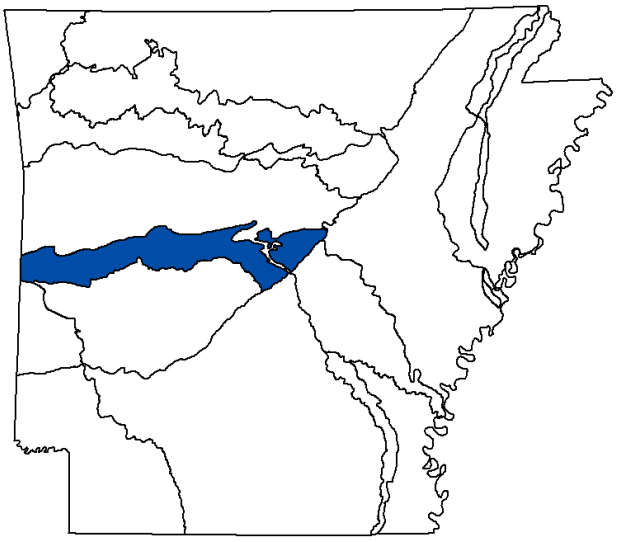


Ecobasins where the species occurs

Ecobasins

Ouachita Mountains - Arkansas River

Habitats	Weight
Natural Groundwater:	Data Gap
Natural Seep: Headwater - Small	Optimal

Problems Faced

Threat: Habitat disturbance
Source: Forestry activities

Threat: Toxins/contaminants
Source: Municipal/Industrial point source

Data Gaps/Research Needs

Determine life history information.

Survey for baseline information on distribution and population status.

Conservation Actions	Importance	Category
Protect seeps and seep recharge zones.	Medium	Habitat Protection

Monitoring Strategies

More data are needed before a monitoring strategy can be developed.

Comments

This Arkansas endemic amphipod has only been collected from a unidentified spring on Rich Mountain (Holsinger 1967).

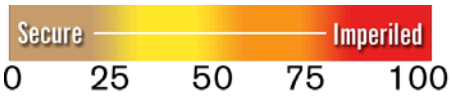
Stygobromus montanus
Mountain Cave Amphipod

Stygobromus ozarkensis

Ozark Cave Amphipod

Class: Malacostraca
Order: Amphipoda
Family: Crangonyctidae

Priority Score: 27 out of 100



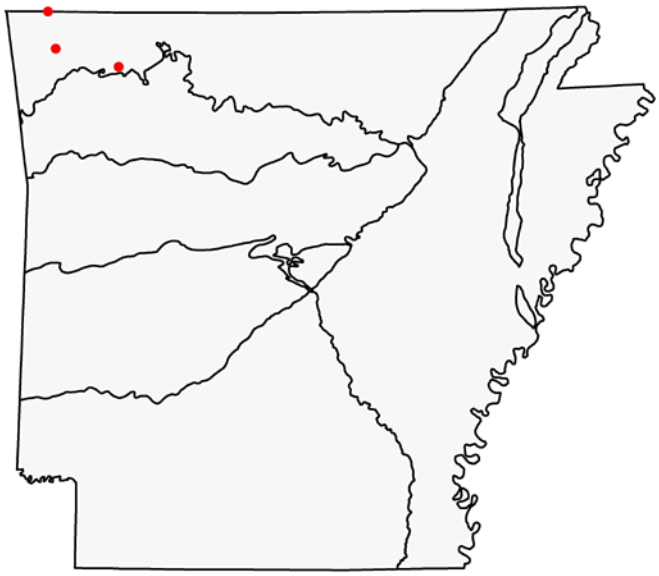
Population Trend: Unknown

Global Rank: G4 — Apparently secure species

State Rank: S1 — Critically imperiled in Arkansas

Distribution

Element Occurrence Records



Ecoregions where the species occurs:

- [x] Ozark Highlands
- [x] Boston Mountains
- [ ] Arkansas Valley
- [ ] Ouachita Mountains
- [ ] South Central Plains
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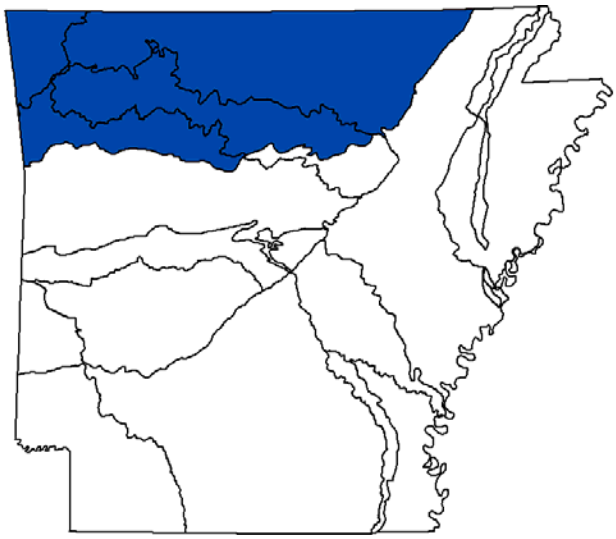
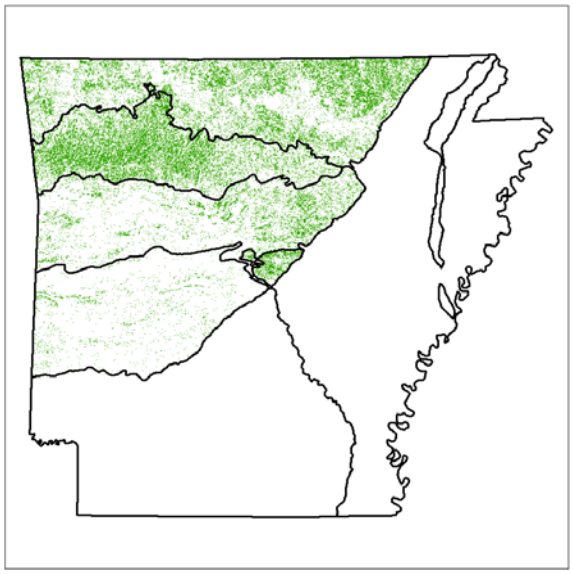


Ecobasins where this species occurs



Terrestrial Habitats

Ecobasins

Boston Mountains - Arkansas River
Boston Mountains - White River
Ozark Highlands - Arkansas River
Ozark Highlands - White River

Terrestrial Habitats

Caves, Mines, Sinkholes and other Karst Features	Obligate

Stygobromus ozarkensis
Ozark Cave Amphipod

Aquatic Habitats

Natural Cave Stream: Headwater - Small	Optimal
Natural Groundwater:	Optimal
Natural Seep: Headwater - Small	Suitable
Natural Spring Run: Headwater - Small	Marginal

Problems Faced

Threat: Sedimentation
Source: Urban development

Threat: Toxins/contaminants
Source: Urban development

Data Gaps/Research Needs

Determine life history information.

Evaluate taxonomic relationships.

Survey and model for additional occurrences.

Conservation Actions	Importance	Category
Protect caves and cave recharge zones.	Medium	Habitat Protection

Monitoring Strategies

Monitor known occurrences in cave surveys.

Comment

This crustacean species is limited to groundwater habitats and occurs in fewer than 15 caves in Arkansas (personal communication, Mike E. Slay).

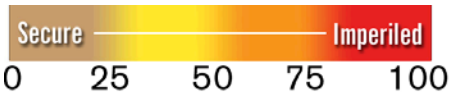
Stygobromus ozarkensis
Ozark Cave Amphipod

Trigenotyla parca

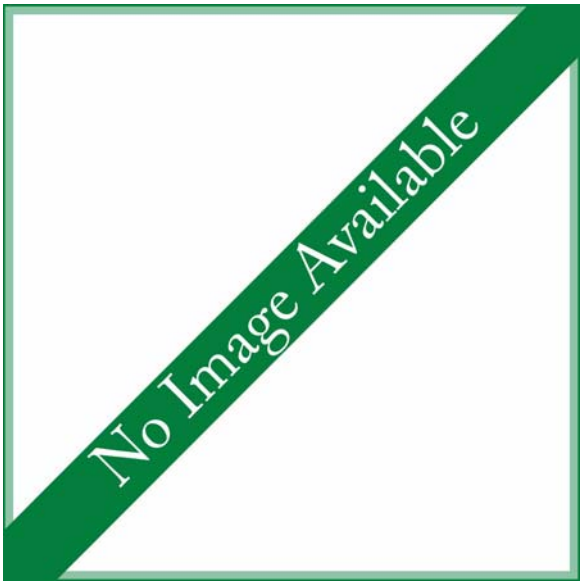
cave obligate millipede

Class: Diplopoda
Order: Chordeumatida
Family: Trichopetalidae

Priority Score: 65 out of 100



Population Trend: Unknown

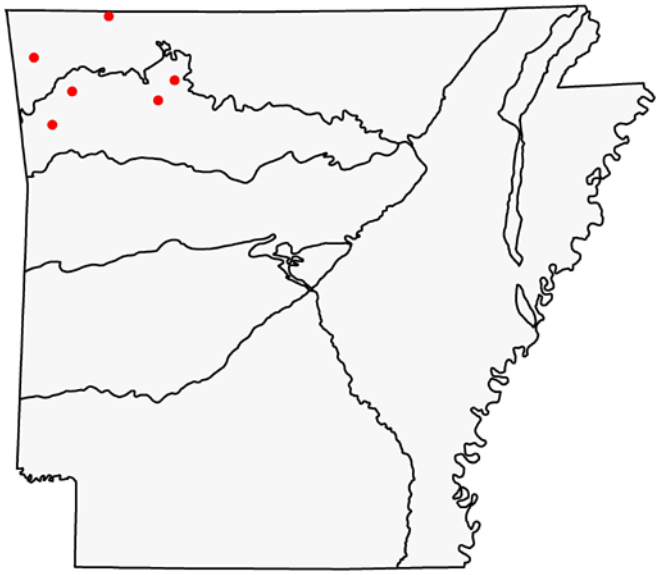


Global Rank: G1G2 — Critically imperiled (uncertain rank)

State Rank: S1 — Critically imperiled in Arkansas

Distribution

Occurrence Records



Ecoregions where the species occurs:

- Ozark Highlands ☑
- Boston Mountains ☑
- Arkansas Valley ☐
- Ouachita Mountains ☐
- South Central Plains ☐
- Mississippi Alluvial Plain ☐
- Mississippi Valley Loess Plain ☐

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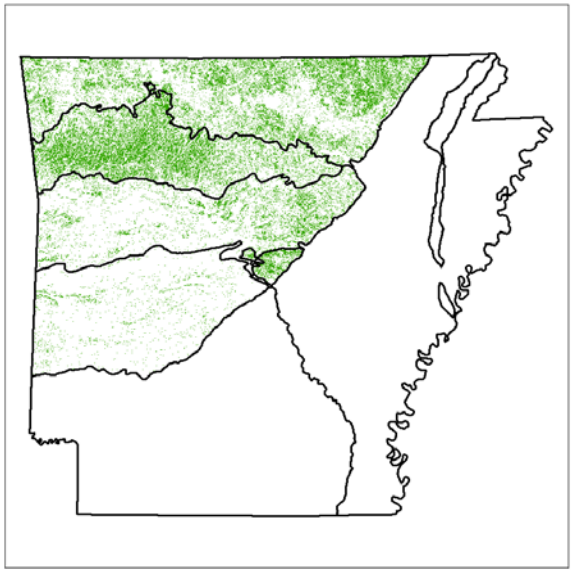


Habitat Map

Habitats

	Weight
Caves, Mines, Sinkholes and other Karst Features	Obligate

Problems Faced

Development/disturbance of cave habitat and recharge zone.	Threat: Habitat destruction Source: Urban development
Groundwater contamination.	Threat: Toxins/contaminants Source: Non-point source pollution

Data Gaps/Research Needs

Determine life history information.

Obtain baseline information on distribution and population status.

Conservation Actions

	Importance	Category
Maintain groundwater quality.	Medium	Habitat Protection
Protect cave habitat and recharge zone from development or disturbance.	Medium	Habitat Protection

Monitoring Strategies

More data are needed before a monitoring strategy can be developed.

Trigenotyla parca
cave obligate millipede

Comments

No information available.

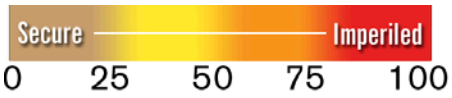
Trigenotyla parca
cave obligate millipede

Xolotrema occidentale

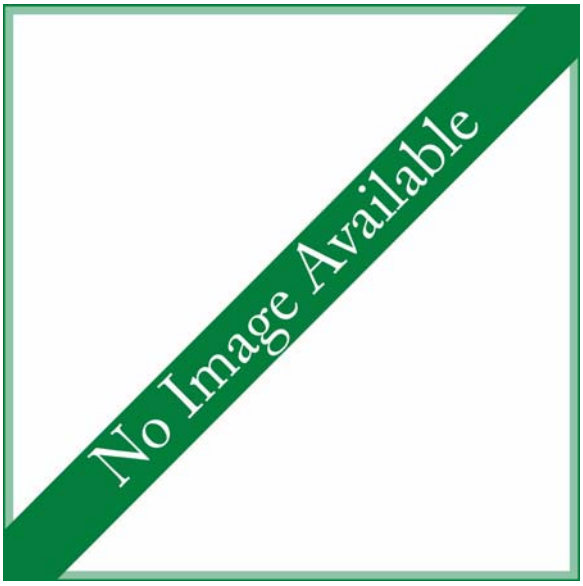
Arkansas Wedge

Class: Gastropoda
Order: Stylommatophora
Family: Polygyridae

Priority Score: 65 out of 100



Population Trend: Unknown

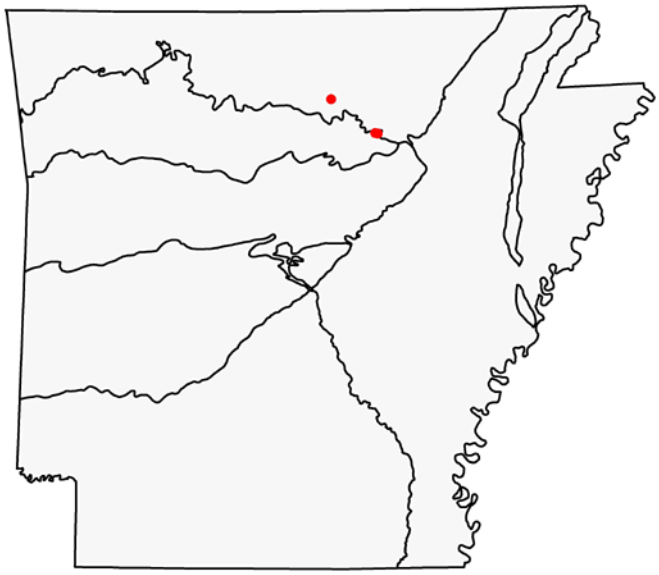


Global Rank: G1 — Critically imperiled species

State Rank: S? — Uncertain ranking in Arkansas

Distribution

Occurrence Records



Ecoregions where the species occurs:

- Ozark Highlands ☑
- Boston Mountains ☐
- Arkansas Valley ☐
- Ouachita Mountains ☐
- South Central Plains ☐
- Mississippi Alluvial Plain ☐
- Mississippi Valley Loess Plain ☐

Taxa Association Team and Peer Reviewers

ANHC Mr. Michael Warriner, AGFC Mr. Brian Wagner

Habitat Map

Data Gaps/Research Needs

Need to obtain baseline information on distribution and population status.

Conservation Actions

	Importance	Category
More data are needed to determine conservation actions.	Medium	Data Gap

Monitoring Strategies

Surveys to locate additional populations and protection of stream habitats.

Comments

Terrestrial snail. (Turgeon and others 1998)

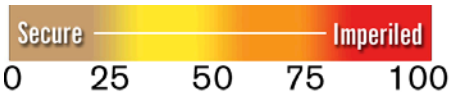
Xolotrema occidentale
Arkansas Wedge

Zealeuctra wachita

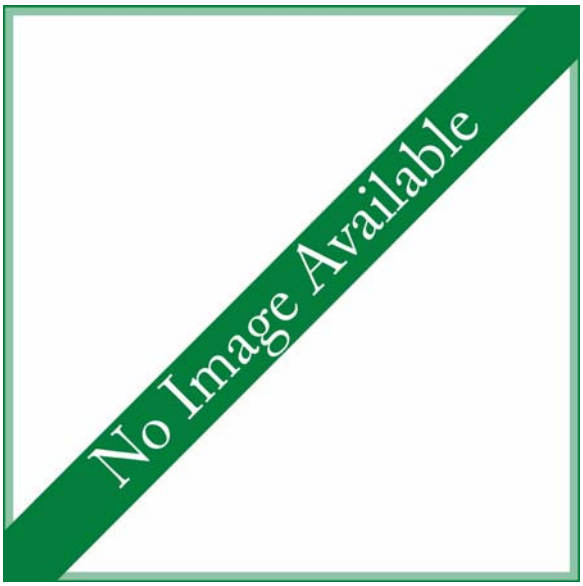
Ouachita Needlefly

Class: Insecta
Order: Plecoptera
Family: Leuctridae

Priority Score: 50 out of 100



Population Trend: Unknown

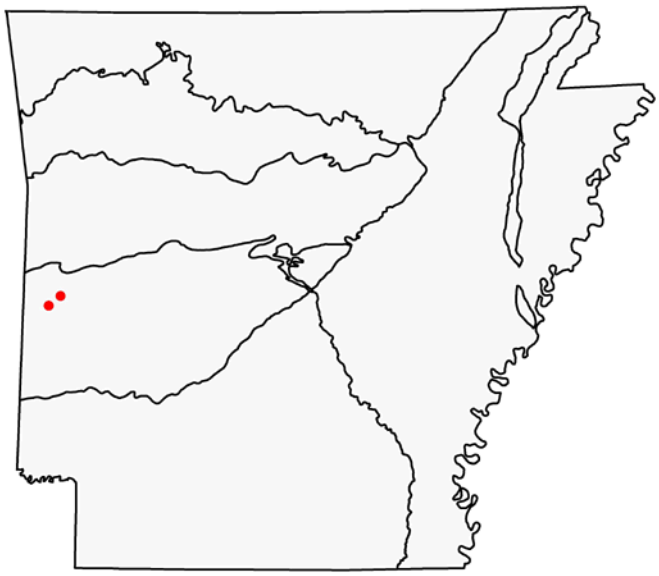


Global Rank: G2 — Imperiled species

State Rank: S1 — Critically imperiled in Arkansas

Distribution

Element Occurrence Records



Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☐ Arkansas Valley
- ☑ Ouachita Mountains
- ☐ South Central Plains
- ☐ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

Taxa Team and Peer Reviewers

ANHC Mr. Michael Warriner, AGFC Mr. Brian Wagner

No Ecobasin Map is available

Ecobasins where this species occurs

Terrestrial Habitats

Ecobasins

Ouachita Mountains - Red River

Problems Faced

Threat: Sedimentation
Source: Resource extraction

Threat: Toxins/contaminants
Source: Municipal/Industrial point source

Data Gaps/Research Needs

Need to obtain baseline information on distribution and population status.

Zealeuctra wachita
Ouachita Needlefly

Conservation Actions

Importance	Category
Medium	Data Gap

More data are needed to determine conservation actions.

Monitoring Strategies

Surveys to locate additional populations and protection of stream habitats.

Comment

Only known from Polk Co. and Scott Co., Arkansas from fewer than five occurrences. Inhabits intermittent streams (Ricker and Ross 1969).

Toxolasma lividum

Purple Lilliput

Class: Bivalvia
Order: Unionoida
Family: Unionidae

Priority Score: **52** **out of 100**

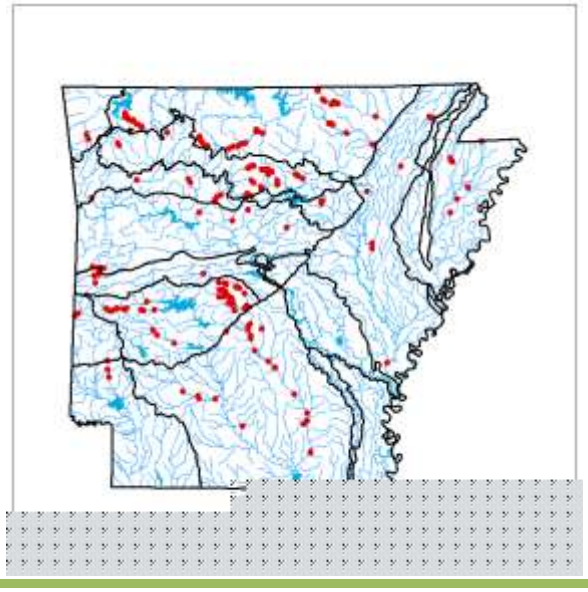
Population Trend: Decreasing

Global Rank: G2 — Imperiled species

State Rank: S3 — Vulnerable in Arkansas

Distribution

Occurrence Records



Ecoregions where the species occurs:

- [x] Ozark Highlands
- [x] Boston Mountains
- [x] Arkansas Valley
- [x] Ouachita Mountains
- [x] South Central Plains
- [x] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

Taxa Association Team and Peer Reviewers

AGFC Mr. Bill Posey, USFWS-ES Mr. Chris Davidson, Dr. John Harris, AHTD Mr. Josh Seagraves, AHTD Mr. Ben Thesing

Ecobasins where the species occurs

Substrate

gravel/cobble

Description

Shell small, rounded to somewhat oblong, relatively solid, and inflated. Anterior end rounded, posterior end bluntly pointed (males) or truncated (females). Umbos inflated and slightly elevated above the hinge line. Beak sculpture of three or four heavy bars. Periostracum tan or dark green to dark brown, becoming black in older shells. Length to one inch (2.5,cm). Pseudocardinal teeth well developed, elevated and serrated; two in the left valve, one in the right. Lateral teeth straight to slightly curved; two in the left valve, one in the right. Beak cavity variable from very shallow to moderately deep. Nacre purple, usually lighter near the ventral margin, and iridescent.

Host Fish

green sunfish, longear sunfish

Ecobasins

Arkansas Valley - Arkansas River

Boston Mountains - Arkansas River

Boston Mountains - White River

Mississippi River Alluvial Plain - St. Francis River

Mississippi River Alluvial Plain - White River

Ouachita Mountains - Arkansas River

Ouachita Mountains - Ouachita River

Ouachita Mountains - Red River

Ozark Highlands - Arkansas River

Ozark Highlands - White River

South Central Plains - Ouachita River

Habitats

	Weight
Natural Pool: Headwater - Small - Medium	Suitable
Natural Run: Headwater - Small - Medium	Optimal

Problems Faced

Threat: Habitat destruction
Source: Dam

Threat: Habitat destruction
Source: Grazing/Browsing

Threat: Habitat destruction
Source: Resource extraction

Threat: Nutrient loading
Source: Confined animal operations

Threat: Nutrient loading
Source: Grazing/Browsing

Threat: Sedimentation
Source: Forestry activities

Threat: Sedimentation
Source: Grazing/Browsing

Threat: Sedimentation
Source: Resource extraction

Threat: Sedimentation
Source: Road construction

Data Gaps/Research Needs

Conduct genetic analysis and comparison of White River and Ouachita River watershed populations.

Conduct life history study.

Conduct status survey.

Conservation Actions

	Importance	Category
Manage watershed, addressing physical, chemical, biological and land use components, to restore or sustain aquatic life.	Medium	Threat Abatement

Monitoring Strategies

Continue to monitor occurrence in ongoing river surveys.

Comments

Widespread but uncommon, usually found in the headwaters to medium rivers. Population numbers appear to be very low (AFMC 2004a, 2004b, 2004c, 2005, AGFC 2003, ANHI 2003, Bates and Dennis 1983, Branson 1984, Brown and Brown 1989, Burns and McDonnell 1992a, Crump 2003, Crump and others 2003a, 2003c, 2003d, 2003e, 2003g, 2003q, 2003r, 2003t, Cummings and Mayer 1992, Davidson 1997, Davidson and others 2000, Ecological Consultants 1984, Gordon 1980, 1980a, 1982, Gordon and Brown 1980, Gordon and others 1979, 1980, Harris 1991d, 1992b, 1994b, 1996, 1997b, 1999, 1999a, Harris and Gordon 1988, 1990, Harris and Milam 2002, Harris and others 1997, Jenkinson and Ahlstedt 1987, Johnson 1980, Meek and Clark 1912, Oesch 1995, ONHI 2003, Posey 1997, Rust 1993, Stansbery 1970, Turgeon and others 1988, 1998, Wheeler 1918, Williams & others 1993).

Toxolasma parvum

Lilliput

Class: Bivalvia
Order: Unionoida
Family: Unionidae

Priority Score: **19** **out of 100**

Population Trend: Decreasing

Global Rank: G5 — Secure

State Rank: S3 — Vulnerable in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- [x] Ozark Highlands
- [x] Boston Mountains
- [x] Arkansas Valley
- [x] Ouachita Mountains
- [x] South Central Plains
- [x] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

Taxa Association Team and Peer Reviewers

AGFC Mr. Bill Posey, USFWS-ES Mr. Chris Davidson, Dr. John Harris, AHTD Mr. Josh Seagraves, AHTD Mr. Ben Thesing

Ecobasins where the species occurs

Substrate

gravel/cobble

Description

Shell small, elliptical or cylindrical, relatively solid, and inflated. Anterior and posterior ends rounded. Umbos inflated and slightly elevated above the hinge line. Beak sculpture consists of five or six distinct angled ridges. Surface of the shell with a clothlike texture, dark green, brown, or dark brown and rayless. Length to 1.5 inches (3.8 cm). Pseudocardinal teeth thin, elevated, compressed, and serrated; two in the left valve, one or two in the right. Lateral teeth long, thin and straight; two in the left valve, one in the right. Beak cavity moderately deep. Nacre silvery or bluish white and highly iridescent.

Host Fish

green sunfish, warmouth, orange spotted sunfish, bluegill, white crappie

Ecobasins

Arkansas Valley - Arkansas River

Boston Mountains - White River

Mississippi River Alluvial Plain - St. Francis River

Mississippi River Alluvial Plain - White River

Ouachita Mountains - Arkansas River

Ouachita Mountains - Ouachita River

Ouachita Mountains - Red River

Ozark Highlands - Arkansas River

Ozark Highlands - White River

South Central Plains - Ouachita River

South Central Plains - Red River

Habitats

	Weight
Natural Pool: Headwater - Small - Medium	Suitable
Natural Run: Headwater - Small - Medium	Optimal

Problems Faced

Threat: Habitat destruction
Source: Dam

Threat: Habitat destruction
Source: Grazing/Browsing

Threat: Habitat destruction
Source: Resource extraction

Threat: Nutrient loading
Source: Confined animal operations

Threat: Nutrient loading
Source: Grazing/Browsing

Threat: Sedimentation
Source: Forestry activities

Threat: Sedimentation
Source: Grazing/Browsing

Threat: Sedimentation
Source: Resource extraction

Threat: Sedimentation
Source: Road construction

Data Gaps/Research Needs

Conduct genetic analysis and comparison of White River, Arkansas River and Ouachita River watershed populations.

Conduct life history study.

Conduct status survey.

Conservation Actions

	Importance	Category
Manage watershed, addressing physical, chemical, biological and land use components, to restore or sustain aquatic life.	Medium	Threat Abatement

Monitoring Strategies

Continue to monitor occurrence in ongoing river surveys.

Comments

Widespread but uncommon, usually found in backwaters and headwaters. Population numbers are unknown. (AFMC 2015)

Toxolasma texasiense

Texas Lilliput

Class: Bivalvia
Order: Unionoida
Family: Unionidae

Priority Score: **19** **out of 100**

Population Trend: Unknown

Global Rank: G4 — Apparently secure species

State Rank: S3 — Vulnerable in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☐ Arkansas Valley
- ☑ Ouachita Mountains
- ☑ South Central Plains
- ☑ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

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Ecobasins where the species occurs

Substrate

sand/silt

Description

Shell elongate, thin to relatively solid, and moderately inflated. Anterior end rounded, posterior end pointed (males) or truncated (females). Umbos even with or only slightly elevated above the hinge line. Beak sculpture of five or six strong angular ridges. Periostracum greenish brown to black with clothlike texture. Length to 2.5 inches (6.4 cm). Pseudocardinal teeth relatively thin and compressed, elevated and serrated; two in the left valve, one in the right. Lateral teeth long, straight or curved; two in the left valve, one in the right. Beak cavity shallow. Nacre white, occasionally tinged with salmon in the beak cavity and center of the shell.

Host Fish

bluegill, warmouth

Ecobasins

Mississippi River Alluvial Plain - White River

Ouachita Mountains - Ouachita River

South Central Plains - Ouachita River

South Central Plains - Red River

Habitats

	Weight
Man-made Littoral: - Small - Large	Suitable
Man-made Pelagic: - Small - Large	Marginal
Natural Other: - Medium - Large	Data Gap
Natural Oxbow - connected: - Medium - Large	Suitable
Natural Oxbow - disconnected:	Suitable
Natural Side channel: - Medium - Large	Suitable
Natural Slough: - Medium - Large	Suitable

Toxolasma texasiense
Texas Lilliput

Problems Faced

Threat: Biological alteration
Source: Exotic species

Threat: Biological alteration
Source: Predation

Threat: Habitat destruction
Source: Channel alteration

Threat: Habitat destruction
Source: Channel maintenance

Data Gaps/Research Needs

Conduct life history study.

Conduct status surveys.

Determine genetic relationships of populations from different streams.

Conservation Actions

	Importance	Category
Manage watershed, addressing physical, chemical, biological and land use components, to restore or sustain aquatic life.	Medium	Threat Abatement

Monitoring Strategies

Continue to monitor occurrence in ongoing river surveys.

Comments

Species is probably more common than is shown by its State Rank. Often found in small, turbid streams with extremely soft substrates and along banks in larger stream which may lead to the species being overlooked during general mussel surveys (AFMC 2004a, 2004b, 2004c, 2005).

Truncilla donaciformis

Fawnsfoot

Class: Bivalvia
Order: Unionoida
Family: Unionidae

Priority Score: **15** **out of 100**

Population Trend: Unknown

Global Rank: G5 — Secure

State Rank: S3 — Vulnerable in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☑ Arkansas Valley
- ☑ Ouachita Mountains
- ☑ South Central Plains
- ☑ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

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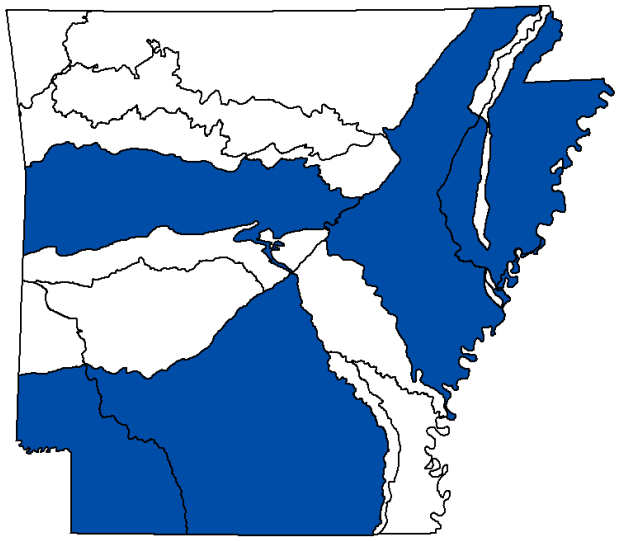

Ecobasins where the species occurs

Substrate

sand/gravel

Description

Shell small, elongate, somewhat oblong, relatively thin, and compressed to moderately inflated. Anterior end rounded, posterior end pointed, ventral margin smoothly rounded. Umbos full, centrally located, and slightly elevated above the hinge line. Beak sculpture of five or six double-looped bars. Periostracum variable from yellow to greenish brown, with numerous dark green rays made up of many smaller broken, V-shaped or zigzag lines. Length to two inches (5.1 cm). Pseudocardinal teeth small, roughened, and elevated; two in the left valve, one in the right. Lateral teeth thin, relatively long, and straight to slightly curved. Beak cavity moderately shallow. Nacre white, iridescent posteriorly.

Host Fish

freshwater drum, sauger

Ecobasins

Arkansas Valley - Arkansas River

Mississippi River Alluvial Plain - St. Francis River

Mississippi River Alluvial Plain - White River

Ouachita Mountains - Arkansas River

South Central Plains - Ouachita River

South Central Plains - Red River

Habitats

	Weight
Natural Pool: - Medium - Large	Optimal
Natural Run: - Medium - Large	Optimal

Truncilla donaciformis
Fawnsfoot

Problems Faced

Threat: Habitat destruction
Source: Dam

Threat: Habitat destruction
Source: Grazing/Browsing

Threat: Habitat destruction
Source: Resource extraction

Threat: Sedimentation
Source: Agricultural practices

Threat: Sedimentation
Source: Dam

Threat: Sedimentation
Source: Forestry activities

Threat: Sedimentation
Source: Resource extraction

Threat: Sedimentation
Source: Road construction

Data Gaps/Research Needs

Conduct life history study.

Conduct status survey.

Conservation Actions

	Importance	Category
More data needed to determine conservation actions.	Medium	Data Gap

Monitoring Strategies

Continue to monitor occurrence in ongoing river surveys.

Comments

Widespread but uncommon. Small size may result in it being overlooked during general mussel surveys (AFMC 2004a, 2004b, 2004c, 2005).

Uniomerus declivis

Tapered Pondhorn

Class: Bivalvia
Order: Unionoida
Family: Unionidae

Priority Score: **19** **out of 100**

Population Trend: Unknown


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Global Rank: G5 — Secure

State Rank: S2 — Imperiled in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☐ Boston Mountains
- ☐ Arkansas Valley
- ☑ Ouachita Mountains
- ☑ South Central Plains
- ☐ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

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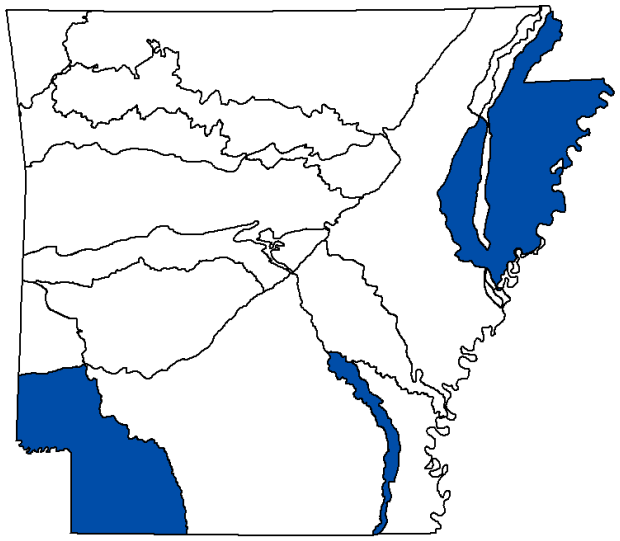

Ecobasins where the species occurs

Description

Shell elliptical, elongate, and compressed to moderately inflated. Anterior end rounded and posterior end acutely pointed. Dorsal and ventral margins both straight. Umbos low, approximately even with hingeline. Two shallow grooves present on posterior slope, giving rise to a short ridge. Posterior ridge prominent. Coloration yellowish brown, green, brown to black; rays generally absent. Pseudocardinal teeth small and thin; lateral teeth relatively thin, short and straight to slightly curved. Beak cavity shallow. Nacre white to occasionally salmon tinged. Maximum length to approximately six inches (15 cm).

Host Fish

unknown

Substrate

silt/sand/gravel

Ecobasins

Mississippi River Alluvial Plain - St. Francis River

Mississippi River Alluvial Plain (Bayou Bartholomew) - Ouachita River

South Central Plains - Red River

Habitats

	Weight
Natural Riffle: Headwater - Small	Suitable
Natural Run: Headwater - Small	Suitable

Problems Faced

Threat:
Source:

Uniomerus declivis
Tapered Pondhorn

Data Gaps/Research Needs

Conduct life history study.

Determine habitat preferences.

Determine problems faced and sources of problems faced.

Conservation Actions

	Importance	Category
Manage watershed, addressing physical, chemical, biological and land use components, to restore or sustain aquatic life.	Medium	Threat Abatement

Monitoring Strategies

Additional information is needed before a monitoring strategy can be developed.

Comments

Species is probably more common than is shown by its State Rank. Often found in small, turbid streams with extremely soft substrates and along banks in larger stream which may lead to the species being overlooked during general mussel surveys (AFMC 2004a, 2004b, 2004c, 2005).

Uniomerus tetralasmus

Pondhorn

Class: Bivalvia
Order: Unionoida
Family: Unionidae

Priority Score: **23** **out of 100**

Population Trend: Unknown

Global Rank: G4 — Apparently secure species

State Rank: S2 — Imperiled in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- ☐ Ozark Highlands
- ☑ Boston Mountains
- ☐ Arkansas Valley
- ☑ Ouachita Mountains
- ☑ South Central Plains
- ☑ Mississippi Alluvial Plain
- ☐ Mississippi Valley Loess Plains

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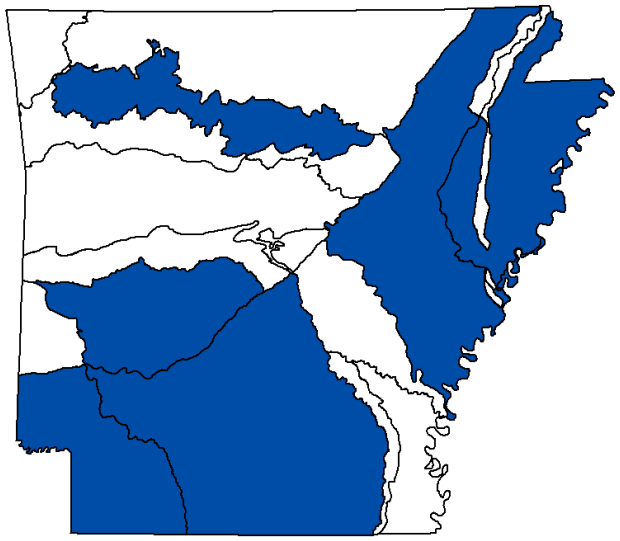

Ecobasins where the species occurs

Substrate

gravel/sand

Description

Shell relatively thin, elongate, and compressed to moderately inflated. Anterior end rounded, posterior end bluntly or sharply pointed. Dorsal margin straight, ventral margin straight, rarely curved. Umbos low, approximately even with the hinge line. Beak sculpture of four or five concentric ridges. Two shallow grooves present on the posterior slope, giving rise to a short ridge. Surface smooth and shiny in small shells, becoming rougher and dull in older individuals. Periostracum greenish or yellowish brown in young individuals, adults dark brown to black and rayless. Length to five inches (12.7 cm). Pseudocardinal teeth small and thin; two in the left valve, one in the right. Lateral teeth relatively thin, short, and straight to slightly curved. Beak cavity shallow. Nacre white, occasionally with a tinge of salmon.

Host Fish

golden shiner

Ecobasins

Boston Mountains - White River

Mississippi River Alluvial Plain - St. Francis River

Mississippi River Alluvial Plain - White River

Mississippi River Alluvial Plain (Lake Chicot) - Mississippi River

Ouachita Mountains - Ouachita River

South Central Plains - Ouachita River

South Central Plains - Red River

Uniomerus tetralasmus
Pondhorn

Habitats

Habitats	Weight
Man-made Littoral: - Small	Optimal
Man-made Pelagic: - Small	Marginal
Natural Other: - Medium - Large	Data Gap
Natural Oxbow - connected: - Medium - Large	Optimal
Natural Pool: Headwater - Medium - Large	Optimal
Natural Side channel: - Medium - Large	Optimal
Natural Slough: - Medium - Large	Optimal

Problems Faced

Threat: Habitat destruction
Source: Grazing/Browsing

Threat: Habitat destruction
Source: Resource extraction

Threat: Habitat destruction
Source: Water diversion

Threat: Sedimentation
Source: Agricultural practices

Threat: Sedimentation
Source: Forestry activities

Threat: Sedimentation
Source: Resource extraction

Data Gaps/Research Needs

Conduct life history study.

Conservation Actions

Conservation Actions	Importance	Category
Manage watershed, addressing physical, chemical, biological and land use components, to restore or sustain aquatic life.	Medium	Threat Abatement

Monitoring Strategies

Continue to monitor occurrence in ongoing river surveys.

Comments

Species is probably more common than is shown by its State Rank. Often found in small, turbid streams with extremely soft substrates, in ponds and lakes, and along banks in larger stream which may lead to the species being overlooked during general mussel surveys (AFMC 2004a, 2004b, 2004c, 2005).

Venustaconcha ellipsiformis

Ellipse

Class: Bivalvia
Order: Unionoida
Family: Unionidae

Priority Score: 27 out of 100

Population Trend: Unknown

Global Rank: G3G4 — Vulnerable (uncertain rank)

State Rank: S2 — Imperiled in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- [x] Ozark Highlands
- [x] Boston Mountains
- [ ] Arkansas Valley
- [ ] Ouachita Mountains
- [ ] South Central Plains
- [ ] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

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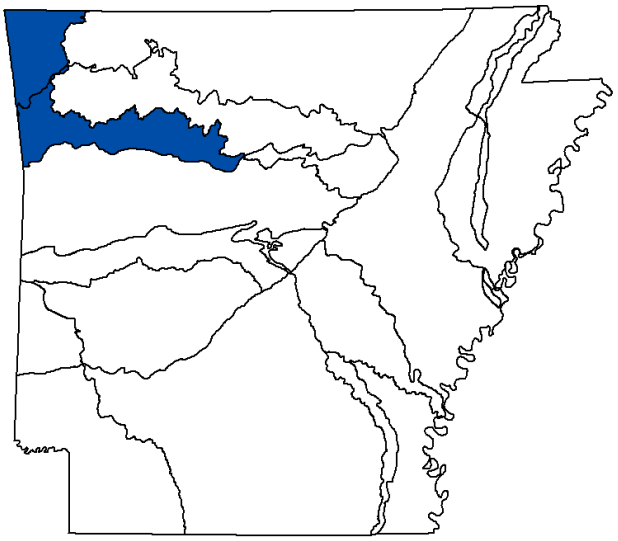

Ecobasins where the species occurs

Description

Shell small, solid, elliptical, and compressed. Anterior end rounded, posterior end bluntly pointed. Ventral margin straight to slightly curved. Umbos only slightly elevated above the hinge line. Beak sculpture of three or four very fine, double-looped ridges. Shell usually smooth, with a few wrinkles or folds on the posterior half in older shells. Periostracum green or greenish yellow with numerous dark green rays, becoming wavy on the posterior half of the shell. Length to three inches (7.6 cm). Pseudocardinal teeth triangular, heavy, roughened, and divergent; two in the left valve, one in the right (occasionally with a thin, ridgelike tooth in front). Lateral teeth relatively short, thick, and straight to slightly curved. Beak cavity shallow. Nacre white, iridescent posteriorly.

Substrate

gravel/cobble

Host Fish

mottled sculpin, slimy sculpin, brook stickleback, rainbow darter, Iowa darter, johnny darter, logperch, blackside darter, greenside darter, orangethroat darter, redfin darter, cardinal shiner, yoke darter

Ecobasins

Boston Mountains - Arkansas River

Ozark Highlands - Arkansas River

Habitats

	Weight
Natural Glide: Headwater	Suitable
Natural Pool: Headwater - Medium - Large	Suitable
Natural Riffle: Headwater - Medium - Large	Suitable
Natural Run: Headwater - Medium - Large	Optimal
Natural Shoal: - Medium - Large	Suitable

Venustaconcha ellipsiformis
Ellipse

Problems Faced

Threat: Habitat destruction
Source: Dam

Threat: Habitat destruction
Source: Grazing/Browsing

Threat: Habitat destruction
Source: Resource extraction

Threat: Nutrient loading
Source: Confined animal operations

Threat: Nutrient loading
Source: Grazing/Browsing

Threat: Sedimentation
Source: Forestry activities

Threat: Sedimentation
Source: Grazing/Browsing

Threat: Sedimentation
Source: Resource extraction

Threat: Sedimentation
Source: Road construction

Data Gaps/Research Needs

Conduct life history study.

Conduct status survey.

Determine genetic relationship to Venustaconcha pleasii.

Conservation Actions

	Importance	Category
Manage watershed, addressing physical, chemical, biological and land use components, to restore or sustain aquatic life.	Medium	Threat Abatement

Monitoring Strategies

Continue to monitor occurrence in ongoing river surveys.

Comments

Only known from Illinois River and Lee Creek in Arkansas (Arkansas River drainages). (AFMC 2004a, 2004b, 2004c, 2005).

Venustaconcha pleasii

Bleedingtooth Mussel

Class: Bivalvia
Order: Unionoida
Family: Unionidae

Priority Score: **23** **out of 100**

Population Trend: Unknown

Global Rank: G3G4 — Vulnerable (uncertain rank)

State Rank: S3 — Vulnerable in Arkansas

Distribution

Occurrence Records

Ecoregions where the species occurs:

- [x] Ozark Highlands
- [x] Boston Mountains
- [x] Arkansas Valley
- [ ] Ouachita Mountains
- [ ] South Central Plains
- [ ] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

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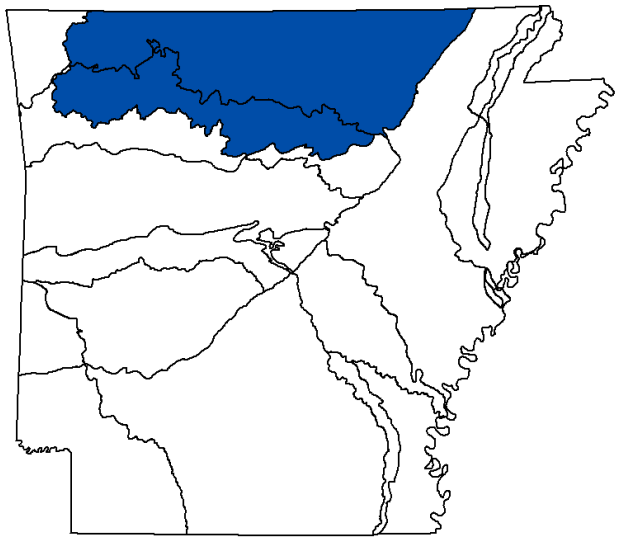

Ecobasins where the species occurs

Description

Similar to Venustaconcha ellipsiformis

Host Fish

greenside darter, rainbow darter, yoke darter

Substrate

cobble/gravel

Ecobasins

Boston Mountains - White River

Mississippi River Alluvial Plain - St. Francis River

Ozark Highlands - White River

Habitats

	Weight
Natural Glide: Headwater	Suitable
Natural Pool: Headwater - Medium - Large	Suitable
Natural Riffle: Headwater - Medium - Large	Suitable
Natural Run: Headwater - Medium - Large	Optimal
Natural Shoal: - Medium - Large	Suitable

Problems Faced

Threat: Habitat destruction
Source: Dam

Threat: Habitat destruction
Source: Grazing/Browsing

Threat: Habitat destruction
Source: Resource extraction

Threat: Nutrient loading
Source: Confined animal operations

Threat: Nutrient loading
Source: Grazing/Browsing

Threat: Sedimentation
Source: Forestry activities

Threat: Sedimentation
Source: Grazing/Browsing

Threat: Sedimentation
Source: Resource extraction

Threat: Sedimentation
Source: Road construction

Data Gaps/Research Needs

Conduct life history study.

Conduct status survey.

Determine genetic relationship to Venustaconcha ellipsiformis.

Conservation Actions

	Importance	Category
Manage watershed, addressing physical, chemical, biological and land use components, to restore or sustain aquatic life.	Medium	Threat Abatement

Monitoring Strategies

Additional information is needed before a monitoring strategy can be developed.

Comments

Widespread in the White River drainage but seldom common (AFMC 2004a, 2004b, 2004c, 2005).

Villosa iris

Rainbow

Class: Bivalvia
Order: Unionoida
Family: Unionidae

Priority Score: **17** **out of 100**

Population Trend: Unknown

Global Rank: G5 — Secure

State Rank: S2S3 — Imperiled species in Arkansas (uncertain rank)

Distribution

Occurrence Records

Ecoregions where the species occurs:

- [x] Ozark Highlands
- [x] Boston Mountains
- [ ] Arkansas Valley
- [x] Ouachita Mountains
- [ ] South Central Plains
- [ ] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

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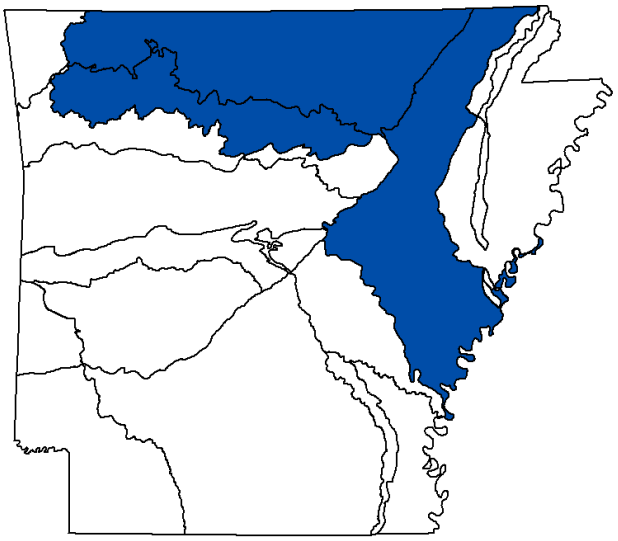


Ecobasins where the species occurs

Substrate

cobble/gravel

Description

Shell small, elongate, relatively thin, and compressed (males) to moderately inflated (females). Anterior end rounded, posterior end rounded (females) to bluntly pointed (males). Umbos even with or slightly elevated above hinge line. Beak sculpture of four to six distinct, double-looped bars. Periostracum yellow or greenish yellow, with dark green rays, often interrupted. Length to three inches (7.6 cm). Pseudocardinal teeth small, triangular, and somewhat divergent; two in the left valve, one in the right. Lateral teeth long, thin, and straight to slightly curved. Beak cavity shallow. Nacre silvery white and highly iridescent on the posterior half, giving this species its common name.

Host Fish

streamline chub, greenside darter, rainbow darter, bluebreast darter, green sunfish, striped shiner, smallmouth bass, largemouth bass, yellow perch, rock bass, mosquito fish, Suwannee bass, spotted bass

Ecobasins

Boston Mountains - White River

Mississippi River Alluvial Plain - White River

Ozark Highlands - White River

Habitats

	Weight
Natural Glide: Headwater	Suitable
Natural Pool: Headwater - Medium - Large	Optimal
Natural Riffle: Headwater	Suitable
Natural Run: Headwater - Medium - Large	Optimal
Natural Shoal: - Medium - Large	Marginal

Problems Faced

Threat: Habitat destruction
Source: Dam

Threat: Habitat destruction
Source: Grazing/Browsing

Threat: Habitat destruction
Source: Resource extraction

Threat: Nutrient loading
Source: Confined animal operations

Threat: Nutrient loading
Source: Grazing/Browsing

Threat: Sedimentation
Source: Forestry activities

Threat: Sedimentation
Source: Grazing

Threat: Sedimentation
Source: Resource extraction

Threat: Sedimentation
Source: Road construction

Data Gaps/Research Needs

Research taxonomic relationship of two forms. Describe species, if necessary.

Review distribution and abundance based on taxonomic status or revision.

Conservation Actions

	Importance	Category
Manage watershed, addressing physical, chemical, biological and land use components, to restore or sustain aquatic life.	Medium	Threat Abatement

Monitoring Strategies

Additional information is needed before a monitoring strategy can be developed.

Comments

Status in Arkansas is unclear due to taxonomic uncertainty. Appear to be two ecological units in Arkansas (AFMC 2004a, 2004b, 2004c, 2005, AGFC 2003, AHTD 1984, ANHI 2003, Bates and Dennis 1983, Branson 1984, Clark 1987, Coker 1919, Crump 2003, Crump and others 2003a, 2003c, 2003d, 2003e, 2003g, 2003q, 2003r, 2003t, Cummings and Mayer 1992, Davidson and others 1997, Ecological Consultants 1984, Gordon 1980a, Gordon and others 1980, Harris 1991b, 1992a, 1993, 1996, 1999, Harris and Christian 2004, Harris and Gordon 1990, Harris and Milam 2002, Johnson 1980, Meek and Clark 1912, Oesch 1995, ONHI 2003, Rust 1993, Turgeon and others 1988, 1998, Vaughn 1996, Vaughn and Spooner 2000, USDA FS 1999, Warren 1991, Williams & others 1993).

Villosa sp. Cf lienosa

Little Spectaclecase group

Class: Bivalvia

Order: Unionoida

Family: Unionidae

Priority Score: **17** **out of 100**

Population Trend: Unknown

Global Rank: G5 — Secure

State Rank: S2S3 — Imperiled species in Arkansas (uncertain rank)

Distribution

Occurrence Records

Ecoregions where the species occurs:

- [x] Ozark Highlands
- [x] Boston Mountains
- [x] Arkansas Valley
- [x] Ouachita Mountains
- [x] South Central Plains
- [x] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

Taxa Association Team and Peer Reviewers

AGFC Mr. Bill Posey, USFWS-ES Mr. Chris Davidson, Dr. John Harris, AHTD Mr. Josh Seagraves, AHTD Mr. Ben Thesing

Ecobasins where the species occurs

Substrate

gravel/sand

Description

Generally for all three taxonomic entities, shell small, slightly elongate, thin to moderately thick, compressed in males and inflated in females. Anterior end rounded, posterior end bluntly pointed (males) or truncated (females). Dorsal margin straight, ventral margin straight to slightly curved. Umbos elevated above the hinge line. Beak sculpture of four to seven distinct, double-looped bars. Periostracum green to dark brown, with green rays (often obscure). Length to 2.5 inches (6.4 cm). Pseudocardinal teeth relatively small and compressed; two in the left valve, one in the right, with a smaller tooth present anteriorly in some shells. Lateral teeth elongate, thin, and straight. Nacre white or bluish white, occasionally tinged with salmon, iridescent posteriorly.

Host Fish

brown bullhead, channel catfish, bluegill, largemouth bass

Ecobasins

Arkansas Valley - Arkansas River

Boston Mountains - Arkansas River

Boston Mountains - White River

Mississippi River Alluvial Plain - St. Francis River

Mississippi River Alluvial Plain - White River

Ouachita Mountains - Arkansas River

Ouachita Mountains - Ouachita River

Ouachita Mountains - Red River

Ozark Highlands - Arkansas River

Ozark Highlands - White River

South Central Plains - Ouachita River

Villosa sp. Cf lienosa
Little Spectaclecase group

Habitats

	Weight
Natural Pool: Headwater - Medium - Large	Optimal
Natural Riffle: Headwater	Suitable
Natural Run: Headwater - Medium - Large	Suitable
Natural Shoal: - Medium - Large	Suitable
Natural Side channel: - Medium - Large	Suitable

Problems Faced

Threat: Habitat destruction
Source: Grazing/Browsing

Threat: Habitat destruction
Source: Resource extraction

Threat: Nutrient loading
Source: Confined animal operations

Threat: Nutrient loading
Source: Grazing/Browsing

Threat: Nutrient loading
Source: Urban development

Threat: Sedimentation
Source: Forestry activities

Threat: Sedimentation
Source: Grazing/Browsing

Threat: Sedimentation
Source: Road construction

Data Gaps/Research Needs

Conduct life history study.

Conservation Actions

	Importance	Category
Manage watershed, addressing physical, chemical, biological and land use components, to restore or sustain aquatic life.	Medium	Threat Abatement

Monitoring Strategies

More information is needed before a monitoring strategy can be developed.

Comments

Widespread but uncommon. Found in habitats not usually surveyed during general mussel surveys. Apparently, three taxonomic units occur in Arkansas with “forms” inhabiting the Red River Basin, Ouachita River Basin and the culmination of the Arkansas, White and St. Francis drainages comprising the third taxonomic unit. (AFMC 2004a, 2004b, 2004c, 2005, G.T. Waters pers. Comm.)

Villosa sp. Cf lienosa
Little Spectaclecase group

Section 3. The Ecoregions of Arkansas

The Ecoregions of Arkansas

Ecoregions denote areas of general similarity in ecosystems and in the type, quality, and quantity of environmental resources. They are designed to serve as a spatial framework for the research, assessment, management and monitoring of ecosystems and ecosystem components.

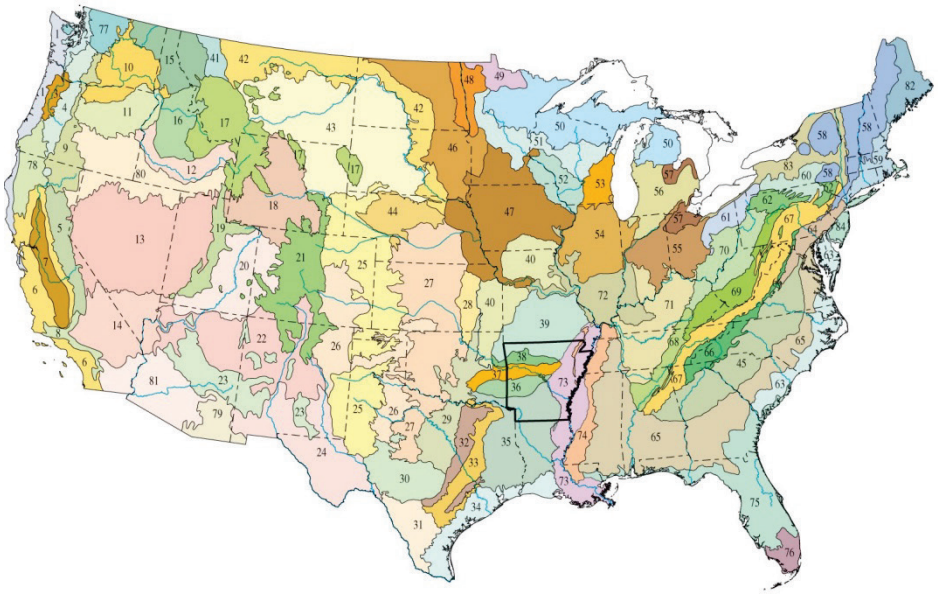
Ecoregions are general purpose regions that are critical for structuring and implementing ecosystem management strategies across federal agencies, state agencies, and nongovernment organizations that are responsible for different types of resources in the same geographical areas.

A Roman numeral hierarchical scheme has been adopted for different levels of ecological regions. Level I is the coarsest level, dividing North America into 15 ecological regions. Level II divides the continent into 52 regions. At level III, the continental United States (Figure 3.1) contains 104 ecoregions and the contermi- nous United States has 84 ecoregions (U.S. Environmental Protection Agency [USEPA], 2003). Level IV ecoregions are further subdivisions of level III ecore- gions.

In Arkansas (Figure 3.2), there are seven level III ecoregions and 32 level IV ecore- gions. Arkansas' ecological diversity is strongly related to regional physiography, geology, soil, climate and land use. Elevated karst plateaus, folded mountains, agri- cultural valleys, forested uplands, and bottomland forests occur. Fire-maintained prairie was once extensive in several parts of the state (adapted from Woods and others 2004).

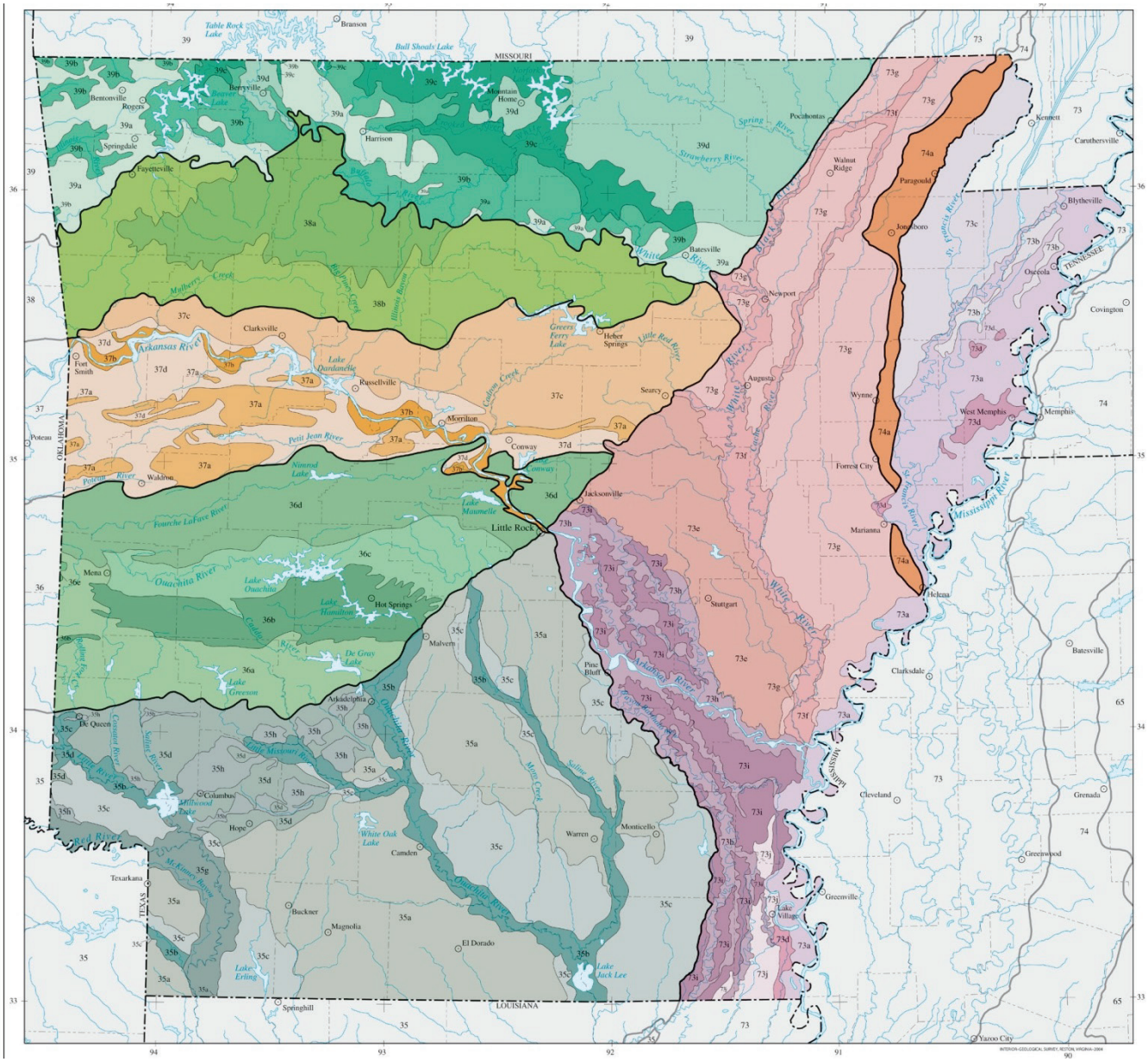
Ecoregional Assessments have been completed by The Nature Conservancy for land covered by five of the seven ecoregions. The assessments are located in Appendices 3.1 (pages 1698-1747), 3.2 (pages 1748-1793) and 3.3 (pages 1794-1849).

Figure 3.1. Level III ecoregions in the United States.



Map Source: USEPA, 2003

Figure 3.2. Level Ill and IV ecoregions in Arkansas (Woods and others 2004).



Conservation priority based on evaluation of species of greatest conservation need (SGCN)

Arkansas determined which ecoregions have more species of greatest conservation concern and/or more greatly imperiled species. Ecoregion Scores (Figure 3.3) equal the sum of all Species Priority Scores (defined on pages 7-15) within an ecoregion. A higher score implies more species of greatest conservation need and/or species with a greater need for conservation (Table 3.1).

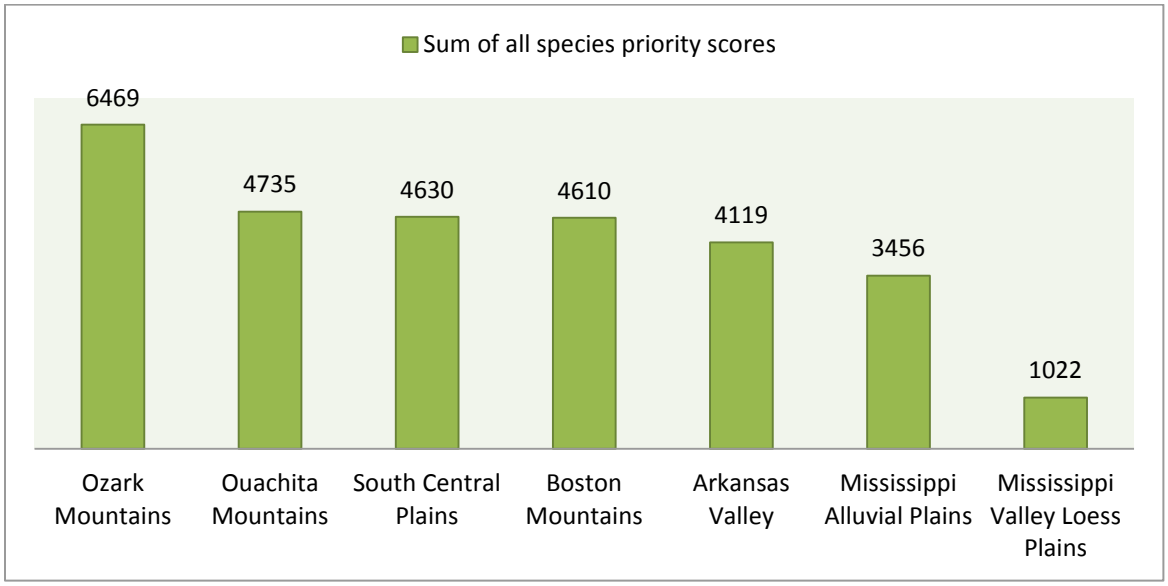


Figure 3.3. Sum of species priority scores by ecoregion.

Table 3.1. Average SPS (Species Priority Score) and number of SGCN in each ecoregion. A greater number of SGCN are affected by conservation actions in ecoregions with higher scores. A higher average SPS means that the ecoregion's species are in greater need of conservation actions.

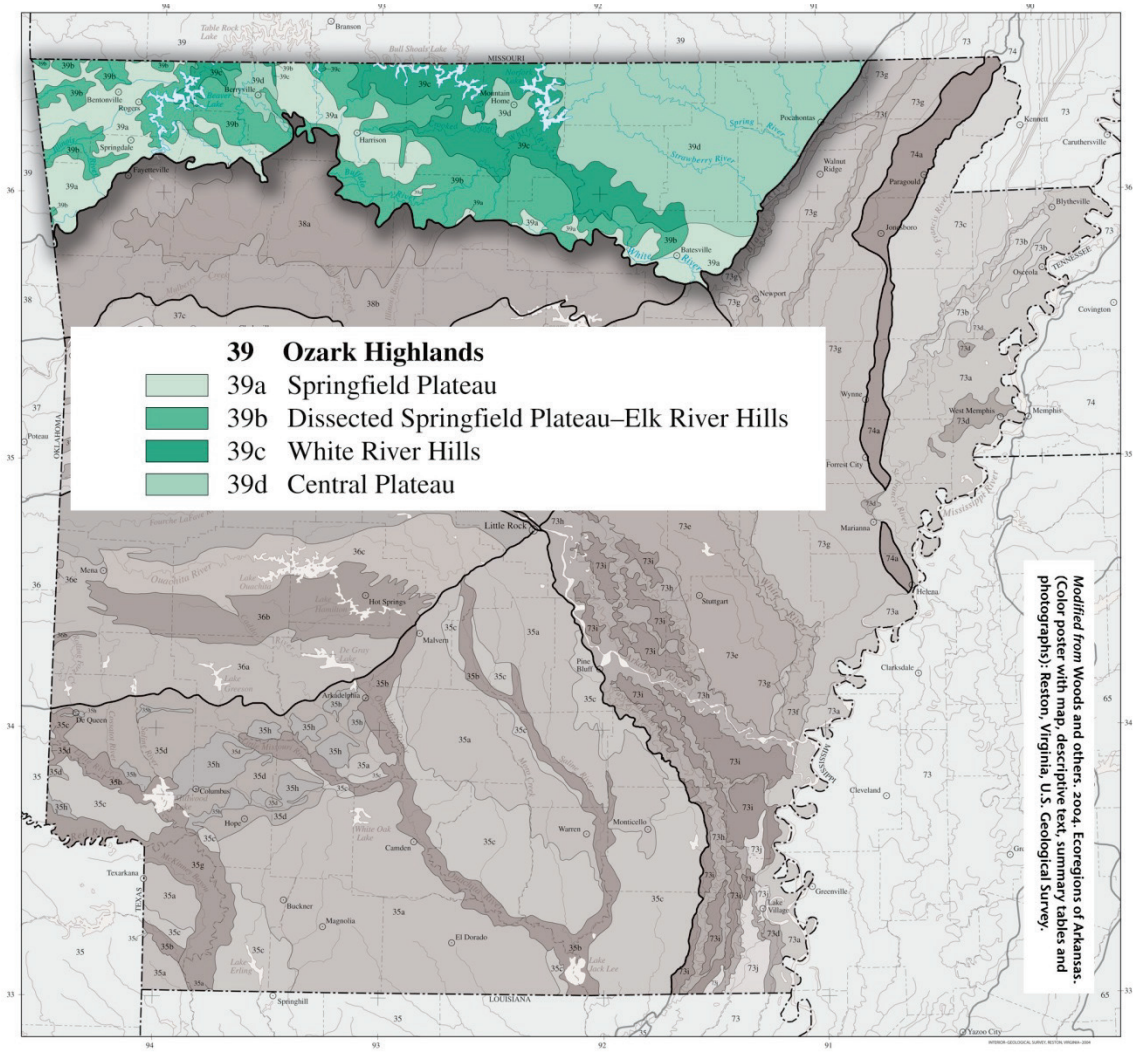
Ecoregion	Total SGCN	Average Priority Score
Ozark Mountains	209	31
South Central Plains	169	27
Ouachita Mountains	163	29
Boston Mountains	154	30
Arkansas Valley	159	26
Mississippi Alluvial Plain	141	25
Mississippi Valley Loess Plains	50	20

Ozark Highlands (Ecoregion 39)

The Ozarks formed as the Ouachita ountains weighted down the edge of the North American continent, flexing the crust of the Arkoma Basin upward; younger sedimentary layers then eroded away, exposing the older, Paleozoic rocks that dominate the area. Ecoregion 39 is composed of the Springfield and Salem plateaus and largely underlain by highly soluble and fractured limestone and dolomite.

It is level to highly dissected, partly forested and rich in karst features. Caves, sink- holes and underground drainage occur, heavily influencing surficial water availability and water temperature. Clear, cold, perennial, spring-fed streams are common and typically have gravelly substrates; in addition, many small dry valleys occur.

Figure 3.4. Ozark Highlands Ecoregion.



Ozark Highlands - Springfield Plateau

Ecoregion 39 is not as mountainous as Ecoregions 36 or 38, but is higher and more rugged than Ecoregion 73. Habitat diversity and species richness is high. Soils are often cherty and have developed from carbonate rocks or interbedded chert, sandstone and shale; mesic Ultisols, Alfisols and Mollisols are common. Soil order mosaic, soil temperature regime and lithology are all distinct from nearby Ecoregions 36, 37, 38, and 73.

Potential natural vegetation is mostly oak–hickory forest. Open forest dominates rugged areas and pastureland and hayland are common on nearly level sites. Shortleaf pine grows on steep, cherty escarpments and on shallow soils derived from sandstone; it becomes more common in Ecoregions 35, 36 and the southern portion of Ecoregion 38. Glades dominated by grass and eastern redcedar are found on shallow, droughty soils especially over dolomite.

Primary land uses are logging, housing, recreation and, especially, poultry and livestock farming. Water quality in the Ozark Highlands (39) is different from the other ecoregions in Arkansas and is strongly influenced by lithology and land use practices. Alkalinity, total dissolved solids and total hardness values are relatively high, reflecting the influence of Ecoregion 39's distinctive limestone and dolomite. Fecal coliform and nitrite-nitrate values are elevated downstream of

improved pastureland that is intensively grazed by cattle and fields where animal wastes from confined poultry and hog operations have been applied. Parts of Ecoregion 39 are experiencing rapid population growth along with associated habitat alteration and water pollution. Fish communities characteristically have a preponderance of sensitive species and are usually dominated by a diverse minnow community along with sunfishes and darters.

Springfield Plateau

39a. The nearly level to rolling Springfield Plateau is underlain by cherty limestone of the Mississippian Boone Formation; it is less rugged and wooded than Ecoregions 38, 39b and 39c and lacks the Ordovician dolomite and limestone of Ecoregions 39c and 39d. Karst features, such as sinkholes and caves, are common. Cold, perennial, spring-fed streams occur.

Upland potential natural vegetation is primarily oak–hickory and also oak–hickory– pine forests; savannas and tall grass prairies also occurred and were maintained by fire. Today, most of the forest and almost all of the prairies have been replaced by agriculture or expanding residential areas. Poultry, cattle and hog farming are primary land uses; pastureland and hayland are common. Application of poultry litter to agricultural fields is a non-point source that can impair water quality. Total suspended solids and turbidity values in streams are usually low, but total dissolved solids and hardness values are high.

Dissected Springfield Plateau–Elk River Hills

39b. The Dissected Springfield Plateau–Elk River Hills are underlain by cherty limestone of the Mississippian Boone Formation and contain many karst features. Cold, perennial, spring-fed streams occur. Ecoregion 39b is more rugged and wooded than the lithologically similar Springfield Plateau (39a) and the lithologically dis- similar Central Plateau (39d).

Potential natural vegetation is oak–hickory and oak–hickory–pine forests. Short- leaf pine grows on the thin, cherty soils of steep slopes and is more common than in Ecoregion 39a, 39c and 39d. Scattered limestone glades occur, but are less extensive than on the dolomites of the lithologically distinct Ecoregion 39c.

Today, Ecoregion 39b remains dominated by forest and woodland. Logging, live- stock farming, woodland grazing, recreation, quarrying and housing are primary land uses.

White River Hills

39c. The forested White River Hills ecoregion is a highly dissected portion of the Salem Plateau that is underlain by cherty Ordovician dolomite and limestone. Soils are usually thin, rocky, steep and nonarable. Flat land is uncommon except along the White River. Ecoregion 39c is lithologically unlike another highly dissected portion of the Ozarks, Ecoregion 39b, where Mississippian cherty limestone of the Boone Formation predominates. Clear, cold, perennial,

spring-fed streams are common, but dry valleys occur.

Potential natural vegetation is oak–hickory forest, oak–hickory–pine forest and cedar glades. Glades are more extensive than elsewhere in Arkansas and occur on thin, droughty soils derived from carbonates. Pine is most common on steep, thin, cherty soils. Ecoregion 39c includes Table Rock, Bull Shoals, Norfork and Beaver lakes. Turbidity and total suspended solids are usually low in its streams and rivers, but total dissolved solids and hardness values are high.

Central Plateau

39d. The Central Plateau is an undulating to hilly portion of the Salem Plateau that is dominated by agriculture. Ecoregion 39d is largely underlain by cherty Ordovician dolomite and limestone; it is lithologically distinct from another slightly dissected part of the Ozarks, the Springfield Plateau (39a). Karst features occur. The Central Plateau (39d) is less rugged and wooded than Ecoregions 38, 39b and 39c.

Natural vegetation is oak–hickory forest, oak–hickory–pine forest (often on soils derived from sandstone), barrens (on thin soils) and scattered cedar glades (on shallow, rocky, droughty soils from dolomite or limestone).

Today, pastureland, hayland and housing are common, but remnant forests and savannas occur in steeper areas. Turbidity, total suspended solids, total dissolved solids and hardness values are often higher than in Ecoregions 39a and 39c (adapted from Woods and others 2004).

Ozark Highlands Ecoregion:

Species of Greatest Conservation Need (SGCN)

Species of greatest conservation need (SGCN) in the Ozark Highlands are presented by taxa association (Table 3.2). A higher priority score indicates a greater need for actions to conserve the species. Calculation of the priority score is discussed in Section 2, pages 5-8. A ranked list of all SGCN associated with the ecoregion is presented in Table 3.3.

Table 3.2. SGCN by taxa association in the Ozark Highlands.

Taxa Association	Common Name	Scientific Name	Priority Score
Amphibian	Ozark Hellbender	*Cryptobranchus bishopi*	100
	Oklahoma Salamander	*Eurycea tynerensis*	27
	Crawfish Frog	*Lithobates areolatus*	23
	Ringed Salamander	*Ambystoma annulatum*	19
	Grotto Salamander "western clade"	*Eurycea spelaea*	19
	Grotto Salamander "eastern clade"	*Eurycea spelaea*	19
	Grotto Salamander "northern clade"	*Eurycea spelaea*	19

	Boreal Chorus Frog	*Pseudacris maculata*	19
	Eastern Spadefoot	*Scaphiopus holbrookii*	19
	Hurter's Spadefoot	*Scaphiopus hurterii*	19
	Eastern Tiger Salamander	*Ambystoma tigrinum*	15
	Wood Frog	*Lithobates sylvaticus*	15
Bird	Piping Plover	*Charadrius melodus*	43
	Henslow's Sparrow	*Ammodramus henslowii*	33
	Sprague's Pipit	*Anthus spragueii*	33
	Bachman's Sparrow	*Peucaea aestivalis*	33
	Buff-breasted Sandpiper	*Calidris subruficollis*	29
	Rusty Blackbird	*Euphagus carolinus*	29
	Bewick's Wren	*Thryomanes bewickii*	29
	Ruddy Turnstone	*Arenaria interpres*	24
	Smith's Longspur	*Calcarius pictus*	24
	Common Nighthawk	*Chordeiles minor*	24
	Migrant Loggerhead Shrike	*Lanius ludovicianus migrans*	24
	Yellow-crowned Night-Heron	*Nyctanassa violacea*	24
	American Woodcock	*Scolopax minor*	24
	Cerulean Warbler	*Setophaga cerulea*	24
	American Bittern	*Botaurus lentiginosus*	23
	Willow Flycatcher	*Empidonax traillii*	23
	Le Conte's Sparrow	*Ammodramus leconteii*	21
	Sedge Wren	*Cistothorus platensis*	21
	Sharp-shinned Hawk	*Accipiter striatus*	19
	Grasshopper Sparrow	*Ammodramus savannarum*	19
	American Black Duck	*Anas rubripes*	19
	Anhinga	*Anhinga anhinga*	19
	Eastern Whip-poor-will	*Antrostomus vociferus*	19
	Sanderling	*Calidris alba*	19
	Dunlin	*Calidris alpina*	19
	Stilt Sandpiper	*Calidris himantopus*	19
	Chimney Swift	*Chaetura pelagica*	19
	Yellow-billed Cuckoo	*Coccyzus americanus*	19
	Northern Bobwhite	*Colinus virginianus*	19
	Tricolored Heron	*Egretta tricolor*	19
	Purple Finch	*Haemorhous purpureus*	19
	Wood Thrush	*Hylocichla mustelina*	19
	Least Bittern	*Ixobrychus exilis*	19
	Short-billed Dowitcher	*Limnodromus griseus*	19
	Swainson's Warbler	*Limnothlypis swainsonii*	19
	Black-crowned Night-Heron	*Nycticorax nycticorax*	19
	Black-bellied Plover	*Pluvialis squatarola*	19
	Bell's Vireo	*Vireo bellii*	19

	Trumpeter Swan	*Cygnus buccinator*	17
	American Kestrel	*Falco sparverius*	15
	American Golden-Plover	*Pluvialis dominica*	15
Crayfish	Benton County Cave Crayfish	*Cambarus aculabrum*	80
	Hell Creek Cave Crayfish	*Cambarus zophonastes*	80
	Coldwater Crayfish	*Orconectes eupunctus*	50
	Mammoth Spring Crayfish	*Orconectes marchandi*	46
	Bristly Cave Crayfish	*Cambarus setosus*	34
	Williams' Crayfish	*Orconectes williamsi*	34
	Meek's Short Pointed Crayfish	*Orconectes meeki brevis*	30
	Midget Crayfish	*Orconectes nana*	30
	Hubbs' Crayfish	*Cambarus hubbsi*	27
	Neosho Midget Crayfish	*Orconectes macrus*	23
	Gapped Ringed Crayfish	*Orconectes neglectus chaenodactylus*	20
Fish	Arkansas Darter	*Etheostoma cragini*	43
	Ozark Cavefish	*Troglichthys rosae*	43
	Crystal Darter	*Crystallaria asprella*	38
	Stargazing Darter	*Percina uranidea*	38
	Western Sand Darter	*Ammocrypta clara*	33
	Ozark Shiner	*Notropis ozarcanus*	33
	Strawberry River Darter	*Etheostoma fragi*	29
	Least Darter	*Etheostoma microperca*	29
	Silver Redhorse	*Moxostoma anisurum*	29
	Longnose Darter	*Percina nasuta*	27
	Southern Cavefish	*Typhlichthys subterraneus*	27
	American Eel	*Anguilla rostrata*	24
	Paddlefish	*Polyodon spathula*	24
	Blue Sucker	*Cycleptus elongatus*	23
	Bluntface Shiner	*Cyprinella camura*	23
	Spotfin Shiner	*Cyprinella spiloptera*	23
	Sabine Shiner	*Notropis sabinae*	23
	Autumn Darter	*Etheostoma autumnale*	19
	Sunburst Darter	*Etheostoma mihileze*	19
	Current Darter	*Etheostoma uniporum*	19
	Mooneye	*Hiodon tergisus*	19
	American Brook Lamprey	*Lethenteron appendix*	19
	Pealip Redhorse	*Moxostoma pisolabrum*	19
	Striped Mullet	*Mugil cephalus*	19
	Redspot Chub	*Nocomis asper*	19
	Channel Shiner	*Notropis wickliffi*	19
	Gilt Darter	*Percina evides*	19
	Slenderhead Darter	*Percina phoxocephala*	19
	Highfin carpsucker	*Carpiodes velifer*	17

	Highland Darter	*Etheostoma teddyroosevelt*	15
	Least Brook Lamprey	*Lampetra aepyptera*	15
	Saddleback Darter	*Percina vigil*	15
Insect	winter stonefly	*Allocapnia warreni*	80
	Sulphur Springs Hydroporus Diving Beetle	*Hydroporus sulphurius*	80
	beetle	*Rimulincola divalis*	80
	winter stonefly	*Allocapnia jeanae*	50
	American Burying Beetle	*Nicrophorus americanus*	42
	Linda's Roadside-Skipper	*Amblyscirtes linda*	38
	Swamp Metalmark	*Calephelis muticum*	34
	Ozark Emerald	*Somatochlora ozarkensis*	34
	Prairie Mole Cricket	*Gryllotalpa major*	32
	Ozark Snaketail Dragonfly	*Ophiogomphus westfalli*	32
	Ozark Swallowtail	*Papilio joanae*	30
	Mottled Duskywing	*Erynnis martialis*	29
	Meske's Skipper	*Hesperia meskei*	29
	Lace-winged Roadside-Skipper	*Amblyscirtes aesculapius*	27
	Appalachian Azure	*Celastrina neglectamajor*	27
	Baltimore Checkerspot	*Euphydryas phaeton ozarkae*	27
	Giant Stag Beetle	*Lucanus elephus*	25
	Northern Metalmark	*Calephelis borealis*	23
	Outis Skipper	*Cogia outis*	23
	Yehl Skipper	*Poanes yehl*	23
	Byssus Skipper	*Problema byssus*	23
	Ozark Pseudactium	*Pseudactium ursum*	23
	Bell's Roadside-Skipper	*Amblyscirtes belli*	21
	Golden-banded Skipper	*Autochton cellus*	21
	Scrubland Tiger Beetle	*Cicindela obsoleta*	21
	Leonard's Skipper	*Hesperia leonardus*	19
	Cobweb Skipper	*Hesperia metea*	19
	predaceous diving beetle	*Heterosternuta phoebeae*	19
	Ouachita Diving Beetle	*Hydroporus ouachitus*	19
	Gray Comma	*Polygonia progne*	19
	Oak Hairstreak	*Satyrium favonius ontario*	19
	Dusky Azure	*Celastrina nigra*	15
	Gorgone Checkerspot	*Chlosyne gorgone*	15
	Cow Path Tiger Beetle	*Cicindela purpurea*	15
	Monarch	*Danaus plexippus*	15
	Twelve-spotted Tiger Beetle	*Cicindela duodecimguttata*	13
	Arkansas agapetus caddisfly	*Agapetus medicus*	8
	contorted ochrotrichian microcaddisfly	*Ochrotrichia contorta*	8

Invertebrate - other	isopod	*Lirceus bidentatus*	80
	Ozark Pyrg	*Pyrgulopsis ozarkensis*	80
	Thicklipped Pebblesnail	*Somatogyrus crassilabris*	80
	Foushee Cavesnail	*Amnicola cora*	65
	cave obligate pseudoscorpion	*Apochthonius titanicus*	65
	cave obligate harvestman	*Crosbyella distincta*	65
	cave obligate harvestman	*Crosbyella roeweri*	65
	Calico Rock Oval	*Patera clenchi*	65
	cave obligate springtail	*Schaefferia alabamensis*	65
	cave obligate millipede	*Trigenotyla parca*	65
	Arkansas Wedge	*Xolotrema occidentale*	65
	bat cave isopod	*Caecidotea macropropoda*	57
	amphipod	*Bactrurus pseudomucronatus*	42
	isopod	*Caecidotea dimorpha*	42
	cave obligate planarian	*Dendrocoelopsis americana*	42
	Shelled Cave Springtail	*Pseudosinella testa*	42
	White Liptooth	*Millerelix peregrina*	34
	isopod	*Caecidotea ancyla*	30
	isopod	*Caecidotea steevesi*	30
	isopod	*Caecidotea stiladactyla*	30
	land snail	*Gastrocopta rogersensis*	27
	isopod	*Lirceus bicuspidatus*	27
	Ozark Cave Amphipod	*Stygobromus ozarkensis*	27
	springtail	*Arrhopalites clarus*	25
	pseudoscorpion	*Microcreagris ozarkensis*	23
	isopod	*Caecidotea salamensis*	8
Mammal	Ozark Big-eared Bat	*Corynorhinus townsendii ingens*	80
	Northern Long-eared Bat	*Myotis septentrionalis*	63
	Indiana Bat	*Myotis sodalis*	62
	Ozark Pocket Gopher	*Geomys bursarius ozarkensis*	57
	Eastern Small-Footed Bat	*Myotis leibii*	34
	Little Brown Bat	*Myotis lucifugus*	33
	Rafinesque's Big-Eared Bat	*Corynorhinus rafinesquii*	29
	Southeastern Bat	*Myotis austroriparius*	24
	Plains Harvest Mouse	*Reithrodontomys montanus*	23
	Black-tailed Jackrabbit	*Lepus californicus*	21
	Eastern Spotted Skunk	*Spilogale putorius*	21
	Crawford's Gray Shrew	*Notiosorex crawfordi*	19
	Eastern Harvest Mouse	*Reithrodontomys humulis*	19
	Southeastern Shrew	*Sorex longirostris*	19
	Gray Bat	*Myotis grisescens*	16
	American Badger	*Taxidea taxus*	16
	Long-tailed Weasel	*Mustela frenata*	15

	Western Harvest Mouse	*Reithrodontomys megalotis*	15
Mussel	Curtis Pearlymussel	*Epioblasma florentina curtisi*	100
	Turgid Blossom	*Epioblasma turgidula*	100
	Scaleshell	*Leptodea leptodon*	95
	White Hickorynut	*Obovaria sp. Cf arkansasensis*	80
	Neosho Mucket	*Lampsilis rafinesqueana*	57
	"Ozark" Fanshell	*Cyprogenia aberti*	52
	Purple Lilliput	*Toxolasma lividum*	52
	Pink Mucket	*Lampsilis abrupta*	46
	Snuffbox	*Epioblasma triquetra*	43
	Salamander Mussel	*Simpsonaias ambigua*	34
	Rabbitsfoot	*Quadrula cylindrica*	33
	Slippershell Mussel	*Alasmidonta viridis*	31
	Ozark Pigtoe	*Fusconaia ozarkensis*	27
	Ohio Pigtoe	*Pleurobema cordatum*	27
	Ellipse	*Venustaconcha ellipsiformis*	27
	"Elongate" Pigtoe	*Fusconaia sp. Cf. sampsoniana*	24
	Ouachita Kidneyshell	*Ptychobranchus occidentalis*	23
	Bleedingtooth Mussel	*Venustaconcha pleasii*	23
	Elktoe	*Alasmidonta marginata*	19
	Hickorynut	*Obovaria olivaria*	19
	Lilliput	*Toxolasma parvum*	19
	Round Pigtoe	*Pleurobema sintoxia*	17
	Rainbow	*Villosa iris*	17
	Little Spectaclecase group	*Villosa sp. Cf lienosa*	17
	Fatmucket	*Lampsilis siliquoidea*	15
Reptile	Collared Lizard	*Crotaphytus collaris*	24
	Great Plains Skink	*Plestiodon obsoletus*	23
	Ground Snake	*Sonora semiannulata*	23
	Lined Snake	*Tropidoclonion lineatum*	23
	Ornate Box Turtle	*Terrapene ornata ornata*	19
	Slender Glass Lizard	*Ophisaurus attenuatus*	15

Table 3.3. All species of greatest conservation need (SGCN) in the Ozark Highlands ranked by priority score. A higher priority score indicates a greater need for actions to conserve the species. Of the 377 SGCN, 209 occur in this ecoregion.

Score	Common Name	Scientific Name	Taxa Association
100	Ozark Hellbender	*Cryptobranchus bishopi*	Amphibian
100	Curtis Pearlymussel	*Epioblasma florentina curtisi*	Mussel
100	Turgid Blossom	*Epioblasma turgidula*	Mussel
95	Scaleshell	*Leptodea leptodon*	Mussel
80	Benton County Cave Crayfish	*Cambarus aculabrum*	Crayfish
80	Hell Creek Cave Crayfish	*Cambarus zophonastes*	Crayfish
80	winter stonefly	*Allocapnia warreni*	Insect
80	Sulphur Springs Hydroporus Diving	*Hydroporus sulphurius*	Insect
80	beetle	*Rimulincola divalis*	Insect
80	isopod	*Lirceus bidentatus*	Invertebrate - other
80	Ozark Pyrg	*Pyrgulopsis ozarkensis*	Invertebrate - other
80	Thicklipped Pebblesnail	*Somatogyrus crassilabris*	Invertebrate - other
80	Ozark Big-eared Bat	*Corynorhinus townsendii ingens*	Mammal
80	White Hickorynut	*Obovaria sp. Cf arkansasensis*	Mussel
65	Foushee Cavesnail	*Amnicola cora*	Invertebrate - other
65	cave obligate pseudoscorpion	*Apochthonius titanicus*	Invertebrate - other
65	cave obligate harvestman	*Crosbyella distincta*	Invertebrate - other
65	cave obligate harvestman	*Crosbyella roeweri*	Invertebrate - other
65	Calico Rock Oval	*Patera clenchi*	Invertebrate - other
65	cave obligate springtail	*Schaefferia alabamensis*	Invertebrate - other
65	cave obligate millipede	*Trigenotyla parca*	Invertebrate - other
65	Arkansas Wedge	*Xolotrema occidentale*	Invertebrate - other
63	Northern Long-eared Bat	*Myotis septentrionalis*	Mammal
62	Indiana Bat	*Myotis sodalis*	Mammal
57	bat cave isopod	*Caecidotea macropropoda*	Invertebrate - other
57	Ozark Pocket Gopher	*Geomys bursarius ozarkensis*	Mammal
57	Neosho Mucket	*Lampsilis rafinesqueana*	Mussel
52	"Ozark" Fanshell	*Cyprogenia aberti*	Mussel
52	Purple Lilliput	*Toxolasma lividum*	Mussel
50	Coldwater Crayfish	*Orconectes eupunctus*	Crayfish
50	winter stonefly	*Allocapnia jeanae*	Insect
46	Mammoth Spring Crayfish	*Orconectes marchandi*	Crayfish
46	Pink Mucket	*Lampsilis abrupta*	Mussel
43	Piping Plover	*Charadrius melodus*	Bird
43	Arkansas Darter	*Etheostoma cragini*	Fish
43	Ozark Cavefish	*Troglichthys rosae*	Fish
43	Snuffbox	*Epioblasma triquetra*	Mussel
42	American Burying Beetle	*Nicrophorus americanus*	Insect
42	amphipod	*Bactrurus pseudomucronatus*	Invertebrate - other
42	isopod	*Caecidotea dimorpha*	Invertebrate - other
42	cave obligate planarian	*Dendrocoelopsis americana*	Invertebrate - other
42	Shelled Cave Springtail	*Pseudosinella testa*	Invertebrate - other
38	Crystal Darter	*Crystallaria asprella*	Fish
38	Stargazing Darter	*Percina uranidea*	Fish

38	Linda's Roadside-Skipper	*Amblyscirtes linda*	Insect
34	Bristly Cave Crayfish	*Cambarus setosus*	Crayfish
34	Williams' Crayfish	*Orconectes williamsi*	Crayfish
34	Swamp Metalmark	*Calephelis muticum*	Insect
34	Ozark Emerald	*Somatochlora ozarkensis*	Insect
34	White Liptooth	*Millerelix peregrina*	Invertebrate - other
34	Eastern Small-Footed Bat	*Myotis leibii*	Mammal
34	Salamander Mussel	*Simpsonaias ambigua*	Mussel
33	Henslow's Sparrow	*Ammodramus henslowii*	Bird
33	Sprague's Pipit	*Anthus spragueii*	Bird
33	Bachman's Sparrow	*Peucaea aestivalis*	Bird
33	Western Sand Darter	*Ammocrypta clara*	Fish
33	Ozark Shiner	*Notropis ozarcanus*	Fish
33	Little Brown Bat	*Myotis lucifugus*	Mammal
33	Rabbitsfoot	*Quadrula cylindrica*	Mussel
32	Prairie Mole Cricket	*Gryllotalpa major*	Insect
32	Ozark Snaketail Dragonfly	*Ophiogomphus westfalli*	Insect
31	Slippershell Mussel	*Alasmidonta viridis*	Mussel
30	Meek's Short Pointed Crayfish	*Orconectes meeki brevis*	Crayfish
30	Midget Crayfish	*Orconectes nana*	Crayfish
30	Ozark Swallowtail	*Papilio joanae*	Insect
30	isopod	*Caecidotea ancyla*	Invertebrate - other
30	isopod	*Caecidotea steevesi*	Invertebrate - other
30	isopod	*Caecidotea stiladactyla*	Invertebrate - other
29	Buff-breasted Sandpiper	*Calidris subruficollis*	Bird
29	Rusty Blackbird	*Euphagus carolinus*	Bird
29	Mottled Duskywing	*Erynnis martialis*	Insect
29	Meske's Skipper	*Hesperia meskei*	Insect
29	Rafinesque's Big-Eared Bat	*Corynorhinus rafinesquii*	Mammal
27	Oklahoma Salamander	*Eurycea tynerensis*	Amphibian
27	Hubbs' Crayfish	*Cambarus hubbsi*	Crayfish
27	Longnose Darter	*Percina nasuta*	Fish
27	Southern Cavefish	*Typhlichthys subterraneus*	Fish
27	Lace-winged Roadside-Skipper	*Amblyscirtes aesculapius*	Insect
27	Appalachian Azure	*Celastrina neglectamajor*	Insect
29	Mottled Duskywing	*Erynnis martialis*	Insect
27	Baltimore Checkerspot	*Euphydryas phaeton ozarkae*	Insect
27	land snail	*Gastrocopta rogersensis*	Invertebrate - other
27	isopod	*Lirceus bicuspidatus*	Invertebrate - other
27	Ozark Cave Amphipod	*Stygobromus ozarkensis*	Invertebrate - other
27	Ozark Pigtoe	*Fusconaia ozarkensis*	Mussel
27	Ohio Pigtoe	*Pleurobema cordatum*	Mussel
27	Ellipse	*Venustaconcha ellipsiformis*	Mussel
25	Giant Stag Beetle	*Lucanus elephus*	Insect
25	springtail	*Arrhopalites clarus*	Invertebrate - other
24	Ruddy Turnstone	*Arenaria interpres*	Bird
24	Smith's Longspur	*Calcarius pictus*	Bird
24	Common Nighthawk	*Chordeiles minor*	Bird
24	Migrant Loggerhead Shrike	*Lanius ludovicianus migrans*	Bird
24	Yellow-crowned Night-Heron	*Nyctanassa violacea*	Bird
24	American Woodcock	*Scolopax minor*	Bird
24	Cerulean Warbler	*Setophaga cerulea*	Bird

24	American Eel	*Anguilla rostrata*	Fish
24	Paddlefish	*Polyodon spathula*	Fish
24	Southeastern Bat	*Myotis austroriparius*	Mammal
24	"Elongate" Pigtoe	*Fusconaia sp. Cf. sampsoniana*	Mussel
24	Collared Lizard	*Crotaphytus collaris*	Reptile
23	Crawfish Frog	*Lithobates areolatus*	Amphibian
23	American Bittern	*Botaurus lentiginosus*	Bird
23	Willow Flycatcher	*Empidonax traillii*	Bird
23	Neosho Midget Crayfish	*Orconectes macrus*	Crayfish
23	Blue Sucker	*Cycleptus elongatus*	Fish
23	Bluntface Shiner	*Cyprinella camura*	Fish
23	Spotfin Shiner	*Cyprinella spiloptera*	Fish
23	Sabine Shiner	*Notropis sabinae*	Fish
23	Northern Metalmark	*Calephelis borealis*	Insect
23	Outis Skipper	*Cogia outis*	Insect
23	Yehl Skipper	*Poanes yehl*	Insect
23	Byssus Skipper	*Problema byssus*	Insect
23	Ozark Pseudactium	*Pseudactium ursum*	Insect
23	pseudoscorpion	*Microcreagris ozarkensis*	Invertebrate - other
23	Plains Harvest Mouse	*Reithrodontomys montanus*	Mammal
23	Ouachita Kidneyshell	*Ptychobranchus occidentalis*	Mussel
23	Bleedingtooth Mussel	*Venustaconcha pleasii*	Mussel
23	Great Plains Skink	*Plestiodon obsoletus*	Reptile
23	Ground Snake	*Sonora semiannulata*	Reptile
23	Lined Snake	*Tropidoclonion lineatum*	Reptile
21	Le Conte's Sparrow	*Ammodramus leconteii*	Bird
21	Sedge Wren	*Cistothorus platensis*	Bird
21	Bell's Roadside-Skipper	*Amblyscirtes belli*	Insect
21	Golden-banded Skipper	*Autochton cellus*	Insect
21	Scrubland Tiger Beetle	*Cicindela obsoleta*	Insect
21	Black-tailed Jackrabbit	*Lepus californicus*	Mammal
21	Eastern Spotted Skunk	*Spilogale putorius*	Mammal
20	Gapped Ringed Crayfish	*Orconectes neglectus chaenodactylus*	Crayfish
19	Ringed Salamander	*Ambystoma annulatum*	Amphibian
19	Grotto Salamander "western clade"	*Eurycea spelaea*	Amphibian
19	Grotto Salamander "eastern clade"	*Eurycea spelaea*	Amphibian
19	Grotto Salamander "northern clade"	*Eurycea spelaea*	Amphibian
19	Boreal Chorus Frog	*Pseudacris maculata*	Amphibian
19	Eastern Spadefoot	*Scaphiopus holbrookii*	Amphibian
19	Hurter's Spadefoot	*Scaphiopus hurterii*	Amphibian
19	Sharp-shinned Hawk	*Accipiter striatus*	Bird
19	Grasshopper Sparrow	*Ammodramus savannarum*	Bird
19	American Black Duck	*Anas rubripes*	Bird
19	Anhinga	*Anhinga anhinga*	Bird
19	Eastern Whip-poor-will	*Antrostomus vociferus*	Bird
19	Sanderling	*Calidris alba*	Bird
19	Dunlin	*Calidris alpina*	Bird
19	Stilt Sandpiper	*Calidris himantopus*	Bird
19	Chimney Swift	*Chaetura pelagica*	Bird
19	Yellow-billed Cuckoo	*Coccyzus americanus*	Bird
19	Northern Bobwhite	*Colinus virginianus*	Bird
19	Tricolored Heron	*Egretta tricolor*	Bird

19	Purple Finch	*Haemorhous purpureus*	Bird
19	Wood Thrush	*Hylocichla mustelina*	Bird
19	Least Bittern	*Ixobrychus exilis*	Bird
19	Short-billed Dowitcher	*Limnodromus griseus*	Bird
19	Swainson's Warbler	*Limnothlypis swainsonii*	Bird
19	Black-crowned Night-Heron	*Nycticorax nycticorax*	Bird
19	Black-bellied Plover	*Pluvialis squatarola*	Bird
19	Bell's Vireo	*Vireo bellii*	Bird
19	Autumn Darter	*Etheostoma autumnale*	Fish
19	Sunburst Darter	*Etheostoma mihileze*	Fish
19	Current Darter	*Etheostoma uniporum*	Fish
19	Mooneye	*Hiodon tergisus*	Fish
19	American Brook Lamprey	*Lethenteron appendix*	Fish
19	Pealip Redhorse	*Moxostoma pisolabrum*	Fish
19	Striped Mullet	*Mugil cephalus*	Fish
19	Redspot Chub	*Nocomis asper*	Fish
19	Channel Shiner	*Notropis wickliffi*	Fish
19	Gilt Darter	*Percina evides*	Fish
19	Slenderhead Darter	*Percina phoxocephala*	Fish
19	Leonard's Skipper	*Hesperia leonardus*	Insect
19	Cobweb Skipper	*Hesperia metea*	Insect
19	predaceous diving beetle	*Heterosternuta phoebeae*	Insect
19	Ouachita Diving Beetle	*Hydroporus ouachitus*	Insect
19	Gray Comma	*Polygonia progne*	Insect
19	Oak Hairstreak	*Satyrium favonius ontario*	Insect
19	Crawford's Gray Shrew	*Notiosorex crawfordi*	Mammal
19	Eastern Harvest Mouse	*Reithrodontomys humulis*	Mammal
19	Southeastern Shrew	*Sorex longirostris*	Mammal
17	Trumpeter Swan	*Cygnus buccinator*	Bird
17	Highfin carpsucker	*Carpiodes velifer*	Fish
17	Round Pigtoe	*Pleurobema sintoxia*	Mussel
17	Rainbow	*Villosa iris*	Mussel
17	Little Spectaclecase group	*Villosa sp. Cf lienosa*	Mussel
16	Gray Bat	*Myotis grisescens*	Mammal
16	American Badger	*Taxidea taxus*	Mammal
15	Eastern Tiger Salamander	*Ambystoma tigrinum*	Amphibian
15	Wood Frog	*Lithobates sylvaticus*	Amphibian
15	American Kestrel	*Falco sparverius*	Bird
15	American Golden-Plover	*Pluvialis dominica*	Bird
15	Highland Darter	*Etheostoma teddyroosevelt*	Fish
15	Least Brook Lamprey	*Lampetra aepyptera*	Fish
15	Saddleback Darter	*Percina vigil*	Fish
15	Dusky Azure	*Celastrina nigra*	Insect
15	Gorgone Checkerspot	*Chlosyne gorgone*	Insect
15	Cow Path Tiger Beetle	*Cicindela purpurea*	Insect
15	Monarch	*Danaus plexippus*	Insect
15	Long-tailed Weasel	*Mustela frenata*	Mammal
15	Western Harvest Mouse	*Reithrodontomys megalotis*	Mammal
15	Fatmucket	*Lampsilis siliquoidea*	Mussel
15	Slender Glass Lizard	*Ophisaurus attenuatus*	Reptile
13	Twelve-spotted Tiger Beetle	*Cicindela duodecimguttata*	Insect
8	Arkansas agapetus caddisfly	*Agapetus medicus*	Insect

8	contorted ochrotrichian microcaddisfly	*Ochrotrichia contorta*	Insect
8	isopod	*Caecidotea salamensis*	Invertebrate - other

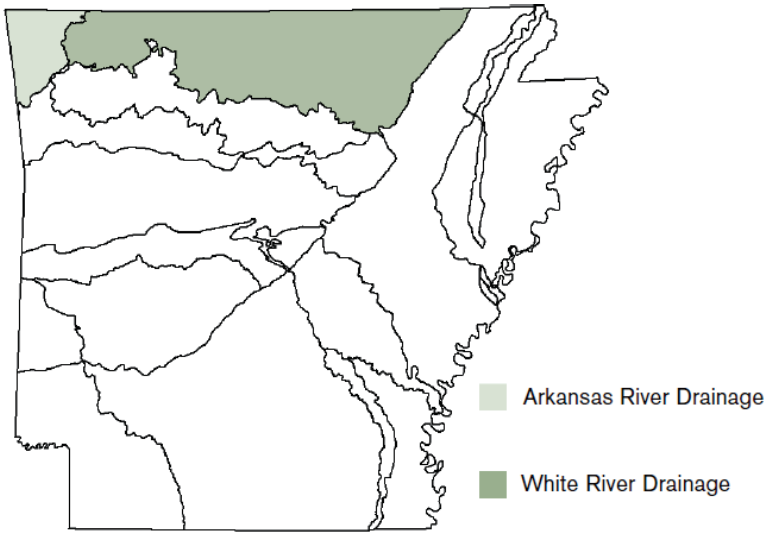
Habitats that occur in the Ozark Highlands

Of the 37 terrestrial habitats in Arkansas, 21 occur in the Ozark Highlands ecoregion (Table 3.4). Of 18 ecobasins in Arkansas, two occur in the Ozark Highlands ecoregion (Figure 3.5). These associations are described in the Section 4. Terrestrial Habitats and Section 5. Aquatic Habitats.

Table 3.4. Terrestrial Habitats in the Ozark Highlands.

Habitat Name
Caves, Mines & Sinkholes, and other Karst Habitat
Crop Land
Cultivated Forest
Herbaceous Wetland
Interior Highlands Calcareous Glade and Barrens
Interior Highlands Dry Acidic Glade and Barrens
Mud Flats
Ozark-Ouachita Cliff and Talus
Ozark-Ouachita Forested Seep
Ozark-Ouachita Dry Oak and Pine Woodland
Ozark-Ouachita Dry-Mesic Oak Forest
Ozark-Ouachita Mesic Hardwood Forest
Ozark-Ouachita Pine-Oak Forest/Woodland
Ozark-Ouachita Prairie and Woodland
Ozark-Ouachita Riparian
Pasture Land
Ponds, Lakes, and Water Holes
Ozark-Ouachita Large Floodplain
Urban/Suburban

Figure 3.5. Ecobasin Distribution in the Ozark Highlands.



Problems faced by Species of Greatest Conservation Need (SGCN)

Taxa association teams listed problems faced by SGCN individually in the Species Reports. A summary of the problems faced by SGCN in the Ozark Highlands is presented below. Each problem has a score which is a sum of all Species Priority Scores associated with species for which this problem was assigned. A higher score implies a higher quantity of SGCN and/or more greatly imperiled species associated with problems listed here.

Table 3.5. Problems faced by SGCN.

Problem Faced	Score
Urban development	3804
Grazing/Browsing	3213
Road construction	2033
Forestry activities	2015
Confined animal operations	1912
Agricultural practices	1793
Dam	1765
Resource extraction	1575
Recreation	933
Municipal/Industrial point source	695
Channel alteration	632
Fire suppression	621
Parasites/pathogens	516
Conversion of riparian forest	427
Water diversion	423
Commercial/industrial development	411
Channel maintenance	401
Exotic species	375
Excessive groundwater withdrawal	230
Non-point source pollution	181
Predation	139
Excessive non-commercial harvest or collection	108
Management of/for certain species	103
Restricted range in Arkansas	57
Interspecific competiton	48
Commercial harvest	43
Unknown	33

Conservation actions needed in the Ozark Highlands

Descriptions of conservation actions linked to individual species on the list of SGCN are presented in the Species Reports, pages 44-1113. Below are categories of conservation actions recommended by the taxa association teams (Figure 3.6). An explanation of the categories follows in Table 3.6.

The score associated with the conservation action category is the sum of all priority scores associated with species for which a conservation action has been assigned, weighted by the importance of the conservation action category to the species. A higher score implies a higher quantity of SGCN and/or more greatly imperiled species would be affected by actions within this conservation action category.

These scores may be used as guides to directing the apportionment of funding toward conservation actions benefiting habitats and species of greatest conservation need.

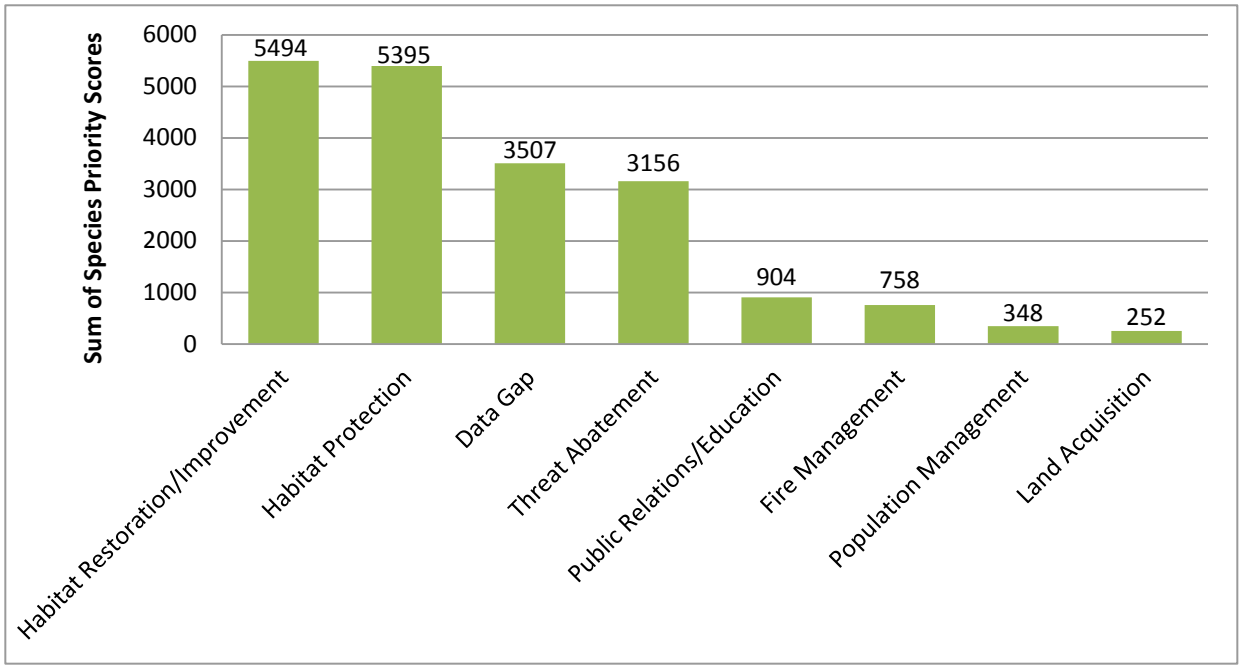


Figure 3.6. Conservation action categories recommended for the Ozark Highlands.

Table 3.6. Conservation action categories explained.

Habitat Restoration/Improvement	Involves the improvement or restoration of habitat or habitat components
Habitat Protection	Involves the protection of existing habitat or habitat components
Fire Management	Management of fire regime
Land Acquisition	Purchase of land or conservation easements critical to species of concern
Population Management	Direct manipulation of populations of species of concern, including restocking, harvest management, and translocation efforts
Threat Abatement	Mitigation of an existing threat, such as predation, pollution, or competing species
Data Gap	Not enough information is known at this time to formulate conservation
Public Relations/Education	Public outreach and education involving species of concern or key habitats
Other	Other conservation actions not covered by these categories

Boston Mountains (Ecoregion 38)

Ecoregion 38 is mountainous, forested and underlain by Pennsylvanian sandstone, shale and siltstone. It is one of the Ozark Plateaus; some folding and faulting has occurred but, in general, strata are much less deformed than in the Ouachita Mountains (36). Maximum elevations are higher, soils have a warmer temperature regime and carbonate rocks are much less extensive than in the Ozark Highlands (39). Physiography is distinct from the Arkansas Valley (37).

Upland soils are mostly Ultisols that developed under oak–hickory and oak–hickory– pine forests. Today, forests are still widespread; northern red oak, southern red oak, white oak and hickories usually dominate the uplands, but shortleaf pine grows on drier, south- and west-facing slopes underlain by sandstone.

Figure 3.7. Boston Mountains ecoregion.

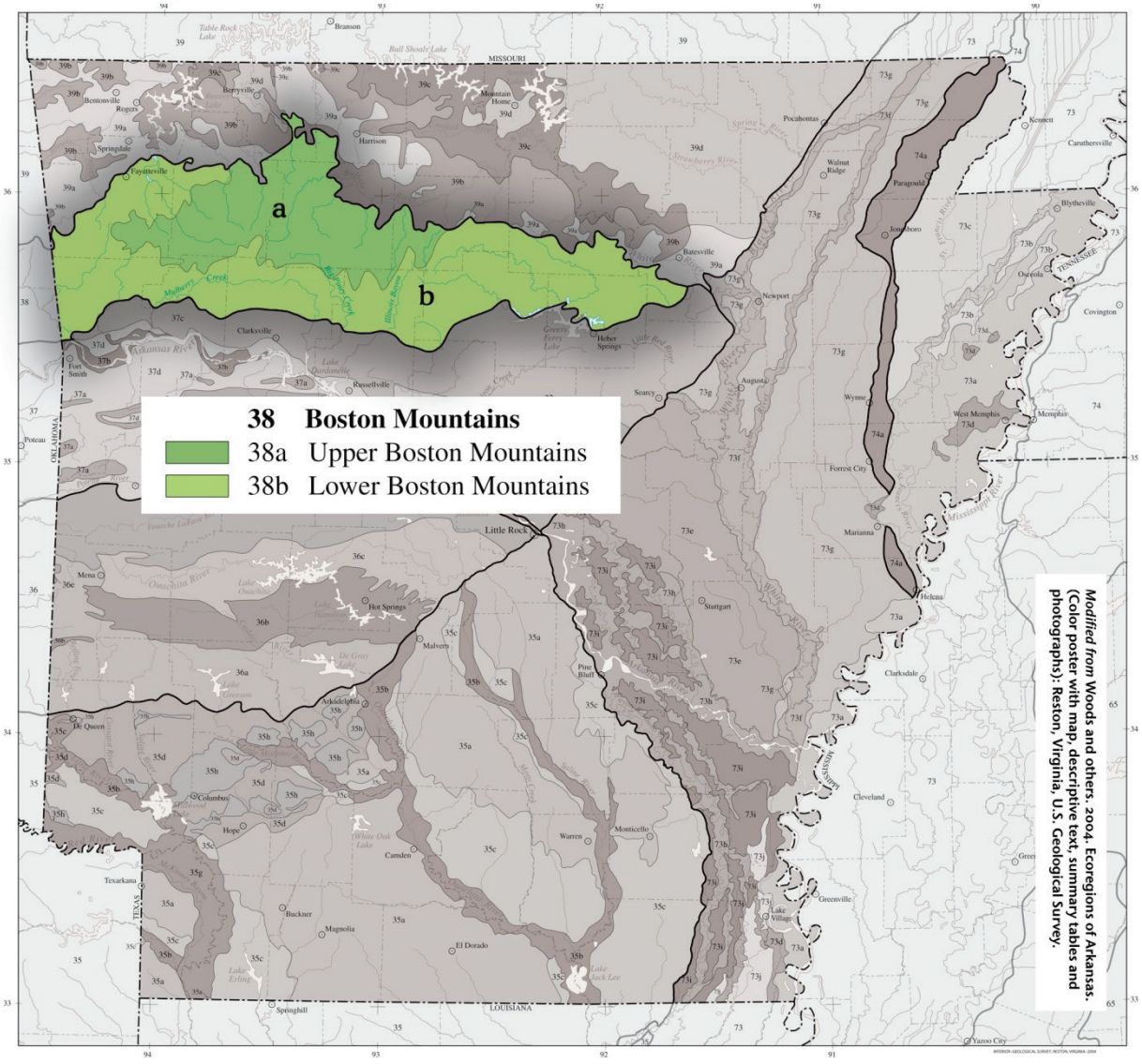


Photo by Tom Foti, AHNC

Upper Boston Mountains

Pastureland or hayland occur on nearly level ridgetops, benches and valley floors. Population density is low; recreation, logging and livestock farming are the primary land uses.

Water quality in streams is generally exceptional; biochemical, nutrient and min- eral water quality parameter concentrations all tend to be very low. Fish communi- ties are mostly composed of sensitive species; a diverse, often darter-dominated community occurs along with nearly equal proportions of minnows and sunfishes. During low flows, streams in both Ecoregions 38 and 36 usually run clear but, during high flow conditions, turbidity in Ecoregion 38 tends to be greater than in Ecoregion 36. Summer flow in many small streams is limited or nonexistent but isolated, enduring pools may occur.

Upper Boston Mountains

38a. The Upper Boston Mountains ecoregion is generally higher and more moist than the Lower Boston Mountains (38b); elevations vary from 1,900 to 2,800 feet. Potential natural vegetation is oak–hickory forest. Characteristically, the forests of the Upper Boston Mountains (38a) are more closed and contain far less pine than those of the Lower Boston Mountains (38b). North-facing slopes support mesic forests. Ecoregion 38a is underlain by Pennsylvanian sandstone, shale and siltstone that contrasts with the limestone and dolomite that dominates Ozark Highlands (39).

Water quality in streams reflects geology, soils and land use and is typically exceptional; mineral, nutrient and solid concentrations as well as turbidity all tend to be very low. During the summer, many streams do not flow.

Lower Boston Mountains

38b. The Lower Boston Mountains ecoregion is a mosaic of woodland, forest and savanna that contrasts with the denser, more moist and closed forests of the Upper Boston Mountains (38a). Potential natural vegetation is oak–hickory– pine and oak–hickory forests; pine is much more common than in Ecoregions 38a or 39. Shortleaf pine is especially widespread on drier, south- and west-facing slopes un- derlain by sandstone. Both precipitation and forest density decrease toward the west, where oak–pine woodland or savanna become common.

Ecoregion 38b is underlain by Pennsylvanian sandstone, shale and siltstone; it is lithologically distinct from the limestone- and dolomite-dominated Ozark High- lands (39).

Overall, water quality is quite similar to Ecoregion 38a, which, although generally higher, has similar lithology and land uses (adapted from Woods and others 2004).

Boston Mountain Ecoregion:

Species of Greatest Conservation Need (SGCN)

Species of greatest conservation need (SGCN) in the Boston Mountains are presented by taxa association (Table 3.7). A higher priority score indicates a greater need for actions to conserve the species. Calculation of the priority score is dis- cussed in Section 2, pages 7-15. A ranked list of all SGCN associated with the ecoregion is presented in Table 3.8.

Table 3.7. SGCN by taxa association in the Boston Mountains.

Taxa Association	Common Name	Scientific Name	Priority Score
Amphibian	Crawfish Frog	*Lithobates areolatus*	23
	Ringed Salamander	*Ambystoma annulatum*	19
	Four-toed Salamander	*Hemidactylium scutatum*	19
	Hurter's Spadefoot	*Scaphiopus hurterii*	19
	Wood Frog	*Lithobates sylvaticus*	15
Bird	Piping Plover	*Charadrius melodus*	43
	Henslow's Sparrow	*Ammodramus henslowii*	33
	Bachman's Sparrow	*Peucaea aestivalis*	33
	Rusty Blackbird	*Euphagus carolinus*	29
	Bewick's Wren	*Thryomanes bewickii*	29
	Common Nighthawk	*Chordeiles minor*	24
	Migrant Loggerhead Shrike	*Lanius ludovicianus migrans*	24
	Yellow-crowned Night-Heron	*Nyctanassa violacea*	24
	American Woodcock	*Scolopax minor*	24
	Cerulean Warbler	*Setophaga cerulea*	24

	American Bittern	*Botaurus lentiginosus*	23
	Willow Flycatcher	*Empidonax traillii*	23
	Le Conte's Sparrow	*Ammodramus leconteii*	21
	Sedge Wren	*Cistothorus platensis*	21
	Sharp-shinned Hawk	*Accipiter striatus*	19
	Grasshopper Sparrow	*Ammodramus savannarum*	19
	Anhinga	*Anhinga anhinga*	19
	Eastern Whip-poor-will	*Antrostomus vociferus*	19
	Sanderling	*Calidris alba*	19
	Dunlin	*Calidris alpina*	19
	Stilt Sandpiper	*Calidris himantopus*	19
	Chimney Swift	*Chaetura pelagica*	19
	Yellow-billed Cuckoo	*Coccyzus americanus*	19
	Northern Bobwhite	*Colinus virginianus*	19
	Tricolored Heron	*Egretta tricolor*	19
	Purple Finch	*Haemorhous purpureus*	19
	Wood Thrush	*Hylocichla mustelina*	19
	Least Bittern	*Ixobrychus exilis*	19
	Short-billed Dowitcher	*Limnodromus griseus*	19
	Swainson's Warbler	*Limnothlypis swainsonii*	19
	Black-crowned Night-Heron	*Nycticorax nycticorax*	19
	Black-bellied Plover	*Pluvialis squatarola*	19
	Bell's Vireo	*Vireo bellii*	19
	Trumpeter Swan	*Cygnus buccinator*	17
	American Kestrel	*Falco sparverius*	15
	American Golden-Plover	*Pluvialis dominica*	15
Crayfish	Boston Mountains Crayfish	*Cambarus causeyi*	62
	Williams' Crayfish	*Orconectes williamsi*	34
	Midget Crayfish	*Orconectes nana*	30
	Hubbs' Crayfish	*Cambarus hubbsi*	27
Fish	Yellowcheek Darter	*Etheostoma moorei*	100
	Ozark Shiner	*Notropis ozarcanus*	33
	Longnose Darter	*Percina nasuta*	27
	American Eel	*Anguilla rostrata*	24
	Paddlefish	*Polyodon spathula*	24
	Bluntface Shiner	*Cyprinella camura*	23
	Autumn Darter	*Etheostoma autumnale*	19
	Sunburst Darter	*Etheostoma mihileze*	19
	American Brook Lamprey	*Lethenteron appendix*	19
	Gilt Darter	*Percina evides*	19
	Highland Darter	*Etheostoma teddyroosevelt*	15
Insect	Bowed Snowfly	*Allocapnia oribata*	80
	Nearctic paduniellan caddisfly	*Paduniella nearctica*	80
	ground beetle	*Rhadine ozarkensis*	80

	beetle	*Rimulincola divalis*	80
	winter stonefly	*Allocapnia jeanae*	50
	winter stonefly	*Allocapnia ozarkana*	50
	Linda's Roadside-Skipper	*Amblyscirtes linda*	38
	Swamp Metalmark	*Calephelis muticum*	34
	Ozark Emerald	*Somatochlora ozarkensis*	34
	mayfly	*Dannella provonshai*	30
	Ozark Swallowtail	*Papilio joanae*	30
	Mottled Duskywing	*Erynnis martialis*	29
	Lace-winged Roadside-Skipper	*Amblyscirtes aesculapius*	27
	Carolina Roadside-Skipper	*Amblyscirtes carolina*	27
	Appalachian Azure	*Celastrina neglectamajor*	27
	Baltimore Checkerspot	*Euphydryas phaeton ozarkae*	27
	Ozark Clubtail Dragonfly	*Gomphus ozarkensis*	27
	Giant Stag Beetle	*Lucanus elephus*	25
	Diana	*Speyeria diana*	25
	Northern Metalmark	*Calephelis borealis*	23
	Woodland Tiger Beetle	*Cicindela unipunctata*	23
	Outis Skipper	*Cogia outis*	23
	Yehl Skipper	*Poanes yehl*	23
	Byssus Skipper	*Problema byssus*	23
	Ozark Pseudactium	*Pseudactium ursum*	23
	ground beetle	*Scaphinotus inflectus*	23
	Bell's Roadside-Skipper	*Amblyscirtes belli*	21
	Golden-banded Skipper	*Autochton cellus*	21
	tiger beetle	*Cicindela lepida*	21
	Leonard's Skipper	*Hesperia leonardus*	19
	Cobweb Skipper	*Hesperia metea*	19
	predaceous diving beetle	*Heterosternuta phoebeae*	19
	Ouachita Diving Beetle	*Hydroporus ouachitus*	19
	Gray Comma	*Polygonia progne*	19
	Oak Hairstreak	*Satyrium favonius ontario*	19
	Beach-dune Tiger Beetle	*Cicindela hirticollis*	17
	Sandy Stream Tiger Beetle	*Cicindela macra*	17
	Gorgone Checkerspot	*Chlosyne gorgone*	15
	Monarch	*Danaus plexippus*	15
	Twelve-spotted Tiger Beetle	*Cicindela duodecimguttata*	13
Invertebrate - other	cave obligate pseudoscorpion	*Apochthonius diabolus*	65
	cave obligate harvestman	*Crosbyella distincta*	65
	cave obligate harvestman	*Crosbyella roeweri*	65
	cave obligate springtail	*Schaefferia alabamensis*	65
	cave obligate millipede	*Trigenotyla parca*	65
	bat cave isopod	*Caecidotea macropropoda*	57
	springtail	*Pseudosinella dubia*	50

	isopod	*Caecidotea dimorpha*	42
	isopod	*Caecidotea oculata*	42
	cave obligate isopod	*Caecidotea simulator*	42
	cave obligate planarian	*Dendrocoelopsis americana*	42
	Shelled Cave Springtail	*Pseudosinella testa*	42
	isopod	*Caecidotea ancyla*	30
	isopod	*Caecidotea stiladactyla*	30
	isopod	*Lirceus bicuspidatus*	27
	Ozark Cave Amphipod	*Stygobromus ozarkensis*	27
	springtail	*Arrhopalites clarus*	25
	pseudoscorpion	*Microcreagris ozarkensis*	23
	pseudoscorpion	*Pseudozaona occidentalis*	23
Mammal	Ozark Big-eared Bat	*Corynorhinus townsendii ingens*	80
	Northern Long-eared Bat	*Myotis septentrionalis*	63
	Indiana Bat	*Myotis sodalis*	62
	Eastern Small-Footed Bat	*Myotis leibii*	34
	Little Brown Bat	*Myotis lucifugus*	33
	Plains Harvest Mouse	*Reithrodontomys montanus*	23
	Eastern Spotted Skunk	*Spilogale putorius*	21
	Crawford's Gray Shrew	*Notiosorex crawfordi*	19
	Southeastern Shrew	*Sorex longirostris*	19
	Gray Bat	*Myotis grisescens*	16
	American Badger	*Taxidea taxus*	16
	Long-tailed Weasel	*Mustela frenata*	15
Mussel	White Hickorynut	*Obovaria sp. Cf arkansasensis*	80
	Speckled Pocketbook	*Lampsilis streckeri*	76
	Neosho Mucket	*Lampsilis rafinesqueana*	57
	"Ozark" Fanshell	*Cyprogenia aberti*	52
	Purple Lilliput	*Toxolasma lividum*	52
	Spectaclecase	*Cumberlandia monodonta*	48
	Salamander Mussel	*Simpsonaias ambigua*	34
	Rabbitsfoot	*Quadrula cylindrica*	33
	Ellipse	*Venustaconcha ellipsiformis*	27
	"Elongate" Pigtoe	*Fusconaia sp. Cf. sampsoniana*	24
	Ouachita Kidneyshell	*Ptychobranchus occidentalis*	23
	Pondhorn	*Uniomerus tetralasmus*	23
	Bleedingtooth Mussel	*Venustaconcha pleasii*	23
	Elktoe	*Alasmidonta marginata*	19
	Gulf mapleleaf	*Quadrula nobilis*	19
	Lilliput	*Toxolasma parvum*	19
	Round Pigtoe	*Pleurobema sintoxia*	17
	Rainbow	*Villosa iris*	17
	Little Spectaclecase group	*Villosa sp. Cf lienosa*	17
	Fatmucket	*Lampsilis siliquoidea*	15

Reptile	Queen Snake	*Regina septemvittata*	29
	Great Plains Skink	*Plestiodon obsoletus*	23
	Southern Prairie Skink	*Plestiodon obtusirostris*	19
	Graham's Crayfish Snake	*Regina grahamii*	19
	Ornate Box Turtle	*Terrapene ornata ornata*	19
	Western Diamondback Rattlesnake	*Crotalus atrox*	17
	Slender Glass Lizard	*Ophisaurus attenuatus*	15

Table 3.8. Species of greatest conservation need (SGCN) in the Boston Mountains ranked by priority score. A higher priority score indicates a greater need for actions to conserve the species. Of the 377 SGCN, 154 occur in this ecoregion.

Priority Score	Common Name	Scientific Name	Taxa Association
100	Yellowcheek Darter	*Etheostoma moorei*	Fish
80	Bowed Snowfly	*Allocapnia oribata*	Insect
80	Ozark Big-eared Bat	*Corynorhinus townsendii ingens*	Mammal
80	White Hickorynut	*Obovaria sp. Cf arkansasensis*	Mussel
80	Nearctic paduniellan caddisfly	*Paduniella nearctica*	Insect
80	ground beetle	*Rhadine ozarkensis*	Insect
80	beetle	*Rimulincola divalis*	Insect
76	Speckled Pocketbook	*Lampsilis streckeri*	Mussel
65	cave obligate pseudoscorpion	*Apochthonius diabolus*	Invertebrate - other
65	cave obligate harvestman	*Crosbyella distincta*	Invertebrate - other
65	cave obligate harvestman	*Crosbyella roeweri*	Invertebrate - other
65	cave obligate springtail	*Schaefferia alabamensis*	Invertebrate - other
65	cave obligate millipede	*Trigenotyla parca*	Invertebrate - other
63	Northern Long-eared Bat	*Myotis septentrionalis*	Mammal
62	Boston Mountains Crayfish	*Cambarus causeyi*	Crayfish
62	Indiana Bat	*Myotis sodalis*	Mammal
57	bat cave isopod	*Caecidotea macropropoda*	Invertebrate - other
57	Neosho Mucket	*Lampsilis rafinesqueana*	Mussel
52	"Ozark" Fanshell	*Cyprogenia aberti*	Mussel
52	Purple Lilliput	*Toxolasma lividum*	Mussel
50	winter stonefly	*Allocapnia jeanae*	Insect
50	winter stonefly	*Allocapnia ozarkana*	Insect
50	springtail	*Pseudosinella dubia*	Invertebrate - other
48	Spectaclecase	*Cumberlandia monodonta*	Mussel
43	Piping Plover	*Charadrius melodus*	Bird
42	isopod	*Caecidotea dimorpha*	Invertebrate - other
42	isopod	*Caecidotea oculata*	Invertebrate - other
42	cave obligate isopod	*Caecidotea simulator*	Invertebrate - other
42	cave obligate planarian	*Dendrocoelopsis americana*	Invertebrate - other
42	Shelled Cave Springtail	*Pseudosinella testa*	Invertebrate - other
38	Linda's Roadside-Skipper	*Amblyscirtes linda*	Insect
34	Swamp Metalmark	*Calephelis muticum*	Insect
34	Eastern Small-Footed Bat	*Myotis leibii*	Mammal
34	Williams' Crayfish	*Orconectes williamsi*	Crayfish
34	Salamander Mussel	*Simpsonaias ambigua*	Mussel
34	Ozark Emerald	*Somatochlora ozarkensis*	Insect
33	Henslow's Sparrow	*Ammodramus henslowii*	Bird
33	Little Brown Bat	*Myotis lucifugus*	Mammal
33	Ozark Shiner	*Notropis ozarcanus*	Fish
33	Bachman's Sparrow	*Peucaea aestivalis*	Bird
33	Rabbitsfoot	*Quadrula cylindrica*	Mussel
30	isopod	*Caecidotea ancyla*	Invertebrate - other
30	isopod	*Caecidotea stiladactyla*	Invertebrate - other
30	mayfly	*Dannella provonshai*	Insect
30	Midget Crayfish	*Orconectes nana*	Crayfish
30	Ozark Swallowtail	*Papilio joanae*	Insect
29	Mottled Duskywing	*Erynnis martialis*	Insect
29	Rusty Blackbird	*Euphagus carolinus*	Bird

29	Queen Snake	*Regina septemvittata*	Reptile
29	Bewick's Wren	*Thryomanes bewickii*	Bird
27	Lace-winged Roadside-Skipper	*Amblyscirtes aesculapius*	Insect
27	Carolina Roadside-Skipper	*Amblyscirtes carolina*	Insect
27	Hubbs' Crayfish	*Cambarus hubbsi*	Crayfish
27	Appalachian Azure	*Celastrina neglectamajor*	Insect
27	Baltimore Checkerspot	*Euphydryas phaeton ozarkae*	Insect
27	Ozark Clubtail Dragonfly	*Gomphus ozarkensis*	Insect
27	isopod	*Lirceus bicuspidatus*	Invertebrate - other
27	Longnose Darter	*Percina nasuta*	Fish
27	Ozark Cave Amphipod	*Stygobromus ozarkensis*	Invertebrate - other
27	Ellipse	*Venustaconcha ellipsiformis*	Mussel
25	springtail	*Arrhopalites clarus*	Invertebrate - other
25	Giant Stag Beetle	*Lucanus elephus*	Insect
25	Diana	*Speyeria diana*	Insect
24	American Eel	*Anguilla rostrata*	Fish
24	Common Nighthawk	*Chordeiles minor*	Bird
24	"Elongate" Pigtoe	*Fusconaia sp. Cf. sampsoniana*	Mussel
24	Migrant Loggerhead Shrike	*Lanius ludovicianus migrans*	Bird
24	Yellow-crowned Night-Heron	*Nyctanassa violacea*	Bird
24	Paddlefish	*Polyodon spathula*	Fish
24	American Woodcock	*Scolopax minor*	Bird
24	Cerulean Warbler	*Setophaga cerulea*	Bird
23	American Bittern	*Botaurus lentiginosus*	Bird
23	Northern Metalmark	*Calephelis borealis*	Insect
23	Woodland Tiger Beetle	*Cicindela unipunctata*	Insect
23	Outis Skipper	*Cogia outis*	Insect
23	Bluntface Shiner	*Cyprinella camura*	Fish
23	Willow Flycatcher	*Empidonax traillii*	Bird
23	Crawfish Frog	*Lithobates areolatus*	Amphibian
23	pseudoscorpion	*Microcreagris ozarkensis*	Invertebrate - other
23	Great Plains Skink	*Plestiodon obsoletus*	Reptile
23	Yehl Skipper	*Poanes yehl*	Insect
23	Byssus Skipper	*Problema byssus*	Insect
23	Ozark Pseudactium	*Pseudactium ursum*	Insect
23	pseudoscorpion	*Pseudozaona occidentalis*	Invertebrate - other
23	Ouachita Kidneyshell	*Ptychobranchus occidentalis*	Mussel
23	Plains Harvest Mouse	*Reithrodontomys montanus*	Mammal
23	ground beetle	*Scaphinotus inflectus*	Insect
23	Pondhorn	*Uniomerus tetralasmus*	Mussel
23	Bleedingtooth Mussel	*Venustaconcha pleasii*	Mussel
21	Le Conte's Sparrow	*Ammodramus leconteii*	Bird
21	Bell's Roadside-Skipper	*Amblyscirtes belli*	Insect
21	Golden-banded Skipper	*Autochton cellus*	Insect
21	tiger beetle	*Cicindela lepida*	Insect
21	Sedge Wren	*Cistothorus platensis*	Bird
21	Eastern Spotted Skunk	*Spilogale putorius*	Mammal
19	Sharp-shinned Hawk	*Accipiter striatus*	Bird
19	Elktoe	*Alasmidonta marginata*	Mussel
19	Ringed Salamander	*Ambystoma annulatum*	Amphibian
19	Grasshopper Sparrow	*Ammodramus savannarum*	Bird

Priority Score	Common Name	Scientific Name	Taxa Association
19	Anhinga	*Anhinga anhinga*	Bird
19	Eastern Whip-poor-will	*Antrostomus vociferus*	Bird
19	Sanderling	*Calidris alba*	Bird
19	Dunlin	*Calidris alpina*	Bird
19	Stilt Sandpiper	*Calidris himantopus*	Bird
19	Chimney Swift	*Chaetura pelagica*	Bird
19	Yellow-billed Cuckoo	*Coccyzus americanus*	Bird
19	Northern Bobwhite	*Colinus virginianus*	Bird
19	Tricolored Heron	*Egretta tricolor*	Bird
19	Autumn Darter	*Etheostoma autumnale*	Fish
19	Sunburst Darter	*Etheostoma mihileze*	Fish
19	Purple Finch	*Haemorhous purpureus*	Bird
19	Four-toed Salamander	*Hemidactylium scutatum*	Amphibian
19	Leonard's Skipper	*Hesperia leonardus*	Insect
19	Cobweb Skipper	*Hesperia metea*	Insect
19	predaceous diving beetle	*Heterosternuta phoebeae*	Insect
19	Ouachita Diving Beetle	*Hydroporus ouachitus*	Insect
19	Wood Thrush	*Hylocichla mustelina*	Bird
19	Least Bittern	*Ixobrychus exilis*	Bird
19	American Brook Lamprey	*Lethenteron appendix*	Fish
19	Short-billed Dowitcher	*Limnodromus griseus*	Bird
19	Swainson's Warbler	*Limnothlypis swainsonii*	Bird
19	Crawford's Gray Shrew	*Notiosorex crawfordi*	Mammal
19	Black-crowned Night-Heron	*Nycticorax nycticorax*	Bird
19	Gilt Darter	*Percina evides*	Fish
19	Southern Prairie Skink	*Plestiodon obtusirostris*	Reptile
19	Black-bellied Plover	*Pluvialis squatarola*	Bird
19	Gray Comma	*Polygonia progne*	Insect
19	Gulf mapleleaf	*Quadrula nobilis*	Mussel
19	Graham's Crayfish Snake	*Regina grahamii*	Reptile
19	Oak Hairstreak	*Satyrium favonius ontario*	Insect
19	Hurter's Spadefoot	*Scaphiopus hurterii*	Amphibian
19	Southeastern Shrew	*Sorex longirostris*	Mammal
19	Ornate Box Turtle	*Terrapene ornata ornata*	Reptile
19	Lilliput	*Toxolasma parvum*	Mussel
19	Bell's Vireo	*Vireo bellii*	Bird
17	Beach-dune Tiger Beetle	*Cicindela hirticollis*	Insect
17	Sandy Stream Tiger Beetle	*Cicindela macra*	Insect
17	Western Diamondback Rattlesnake	*Crotalus atrox*	Reptile
17	Trumpeter Swan	*Cygnus buccinator*	Bird
17	Round Pigtoe	*Pleurobema sintoxia*	Mussel
17	Rainbow	*Villosa iris*	Mussel
17	Little Spectaclecase group	*Villosa sp. Cf lienosa*	Mussel
16	Gray Bat	*Myotis grisescens*	Mammal
16	American Badger	*Taxidea taxus*	Mammal
15	Gorgone Checkerspot	*Chlosyne gorgone*	Insect
15	Monarch	*Danaus plexippus*	Insect
15	Highland Darter	*Etheostoma teddyroosevelt*	Fish
15	American Kestrel	*Falco sparverius*	Bird
15	Fatmucket	*Lampsilis siliquoidea*	Mussel
15	Wood Frog	*Lithobates sylvaticus*	Amphibian
15	Long-tailed Weasel	*Mustela frenata*	Mammal
15	Slender Glass Lizard	*Ophisaurus attenuatus*	Reptile
15	American Golden-Plover	*Pluvialis dominica*	Bird

13	Twelve-spotted Tiger Beetle	*Cicindela duodecimguttata*	Insect
19	Southeastern Shrew	*Sorex longirostris*	Mammal

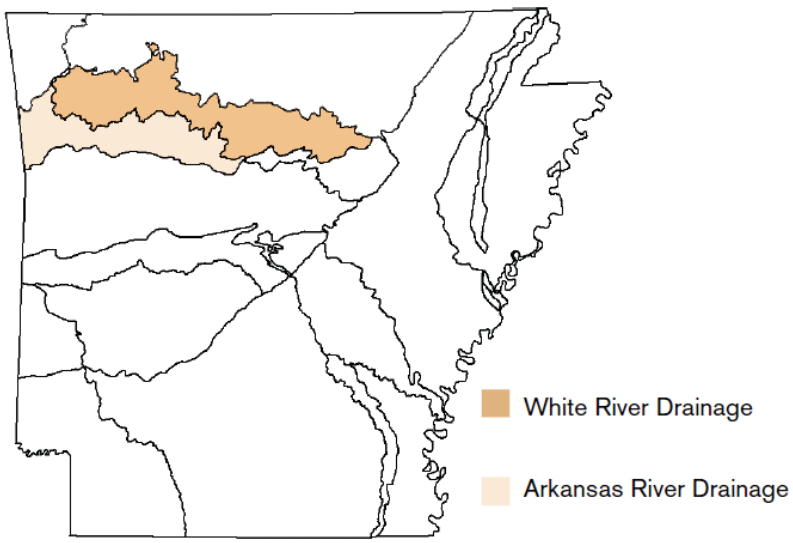
Habitats that occur in the Boston Mountains

Of the37 terrestrial habitats in Arkansas, 19 occur in the Boston Mountains ecore gion (Table 3.9). Of 18 ecobasins in Arkansas, two occur in the Boston Mountains (Figure 3.8). These associations are described in the Section 4. Terrestrial Habitats, pages 1188-1575 and Section 5. Aquatic Habitats, pages 1576-1612.

Table 3.9. Terrestrial Habitats in the Boston Mountains

Habitat Name
Caves, Mines, Sinkholes, and other Karst Habitat
Crop Land
Cultivated Forest
Herbaceous Wetland
Interior Highlands Calcareous Glade and Barrens
Interior Highlands Dry Acidic Glade and Barrens
Mud Flats
Ozark-Ouachita Cliff and Talus
Ozark-Ouachita Dry Oak and Pine Woodland
Ozark-Ouachita Dry-Mesic Oak Forest
Ozark-Ouachita Forested Seep
Ozark-Ouachita Large Floodplain
Ozark-Ouachita Mesic Hardwood Forest
Ozark-Ouachita Pine/Bluestem Woodland
Ozark-Ouachita Pine-Oak Forest/ Woodland
Ozark-Ouachita Riparian
Pasture Land
Ponds, Lakes, and Water Holes
Urban/Suburban

Figure 3.8. Ecobasin distribution in the Boston Mountains.



Problems faced by Species of Greatest Conservation Need (SGCN)

Taxa association teams listed problems faced by SGCN individually in the Species Reports, pages 45-1082. A summary of the problems faced by SGCN in the Boston Mountains is presented below. Each problem has a score which is a sum of all Species Priority Scores associated with species for which this problem was assigned. A higher score implies a higher quantity of SGCN and/or more greatly imperiled species associated with problems listed here.

Table 3.10. Problems faced by SGCN.

Problem faced	Score
Urban development	2094
Forestry activities	1838
Grazing/Browsing	1741
Resource extraction	1682
Dam	1490
Agricultural practices	1482
Road construction	852
Confined animal operations	633
Municipal/Industrial point source	570

Fire suppression	452
Parasites/pathogens	392
Recreation	375
Channel alteration	343
Conversion of riparian forest	333
Water diversion	312
Channel maintenance	302
Commercial/Industrial development	294
Exotic species	241
Non-point source pollution	131
Excessive groundwater withdrawal	121
Predation	97
Management of/for certain species	46
Interspecific competiton	29
Excessive non-commercial harvest or collection	27
Commercial harvest	24

Conservation actions needed in the Boston Mountains

Descriptions of conservation actions linked to individual species on the list of SGCN are presented in the Species Reports, pages 45-1082. Below are categories of conservation actions recommended by the taxa association teams (Figure 3.9).

The score associated with the conservation action category is the sum of all priority scores associated with species for which a conservation action has been assigned, weighted by the importance of the conservation action category to the species. A higher score implies a higher quantity of SGCN and/or more greatly imperiled species would be affected by actions within this conservation action category.

These scores may be used as guides to directing the apportionment of funding toward conservation actions benefiting habitats and species of greatest conservation need.

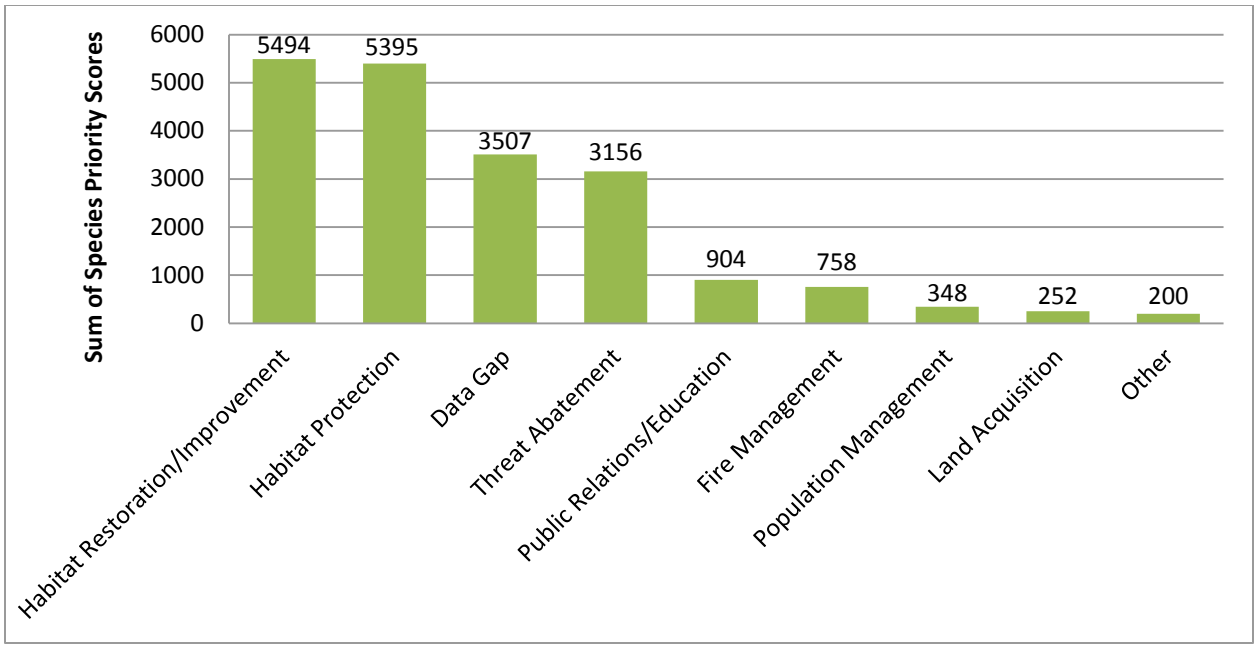


Figure 3.9. Conservation action categories recommended for the Boston Mountains.

Arkansas Valley (Ecoregion 37)

Ecoregion 37 is a synclinal and alluvial valley lying between the Ozark Highlands (39) and the Ouachita Mountains (36). The Arkansas Valley (37) is, characteristically, diverse and transitional. It generally coincides with the Arkoma Basin, an oil and gas province, that developed as sand and mud were deposited in a depression north of the rising Ouachita Mountains during the Mississippian and Pennsylva- nian eras.

The Arkansas Valley (37) contains plains, hills, floodplains, terraces and scattered mountains. It is largely underlain by interbedded Pennsylvanian sandstone, shale and siltstone.

Figure 3.10. Arkansas Valley Ecoregion

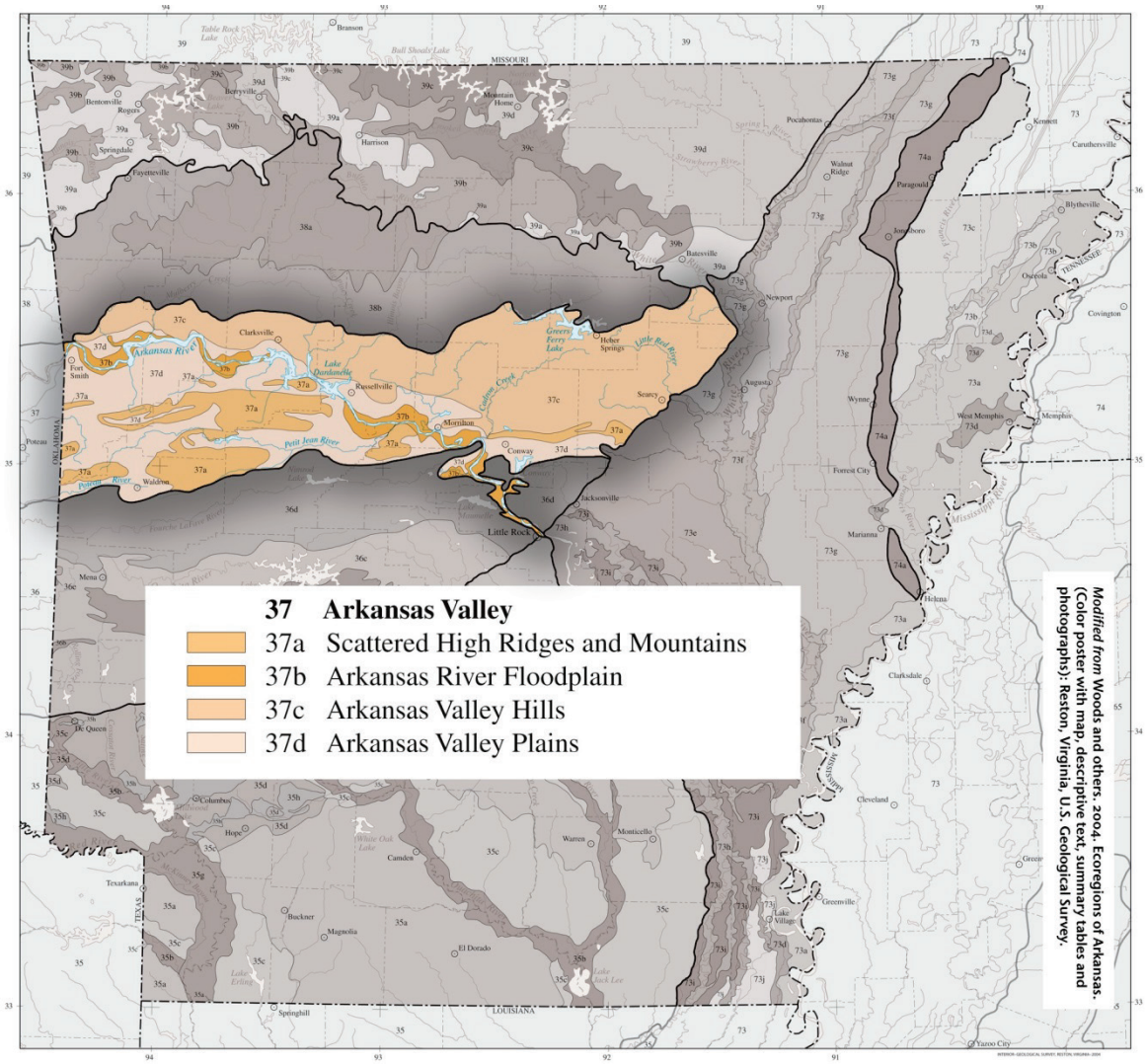


Photo by MAWPT

Prior to the 19th century, uplands were dominated by a mix of forest, woodland, savanna and prairie whereas floodplains and lower terraces were covered by bottomland deciduous forest. Today, less rugged upland areas have been cleared for pastureland or hayland. Poultry and livestock farming are important land uses.

Water quality is generally good and influenced more by land use activities than by soils or geology; average stream gradients and dissolved oxygen levels are lower in the Arkansas Valley (37) than in the Ouachita Mountains (36) or Ozark Highlands (39), whereas turbidity, total suspended solids, total organic carbon, total phosphorus and biochemical oxygen demand values are typically higher. The Arkansas River is continuously turbid. Summer flow in smaller streams is typically limited or non- existent.

Fish communities characteristically contain a substantial proportion of sensitive species; a sunfish and minnow-dominated community exists along with substantial proportions of darters and catfishes (particularly madtoms).

Scattered High Ridges and Mountains

37a. The Scattered High Ridges and Mountains ecoregion is more rugged and wooded than Ecoregions 37b, 37c, or 37d. Ecoregion 37a is characteristically covered by savannas, open woodlands, or forests dominated or codominated by upland oaks, hickory and shortleaf pine; loblolly pine occurs but is not native. It is underlain by Pennsylvanian sandstone and shale; calcareous rocks such as those that dominate the Ozark Highlands (39) are absent.

Nutrient and mineral values (including turbidity and hardness) in streams are slightly higher than

in other parts of the Arkansas Valley (37). Magazine Mountain, the highest point in Arkansas at 2,753 feet, is distinguished by diverse habitats. Its flat top is covered with xeric, stunted woodlands. Mesic sites also occur and may contain beech–maple forests.

Arkansas River Floodplain

37b. The Arkansas River Floodplain is characteristically veneered with Holocene alluvium and includes natural levees, meander scars, oxbow lakes, point bars, swales and backswamps. It is lithologically and physiographically distinct from the surrounding uplands of the Arkansas Valley (37). Mollisols, Entisols, Alfisols and Inceptisols are common; the soil mosaic sharply contrasts with nearby, higher elevation ecoregions where Ultisols developed under upland oaks, hickory and pine.

Potential natural vegetation is southern floodplain forest. Bottomland oaks includ- ing bur oak, American sycamore, sweetgum, willows, eastern cottonwood, green ash, pecan, hackberry and elm were once extensive. They have been widely cleared for pastureland, hayland and cropland. However, some forest remains in frequently flooded or poorly-drained areas. In Arkansas, bur oak is most dominant in Ecoregion 37b.

Arkansas Valley Hills

37c. The Arkansas Valley Hills are underlain by Pennsylvanian sandstone and shale and are lithologically distinct from Ecoregions 37b and 39. Ecoregion 37c is more hilly than the Arkansas Valley Plains (37d) and less rugged than Ecoregions 36, 37a and 38. Ultisols are common and support a potential natural vegetation of oak– hickory forest or oak–hickory–pine forest; both soils and natural vegetation contrast with those of Ecoregion 37b.

Today, pastureland is extensive, but rugged areas are wooded; overall, trees are much less extensive than in neighboring Ecoregions 36d, 37a and 38 but more widespread than in Ecoregions 37b and 37d. Poultry operations, livestock farming and logging are important land uses.

Arkansas Valley Plains

37d. The Arkansas Valley Plains are in the rainshadow of the Fourche Mountains and were once covered by a distinctive mosaic of prairie, savanna and woodland. Ecoregion 37d is mostly undulating but a few hills and ridges occur.

Westward, Ecoregion 37d becomes flatter, drier, more open and has fewer topographic fire barriers. Prior to the 19th century, frequently burned western areas had extensive prairie on droughty soils; scattered pine–oak savanna also occurred. Elsewhere, potential natural vegetation is primarily oak–hickory forest or oak–hickory– pine forest.

Today, pastureland and hayland are extensive but remnants of prairie, particularly the Cherokee Prairie near Fort Smith and woodland occur. Poultry and livestock farming are primary land uses. Cropland agriculture in the Arkansas Valley Plains (37d) is less important than in Ecoregion 37b and wooded areas are not as extensive as in more rugged Ecoregions 36, 37a, 37c and 38. Stream turbidity generally remains low except during storm events (adapted from Woods and others 2004).

Arkansas Valley Ecoregion:

Species of Greatest Conservation Need (SGCN)

Species of greatest conservation need (SGCN) in the Arkansas Valley are presented by taxa association (Table 3.11). A higher priority score indicates a greater need for actions to conserve the species. Calculation of the priority score is discussed in Section 2, pages 8-8. A ranked list of all SGCN associated with the ecoregion is presented in Table 3.12.

Table 3.11. SGCN by taxa association in the Arkansas Valley ecoregion.

Taxa Association	Common Name	*Scientific Name*	Priority Score
Amphibian	Crawfish Frog	*Lithobates areolatus*	23
	Plains Spadefoot	*Spea bombifrons*	23
	Ringed Salamander	*Ambystoma annulatum*	19
	Great Plains Narrowmouth Toad	*Gastrophryne olivacea*	19
	Strecker's Chorus Frog	*Pseudacris streckeri*	19
	Hurter's Spadefoot	*Scaphiopus hurterii*	19
	Bird-voiced Treefrog	*Hyla avivoca*	15
Bird	Piping Plover	*Charadrius melodus*	43
	Henslow's Sparrow	*Ammodramus henslowii*	33
	Sprague's Pipit	*Anthus spragueii*	33
	Bachman's Sparrow	*Peucaea aestivalis*	33
	King Rail	*Rallus elegans*	33
	Interior Least Tern	*Sterna antillarum athalassos*	31
	Buff-breasted Sandpiper	*Calidris subruficollis*	29
	Rusty Blackbird	*Euphagus carolinus*	29
	Bewick's Wren	*Thryomanes bewickii*	29
	Ruddy Turnstone	*Arenaria interpres*	24
	Smith's Longspur	*Calcarius pictus*	24
	Common Nighthawk	*Chordeiles minor*	24
	Migrant Loggerhead Shrike	*Lanius ludovicianus migrans*	24
	Yellow-crowned Night-Heron	*Nyctanassa violacea*	24
	American Woodcock	*Scolopax minor*	24

	Cerulean Warbler	*Setophaga cerulea*	24
	Rufous-crowned Sparrow	*Aimophila ruficeps*	23
	American Bittern	*Botaurus lentiginosus*	23
	Willow Flycatcher	*Empidonax traillii*	23
	Purple Gallinule	*Porphyrio martinicus*	23
	Le Conte's Sparrow	*Ammodramus leconteii*	21
	Sedge Wren	*Cistothorus platensis*	21
	Sharp-shinned Hawk	*Accipiter striatus*	19
	Grasshopper Sparrow	*Ammodramus savannarum*	19
	American Black Duck	*Anas rubripes*	19
	Anhinga	*Anhinga anhinga*	19
	Eastern Whip-poor-will	*Antrostomus vociferus*	19
	Sanderling	*Calidris alba*	19
	Dunlin	*Calidris alpina*	19
	Stilt Sandpiper	*Calidris himantopus*	19
	Chimney Swift	*Chaetura pelagica*	19
	Yellow-billed Cuckoo	*Coccyzus americanus*	19
	Northern Bobwhite	*Colinus virginianus*	19
	Tricolored Heron	*Egretta tricolor*	19
	Common Gallinule	*Gallinula chloropus*	19
	Purple Finch	*Haemorhous purpureus*	19
	Wood Thrush	*Hylocichla mustelina*	19
	Least Bittern	*Ixobrychus exilis*	19
	Short-billed Dowitcher	*Limnodromus griseus*	19
	Swainson's Warbler	*Limnothlypis swainsonii*	19
	Black-crowned Night-Heron	*Nycticorax nycticorax*	19
	Black-bellied Plover	*Pluvialis squatarola*	19
	Bell's Vireo	*Vireo bellii*	19
	Trumpeter Swan	*Cygnus buccinator*	17
	American Kestrel	*Falco sparverius*	15
	American Golden-Plover	*Pluvialis dominica*	15
Crayfish	Boston Mountains Crayfish	*Cambarus causeyi*	62
	Bismark Burrowing Crayfish	*Procambarus parasimulans*	19
Fish	Alabama Shad	*Alosa alabamae*	52
	Arkansas River Shiner	*Notropis girardi*	50
	Alligator Gar	*Atractosteus spatula*	27
	Plains Minnow	*Hybognathus placitus*	27
	Longnose Darter	*Percina nasuta*	27
	American Eel	*Anguilla rostrata*	24
	Paddlefish	*Polyodon spathula*	24
	Blue Sucker	*Cycleptus elongatus*	23
	Bluntface Shiner	*Cyprinella camura*	23

	Suckermouth Minnow	*Phenacobius mirabilis*	23
	Brown Bullhead	*Ameiurus nebulosus*	19
	Sunburst Darter	*Etheostoma mihileze*	19
	Goldeye	*Hiodon alosoides*	19
	Mooneye	*Hiodon tergisus*	19
	Pealip Redhorse	*Moxostoma pisolabrum*	19
	Striped Mullet	*Mugil cephalus*	19
	Slenderhead Darter	*Percina phoxocephala*	19
	Highfin carpsucker	*Carpiodes velifer*	17
	Lake Chubsucker	*Erimyzon sucetta*	15
	Highland Darter	*Etheostoma teddyroosevelt*	15
	Shoal Chub	*Macrhybopsis hyostoma*	15
	Saddleback Darter	*Percina vigil*	15
Insect	Magazine Mountain mold beetle	*Arianops sandersoni*	80
	Magazine stripetail	*Isoperla szczytkoi*	80
	Nearctic paduniellan caddisfly	*Paduniella nearctica*	80
	beetle	*Rimulincola divalis*	80
	mayfly	*Paraleptophlebia calcarica*	65
	Texas Frosted Elfin	*Callophrys irus hadros*	42
	American Burying Beetle	*Nicrophorus americanus*	42
	Dukes' Skipper	*Euphyes dukesi*	32
	Prairie Mole Cricket	*Gryllotalpa major*	32
	Mottled Duskywing	*Erynnis martialis*	29
	Meske's Skipper	*Hesperia meskei*	29
	Lace-winged Roadside-Skipper	*Amblyscirtes aesculapius*	27
	Giant Stag Beetle	*Lucanus elephus*	25
	Diana	*Speyeria diana*	25
	lace bug	*Acalypta susanae*	23
	Northern Metalmark	*Calephelis borealis*	23
	Woodland Tiger Beetle	*Cicindela unipunctata*	23
	Outis Skipper	*Cogia outis*	23
	microcaddisfly	*Paucicalcaria ozarkensis*	23
	Yehl Skipper	*Poanes yehl*	23
	Byssus Skipper	*Problema byssus*	23
	Ouachita Pseudactium	*Pseudactium magazinensis*	23
	King's Hairstreak	*Satyrium kingi*	23
	ground beetle	*Scaphinotus parisiana*	23
	Bell's Roadside-Skipper	*Amblyscirtes belli*	21
	tiger beetle	*Cicindela lepida*	21
	red milkweed beetle	*Tetraopes quinquemaculatus*	21
	Texas milkweed beetle	*Tetraopes texanus*	21
	lace bug	*Acalypta lillianus*	19
	Arogos Skipper	*Atrytone arogos iowa*	19

	Dion Skipper	*Euphyes dion*	19
	Leonard's Skipper	*Hesperia leonardus*	19
	Cobweb Skipper	*Hesperia metea*	19
	Small-eyed Mold Beetle	*Ouachitychus parvoculus*	19
	Gray Comma	*Polygonia progne*	19
	Oak Hairstreak	*Satyrium favonius ontario*	19
	Ant-like Tiger Beetle	*Cicindela cursitans*	17
	Big Sand tiger beetle	*Cicindela formosa pigmentosignata*	17
	Beach-dune Tiger Beetle	*Cicindela hirticollis*	17
	Sandy Stream Tiger Beetle	*Cicindela macra*	17
	Gorgone Checkerspot	*Chlosyne gorgone*	15
	Monarch	*Danaus plexippus*	15
	Twelve-spotted Tiger Beetle	*Cicindela duodecimguttata*	13
Invertebrate - other	Magazine Mountain Shagreen	*Inflectarius magazinensis*	80
	Striate Supercoil	*Paravitrea aulacogyra*	80
	Calico Rock Oval	*Patera clenchi*	65
	Elevated Spring Amphipod	*Stygobromus elatus*	50
	Hubricht's Long-tailed Amphipod	*Allocrangonyx hubrichti*	42
	isopod	*Caecidotea dimorpha*	42
	isopod	*Lirceus bicuspidatus*	27
Mammal	Northern Long-eared Bat	*Myotis septentrionalis*	63
	Eastern Small-Footed Bat	*Myotis leibii*	34
	Little Brown Bat	*Myotis lucifugus*	33
	Rafinesque's Big-Eared Bat	*Corynorhinus rafinesquii*	29
	Southeastern Bat	*Myotis austroriparius*	24
	Black-tailed Jackrabbit	*Lepus californicus*	21
	Eastern Spotted Skunk	*Spilogale putorius*	21
	Crawford's Gray Shrew	*Notiosorex crawfordi*	19
	Eastern Harvest Mouse	*Reithrodontomys humulis*	19
	Southeastern Shrew	*Sorex longirostris*	19
	Gray Bat	*Myotis grisescens*	16
	American Badger	*Taxidea taxus*	16
	Long-tailed Weasel	*Mustela frenata*	15
Mussel	Purple Lilliput	*Toxolasma lividum*	52
	Bleedingtooth Mussel	*Venustaconcha pleasii*	23
	Elktoe	*Alasmidonta marginata*	19
	Lilliput	*Toxolasma parvum*	19
	Round Pigtoe	*Pleurobema sintoxia*	17
	Little Spectaclecase group	*Villosa sp. Cf lienosa*	17
	Fatmucket	*Lampsilis siliquoidea*	15
	"Arkoma" Fatmucket	*Lampsilis sp. A*	15
	Fawnsfoot	*Truncilla donaciformis*	15
Reptile	Queen Snake	*Regina septemvittata*	29

	Collared Lizard	*Crotaphytus collaris*	24
	Great Plains Skink	*Plestiodon obsoletus*	23
	Western Chicken Turtle	*Deirochelys reticularia miaria*	19
	Southern Prairie Skink	*Plestiodon obtusirostris*	19
	Graham's Crayfish Snake	*Regina grahamii*	19
	Ornate Box Turtle	*Terrapene ornata ornata*	19
	Western Diamondback Rattlesnake	*Crotalus atrox*	17
	Gulf Swampsnake	*Liodytes rigida*	15
	Slender Glass Lizard	*Ophisaurus attenuatus*	15

Table 3.12. Species of greatest conservation need (SGCN) in the Arkansas Valley ranked by priority score. A higher priority score indicates a greater need for actions to conserve the species. Of the 377 SGCN, 159 occur in this ecoregion.

Priority Score	Common Name	Scientific Name	Taxa Association
80	Magazine Mountain mold beetle	*Arianops sandersoni*	Insect
80	Magazine Mountain Shagreen	*Inflectarius magazinensis*	Invertebrate - other
80	Magazine stripetail	*Isoperla szczytkoi*	Insect
80	Nearctic paduniellan caddisfly	*Paduniella nearctica*	Insect
80	Striate Supercoil	*Paravitrea aulacogyra*	Invertebrate - other
80	beetle	*Rimulincola divalis*	Insect
65	mayfly	*Paraleptophlebia calcarica*	Insect
65	Calico Rock Oval	*Patera clenchi*	Invertebrate - other
63	Northern Long-eared Bat	*Myotis septentrionalis*	Mammal
62	Boston Mountains Crayfish	*Cambarus causeyi*	Crayfish
52	Alabama Shad	*Alosa alabamae*	Fish
52	Purple Lilliput	*Toxolasma lividum*	Mussel
50	Arkansas River Shiner	*Notropis girardi*	Fish
50	Elevated Spring Amphipod	*Stygobromus elatus*	Invertebrate - other
43	Piping Plover	*Charadrius melodus*	Bird
42	Hubricht's Long-tailed Amphipod	*Allocrangonyx hubrichti*	Invertebrate - other
42	isopod	*Caecidotea dimorpha*	Invertebrate - other
42	Texas Frosted Elfin	*Callophrys irus hadros*	Insect
42	American Burying Beetle	*Nicrophorus americanus*	Insect
34	Eastern Small-Footed Bat	*Myotis leibii*	Mammal
33	Henslow's Sparrow	*Ammodramus henslowii*	Bird
33	Sprague's Pipit	*Anthus spragueii*	Bird
33	Little Brown Bat	*Myotis lucifugus*	Mammal
33	Bachman's Sparrow	*Peucaea aestivalis*	Bird
33	King Rail	*Rallus elegans*	Bird
32	Dukes' Skipper	*Euphyes dukesi*	Insect
32	Prairie Mole Cricket	*Gryllotalpa major*	Insect
31	Interior Least Tern	*Sterna antillarum athalassos*	Bird
29	Buff-breasted Sandpiper	*Calidris subruficollis*	Bird
29	Rafinesque's Big-Eared Bat	*Corynorhinus rafinesquii*	Mammal
29	Mottled Duskywing	*Erynnis martialis*	Insect
29	Rusty Blackbird	*Euphagus carolinus*	Bird
29	Meske's Skipper	*Hesperia meskei*	Insect
29	Queen Snake	*Regina septemvittata*	Reptile
29	Bewick's Wren	*Thryomanes bewickii*	Bird
27	Lace-winged Roadside-Skipper	*Amblyscirtes aesculapius*	Insect
27	Alligator Gar	*Atractosteus spatula*	Fish
27	Plains Minnow	*Hybognathus placitus*	Fish
27	isopod	*Lirceus bicuspidatus*	Invertebrate - other
27	Longnose Darter	*Percina nasuta*	Fish
25	Giant Stag Beetle	*Lucanus elephus*	Insect
25	Diana	*Speyeria diana*	Insect
24	American Eel	*Anguilla rostrata*	Fish
24	Ruddy Turnstone	*Arenaria interpres*	Bird

Priority Score	Common Name	Scientific Name	Taxa Association
24	Smith's Longspur	*Calcarius pictus*	Bird
24	Common Nighthawk	*Chordeiles minor*	Bird
24	Collared Lizard	*Crotaphytus collaris*	Reptile
24	Migrant Loggerhead Shrike	*Lanius ludovicianus migrans*	Bird
24	Southeastern Bat	*Myotis austroriparius*	Mammal
24	Yellow-crowned Night-Heron	*Nyctanassa violacea*	Bird
24	Paddlefish	*Polyodon spathula*	Fish
24	American Woodcock	*Scolopax minor*	Bird
24	Cerulean Warbler	*Setophaga cerulea*	Bird
23	lace bug	*Acalypta susanae*	Insect
23	Rufous-crowned Sparrow	*Aimophila ruficeps*	Bird
23	American Bittern	*Botaurus lentiginosus*	Bird
23	Northern Metalmark	*Calephelis borealis*	Insect
23	Woodland Tiger Beetle	*Cicindela unipunctata*	Insect
23	Outis Skipper	*Cogia outis*	Insect
23	Blue Sucker	*Cycleptus elongatus*	Fish
23	Bluntface Shiner	*Cyprinella camura*	Fish
23	Willow Flycatcher	*Empidonax traillii*	Bird
23	Crawfish Frog	*Lithobates areolatus*	Amphibian
23	microcaddisfly	*Paucicalcaria ozarkensis*	Insect
23	Suckermouth Minnow	*Phenacobius mirabilis*	Fish
23	Great Plains Skink	*Plestiodon obsoletus*	Reptile
23	Yehl Skipper	*Poanes yehl*	Insect
23	Purple Gallinule	*Porphyrio martinicus*	Bird
23	Byssus Skipper	*Problema byssus*	Insect
23	Ouachita Pseudactium	*Pseudactium magazinensis*	Insect
23	King's Hairstreak	*Satyrium kingi*	Insect
23	ground beetle	*Scaphinotus parisiana*	Insect
23	Plains Spadefoot	*Spea bombifrons*	Amphibian
23	Bleedingtooth Mussel	*Venustaconcha pleasii*	Mussel
21	Le Conte's Sparrow	*Ammodramus leconteii*	Bird
21	Bell's Roadside-Skipper	*Amblyscirtes belli*	Insect
21	tiger beetle	*Cicindela lepida*	Insect
21	Sedge Wren	*Cistothorus platensis*	Bird
21	Black-tailed Jackrabbit	*Lepus californicus*	Mammal
21	Eastern Spotted Skunk	*Spilogale putorius*	Mammal
21	red milkweed beetle	*Tetraopes quinquemaculatus*	Insect
21	Texas milkweed beetle	*Tetraopes texanus*	Insect
19	lace bug	*Acalypta lillianus*	Insect
19	Sharp-shinned Hawk	*Accipiter striatus*	Bird
19	Elktoe	*Alasmidonta marginata*	Mussel
19	Ringed Salamander	*Ambystoma annulatum*	Amphibian
19	Brown Bullhead	*Ameiurus nebulosus*	Fish
19	Grasshopper Sparrow	*Ammodramus savannarum*	Bird
19	American Black Duck	*Anas rubripes*	Bird
19	Anhinga	*Anhinga anhinga*	Bird
19	Eastern Whip-poor-will	*Antrostomus vociferus*	Bird
19	Arogos Skipper	*Atrytone arogos iowa*	Insect
19	Sanderling	*Calidris alba*	Bird
19	Dunlin	*Calidris alpina*	Bird

Priority Score	Common Name	Scientific Name	Taxa Association
19	Stilt Sandpiper	*Calidris himantopus*	Bird
19	Chimney Swift	*Chaetura pelagica*	Bird
19	Yellow-billed Cuckoo	*Coccyzus americanus*	Bird
19	Northern Bobwhite	*Colinus virginianus*	Bird
19	Western Chicken Turtle	*Deirochelys reticularia miaria*	Reptile
19	Tricolored Heron	*Egretta tricolor*	Bird
19	Sunburst Darter	*Etheostoma mihileze*	Fish
19	Dion Skipper	*Euphyes dion*	Insect
19	Common Gallinule	*Gallinula chloropus*	Bird
19	Great Plains Narrowmouth Toad	*Gastrophryne olivacea*	Amphibian
19	Purple Finch	*Haemorhous purpureus*	Bird
19	Leonard's Skipper	*Hesperia leonardus*	Insect
19	Cobweb Skipper	*Hesperia metea*	Insect
19	Goldeye	*Hiodon alosoides*	Fish
19	Mooneye	*Hiodon tergisus*	Fish
19	Wood Thrush	*Hylocichla mustelina*	Bird
19	Least Bittern	*Ixobrychus exilis*	Bird
19	Short-billed Dowitcher	*Limnodromus griseus*	Bird
19	Swainson's Warbler	*Limnothlypis swainsonii*	Bird
19	Pealip Redhorse	*Moxostoma pisolabrum*	Fish
19	Striped Mullet	*Mugil cephalus*	Fish
19	Crawford's Gray Shrew	*Notiosorex crawfordi*	Mammal
19	Black-crowned Night-Heron	*Nycticorax nycticorax*	Bird
19	Small-eyed Mold Beetle	*Ouachitychus parvoculus*	Insect
19	Slenderhead Darter	*Percina phoxocephala*	Fish
19	Southern Prairie Skink	*Plestiodon obtusirostris*	Reptile
19	Black-bellied Plover	*Pluvialis squatarola*	Bird
19	Gray Comma	*Polygonia progne*	Insect
19	Bismark Burrowing Crayfish	*Procambarus parasimulans*	Crayfish
19	Strecker's Chorus Frog	*Pseudacris streckeri*	Amphibian
19	Graham's Crayfish Snake	*Regina grahamii*	Reptile
19	Eastern Harvest Mouse	*Reithrodontomys humulis*	Mammal
19	Oak Hairstreak	*Satyrium favonius ontario*	Insect
19	Hurter's Spadefoot	*Scaphiopus hurterii*	Amphibian
19	Southeastern Shrew	*Sorex longirostris*	Mammal
19	Ornate Box Turtle	*Terrapene ornata ornata*	Reptile
19	Lilliput	*Toxolasma parvum*	Mussel
19	Bell's Vireo	*Vireo bellii*	Bird
17	Highfin carpsucker	*Carpiodes velifer*	Fish
17	Ant-like Tiger Beetle	*Cicindela cursitans*	Insect
17	Big Sand tiger beetle	*Cicindela formosa pigmentosignata*	Insect
17	Beach-dune Tiger Beetle	*Cicindela hirticollis*	Insect
17	Sandy Stream Tiger Beetle	*Cicindela macra*	Insect
17	Western Diamondback Rattlesnake	*Crotalus atrox*	Reptile
17	Trumpeter Swan	*Cygnus buccinator*	Bird
17	Round Pigtoe	*Pleurobema sintoxia*	Mussel
17	Little Spectaclecase group	*Villosa sp. Cf lienosa*	Mussel
16	Gray Bat	*Myotis grisescens*	Mammal
16	American Badger	*Taxidea taxus*	Mammal
15	Gorgone Checkerspot	*Chlosyne gorgone*	Insect

Priority Score	Common Name	Scientific Name	Taxa Association
15	Monarch	*Danaus plexippus*	Insect
15	Lake Chubsucker	*Erimyzon sucetta*	Fish
15	Highland Darter	*Etheostoma teddyroosevelt*	Fish
15	American Kestrel	*Falco sparverius*	Bird
15	Bird-voiced Treefrog	*Hyla avivoca*	Amphibian
15	Fatmucket	*Lampsilis siliquoidea*	Mussel
15	"Arkoma" Fatmucket	*Lampsilis sp. A*	Mussel
15	Gulf Swampsnake	*Liodytes rigida*	Reptile
15	Shoal Chub	*Macrhybopsis hyostoma*	Fish
15	Long-tailed Weasel	*Mustela frenata*	Mammal
15	Slender Glass Lizard	*Ophisaurus attenuatus*	Reptile
15	Saddleback Darter	*Percina vigil*	Fish
15	American Golden-Plover	*Pluvialis dominica*	Bird
15	Fawnsfoot	*Truncilla donaciformis*	Mussel
13	Twelve-spotted Tiger Beetle	*Cicindela duodecimguttata*	Insect

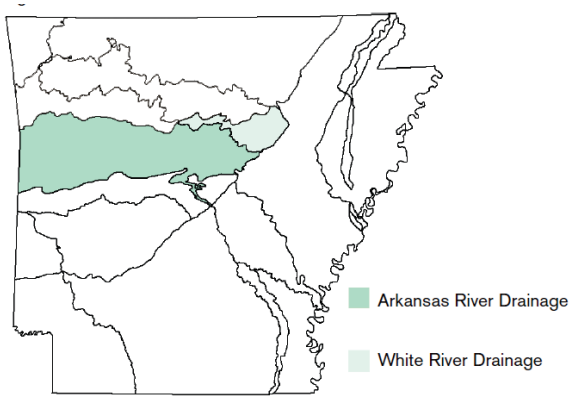
Habitats that occur in the Arkansas Valley

Of the 37 terrestrial habitats in Arkansas, 20 occur in the Arkansas Valley ecoregion (Table 3.14). Of 18 ecobasins in Arkansas, two occur in the Arkansas Valley ecoregion (Figure 3.11). These associations are described in the Section 4. Terrestrial Habitats, pages 1188-1575 and Section 5. Aquatic Habitats, pages 1576-1612.

Table 3.14. Terrestrial Habitats in the Arkansas Valley

Habitat Name
Caves, Mines, Sinkholes, and other Karst Habitat
Crop Land
Cultivated Forest
Herbaceous Wetland
Interior Highlands Dry Acidic Glade and Barrens
Mud Flats
Ouachita Montane Oak Forest
Ozark-Ouachita Cliff and Talus
Ozark-Ouachita Dry Oak and Pine Woodland
Ozark-Ouachita Dry-Mesic Oak Forest
Ozark-Ouachita Forested Seep
Ozark-Ouachita Large Floodplain
Ozark-Ouachita Mesic Hardwood Forest
Ozark-Ouachita Prairie and Woodland
Ozark-Ouachita Pine/Bluestem Woodland
Ozark-Ouachita Pine-Oak Forest/Woodland
Ozark-Ouachita Riparian
Pasture Land
Ponds, Lakes, and Water Holes
Urban/Suburban

Figure 3.11. Ecobasin Distribution in the Arkansas Valley



Problems faced by Species of Greatest Conservation Need (SGCN)

Taxa association teams listed problems faced by SGCN individually in the Species Reports, pages 44-1113. A summary of the problems faced by SGCN in the Arkansas Valley is presented below. Each problem has a score which is a sum of all Species Priority Scores associated with species for which this problem was assigned. A higher score implies a higher quantity of SGCN and/or more greatly imperiled species associated with problems listed here.

Table 3.15. Problems faced by SGCN in the Arkansas Valley.

Problem faced	Score
Forestry activities	1825
Agricultural practices	1799
Dam	1168
Urban development	989
Grazing/Browsing	741
Resource extraction	726
Fire suppression	623
Recreation	497
Conversion of riparian forest	423
Water diversion	334
Road construction	318
Commercial/industrial development	311
Channel alteration	277
Parasites/pathogens	274
Confined animal operations	244
Exotic species	234
Channel maintenance	229
Predation	170
Municipal/Industrial point source	164
Commercial harvest	150
Excessive groundwater withdrawal	121
Management of/for certain species	103
Non-point source pollution	82

unknown	52
Interspecific competiton	48

Conservation actions needed in the Arkansas Valley

Descriptions of conservation actions linked to individual species on the list of SGCN are presented in the Species Reports, pages 41-1113. Below are categories of conservation actions recommended by the taxa association teams (Figure 3.12). An explanation of the categories follows in Table 3.16.

The score associated with the conservation action category is the sum of all priority scores associated with species for which a conservation action has been assigned, weighted by the importance of the conservation action category to the species. A higher score implies a higher quantity of SGCN and/or more greatly imperiled species would be affected by actions within this conservation action category.

These scores may be used as guides to directing the apportionment of funding toward conservation actions benefiting habitats and species of greatest conservation need.

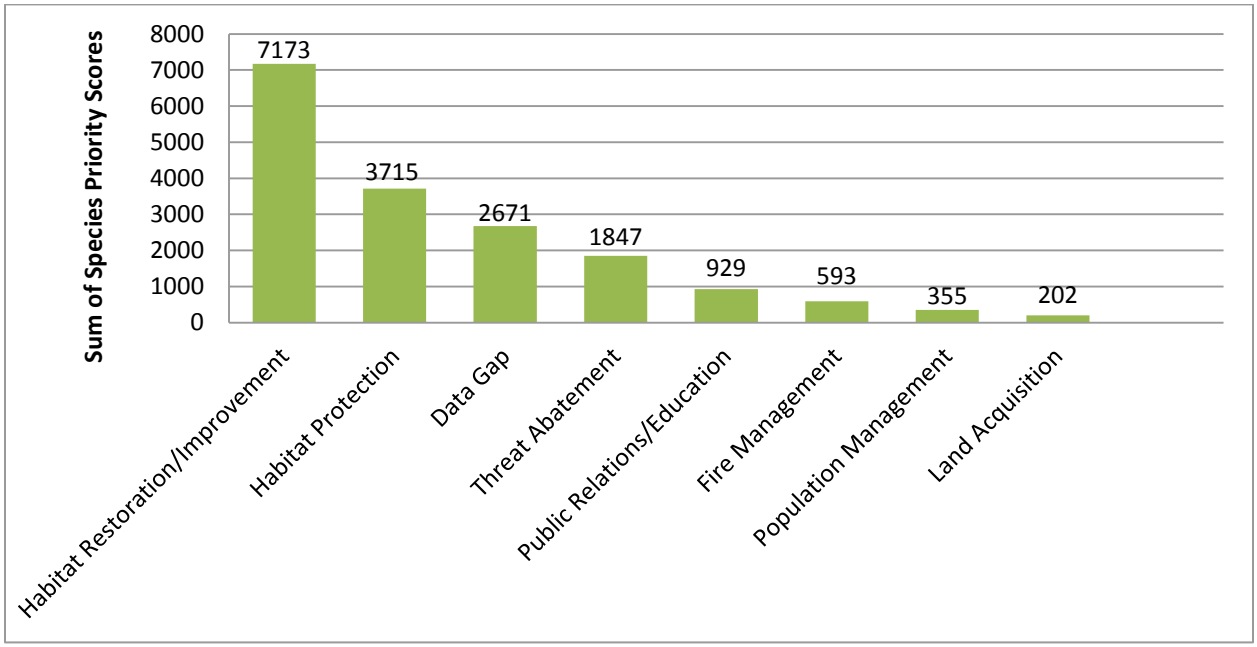


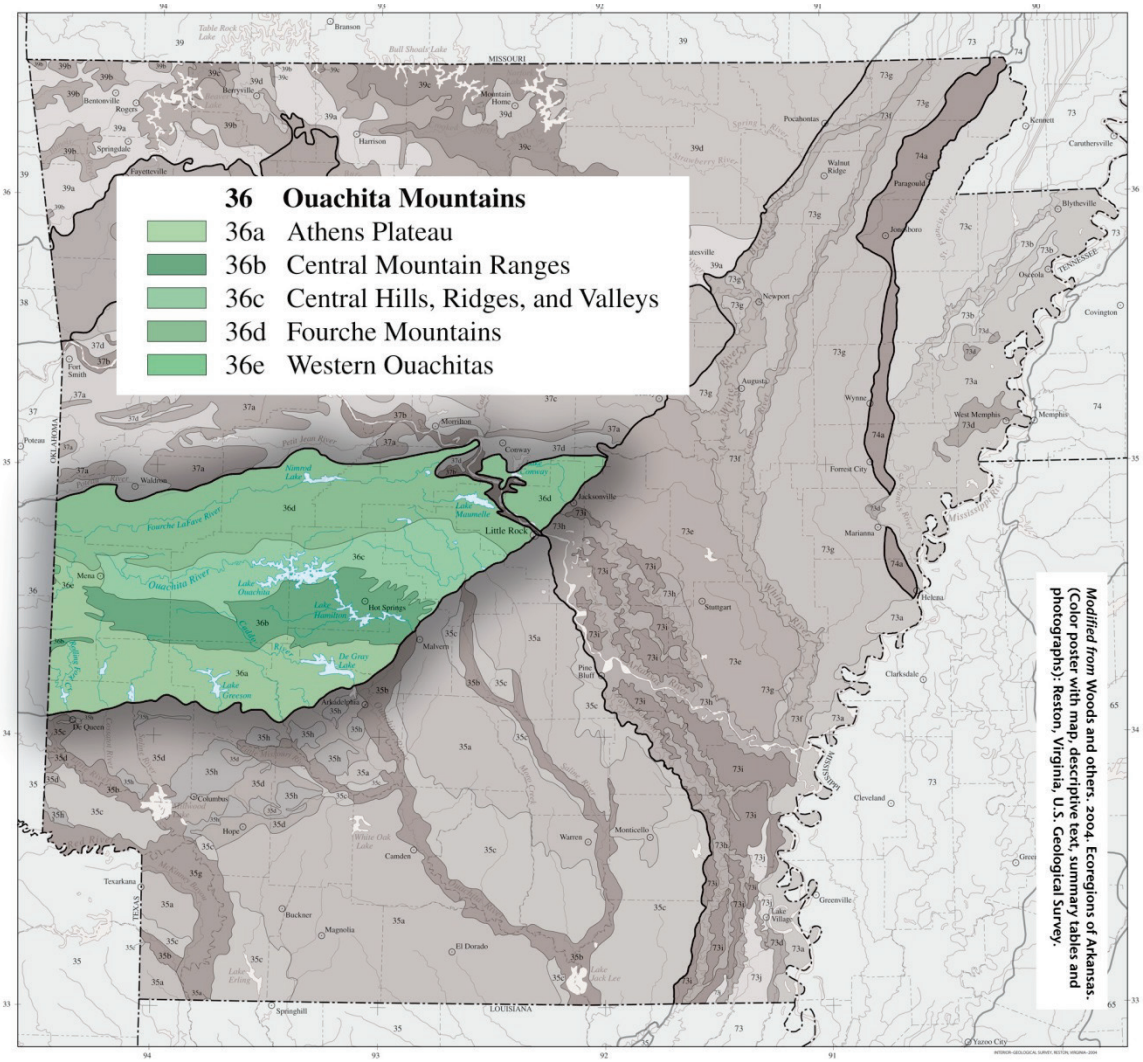
Figure 3.12. Conservation action categories recommended for the Arkansas Valley.

Ouachita Mountains (Ecoregion 36)

The Ouachitas are made up of ridges, hills and valleys formed by the erosion of folded and faulted Paleozoic sandstone, shale and chert, known locally as novaculite. They are a continuation of the Appalachians, formed during the late Paleozoic Era when an ocean closed and continents collided, causing marine sediments to be folded, faulted and thrust northward. The Ouachitas are structurally different from the Boston Mountains (38), more folded and rugged than the lithologically distinct Ozark Highlands (39) and physiographically unlike the Arkansas Valley (37), South Central Plains (35) and Mississippi Alluvial Plain (73).

Potential natural vegetation is oak–hickory–pine forest; it contrasts with the oak– hickory forest that dominates Ecoregion 39 and the northern part of Ecoregion 38. Today, loblolly pine and shortleaf pine grow in a distinctive mix of thermic Ultisols and Inceptisols.

Figure 3.13. Ouachita Mountains ecoregion.



Athens Plateau - Ouachita Mountains

Logging and recreation are major land uses and pastureland and hayland are found in broader valleys.

Regional water quality is influenced by lithology, soil composition and land use activities. In most reaches, water quality is exceptional; typically, total phosphorus, turbidity, total suspended solids and biological oxygen demand values are lower whereas dissolved oxygen levels are higher than in Ecoregions 35, 37 and 73. Water hardness varies by level IV ecoregion; Ecoregions 36d and 36e tend to have the lowest hardness values while progressively higher values occur in Ecoregions 36a, 36b and 36c. Stream substrates are made up of gravel, cobbles, boulders, or bedrock; they contrast with the fine-grained substrates of lower gradient streams in Ecoregions 35 and 73.

The fish community is dominated by sensitive species; minnows and sunfish along with darters and bass are common.

Athens Plateau

36a. The low ridges and hills of the Athens Plateau are widely underlain by shale in contrast to other parts of Ecoregion 36. Rocks are less resistant to erosion than in higher, more rugged Ecoregions 36b, 36d and 36e but are more resistant than the unconsolidated rocks of the coastal plain in Ecoregion 35.

Ouachita Mountains Ecoregion

Today, pine plantations are widespread; they are far more extensive than in the more rugged parts of Ecoregion 36 in Arkansas. Pastureland and hayland also occur. Cattle and broiler chickens are important farm products. Water quality values are distinct from Ecoregion 36c.

Central Mountain Ranges

36b. The Central Mountain Ranges are dominated by east-west trending ridges that are characteristically steep and rugged and underlain by resistant sandstone and novaculite (chert). Igneous intrusions occur along with associated hot springs. Rock outcrops and shallow, stony soils are widespread. Novaculite glades occur.

Potential natural vegetation is oak–hickory– pine forest. Perennial springs and seeps are common and support diverse vegetation. Constricted valleys between ridges have waterfalls and rapids. The surface waters of Ecoregion 36b have very low nutrient, mineral and biochemical water quality parameter concentrations and turbidity. Logging is not nearly as common as in the less rugged Athens Plateau (36a).

Central Hills, Ridges and Valleys

36c. The Central Hills, Ridges and Valleys ecoregion is lower, less rugged and more open than neighboring Ecoregions 36b and 36d. Ecoregion 36c is underlain by folded and faulted sandstone, shale and novaculite (chert); the lithologic mosaic is distinct from the Athens Plateau (36a).

Its forests are codominated by loblolly pine–shortleaf pine and upland oak–hickory–pine forest types. Pastureland is also common, much more so than in Ecoregions 36b and 36d.

Fourche Mountains

36d. The Fourche Mountains are the archetypal Ouachita Mountains. Ecoregion 36d is composed of long, east-west trending, forested ridges composed of sand- stone. Intervening valleys are cut into shale. Ridges are longer, habitat continuity is greater, the lithologic mosaic is different and the topographic orientation is more consistent than in other parts of the Ouachita Mountains (36).

Differences in moisture and temperature between north- and south-facing slopes significantly influence native plant communities; they are products of the prevailing topographic trend. Forests on steep, north-facing slopes are more mesic than on southern aspects; grassy woodlands are found on steepest, south-facing slopes.

Pastureland and hayland are restricted to a few broad valleys. Logging is not nearly as intensive as in the commercial pine plantations of the less rugged Athens Plateau.

Nutrient, mineral and biochemical water quality parameter concentrations are low in the surface waters of Ecoregion 36d but turbidity can be higher than in other mountainous parts of the Ouachitas.

Western Ouachitas

36e. The Western Ouachitas ecoregion is composed of mountains, hills and narrow valleys. In Arkansas, Ecoregion 36e is confined to Round Mountain in western Polk County, where it is underlain by sandstone and shale; novaculite (chert) is absent in contrast to the Central Mountain Ranges (36b). Ridgetop elevations exceed 2,300 feet in Arkansas; both elevation and precipitation decrease westward into Oklahoma. Ecoregion 36e in Arkansas is higher and more rugged than the lithologically distinct Athens Plateau (36a).

Today, pine and upland oak–hickory–pine forest types codominate. Ecoregion 36e in Arkansas and Oklahoma contains, perhaps, the greatest concentration of critically-imperiled and imperiled species in mid-North America (adapted from Woods and others 2004).

Ouachita Mountains Ecoregion:

Species of Greatest Conservation Need (SGCN)

Species of greatest conservation need (SGCN) in the Ouachita Mountains are presented by taxa association (Table 3.17). A higher priority score indicates a greater need for actions to conserve the species. A ranked list of all SGCN associated with the ecoregion is presented in Table 3.18.

Table 3.17. SGCN by taxa association in the Ouachita Mountains ecoregion.

Taxa Association	Common Name	*Scientific Name*	Priority Score
Amphibian	Ouachita Streambed Salamander	*Eurycea subfluvicola*	80
	Sequoyah Slimy Salamander	*Plethodon sequoyah*	50
	Fourche Mountain Salamander	*Plethodon fourchensis*	46
	Kiamichi Slimy Salamander	*Plethodon kiamichi*	46
	Caddo Mountain Salamander	*Plethodon caddoensis*	42

	Rich Mountain Salamander	*Plethodon ouachitae*	38
	Crawfish Frog	*Lithobates areolatus*	23
	Ringed Salamander	*Ambystoma annulatum*	19
	Four-toed Salamander	*Hemidactylium scutatum*	19
	Hurter's Spadefoot	*Scaphiopus hurterii*	19
	Mole Salamander	*Ambystoma talpoideum*	15
	Bird-voiced Treefrog	*Hyla avivoca*	15
Bird	Piping Plover	*Charadrius melodus*	43
	Red-cockaded Woodpecker	*Picoides borealis*	43
	Sprague's Pipit	*Anthus spragueii*	33
	Bachman's Sparrow	*Peucaea aestivalis*	33
	Buff-breasted Sandpiper	*Calidris subruficollis*	29
	Rusty Blackbird	*Euphagus carolinus*	29
	Bewick's Wren	*Thryomanes bewickii*	29
	Ruddy Turnstone	*Arenaria interpres*	24
	Smith's Longspur	*Calcarius pictus*	24
	Common Nighthawk	*Chordeiles minor*	24
	Migrant Loggerhead Shrike	*Lanius ludovicianus migrans*	24
	Yellow-crowned Night-Heron	*Nyctanassa violacea*	24
	American Woodcock	*Scolopax minor*	24
	Cerulean Warbler	*Setophaga cerulea*	24
	Rufous-crowned Sparrow	*Aimophila ruficeps*	23
	American Bittern	*Botaurus lentiginosus*	23
	Willow Flycatcher	*Empidonax traillii*	23
	Le Conte's Sparrow	*Ammodramus leconteii*	21
	Sedge Wren	*Cistothorus platensis*	21
	Sharp-shinned Hawk	*Accipiter striatus*	19
	Grasshopper Sparrow	*Ammodramus savannarum*	19
	Anhinga	*Anhinga anhinga*	19
	Eastern Whip-poor-will	*Antrostomus vociferus*	19
	Sanderling	*Calidris alba*	19
	Dunlin	*Calidris alpina*	19
	Stilt Sandpiper	*Calidris himantopus*	19
	Chimney Swift	*Chaetura pelagica*	19
	Yellow-billed Cuckoo	*Coccyzus americanus*	19
	Northern Bobwhite	*Colinus virginianus*	19
	Tricolored Heron	*Egretta tricolor*	19
	Purple Finch	*Haemorhous purpureus*	19
	Wood Thrush	*Hylocichla mustelina*	19
	Least Bittern	*Ixobrychus exilis*	19
	Short-billed Dowitcher	*Limnodromus griseus*	19
	Swainson's Warbler	*Limnothlypis swainsonii*	19
	Black-crowned Night-Heron	*Nycticorax nycticorax*	19
	Black-bellied Plover	*Pluvialis squatarola*	19
	Bell's Vireo	*Vireo bellii*	19
	Trumpeter Swan	*Cygnus buccinator*	17

	American Kestrel	*Falco sparverius*	15
	American Golden-Plover	*Pluvialis dominica*	15
Crayfish	Irons Fork Burrowing Crayfish	*Procambarus reimeri*	80
	Saline Burrowing Crayfish	*Fallicambarus strawni*	65
	Ouachita Burrowing Crayfish	*Fallicambarus harpi*	46
	Daisy Burrowing Crayfish	*Fallicambarus jeanae*	46
	Ouachita Mountain Crayfish	*Procambarus tenuis*	30
	Mena Crayfish	*Orconectes menae*	27
	Redspotted Stream Crayfish	*Orconectes acares*	19
	Little River Creek Crayfish	*Orconectes leptogonopodus*	19
	Bismark Burrowing Crayfish	*Procambarus parasimulans*	19
Fish	Caddo Madtom	*Noturus taylori*	80
	Leopard Darter	*Percina pantherina*	62
	Alabama Shad	*Alosa alabamae*	52
	Paleback Darter	*Etheostoma pallididorsum*	46
	Ouachita Madtom	*Noturus lachneri*	46
	Ouachita Darter	*Percina brucethompsoni*	46
	Crystal Darter	*Crystallaria asprella*	38
	Stargazing Darter	*Percina uranidea*	38
	Kiamichi Shiner	*Notropis ortenburgeri*	33
	Peppered Shiner	*Notropis perpallidus*	33
	Ouachita Mountain Shiner	*Lythrurus snelsoni*	27
	Rocky Shiner	*Notropis suttkusi*	27
	Longnose Darter	*Percina nasuta*	27
	American Eel	*Anguilla rostrata*	24
	Paddlefish	*Polyodon spathula*	24
	Blue Sucker	*Cycleptus elongatus*	23
	Lowland Topminnow	*Fundulus blairae*	23
	Suckermouth Minnow	*Phenacobius mirabilis*	23
	Brown Bullhead	*Ameiurus nebulosus*	19
	Redspot Chub	*Nocomis asper*	19
	Beaded Darter	*Etheostoma clinton*	15
	Saddleback Darter	*Percina vigil*	15
Insect	beetle	*Rimulincola divalis*	80
	Ouachita Spiketail	*Cordulegaster talaria*	65
	Rattlesnake-Master Borer Moth	*Papaipema eryngii*	65
	Caddo Sallfly	*Alloperla caddo*	50
	Texas Frosted Elfin	*Callophrys irus hadros*	42
	American Burying Beetle	*Nicrophorus americanus*	42
	Linda's Roadside-Skipper	*Amblyscirtes linda*	38
	Indiana Phlox Moth	*Schinia indiana*	38
	Ozark Emerald	*Somatochlora ozarkensis*	34
	Ozark Snaketail Dragonfly	*Ophiogomphus westfalli*	32
	Mottled Duskywing	*Erynnis martialis*	29
	Meske's Skipper	*Hesperia meskei*	29
	Lace-winged Roadside-Skipper	*Amblyscirtes aesculapius*	27

	Appalachian Azure	*Celastrina neglectamajor*	27
	Ozark Clubtail Dragonfly	*Gomphus ozarkensis*	27
	Giant Stag Beetle	*Lucanus elephus*	25
	Diana	*Speyeria diana*	25
	Copeland's Mold Beetle	*Arianops copelandi*	23
	Northern Metalmark	*Calephelis borealis*	23
	microcaddisfly	*Ochrotrichia robisoni*	23
	Ouachita Shore Bug	*Pentacora ouachita*	23
	Yehl Skipper	*Poanes yehl*	23
	Byssus Skipper	*Problema byssus*	23
	Ouachita Pseudactium	*Pseudactium magazinensis*	23
	Bell's Roadside-Skipper	*Amblyscirtes belli*	21
	Golden-banded Skipper	*Autochton cellus*	21
	Six-banded Longhorn Beetle	*Dryobius sexnotatus*	19
	Dion Skipper	*Euphyes dion*	19
	Leonard's Skipper	*Hesperia leonardus*	19
	Cobweb Skipper	*Hesperia metea*	19
	Ouachita Diving Beetle	*Hydroporus ouachitus*	19
	Gray Comma	*Polygonia progne*	19
	Oak Hairstreak	*Satyrium favonius ontario*	19
	Sandy Stream Tiger Beetle	*Cicindela macra*	17
	Gorgone Checkerspot	*Chlosyne gorgone*	15
	Monarch	*Danaus plexippus*	15
	Broad-winged Skipper	*Poanes viator*	15
	Twelve-spotted Tiger Beetle	*Cicindela duodecimguttata*	13
	Arkansas agapetus caddisfly	*Agapetus medicus*	8
Invertebrate - other	Mountain Cave Amphipod	*Stygobromus montanus*	65
	Ouachita Needlefly	*Zealeuctra wachita*	50
	Rich Mountain Slitmouth	*Stenotrema pilsbryi*	46
	Ouachita Slitmouth	*Stenotrema unciferum*	34
	isopod	*Lirceus bicuspidatus*	27
	millipede	*Abacion wilhelminae*	23
	isopod	*Caecidotea fonticulus*	23
	earthworm	*Diplocardia meansi*	17
Mammal	Northern Long-eared Bat	*Myotis septentrionalis*	63
	Eastern Small-Footed Bat	*Myotis leibii*	34
	Little Brown Bat	*Myotis lucifugus*	33
	Rafinesque's Big-Eared Bat	*Corynorhinus rafinesquii*	29
	Southeastern Bat	*Myotis austroriparius*	24
	Eastern Spotted Skunk	*Spilogale putorius*	21
	Crawford's Gray Shrew	*Notiosorex crawfordi*	19
	Southeastern Shrew	*Sorex longirostris*	19
	Long-tailed Weasel	*Mustela frenata*	15
Mussel	Scaleshell	*Leptodea leptodon*	95
	Arkansas Fatmucket	*Lampsilis powellii*	76
	"Ouachita" Fanshell	*Cyprogenia sp. Cf aberti*	52

	Purple Lilliput	*Toxolasma lividum*	52
	Spectaclecase	*Cumberlandia monodonta*	48
	Rabbitsfoot	*Quadrula cylindrica*	33
	Ouachita Kidneyshell	*Ptychobranchus occidentalis*	23
	Pondhorn	*Uniomerus tetralasmus*	23
	Elktoe	*Alasmidonta marginata*	19
	Southern Pocketbook	*Lampsilis ornata*	19
	Lilliput	*Toxolasma parvum*	19
	Texas Lilliput	*Toxolasma texasiense*	19
	Round Pigtoe	*Pleurobema sintoxia*	17
	Little Spectaclecase group	*Villosa sp. Cf lienosa*	17
	Fatmucket	*Lampsilis siliquoidea*	15
	"Arkoma" Fatmucket	*Lampsilis sp. A*	15
	Fawnsfoot	*Truncilla donaciformis*	15
Reptile	Collared Lizard	*Crotaphytus collaris*	24
	Great Plains Skink	*Plestiodon obsoletus*	23
	Western Chicken Turtle	*Deirochelys reticularia miaria*	19
	Southern Prairie Skink	*Plestiodon obtusirostris*	19
	Western Diamondback	*Crotalus atrox*	17
	Slender Glass Lizard	*Ophisaurus attenuatus*	15

Table 3.18. Species of greatest conservation need (SGCN) in the Ouachita Mountains ranked by priority score. A higher priority score indicates a greater need for actions to conserve the species. Of the 377 SGCN, 163 occur in this ecoregion.

Priority Score	Common Name	Scientific Name	Taxa Association
95	Scaleshell	*Leptodea leptodon*	Mussel
80	Ouachita Streambed Salamander	*Eurycea subfluvicola*	Amphibian
80	Caddo Madtom	*Noturus taylori*	Fish
80	Irons Fork Burrowing Crayfish	*Procambarus reimeri*	Crayfish
80	beetle	*Rimulincola divalis*	Insect
76	Arkansas Fatmucket	*Lampsilis powellii*	Mussel
65	Ouachita Spiketail	*Cordulegaster talaria*	Insect
65	Saline Burrowing Crayfish	*Fallicambarus strawni*	Crayfish
65	Rattlesnake-Master Borer Moth	*Papaipema eryngii*	Insect
65	Mountain Cave Amphipod	*Stygobromus montanus*	Invertebrate - other
63	Northern Long-eared Bat	*Myotis septentrionalis*	Mammal
62	Leopard Darter	*Percina pantherina*	Fish
52	Alabama Shad	*Alosa alabamae*	Fish
52	"Ouachita" Fanshell	*Cyprogenia sp. Cf aberti*	Mussel
52	Purple Lilliput	*Toxolasma lividum*	Mussel
50	Caddo Sallfly	*Alloperla caddo*	Insect
50	Sequoyah Slimy Salamander	*Plethodon sequoyah*	Amphibian
50	Ouachita Needlefly	*Zealeuctra wachita*	Invertebrate - other
48	Spectaclecase	*Cumberlandia monodonta*	Mussel
46	Paleback Darter	*Etheostoma pallididorsum*	Fish

46	Ouachita Burrowing Crayfish	*Fallicambarus harpi*	Crayfish
46	Daisy Burrowing Crayfish	*Fallicambarus jeanae*	Crayfish
46	Ouachita Madtom	*Noturus lachneri*	Fish
46	Ouachita Darter	*Percina brucethompsoni*	Fish
46	Fourche Mountain Salamander	*Plethodon fourchensis*	Amphibian
46	Kiamichi Slimy Salamander	*Plethodon kiamichi*	Amphibian
46	Rich Mountain Slitmouth	*Stenotrema pilsbryi*	Invertebrate - other
43	Piping Plover	*Charadrius melodus*	Bird
43	Red-cockaded Woodpecker	*Picoides borealis*	Bird
42	Texas Frosted Elfin	*Callophrys irus hadros*	Insect
42	American Burying Beetle	*Nicrophorus americanus*	Insect
42	Caddo Mountain Salamander	*Plethodon caddoensis*	Amphibian
38	Linda's Roadside-Skipper	*Amblyscirtes linda*	Insect
38	Crystal Darter	*Crystallaria asprella*	Fish
38	Stargazing Darter	*Percina uranidea*	Fish
38	Rich Mountain Salamander	*Plethodon ouachitae*	Amphibian
38	Indiana Phlox Moth	*Schinia indiana*	Insect
34	Eastern Small-Footed Bat	*Myotis leibii*	Mammal
34	Ozark Emerald	*Somatochlora ozarkensis*	Insect
34	Ouachita Slitmouth	*Stenotrema unciferum*	Invertebrate - other
33	Sprague's Pipit	*Anthus spragueii*	Bird
33	Little Brown Bat	*Myotis lucifugus*	Mammal
33	Kiamichi Shiner	*Notropis ortenburgeri*	Fish
33	Peppered Shiner	*Notropis perpallidus*	Fish
33	Bachman's Sparrow	*Peucaea aestivalis*	Bird
33	Rabbitsfoot	*Quadrula cylindrica*	Mussel
32	Ozark Snaketail Dragonfly	*Ophiogomphus westfalli*	Insect
30	Ouachita Mountain Crayfish	*Procambarus tenuis*	Crayfish
29	Buff-breasted Sandpiper	*Calidris subruficollis*	Bird
29	Rafinesque's Big-Eared Bat	*Corynorhinus rafinesquii*	Mammal
29	Mottled Duskywing	*Erynnis martialis*	Insect
29	Rusty Blackbird	*Euphagus carolinus*	Bird
29	Meske's Skipper	*Hesperia meskei*	Insect
29	Bewick's Wren	*Thryomanes bewickii*	Bird
27	Lace-winged Roadside-Skipper	*Amblyscirtes aesculapius*	Insect
27	Appalachian Azure	*Celastrina neglectamajor*	Insect
27	Ozark Clubtail Dragonfly	*Gomphus ozarkensis*	Insect
27	isopod	*Lirceus bicuspidatus*	Invertebrate - other
27	Ouachita Mountain Shiner	*Lythrurus snelsoni*	Fish
27	Rocky Shiner	*Notropis suttkusi*	Fish
27	Mena Crayfish	*Orconectes menae*	Crayfish
27	Longnose Darter	*Percina nasuta*	Fish
25	Giant Stag Beetle	*Lucanus elephus*	Insect
25	Diana	*Speyeria diana*	Insect
24	American Eel	*Anguilla rostrata*	Fish
24	Ruddy Turnstone	*Arenaria interpres*	Bird
24	Smith's Longspur	*Calcarius pictus*	Bird
24	Common Nighthawk	*Chordeiles minor*	Bird
24	Collared Lizard	*Crotaphytus collaris*	Reptile
24	Migrant Loggerhead Shrike	*Lanius ludovicianus migrans*	Bird
24	Southeastern Bat	*Myotis austroriparius*	Mammal

24	Yellow-crowned Night-Heron	*Nyctanassa violacea*	Bird
24	Paddlefish	*Polyodon spathula*	Fish
24	American Woodcock	*Scolopax minor*	Bird
24	Cerulean Warbler	*Setophaga cerulea*	Bird
23	millipede	*Abacion wilhelminae*	Invertebrate - other
23	Rufous-crowned Sparrow	*Aimophila ruficeps*	Bird
23	Copeland's Mold Beetle	*Arianops copelandi*	Insect
23	American Bittern	*Botaurus lentiginosus*	Bird
23	isopod	*Caecidotea fonticulus*	Invertebrate - other
23	Northern Metalmark	*Calephelis borealis*	Insect
23	Blue Sucker	*Cycleptus elongatus*	Fish
23	Willow Flycatcher	*Empidonax traillii*	Bird
23	Lowland Topminnow	*Fundulus blairae*	Fish
23	Crawfish Frog	*Lithobates areolatus*	Amphibian
23	microcaddisfly	*Ochrotrichia robisoni*	Insect
23	Ouachita Shore Bug	*Pentacora ouachita*	Insect
23	Suckermouth Minnow	*Phenacobius mirabilis*	Fish
23	Great Plains Skink	*Plestiodon obsoletus*	Reptile
23	Yehl Skipper	*Poanes yehl*	Insect
23	Byssus Skipper	*Problema byssus*	Insect
23	Ouachita Pseudactium	*Pseudactium magazinensis*	Insect
23	Ouachita Kidneyshell	*Ptychobranchus occidentalis*	Mussel
23	Pondhorn	*Uniomerus tetralasmus*	Mussel
21	Le Conte's Sparrow	*Ammodramus leconteii*	Bird
21	Bell's Roadside-Skipper	*Amblyscirtes belli*	Insect
21	Golden-banded Skipper	*Autochton cellus*	Insect
21	Sedge Wren	*Cistothorus platensis*	Bird
21	Eastern Spotted Skunk	*Spilogale putorius*	Mammal
19	Sharp-shinned Hawk	*Accipiter striatus*	Bird
19	Elktoe	*Alasmidonta marginata*	Mussel
19	Ringed Salamander	*Ambystoma annulatum*	Amphibian
19	Brown Bullhead	*Ameiurus nebulosus*	Fish
19	Grasshopper Sparrow	*Ammodramus savannarum*	Bird
19	Anhinga	*Anhinga anhinga*	Bird
19	Eastern Whip-poor-will	*Antrostomus vociferus*	Bird
19	Sanderling	*Calidris alba*	Bird
19	Dunlin	*Calidris alpina*	Bird
19	Stilt Sandpiper	*Calidris himantopus*	Bird
19	Chimney Swift	*Chaetura pelagica*	Bird
19	Yellow-billed Cuckoo	*Coccyzus americanus*	Bird
19	Northern Bobwhite	*Colinus virginianus*	Bird
19	Western Chicken Turtle	*Deirochelys reticularia miaria*	Reptile
19	Six-banded Longhorn Beetle	*Dryobius sexnotatus*	Insect
19	Tricolored Heron	*Egretta tricolor*	Bird
19	Dion Skipper	*Euphyes dion*	Insect
19	Purple Finch	*Haemorhous purpureus*	Bird
19	Four-toed Salamander	*Hemidactylium scutatum*	Amphibian
19	Leonard's Skipper	*Hesperia leonardus*	Insect
19	Cobweb Skipper	*Hesperia metea*	Insect

19	Ouachita Diving Beetle	*Hydroporus ouachitus*	Insect
19	Wood Thrush	*Hylocichla mustelina*	Bird
19	Least Bittern	*Ixobrychus exilis*	Bird
19	Southern Pocketbook	*Lampsilis ornata*	Mussel
19	Short-billed Dowitcher	*Limnodromus griseus*	Bird
19	Swainson's Warbler	*Limnothlypis swainsonii*	Bird
19	Redspot Chub	*Nocomis asper*	Fish
19	Crawford's Gray Shrew	*Notiosorex crawfordi*	Mammal
19	Black-crowned Night-Heron	*Nycticorax nycticorax*	Bird
19	Redspotted Stream Crayfish	*Orconectes acares*	Crayfish
19	Little River Creek Crayfish	*Orconectes leptogonopodus*	Crayfish
19	Southern Prairie Skink	*Plestiodon obtusirostris*	Reptile
19	Black-bellied Plover	*Pluvialis squatarola*	Bird
19	Gray Comma	*Polygonia progne*	Insect
19	Bismark Burrowing Crayfish	*Procambarus parasimulans*	Crayfish
19	Oak Hairstreak	*Satyrium favonius ontario*	Insect
19	Hurter's Spadefoot	*Scaphiopus hurterii*	Amphibian
19	Southeastern Shrew	*Sorex longirostris*	Mammal
19	Lilliput	*Toxolasma parvum*	Mussel
19	Texas Lilliput	*Toxolasma texasiense*	Mussel
19	Bell's Vireo	*Vireo bellii*	Bird
17	Sandy Stream Tiger Beetle	*Cicindela macra*	Insect
17	Western Diamondback Rattlesnake	*Crotalus atrox*	Reptile
17	Trumpeter Swan	*Cygnus buccinator*	Bird
17	earthworm	*Diplocardia meansi*	Invertebrate - other
17	Round Pigtoe	*Pleurobema sintoxia*	Mussel
17	Little Spectaclecase group	*Villosa sp. Cf lienosa*	Mussel
15	Mole Salamander	*Ambystoma talpoideum*	Amphibian
15	Gorgone Checkerspot	*Chlosyne gorgone*	Insect
15	Monarch	*Danaus plexippus*	Insect
15	Beaded Darter	*Etheostoma clinton*	Fish
15	American Kestrel	*Falco sparverius*	Bird
15	Bird-voiced Treefrog	*Hyla avivoca*	Amphibian
15	Fatmucket	*Lampsilis siliquoidea*	Mussel
15	"Arkoma" Fatmucket	*Lampsilis sp. A*	Mussel
15	Long-tailed Weasel	*Mustela frenata*	Mammal
15	Slender Glass Lizard	*Ophisaurus attenuatus*	Reptile
15	Saddleback Darter	*Percina vigil*	Fish
15	American Golden-Plover	*Pluvialis dominica*	Bird
15	Broad-winged Skipper	*Poanes viator*	Insect
15	Fawnsfoot	*Truncilla donaciformis*	Mussel
13	Twelve-spotted Tiger Beetle	*Cicindela duodecimguttata*	Insect
8	Arkansas agapetus caddisfly	*Agapetus medicus*	Insect

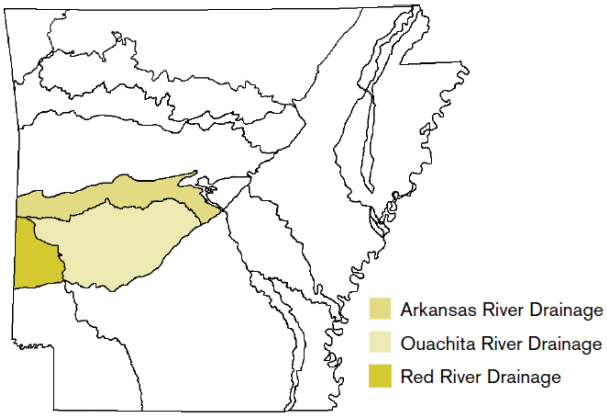
Habitats that occur in the Ouachita Mountains

Of the 37 terrestrial habitats in Arkansas, 20 occur in the Ouachita Mountains ecoregion (Table 3.19). Of 18 ecobasins in Arkansas, three occur in the Ouachita Mountains ecoregion (Figure 3.14). These associations are described in the Section 4. Terrestrial Habitats Section 5. Aquatic Habitats.

Table 3.19. Terrestrial Habitats in the Ouachita Mountains.

Habitat Name
Caves, Mines, Sinkholes, and other Karst Habitat
Crop Land
Cultivated Forest
Herbaceous Wetland
Interior Highlands Calcareous Glade and Barrens
Interior Highlands Dry Acidic Glade and Barrens
Mud Flats
Ouachita Montane Oak Forest
Ozark-Ouachita Cliff and Talus
Ozark-Ouachita Dry Oak and Pine Woodland
Ozark-Ouachita Dry-Mesic Oak Forest
Ozark-Ouachita Forested Seep
Ozark-Ouachita Large Floodplain
Ozark-Ouachita Mesic Hardwood Forest
Ozark-Ouachita Pine/Bluestem Woodland
Ozark-Ouachita Pine-Oak Forest/ Woodland
Ozark-Ouachita Riparian
Pasture Land
Ponds, Lakes, and Water Holes
Urban/Suburban

Figure 3.14. Ecobasin Distribution in the Ouachita Mountains.



Problems faced by Species of Greatest Conservation Need (SGCN)

Taxa association teams listed problems faced by SGCN individually in the Species Reports, pages 45-1082. A summary of the problems faced by SGCN in the Ouachita Mountains is presented below. Each problem has a score which is a sum of all Species Priority Scores associated with species for which this problem was assigned. A higher score implies a higher quantity of SGCN and/or more greatly imperiled species associated with problems listed here.

Table 3.20. Problems faced by SGCN.

Problem faced	Score
Forestry activities	2914
Dam	1652
Road construction	1589
Agricultural practices	1544
Grazing/Browsing	1343
Resource extraction	1341
Urban development	937
Fire suppression	702
Conversion of riparian forest	572
Confined animal operations	558
Water diversion	515
Municipal/Industrial point source	511
Channel alteration	410
Channel maintenance	311
Recreation	290
Parasites/pathogens	258
Predation	247
Commercial/industrial development	240
Exotic species	234
Non-point source pollution	192
Management of/for certain species	168
unknown	52
Excessive non-commercial harvest or collection	50
Commercial harvest	43
Excessive groundwater withdrawal	40

Conservation actions needed in the Ouachita Mountains

Descriptions of conservation actions linked to individual species on the list of SGCN are presented in the Species Reports, pages 44-1113. Below are categories of conservation actions recommended by the taxa association teams (Figure 3.15). An explanation of the categories follows in Table 3.21.

The score associated with the conservation action category is the sum of all priority scores associated with species for which a conservation action has been assigned, weighted by the importance of the conservation action category to the species. A higher score implies a higher quantity of SGCN and/or more greatly imperiled species would be affected by actions within this conservation action category.

These scores may be used as guides to directing the apportionment of funding toward conservation actions benefiting habitats and species of greatest conservation need.

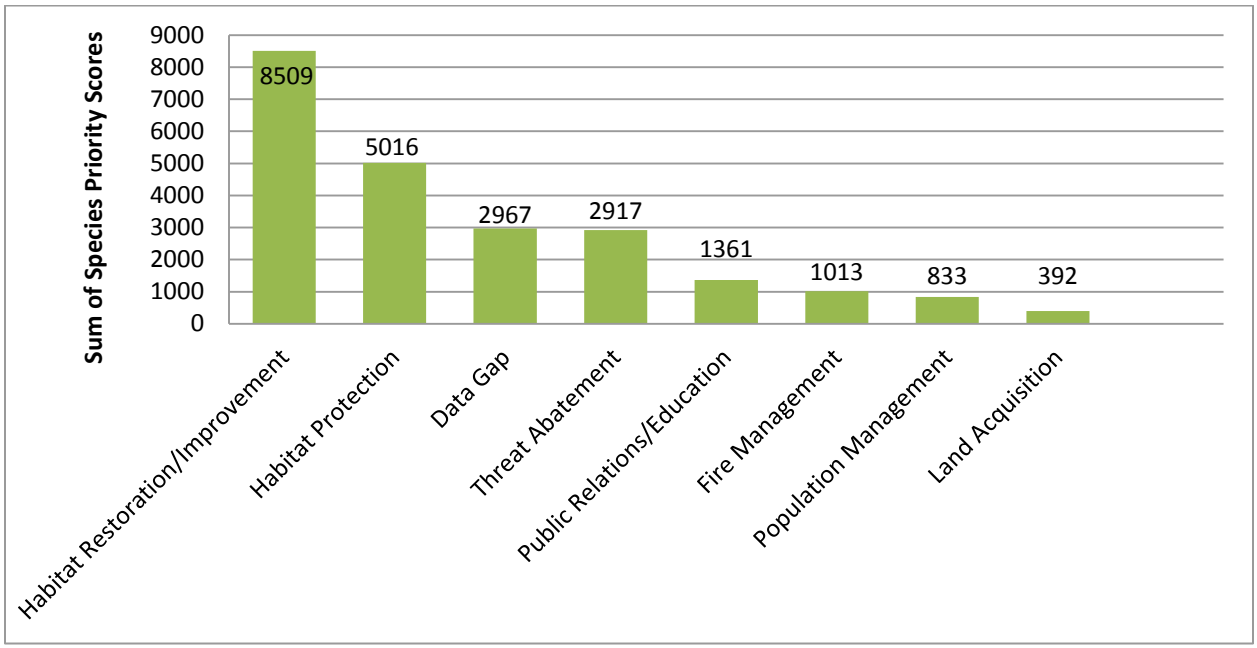


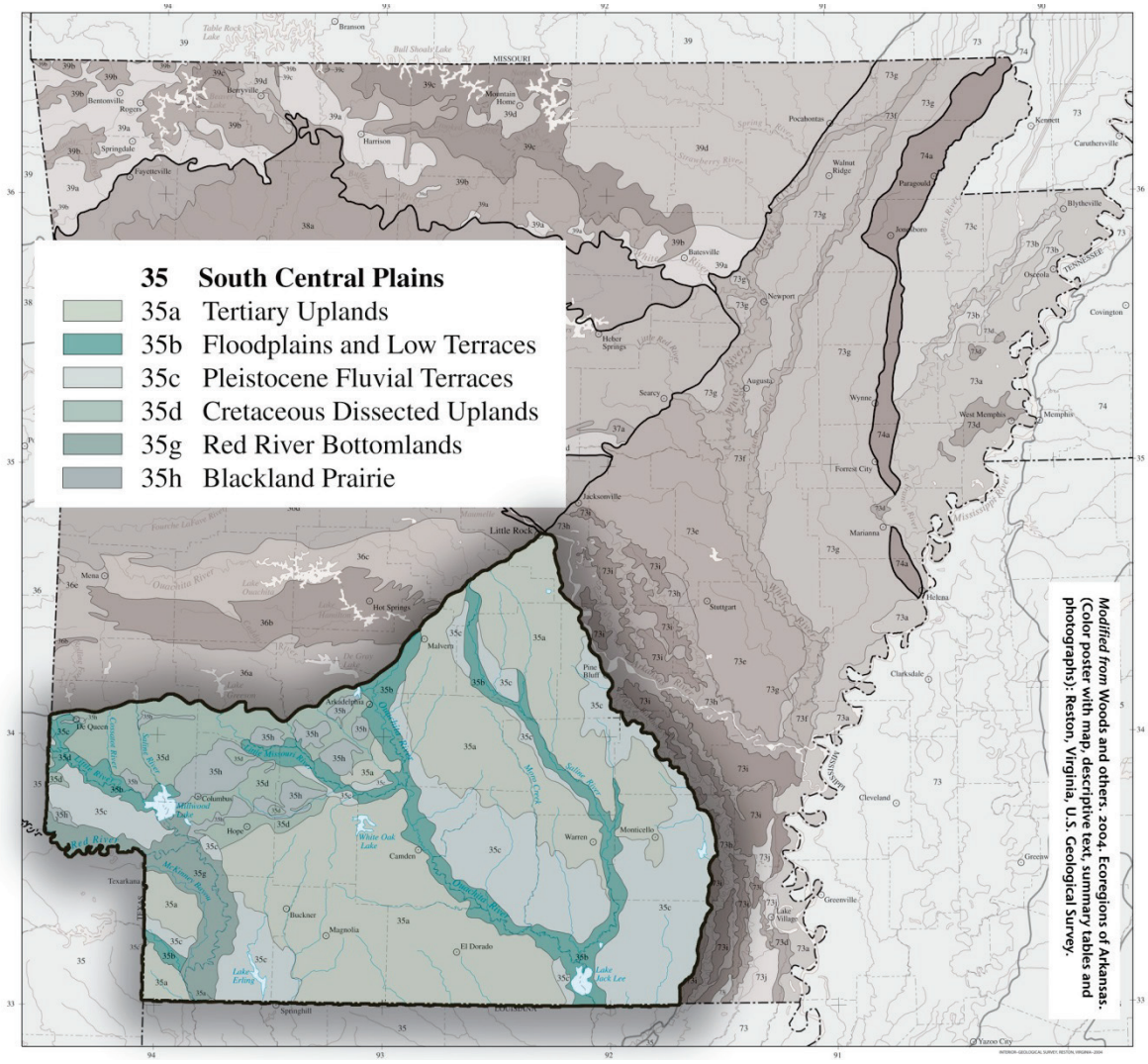
Figure 3.15. Conservation action categories recommended for the Ouachita Mountains.

South Central Plains (Ecoregion 35)

Ecoregion 35 is composed of rolling plains that are broken by nearly flat fluvial ter- races, bottomlands, sandy low hills and low cuestas; its terrain is unlike the much more rugged Ouachita Mountains (36) or the flatter, less dissected Mississippi Alluvial Plain (73). Uplands are underlain by poorly-consolidated, Tertiary- through Cretaceous-age, coastal plain deposits and marginal marine sediments (laid down as the Gulf of Mexico opened and North America's southern continental margin subsided). Bottomlands and terraces are veneered with Quaternary alluvium or windblown silt deposits (loess). The lithologic mosaic is distinct from the Paleozoic rocks of Ecoregion 36 and the strictly Quaternary deposits of Ecoregion 73.

Potential natural vegetation is oak–hickory–pine forest on uplands and southern floodplain forest on bottomlands. Today, more than 75 percent of Ecoregion 35 remains wooded.

Figure 3.16. South Central Plains Ecoregion



South Central Plains - Blackland Prairie

Extensive commercial loblolly pine–shortleaf pine plantations occur. Lumber and pulpwood production, livestock grazing and crawfish farming are major land uses.

Cropland dominates the drained bottomlands of the Red River. Turbidity and total suspended solid concentrations are usually low except in the Red River. Summer flow in many small streams is limited or nonexistent but enduring pools may occur. Fish communities typically have a limited proportion of sensitive species; sunfishes are dominant and darters and minnows are common.

Tertiary Uplands

35a. The rolling Tertiary Uplands are dominated by commercial pine plantations that have replaced the native oak– hickory–pine forest. Ecoregion 35a is underlain by poorly-consolidated Tertiary sand, silt and gravel; it lacks the Cretaceous, often calcareous rocks of Ecoregion 35d and the extensive Quaternary alluvium of Ecoregions 35b, 35g and 73.

Extensive forests dominated by loblolly and shortleaf pines grow on loamy, well- drained, thermic Ultisols; scattered, stunted, sandhill woodlands also occur.

Waters tend to be stained by organics, thus lowering water clarity and increasing total organic carbon and biochemical oxygen demand levels. Most streams have a sandy substrate and a forest canopy. Many do not flow during the summer or early fall. However, in sandhills, spring-fed, perennial streams occur; here, total dissolved solids, total suspended solids, alkalinity and hardness values are lower than elsewhere in Ecoregion 35. Water quality in forested basins is

better than in pastureland. Oil production has lowered stream quality in the south.

Floodplains and Low Terraces

35b. The Floodplains and Low Terraces ecoregion is nearly level, veneered by Holocene alluvium and contains natural levees, swales, oxbow lakes and meander scars. Longitudinal channel gradients are low and are less than in the Ouachita Mountains (36). Large parts of Ecoregion 35b are frequently flooded.

Forested wetlands are characteristic, but pastureland also occurs. Cropland is far less common than in the Red River Bottomlands (35g). Potential natural vegetation is southern floodplain forest as in the Mississippi Alluvial Plain (73); it is unlike the oak–hickory–pine forest of the higher, better drained and lithologically distinct Tertiary Uplands (35a) and Cretaceous Dissected Uplands (35d).

Pleistocene Fluvial Terraces

35c. The Pleistocene Fluvial Terraces are nearly level, poorly-drained, periodically wet, underlain by Pleistocene unconsolidated terrace deposits and covered by pine flatwoods. Loblolly pine and oaks are common and are adapted to the prevailing hydroxeric regime; pastureland and hayland are less extensive.

A vertical sequence of terraces occurs. The lowest terrace is nearly flat, clayey and has extensive hardwood wetlands. Higher terraces become progressively older and more dissected; they are dominated by pine flatwoods, pine savanna, or prairie; flatwood wetlands are less extensive than on the lowest terrace. The midlevel terrace is veneered with windblown silt deposits (loess). Streams tend to be mildly acidic and stained by organic matter. They have more suspended solids, greater turbidity and higher hardness values than Ecoregion 35a.

Cretaceous Dissected Uplands

35d. The nearly level to hilly Cretaceous Dissected Uplands ecoregion has a greater drainage density than other parts of Ecoregion 35. Ecoregion 35a is underlain by Cretaceous sandy, clayey, or gravelly deposits that are often calcareous; it is lithologically distinct from the Tertiary noncalcareous deposits of Ecoregion 35a, the Quaternary alluvium of Ecoregions 35b, 35g and 73 and the chalks and marls of Ecoregion 35h.

Native vegetation is largely oak–hickory–pine forest. Today, woods and pastureland are common. Water quality in forested watersheds tends to be good and is better than in pastureland. Streams generally have lower total dissolved solids values and much lower total organic carbon values than Ecoregions 35a and 35c, although turbidity, total suspended solids and hardness values are slightly higher. Longitudinal stream gradients and Ouachita Mountain influences are greater than in Ecoregions 35a or 35c.

Red River Bottomlands

35g. The nearly flat Red River Bottomlands ecoregion is veneered with Holocene alluvium and has been widely cleared and drained for agriculture. It contains flood- plains, low terraces, oxbow lakes, meander scars, backswamps, natural levees and the meandering Red River.

Potential natural vegetation is southern floodplain forest; it is unlike the oak–hickory–pine forest of higher, better drained and lithologically distinct Ecoregions 35a and 35d. Western species, such as bur oak and Durand oak, were native to Ecoregion

35g but were typically absent from the Mississippi Alluvial Plain (73). The natural forest of Ecoregion 35g has been largely replaced by agriculture. Today, cropland is more extensive than in other parts of Ecoregion 35 in Arkansas. The Red River is almost continuously turbid; suspended sediment concentrations are usually much higher than in the Saline or Ouachita rivers of Ecoregion 35b due to land cover, land use and upstream lithology differences.

Blackland Prairie

35h. The level to rolling Blackland Prairie characteristically has dark soils derived from underlying Cretaceous marl, chalk and limestone.

Prairie was common or dominant during and shortly after the Hypsithermal Period in the middle of the Holocene Epoch. By the late 18th century, Ecoregion 35h was a mosaic of woodland, savanna and prairies, containing species that were found nowhere else in Arkansas. Today, hayland and, especially, pastureland dominate; pastureland is more common than elsewhere in Arkansas' South Central Plains (35). Only a few prairie remnants still occur and are mostly limited to the thin, droughty soils of cuesta scarps (adapted from Woods and others 2004).

South Central Plains Ecoregion: Species of Greatest Conservation Need (SGCN)

Species of greatest conservation need (SGCN) in the South Central Plains are presented by taxa association (Table 3.22). A higher priority score indicates a greater need for actions to conserve the species. A ranked list of all SGCN associated with the ecoregion is presented in Table 3.23.

Table 3.22. SGCN by taxa association.

Taxa Association	Common Name	*Scientific Name*	Priority Score
Amphibian	Louisiana Slimy Salamander	*Plethodon kisatchie*	27
	Spotted Dusky Salamander	*Desmognathus conanti*	23
	Squirrel Treefrog	*Hyla squirella*	23
	Crawfish Frog	*Lithobates areolatus*	23
	Hurter's Spadefoot	*Scaphiopus hurterii*	19

	Mole Salamander	*Ambystoma talpoideum*	15
	Dwarf Salamander	*Eurycea quadridigitata*	15
	Bird-voiced Treefrog	*Hyla avivoca*	15
Bird	Piping Plover	*Charadrius melodus*	43
	Red-cockaded Woodpecker	*Picoides borealis*	43
	Henslow's Sparrow	*Ammodramus henslowii*	33
	Sprague's Pipit	*Anthus spragueii*	33
	Bachman's Sparrow	*Peucaea aestivalis*	33
	King Rail	*Rallus elegans*	33
	Interior Least Tern	*Sterna antillarum athalassos*	31
	Buff-breasted Sandpiper	*Calidris subruficollis*	29
	Swallow-tailed Kite	*Elanoides forficatus forficatus*	29
	Rusty Blackbird	*Euphagus carolinus*	29
	Bewick's Wren	*Thryomanes bewickii*	29
	Ruddy Turnstone	*Arenaria interpres*	24
	Smith's Longspur	*Calcarius pictus*	24
	Common Nighthawk	*Chordeiles minor*	24
	Migrant Loggerhead Shrike	*Lanius ludovicianus migrans*	24
	Yellow-crowned Night-Heron	*Nyctanassa violacea*	24
	American Woodcock	*Scolopax minor*	24
	Cerulean Warbler	*Setophaga cerulea*	24
	American Bittern	*Botaurus lentiginosus*	23
	Willow Flycatcher	*Empidonax traillii*	23
	Purple Gallinule	*Porphyrio martinicus*	23
	Le Conte's Sparrow	*Ammodramus leconteii*	21
	Sedge Wren	*Cistothorus platensis*	21
	Sharp-shinned Hawk	*Accipiter striatus*	19
	Grasshopper Sparrow	*Ammodramus savannarum*	19
	American Black Duck	*Anas rubripes*	19
	Anhinga	*Anhinga anhinga*	19
	Eastern Whip-poor-will	*Antrostomus vociferus*	19
	Sanderling	*Calidris alba*	19
	Dunlin	*Calidris alpina*	19
	Stilt Sandpiper	*Calidris himantopus*	19
	Chimney Swift	*Chaetura pelagica*	19
	Yellow-billed Cuckoo	*Coccyzus americanus*	19
	Northern Bobwhite	*Colinus virginianus*	19
	Tricolored Heron	*Egretta tricolor*	19
	Common Gallinule	*Gallinula chloropus*	19
	Purple Finch	*Haemorhous purpureus*	19
	Wood Thrush	*Hylocichla mustelina*	19
	Least Bittern	*Ixobrychus exilis*	19
	Short-billed Dowitcher	*Limnodromus griseus*	19
	Swainson's Warbler	*Limnothlypis swainsonii*	19
	Black-crowned Night-Heron	*Nycticorax nycticorax*	19
	Black-bellied Plover	*Pluvialis squatarola*	19

	Bell's Vireo	*Vireo bellii*	19
	Trumpeter Swan	*Cygnus buccinator*	17
	American Kestrel	*Falco sparverius*	15
	American Golden-Plover	*Pluvialis dominica*	15
Crayfish	Slenderwrist Burrowing Crayfish	*Fallicambarus petilicarpus*	80
	Saline Burrowing Crayfish	*Fallicambarus strawni*	65
	Bayou Bodcau Crayfish	*Bouchardina robisoni*	50
	Jefferson County Crayfish	*Fallicambarus gilpini*	50
	Blair's Fencing Crayfish	*Faxonella blairi*	46
	Regal Burrowing Crayfish	*Procambarus regalis*	36
	Pine Hills Digger	*Fallicambarus dissitus*	32
	Bismark Burrowing Crayfish	*Procambarus parasimulans*	19
Fish	Alabama Shad	*Alosa alabamae*	52
	Ouachita Darter	*Percina brucethompsoni*	46
	Crystal Darter	*Crystallaria asprella*	38
	Stargazing Darter	*Percina uranidea*	38
	Western Sand Darter	*Ammocrypta clara*	33
	Peppered Shiner	*Notropis perpallidus*	33
	Bluehead Shiner	*Pteronotropis hubbsi*	33
	Alligator Gar	*Atractosteus spatula*	27
	Plains Minnow	*Hybognathus placitus*	27
	Ouachita Mountain Shiner	*Lythrurus snelsoni*	27
	Red River Shiner	*Notropis bairdi*	27
	Brown Madtom	*Noturus phaeus*	27
	American Eel	*Anguilla rostrata*	24
	Paddlefish	*Polyodon spathula*	24
	Blue Sucker	*Cycleptus elongatus*	23
	Lowland Topminnow	*Fundulus blairae*	23
	Chub Shiner	*Notropis potteri*	23
	Brown Bullhead	*Ameiurus nebulosus*	19
	Goldeye	*Hiodon alosoides*	19
	Mooneye	*Hiodon tergisus*	19
	American Brook Lamprey	*Lethenteron appendix*	19
	Striped Mullet	*Mugil cephalus*	19
	Blackspot Shiner	*Notropis atrocaudalis*	19
	Slenderhead Darter	*Percina phoxocephala*	19
	Highfin carpsucker	*Carpiodes velifer*	17
	Goldstripe Darter	*Etheostoma parvipinne*	17
	Lake Chubsucker	*Erimyzon sucetta*	15
	Swamp Darter	*Etheostoma fusiforme*	15
	Shoal Chub	*Macrhybopsis hyostoma*	15
	Saddleback Darter	*Percina vigil*	15
Insect	Rattlesnake-Master Borer Moth	*Papaipema eryngii*	65
	stonefly	*Leuctra paleo*	50
	Texas Frosted Elfin	*Callophrys irus hadros*	42
	American Burying Beetle	*Nicrophorus americanus*	42

	Dukes' Skipper	*Euphyes dukesi*	32
	Mottled Duskywing	*Erynnis martialis*	29
	Meske's Skipper	*Hesperia meskei*	29
	Lace-winged Roadside-Skipper	*Amblyscirtes aesculapius*	27
	Appalachian Azure	*Celastrina neglectamajor*	27
	Ozark Clubtail Dragonfly	*Gomphus ozarkensis*	27
	Georgia Satyr	*Neonympha areolata areolata*	27
	Giant Stag Beetle	*Lucanus elephus*	25
	Diana	*Speyeria diana*	25
	Northern Metalmark	*Calephelis borealis*	23
	Outis Skipper	*Cogia outis*	23
	Yehl Skipper	*Poanes yehl*	23
	Byssus Skipper	*Problema byssus*	23
	King's Hairstreak	*Satyrium kingi*	23
	anthophorid bee	*Tetraloniella albata*	23
	Bell's Roadside-Skipper	*Amblyscirtes belli*	21
	tiger beetle	*Cicindela lepida*	21
	Texas milkweed beetle	*Tetraopes texanus*	21
	Dion Skipper	*Euphyes dion*	19
	Leonard's Skipper	*Hesperia leonardus*	19
	Cobweb Skipper	*Hesperia metea*	19
	Oak Hairstreak	*Satyrium favonius ontario*	19
	Beach-dune Tiger Beetle	*Cicindela hirticollis*	17
	Dusky Azure	*Celastrina nigra*	15
	Gorgone Checkerspot	*Chlosyne gorgone*	15
	Monarch	*Danaus plexippus*	15
	robberfly	*Microstylum morosum*	15
	Broad-winged Skipper	*Poanes viator*	15
	winter stonefly	*Allocapnia malverna*	11
Invertebrate - other	Channelled Pebblesnail	*Somatogyrus wheeleri*	80
Mammal	Northern Long-eared Bat	*Myotis septentrionalis*	63
	Little Brown Bat	*Myotis lucifugus*	33
	Rafinesque's Big-Eared Bat	*Corynorhinus rafinesquii*	29
	Southeastern Bat	*Myotis austroriparius*	24
	Eastern Spotted Skunk	*Spilogale putorius*	21
	Crawford's Gray Shrew	*Notiosorex crawfordi*	19
	Eastern Harvest Mouse	*Reithrodontomys humulis*	19
	Long-tailed Weasel	*Mustela frenata*	15
Mussel	Scaleshell	*Leptodea leptodon*	95
	Ouachita Rock Pocketbook	*Arcidens wheeleri*	80
	Arkansas Fatmucket	*Lampsilis powellii*	76
	Winged Mapleleaf	*Quadrula fragosa*	76
	Louisiana Pearlshell	*Margaritifera hembeli*	65
	Texas Pigtoe	*Pleurobema riddellii*	57
	"Ouachita" Fanshell	*Cyprogenia sp. Cf aberti*	52
	Purple Lilliput	*Toxolasma lividum*	52

	Spectaclecase	*Cumberlandia monodonta*	48
	Pink Mucket	*Lampsilis abrupta*	46
	Rabbitsfoot	*Quadrula cylindrica*	33
	Purple Pimpleback	*Quadrula refulgens*	30
	Ohio Pigtoe	*Pleurobema cordatum*	27
	Ouachita Kidneyshell	*Ptychobranchus occidentalis*	23
	Pondhorn	*Uniomerus tetralasmus*	23
	Elktoe	*Alasmidonta marginata*	19
	Southern Pocketbook	*Lampsilis ornata*	19
	"Red River" Mucket	*Lampsilis sp. B*	19
	Hickorynut	*Obovaria olivaria*	19
	Gulf mapleleaf	*Quadrula nobilis*	19
	Lilliput	*Toxolasma parvum*	19
	Texas Lilliput	*Toxolasma texasiense*	19
	Tapered Pondhorn	*Uniomerus declivis*	19
	Round Pigtoe	*Pleurobema sintoxia*	17
	Little Spectaclecase group	*Villosa sp. Cf lienosa*	17
	Fatmucket	*Lampsilis siliquoidea*	15
	Southern Mapleleaf	*Quadrula apiculata*	15
	Fawnsfoot	*Truncilla donaciformis*	15
Reptile	Western Chicken Turtle	*Deirochelys reticularia miaria*	19
	Texas Coral Snake	*Micrurus tener*	19
	Southern Prairie Skink	*Plestiodon obtusirostris*	19
	Graham's Crayfish Snake	*Regina grahamii*	19
	Gulf Swampsnake	*Liodytes rigida*	15
	Slender Glass Lizard	*Ophisaurus attenuatus*	15

Table 3.23. Species of greatest conservation need (SGCN) in the South Central Plains ranked by priority score. A higher priority score indicates a greater need for actions to conserve the species. Of the 377 SGCN, 169 occur in this ecoregion.

Priority Score	Common Name	Scientific Name	Taxa Association
95	Scaleshell	*Leptodea leptodon*	Mussel
80	Ouachita Rock Pocketbook	*Arcidens wheeleri*	Mussel
80	Slenderwrist Burrowing Crayfish	*Fallicambarus petilicarpus*	Crayfish
80	Channelled Pebblesnail	*Somatogyrus wheeleri*	Invertebrate - other
76	Arkansas Fatmucket	*Lampsilis powellii*	Mussel
76	Winged Mapleleaf	*Quadrula fragosa*	Mussel
65	Saline Burrowing Crayfish	*Fallicambarus strawni*	Crayfish
65	Louisiana Pearlshell	*Margaritifera hembeli*	Mussel
65	Rattlesnake-Master Borer Moth	*Papaipema eryngii*	Insect
63	Northern Long-eared Bat	*Myotis septentrionalis*	Mammal
57	Texas Pigtoe	*Pleurobema riddellii*	Mussel
52	Alabama Shad	*Alosa alabamae*	Fish
52	"Ouachita" Fanshell	*Cyprogenia sp. Cf aberti*	Mussel
52	Purple Lilliput	*Toxolasma lividum*	Mussel

50	Bayou Bodcau Crayfish	*Bouchardina robisoni*	Crayfish
50	Jefferson County Crayfish	*Fallicambarus gilpini*	Crayfish
50	stonefly	*Leuctra paleo*	Insect
48	Spectaclecase	*Cumberlandia monodonta*	Mussel
46	Blair's Fencing Crayfish	*Faxonella blairi*	Crayfish
46	Pink Mucket	*Lampsilis abrupta*	Mussel
46	Ouachita Darter	*Percina brucethompsoni*	Fish
43	Piping Plover	*Charadrius melodus*	Bird
43	Red-cockaded Woodpecker	*Picoides borealis*	Bird
42	Texas Frosted Elfin	*Callophrys irus hadros*	Insect
42	American Burying Beetle	*Nicrophorus americanus*	Insect
38	Crystal Darter	*Crystallaria asprella*	Fish
38	Stargazing Darter	*Percina uranidea*	Fish
36	Regal Burrowing Crayfish	*Procambarus regalis*	Crayfish
33	Western Sand Darter	*Ammocrypta clara*	Fish
33	Henslow's Sparrow	*Ammodramus henslowii*	Bird
33	Sprague's Pipit	*Anthus spragueii*	Bird
33	Little Brown Bat	*Myotis lucifugus*	Mammal
33	Peppered Shiner	*Notropis perpallidus*	Fish
33	Bachman's Sparrow	*Peucaea aestivalis*	Bird
33	Bluehead Shiner	*Pteronotropis hubbsi*	Fish
33	Rabbitsfoot	*Quadrula cylindrica*	Mussel
33	King Rail	*Rallus elegans*	Bird
32	Dukes' Skipper	*Euphyes dukesi*	Insect
32	Pine Hills Digger	*Fallicambarus dissitus*	Crayfish
31	Interior Least Tern	*Sterna antillarum athalassos*	Bird
30	Purple Pimpleback	*Quadrula refulgens*	Mussel
29	Buff-breasted Sandpiper	*Calidris subruficollis*	Bird
29	Rafinesque's Big-Eared Bat	*Corynorhinus rafinesquii*	Mammal
29	Swallow-tailed Kite	*Elanoides forficatus forficatus*	Bird
29	Mottled Duskywing	*Erynnis martialis*	Insect
29	Rusty Blackbird	*Euphagus carolinus*	Bird
29	Meske's Skipper	*Hesperia meskei*	Insect
29	Bewick's Wren	*Thryomanes bewickii*	Bird
27	Lace-winged Roadside-Skipper	*Amblyscirtes aesculapius*	Insect
27	Alligator Gar	*Atractosteus spatula*	Fish
27	Appalachian Azure	*Celastrina neglectamajor*	Insect
27	Ozark Clubtail Dragonfly	*Gomphus ozarkensis*	Insect
27	Plains Minnow	*Hybognathus placitus*	Fish
27	Ouachita Mountain Shiner	*Lythrurus snelsoni*	Fish
27	Georgia Satyr	*Neonympha areolata areolata*	Insect
27	Red River Shiner	*Notropis bairdi*	Fish
27	Brown Madtom	*Noturus phaeus*	Fish
27	Louisiana Slimy Salamander	*Plethodon kisatchie*	Amphibian
27	Ohio Pigtoe	*Pleurobema cordatum*	Mussel
25	Giant Stag Beetle	*Lucanus elephus*	Insect
25	Diana	*Speyeria diana*	Insect
24	American Eel	*Anguilla rostrata*	Fish
24	Ruddy Turnstone	*Arenaria interpres*	Bird
24	Smith's Longspur	*Calcarius pictus*	Bird

24	Common Nighthawk	*Chordeiles minor*	Bird
24	Migrant Loggerhead Shrike	*Lanius ludovicianus migrans*	Bird
24	Southeastern Bat	*Myotis austroriparius*	Mammal
24	Yellow-crowned Night-Heron	*Nyctanassa violacea*	Bird
24	Paddlefish	*Polyodon spathula*	Fish
24	American Woodcock	*Scolopax minor*	Bird
24	Cerulean Warbler	*Setophaga cerulea*	Bird
23	American Bittern	*Botaurus lentiginosus*	Bird
23	Northern Metalmark	*Calephelis borealis*	Insect
23	Outis Skipper	*Cogia outis*	Insect
23	Blue Sucker	*Cycleptus elongatus*	Fish
23	Spotted Dusky Salamander	*Desmognathus conanti*	Amphibian
23	Willow Flycatcher	*Empidonax traillii*	Bird
23	Lowland Topminnow	*Fundulus blairae*	Fish
23	Squirrel Treefrog	*Hyla squirella*	Amphibian
23	Crawfish Frog	*Lithobates areolatus*	Amphibian
23	Chub Shiner	*Notropis potteri*	Fish
23	Yehl Skipper	*Poanes yehl*	Insect
23	Purple Gallinule	*Porphyrio martinicus*	Bird
23	Byssus Skipper	*Problema byssus*	Insect
23	Ouachita Kidneyshell	*Ptychobranchus occidentalis*	Mussel
23	King's Hairstreak	*Satyrium kingi*	Insect
23	anthophorid bee	*Tetraloniella albata*	Insect
23	Pondhorn	*Uniomerus tetralasmus*	Mussel
21	Le Conte's Sparrow	*Ammodramus leconteii*	Bird
21	Bell's Roadside-Skipper	*Amblyscirtes belli*	Insect
21	tiger beetle	*Cicindela lepida*	Insect
21	Sedge Wren	*Cistothorus platensis*	Bird
21	Eastern Spotted Skunk	*Spilogale putorius*	Mammal
21	Texas milkweed beetle	*Tetraopes texanus*	Insect
19	Sharp-shinned Hawk	*Accipiter striatus*	Bird
19	Elktoe	*Alasmidonta marginata*	Mussel
19	Brown Bullhead	*Ameiurus nebulosus*	Fish
19	Grasshopper Sparrow	*Ammodramus savannarum*	Bird
19	American Black Duck	*Anas rubripes*	Bird
19	Anhinga	*Anhinga anhinga*	Bird
19	Eastern Whip-poor-will	*Antrostomus vociferus*	Bird
19	Sanderling	*Calidris alba*	Bird
19	Dunlin	*Calidris alpina*	Bird
19	Stilt Sandpiper	*Calidris himantopus*	Bird
19	Chimney Swift	*Chaetura pelagica*	Bird
19	Yellow-billed Cuckoo	*Coccyzus americanus*	Bird
19	Northern Bobwhite	*Colinus virginianus*	Bird
19	Western Chicken Turtle	*Deirochelys reticularia miaria*	Reptile
19	Tricolored Heron	*Egretta tricolor*	Bird
19	Dion Skipper	*Euphyes dion*	Insect

19	Common Gallinule	*Gallinula chloropus*	Bird
19	Purple Finch	*Haemorhous purpureus*	Bird
19	Leonard's Skipper	*Hesperia leonardus*	Insect
19	Cobweb Skipper	*Hesperia metea*	Insect
19	Goldeye	*Hiodon alosoides*	Fish
19	Mooneye	*Hiodon tergisus*	Fish
19	Wood Thrush	*Hylocichla mustelina*	Bird
19	Least Bittern	*Ixobrychus exilis*	Bird
19	Southern Pocketbook	*Lampsilis ornata*	Mussel
19	"Red River" Mucket	*Lampsilis sp. B*	Mussel
19	American Brook Lamprey	*Lethenteron appendix*	Fish
19	Short-billed Dowitcher	*Limnodromus griseus*	Bird
19	Swainson's Warbler	*Limnothlypis swainsonii*	Bird
19	Texas Coral Snake	*Micrurus tener*	Reptile
19	Striped Mullet	*Mugil cephalus*	Fish
19	Crawford's Gray Shrew	*Notiosorex crawfordi*	Mammal
19	Blackspot Shiner	*Notropis atrocaudalis*	Fish
19	Black-crowned Night-Heron	*Nycticorax nycticorax*	Bird
19	Hickorynut	*Obovaria olivaria*	Mussel
19	Slenderhead Darter	*Percina phoxocephala*	Fish
19	Southern Prairie Skink	*Plestiodon obtusirostris*	Reptile
19	Black-bellied Plover	*Pluvialis squatarola*	Bird
19	Bismark Burrowing Crayfish	*Procambarus parasimulans*	Crayfish
19	Gulf mapleleaf	*Quadrula nobilis*	Mussel
19	Graham's Crayfish Snake	*Regina grahamii*	Reptile
19	Eastern Harvest Mouse	*Reithrodontomys humulis*	Mammal
19	Oak Hairstreak	*Satyrium favonius ontario*	Insect
19	Hurter's Spadefoot	*Scaphiopus hurterii*	Amphibian
19	Lilliput	*Toxolasma parvum*	Mussel
19	Texas Lilliput	*Toxolasma texasiense*	Mussel
19	Tapered Pondhorn	*Uniomerus declivis*	Mussel
19	Bell's Vireo	*Vireo bellii*	Bird
17	Highfin carpsucker	*Carpiodes velifer*	Fish
17	Beach-dune Tiger Beetle	*Cicindela hirticollis*	Insect
17	Trumpeter Swan	*Cygnus buccinator*	Bird
17	Goldstripe Darter	*Etheostoma parvipinne*	Fish
17	Round Pigtoe	*Pleurobema sintoxia*	Mussel
17	Little Spectaclecase group	*Villosa sp. Cf lienosa*	Mussel
15	Mole Salamander	*Ambystoma talpoideum*	Amphibian
15	Dusky Azure	*Celastrina nigra*	Insect
15	Gorgone Checkerspot	*Chlosyne gorgone*	Insect
15	Monarch	*Danaus plexippus*	Insect
15	Lake Chubsucker	*Erimyzon sucetta*	Fish
15	Swamp Darter	*Etheostoma fusiforme*	Fish
15	Dwarf Salamander	*Eurycea quadridigitata*	Amphibian
15	American Kestrel	*Falco sparverius*	Bird

15	Bird-voiced Treefrog	*Hyla avivoca*	Amphibian
15	Fatmucket	*Lampsilis siliquoidea*	Mussel
15	Gulf Swampsnake	*Liodytes rigida*	Reptile
15	Shoal Chub	*Macrhybopsis hyostoma*	Fish
15	robberfly	*Microstylum morosum*	Insect
15	Long-tailed Weasel	*Mustela frenata*	Mammal
15	Slender Glass Lizard	*Ophisaurus attenuatus*	Reptile
15	Saddleback Darter	*Percina vigil*	Fish
15	American Golden-Plover	*Pluvialis dominica*	Bird
15	Broad-winged Skipper	*Poanes viator*	Insect
15	Southern Mapleleaf	*Quadrula apiculata*	Mussel
15	Fawnsfoot	*Truncilla donaciformis*	Mussel
11	winter stonefly	*Allocapnia malverna*	Insect

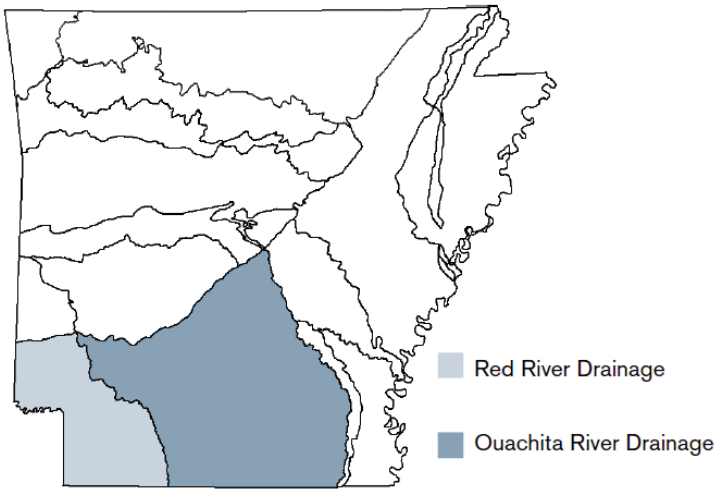
Habitats that occur in the South Central Plains

Of the 37 terrestrial habitats in Arkansas, 17 occur in the South Central Plains ecoregion (Table 3.24). Of 18 ecobasins in Arkansas, two occur in the South Central Plains ecoregion (Figure 3.17). These associations are described in the Section 4. Terrestrial Habitats and Section 5. Aquatic Habitats.

Table 3.24. Terrestrial Habitats in the South Central Plains.

Habitat Name
Crop Land
Cultivated Forest
Herbaceous Wetland
Lower Mississippi Alluvial Plain Grand Prairie
Mud Flats
Pasture Land
Ponds, Lakes, and Water Holes
Urban/Suburban
West Gulf Coastal Plain Calcareous Prairie and Woodland
West Gulf Coastal Plain Pine-Hardwood Flatwoods
West Gulf Coastal Plain Large River Floodplain Forest
West Gulf Coastal Plain Pine-Hardwood Forest/Woodland
West Gulf Coastal Plain Red River Floodplain Forest
West Gulf Coastal Plain Sandhill Oak and Shortleaf Pine Forest/Woodland
West Gulf Coastal Plain Seepage Swamp and Baygall
West Gulf Coastal Plain Small Stream/River Forest
West Gulf Coastal Plain Wet Hardwood Flatwoods

Figure 3.17. Ecobasin Distribution in the South Central Plains.



Problems faced by Species of Greatest Conservation Need (SGCN)

Taxa association teams listed problems faced by SGCN individually in the Species Reports, pages 44-1113. A summary of the problems faced by SGCN in the South Central Plains is presented below. Each problem has a score which is a sum of all Species Priority Scores associated with species for which this problem was assigned. A higher score implies a higher quantity of SGCN and/or more greatly imperiled species associated with problems listed here.

Table 3.25. Problems faced by SGCN.

Problem faced	Score
Agricultural practices	1958
Road construction	1497
Grazing/Browsing	1439
Urban development	1017
Channel alteration	966
Resource extraction	948
Channel maintenance	856
Fire suppression	708
Water diversion	690
Confined animal operations	596
Conversion of riparian forest	484
Exotic species	284
Recreation	268
Predation	261
Commercial/industrial development	230
Parasites/pathogens	224
Municipal/Industrial point source	192
Management of/for certain species	168
Non-point source pollution	128
Commercial harvest	89
unknown	86
Interspecific competiton	48
Excessive groundwater withdrawal	40
Excessive non-commercial harvest or collection	27

Conservation actions needed in the South Central Plains

Descriptions of conservation actions linked to individual species on the list of SGCN are presented in the Species Reports, pages 44-1113. Below are categories of conservation actions recommended by the taxa association teams (Figure 3.18). An explanation of the categories follows in Table 3.26.

The score associated with the conservation action category is the sum of all priority scores associated with species for which a conservation action has been assigned, weighted by the importance of the conservation action category to the species. A higher score implies a higher quantity of SGCN and/or more greatly imperiled species would be affected by actions within this conservation action category.

These scores may be used as guides to directing the apportionment of funding toward conservation actions benefiting habitats and species of greatest conservation need.

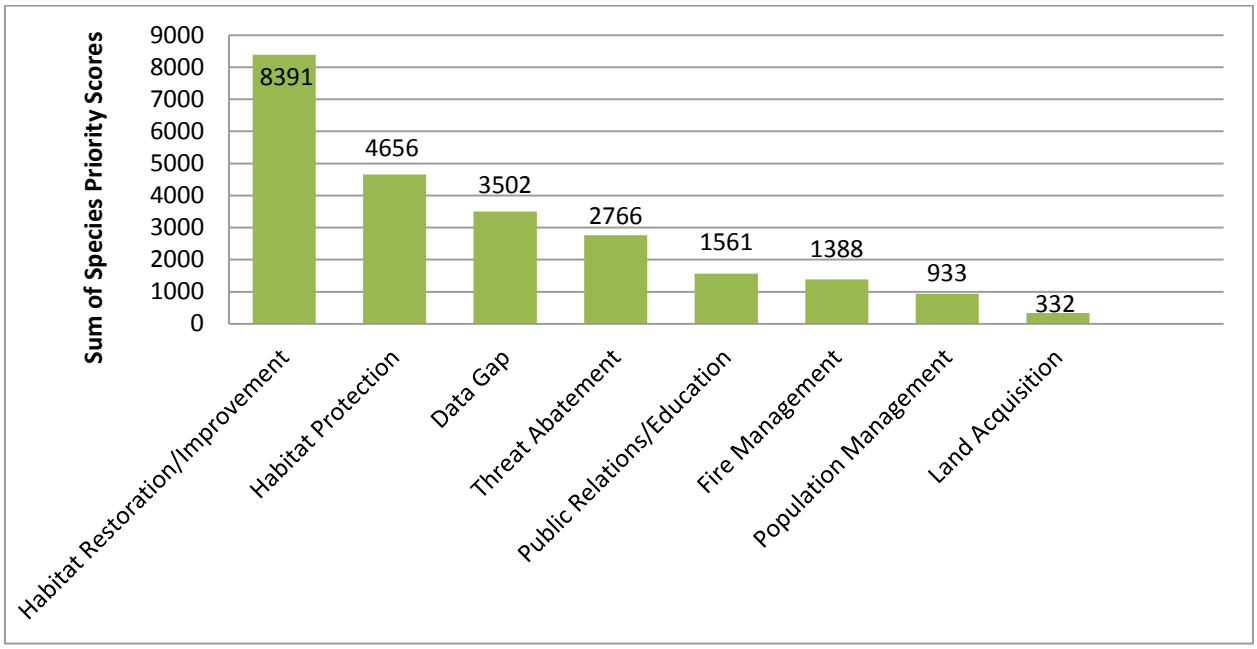


Figure 3.18. Conservation action categories recommended for the South Central Plains.

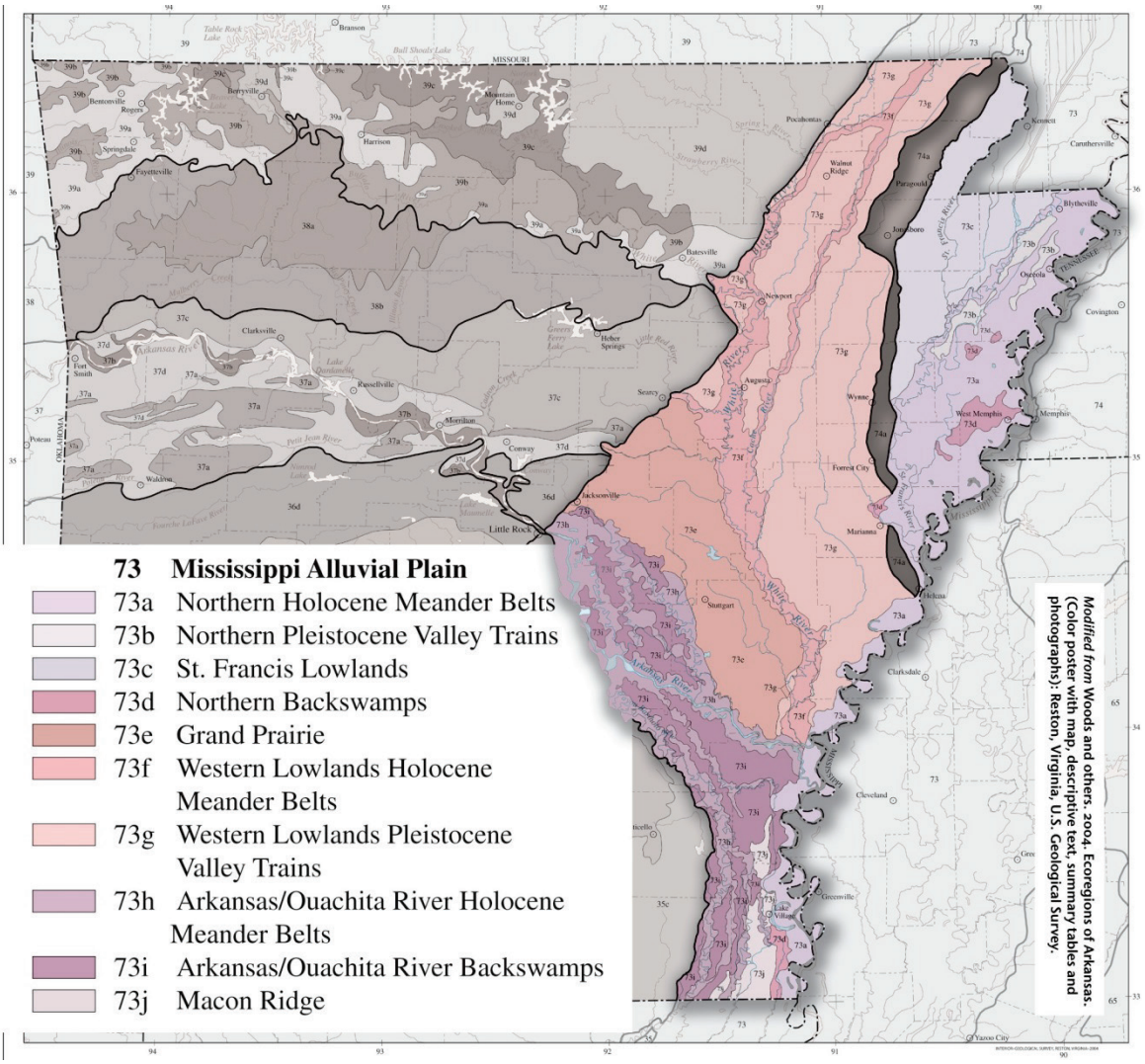
Mississippi Alluvial Plain (Ecoregion 73)

The Mississippi Alluvial Plain (73) extends along the Mississippi River from the confluence of the Ohio and Mississippi rivers southward to the Gulf of Mexico; temperatures and annual average precipitation increase toward the south. Ecoregion

73 is a broad, nearly level, agriculturally-dominated alluvial plain. It is veneered by Quaternary alluvium, loess, glacial outwash and lacustrine deposits. River terraces, swales and levees provide limited relief, but overall, the Mississippi Alluvial Plain (73) is flatter than neighboring ecoregions in Arkansas, including the South Central Plains (35).

Nearly flat, clayey, poorly-drained soils are widespread and characteristic. Streams and rivers have very low gradients and fine-grained substrates. Many reaches have ill-defined stream channels.

Figure 3.19. Mississippi Alluvial Plain ecoregion.



Ecoregion 73 provides important habitat for fish and wildlife and includes the largest continuous system of wetlands in North America. It is also a major bird migration corridor used in fall and spring migrations.

Potential natural vegetation is largely southern floodplain forest and is unlike the oak–hickory and oak–hickory–pine forests that dominate uplands to the west in Ecoregions 35, 36, 37, 38 and 39; loblolly pine, so common in the South Central Plains (35), is not native to most forests in the Arkansas portion of Ecoregion 73.

The Mississippi Alluvial Plain (73) has been widely cleared and drained for cultiva- tion; this widespread loss or degradation of forest and wetland habitat has impacted wildlife and reduced bird populations.

Presently, most of the northern and central sections of Ecoregion 73, including Arkansas, are in cropland and receive heavy treatments of insecticides and herbicides; soybeans, cotton and rice are the major crops and aquaculture is also important. Agricultural runoff containing fertilizers, herbicides, pesticides and livestock waste have degraded surficial water quality.

Concentrations of total suspended solids, total dissolved solids, total phosphorus, ammonia nitrogen, sulfates, turbidity, biological oxygen demand, chlorophyll a and fecal coliform are high in the rivers, streams and ditches of Ecoregion 73; they are often much greater than elsewhere in Arkansas, increase with increasing watershed size and are greatest during the spring, high-flow season.

Fish communities in least altered streams typically have an insignificant proportion of sensitive species; sunfishes are dominant followed by minnows. Man-made flood control levees typically flank the Mississippi River and, in effect, separate the river and its adjoining habitat from the remainder of its natural hydrologic system; in so doing, they interfere with sediment transfer within Ecoregion 73 and have reduced available habitat for many species.

Between the levees that parallel the Mississippi River is a corridor known as the “batture lands”. Batture lands are hydrologically linked to the Mississippi River, flood-prone and contain remnant habitat for “big river” species (e.g., pallid sturgeon) as well as river-front plant communities; they are too narrow to map as a separate level IV ecoregion.

Earthquakes in the early nineteenth century offset river courses in Ecoregion 73. Small to medium size earthquakes still occur frequently; their shocks are magnified by the alluvial plain’s unconsolidated deposits, creating regional land management issues.

Northern Holocene Meander Belts

73a. The Northern Holocene Meander Belts ecoregion is a flat to nearly flat flood- plain containing the meander belts of the present and past courses of the Mississippi River. Point bars, natural levees, swales and abandoned channels marked by meander scars and oxbow lakes are

common and characteristic.

Ecoregion 73a tends to be slightly lower in elevation than adjacent ecoregions. Its abandoned channel network is more extensive than in the Southern Holocene Meander Belts (73k) of Louisiana. Ecoregion 73a is underlain by Holocene alluvium; it lacks the Pleistocene glacial outwash deposits of Ecoregion 73b. Soils on natural levees are relatively coarse-textured, well-drained and higher than those on levee back slopes and point bars; they grade to very heavy, poorly-drained clays in aban- doned channels and swales. Overall, soils are not as sandy as the Northern Pleistocene Valley Trains (73b) and are finer and have more organic matter than the Arkansas/Ouachita River Holocene Meander Belts (73h).

Natural vegetation varies with site characteristics. Younger sandy soils have fewer oaks and more sugarberry, elm, ash, pecan, cottonwood and sycamore than Ecoregion73d.

Widespread draining of wetlands and removal of bottomland forests for cropland has occurred. Soybeans, cotton, corn, sorghum, wheat and rice are the main crops. Catfish farms are increasingly common and contribute to the already large agricultural base.

Northern Pleistocene Valley Trains

73b. The Northern Pleistocene Valley Trains ecoregion is a flat to irregular alluvial plain composed of sandy to gravelly glacial outwash overlain by alluvium; sand sheets, widespread in the St. Francis Lowlands (73c), are absent. The Pleistocene outwash deposits of Ecoregion 73b are usually coarser and better drained than the alluvial deposits of Ecoregions 73a, 73d and 73f. They were transported to Arkan- sas by the Mississippi River and its tributaries and have been subsequently eroded, reduced in size and fragmented by laterally migrating channels or buried by thick sediments.

Ecoregion 73b has little local relief or stream incision. Elevations tend to be slightly higher than adjacent parts of Ecoregions 73a and 73d.

Cropland is extensive and has largely replaced the original forests; soybeans are the main crop and cotton is also produced. The few remaining forests are dominated by species typical of higher bottomlands such as Nuttall oak, willow oak, swamp chestnut oak, sugarberry and green ash. There are more lowland oaks in Ecoregion 73b than in Ecoregions 73a and 73d.

St. Francis Lowlands

73c. The St. Francis Lowlands ecoregion is flat to irregular and has many relict channels. Ecoregion 73c is mainly composed of late-Wisconsinan age glacial outwash deposits and, in contrast to Ecoregion 73b, is partly covered by undulating sand sheets.

“Sand blows” and “sunk lands” occur and have been attributed to the New Madrid earthquakes of 1811-12 (~ magnitude 8). Loess, which veneers older outwash deposits in Ecoregion 73g, is

absent. Topography, lithology and hydrology vary over short distances and natural vegetation varies with site characteristics.

Cropland is extensive and has largely replaced the original forests; soybeans, corn, and cotton are the most common crops but wheat, sorghum and rice are also produced.

Although the streams of the St. Francis Lowlands (73c) have been extensively channelized, water quality tends to be better than in the less channelized areas of Ecoregion 73g because of a lack of loess veneer in Ecoregion 73c.

Northern Backswamps

73d. The Northern Backswamps ecoregion is made up of low-lying overflow areas on floodplains and includes poorly-drained flats and swales. Water often collects in its marshes, swamps, oxbow lakes, ponds and low gradient streams.

Soils developed from clayey alluvium including overbank and slack-water deposits; they commonly have a high shrink-swell potential and are locally rich in organic material. Water levels are seasonally variable.

Native vegetation in the wettest areas is generally dominated by bald cypress–water tupelo forest; slightly higher and better drained sites have overcup oak–water hickory forest and the highest, best-drained areas support Nuttall oak forest. Today, bot- tomland forest, cropland, farmed wetlands, pastureland and catfish farms occur.

Backswamps are important areas for capturing excess nutrients from local waters and for storing water during heavy rain events.

Grand Prairie

73e. The Grand Prairie ecoregion is a broad, loess-covered terrace formerly dominated by tall grass prairie and now primarily used as cropland. It is typically almost level. However, incised perennial and intermittent streams occur and a narrow belt of low hills is found in the east.

Prior to the 19th century, flatter areas with slowly to very slowly permeable soils (often containing fragipans) supported Arkansas' largest prairie. They were generally bounded by open woodland or savanna. In all, about 400,000 acres of prairie grasses and forbs occurred in Ecoregion 73e and were a sharp contrast to the bottomland forests that once dominated other parts of the Mississippi Alluvial Plain (73). Low hills were covered by upland deciduous forest containing white oak, black oak and southern red oak. Drier ridges were dominated by post oak. Narrow floodplains had bottomland hardwood forests.

Cropland has now largely replaced the native vegetation. In the process, some prairie species have been extirpated from the ecoregion (e.g., greater prairie chicken); others have been sharply

reduced in population and restricted to a few prairie remnants.

Distinctively, rice is the main crop; soybeans, cotton, corn and wheat are also grown. Rice fields provide habitat and forage for large numbers and many species of waterfowl; duck and goose hunting occurs.

Western Lowlands Holocene Meander Belts

Western Lowlands Holocene Meander Belts

73f. The Western Lowlands Holocene Meander Belts ecoregion is a flat to nearly flat floodplain containing the meander belts of the present and past courses of the White, Black and Cache rivers. Its meander belts are narrower than the Northern Holocene Meander Belts (73a), but point bars, natural levees, swales and abandoned channels are common in both regions.

Soils on natural levees are relatively coarse-textured, well-drained and higher than those on levee back slopes and point bars; they grade to heavy, poorly-drained clays in abandoned channels and swales.

Natural vegetation varies with site characteristics. Today, Ecoregion 73f contains some of the most extensive remaining tracts of native bottomland hardwood forest in the Mississippi Alluvial Plain (73). Cropland also occurs.

Flood control levees are less developed and riverine processes are more natural and dynamic than in Ecoregion 73a. Backwater flooding in the White River occurs well upstream of its confluence with the higher Mississippi River; as a result, riparian and natural levee communities are less common and oak-dominated communities are more widespread than in Ecoregion 73a.

Wetlands in the Cache-lower White River systems have been designated as one of only nineteen "Wetlands of International Importance" in the United States by the Ramsar Convention on Wetlands.

Regulation of White River flow, in combination with the downcutting of the Mis- sissippi River for navigation (and related wing levees and cutoffs), have altered flood regimes on the lower White River, thereby increasing stream bank instability and bottomland forest mortality in Ecoregion 73f.

Most streams and rivers in Ecoregion 73f are fed by the Ozark Highlands and Boston Mountains; sediment load is generally less than in the Mississippi River.

Western Lowlands Pleistocene Valley Trains

73g. The terraces of the Western Lowlands Pleistocene Valley Trains are largely composed of Pleistocene glacial outwash that was transported to Arkansas by the Mississippi River and deposited by braided streams. Physiography is widely muted by windblown silt deposits (loess), sand sheets, or sand dunes; loess and sand sheets are more widespread than in the Northern Pleistocene Valley Trains (73b) and St. Francis Lowlands (73c).

Many interdunal depressions called "sandponds" occur and are either in contact with the water table or have a perched aquifer. Elevations are higher than adjacent parts of the Northern Holocene Meander Belts (73a) and Western Lowlands Ho- locene Meander Belts (73f); consequently, uplands are rarely if ever flooded.

Native plant communities are different from more frequently inundated ecoregions; for example, post oak and loblolly pine are native to Ecoregion 73g but are absent from lower, overflow areas. Sandpond forest communities are generally dominated by overcup oak, water hickory, willow oak and pin oak; understory in a few sandponds may include pondberry (*Lindera melissifolia*), federally listed as endangered.

Today, cropland is extensive and the main crops are soybeans and cotton. Commer cial crawfish, baitfish and catfish farms are common. The Western Lowlands Pleistocene Valley Trains (73g) ecoregion is a wintering ground for waterfowl. Duck hunting is widespread.

Arkansas/Ouachita River Holocene Meander Belts

73h. The Arkansas/Ouachita River Holocene Meander Belts ecoregion is a flat to nearly flat floodplain containing the meander belts of the present and past courses of the lower Arkansas and Ouachita rivers. Point bars, natural levees, swales and abandoned channels, marked by meander scars and oxbow lakes, are common and characteristic. Soils on natural levees are relatively coarse-textured, well-drained and higher than those on levee back slopes and point bars; they grade to heavy, poorly- drained clays in abandoned channels and swales. Overall, soils have less organic matter than in the Northern Holocene Meander Belts (73a).

Arkansas/Ouachita River Holocene Meander Belts

The modern, active Arkansas River meander belt comprises only a small portion of Ecoregion 73h. The rest of Ecoregion 73h contains small streams flowing in abandoned courses of the Arkansas River. These small streams are usually underfit relative to the older channels, higher than the adjacent Arkansas/Ouachita River Backswamps (73i) and have small watersheds. Bayou Bartholomew inhabits the longest section of abandoned channels. It flows against the edge of and receives drainage from the South Central Plains (35); habitat diversity is sufficient for Bayou

Bartholomew to be one of the most species-rich streams in North America. The pink mucket and the fat pocketbook mussels, both federally listed as endangered, have been collected from the Bayou.

Within an abandoned course, bald cypress and water tupelo often grow in the modern stream channel adjacent to a strip of wet bottomland hardwood forest dominated by overcup oak and water hickory. In the rest of Ecoregion 73h, cropland and pastureland are widespread; soybeans, rice and wheat are the main crops.

Arkansas/Ouachita River Backswamps

73i. The flats, swales and natural levees of the Arkansas/Ouachita River Backswamps ecoregion include the slackwater areas along the Arkansas and Ouachita rivers, where water often collects into marshes, swamps, oxbow lakes, ponds and sloughs. Ecoregion 73i, in contrast to the Northern Backswamps (73d), is widely veneered with natural levee deposits. Soils derived from these natural levee deposits are coarser and are not as poorly drained as the clayey soils of the Northern Backswamps (73d). As a result, willow oak and water oak are native instead of species adapted to wetter overflow conditions.

Drainage canals and ditches are common. This artificial drainage, together with the sandy veneer of natural levee deposits, help explain why Ecoregion 73i is more easily and widely farmed than the Northern Backswamps (73d). Rice, cotton and soybeans are important crops but forests and forested wetlands also occur.

Macon Ridge

73j. Macon Ridge is underlain almost entirely by Pleistocene glacial outwash deposits that were transported to Arkansas by the Mississippi River and deposited by braided streams. It is veneered by windblown silt deposits (i.e. loess) like Ecoregions 73e, 73g and 74a. Soils are influenced by loess and contrast with the alluvial soils of Ecoregions 73a and 73h.

Macon Ridge (73j) is a continuation of the Western Lowlands Pleistocene Valley Trains (73g) but is better drained and supports drier plant communities. Its eastern edge is 20 to 30 feet above the adjacent, lithologically and physiographically distinct, Northern Holocene Meander Belts (73a).

The western side of Macon Ridge (73j) is lower than the eastern side and is about the same elevation as the lithologically and physiographically distinct Arkansas/ Ouachita River Holocene Meander Belts (73h).

Native forest types range from those of better drained bottomlands dominated by willow oak, water oak and swamp chestnut oak to upland hardwood forests domi- nated by white oak, southern red oak and post oak. Prairies and loblolly pine- dominated areas may also have occurred on Macon Ridge (73j).

Today, Ecoregion 73j is a mosaic of pastureland, forest and cropland. Soybeans, cotton and oats are major crops (adapted from Woods and others 2004).

Mississippi Alluvial Plain Ecoregion: Species of Greatest Conservation Need (SGCN)

Species of greatest conservation need (SGCN) in the Mississippi Alluvial Plain are presented by taxa association (Table 3.27). A higher priority score indicates a greater need for actions to conserve the species. A ranked list of all SGCN associated with the ecoregion is presented in Table 3.28.

Table 3.27. SGCN by taxa association.

Taxa Association	Common Name	*Scientific Name*	Priority Score
Amphibian	Illinois Chorus Frog	*Pseudacris illinoensis*	43
	Crawfish Frog	*Lithobates areolatus*	23
	Eastern Spadefoot	*Scaphiopus holbrookii*	19
	Mole Salamander	*Ambystoma talpoideum*	15
	Dwarf Salamander	*Eurycea quadridigitata*	15
	Bird-voiced Treefrog	*Hyla avivoca*	15
Bird	Piping Plover	*Charadrius melodus*	43
	Red-cockaded Woodpecker	*Picoides borealis*	43
	Henslow's Sparrow	*Ammodramus henslowii*	33
	Sprague's Pipit	*Anthus spragueii*	33
	King Rail	*Rallus elegans*	33
	Interior Least Tern	*Sterna antillarum athalassos*	31
	Buff-breasted Sandpiper	*Calidris subruficollis*	29
	Swallow-tailed Kite	*Elanoides forficatus forficatus*	29
	Rusty Blackbird	*Euphagus carolinus*	29
	Bewick's Wren	*Thryomanes bewickii*	29
	Ruddy Turnstone	*Arenaria interpres*	24
	Smith's Longspur	*Calcarius pictus*	24
	Common Nighthawk	*Chordeiles minor*	24
	Migrant Loggerhead Shrike	*Lanius ludovicianus migrans*	24
	Yellow-crowned Night-Heron	*Nyctanassa violacea*	24
	American Woodcock	*Scolopax minor*	24
	Cerulean Warbler	*Setophaga cerulea*	24
	American Bittern	*Botaurus lentiginosus*	23
	Willow Flycatcher	*Empidonax traillii*	23
	Purple Gallinule	*Porphyrio martinicus*	23
	Le Conte's Sparrow	*Ammodramus leconteii*	21
	Sedge Wren	*Cistothorus platensis*	21
	Sharp-shinned Hawk	*Accipiter striatus*	19
	Grasshopper Sparrow	*Ammodramus savannarum*	19
	American Black Duck	*Anas rubripes*	19

	Anhinga	*Anhinga anhinga*	19
	Eastern Whip-poor-will	*Antrostomus vociferus*	19
	Sanderling	*Calidris alba*	19
	Dunlin	*Calidris alpina*	19
	Stilt Sandpiper	*Calidris himantopus*	19
	Chimney Swift	*Chaetura pelagica*	19
	Yellow-billed Cuckoo	*Coccyzus americanus*	19
	Northern Bobwhite	*Colinus virginianus*	19
	Tricolored Heron	*Egretta tricolor*	19
	Common Gallinule	*Gallinula chloropus*	19
	Purple Finch	*Haemorhous purpureus*	19
	Wood Thrush	*Hylocichla mustelina*	19
	Least Bittern	*Ixobrychus exilis*	19
	Short-billed Dowitcher	*Limnodromus griseus*	19
	Swainson's Warbler	*Limnothlypis swainsonii*	19
	Black-crowned Night-Heron	*Nycticorax nycticorax*	19
	Black-bellied Plover	*Pluvialis squatarola*	19
	Bell's Vireo	*Vireo bellii*	19
	Trumpeter Swan	*Cygnus buccinator*	17
	American Kestrel	*Falco sparverius*	15
	American Golden-Plover	*Pluvialis dominica*	15
Fish	Alabama Shad	*Alosa alabamae*	52
	Pallid Sturgeon	*Scaphirhynchus albus*	48
	Sicklefin Chub	*Macrhybopsis meeki*	43
	Crystal Darter	*Crystallaria asprella*	38
	Stargazing Darter	*Percina uranidea*	38
	Western Sand Darter	*Ammocrypta clara*	33
	Bluehead Shiner	*Pteronotropis hubbsi*	33
	Stonecat	*Noturus flavus*	29
	Lake Sturgeon	*Acipenser fulvescens*	27
	Alligator Gar	*Atractosteus spatula*	27
	Plains Minnow	*Hybognathus placitus*	27
	American Eel	*Anguilla rostrata*	24
	Paddlefish	*Polyodon spathula*	24
	Blue Sucker	*Cycleptus elongatus*	23
	Sabine Shiner	*Notropis sabinae*	23
	Suckermouth Minnow	*Phenacobius mirabilis*	23
	Flathead Chub	*Platygobio gracilis*	23
	Central mudminnow	*Umbra limi*	23
	Brown Bullhead	*Ameiurus nebulosus*	19
	Goldeye	*Hiodon alosoides*	19
	Mooneye	*Hiodon tergisus*	19
	American Brook Lamprey	*Lethenteron appendix*	19
	Pealip Redhorse	*Moxostoma pisolabrum*	19
	Striped Mullet	*Mugil cephalus*	19
	Channel Shiner	*Notropis wickliffi*	19

	Gilt Darter	*Percina evides*	19
	Highfin carpsucker	*Carpiodes velifer*	17
	Goldstripe Darter	*Etheostoma parvipinne*	17
	Lake Chubsucker	*Erimyzon sucetta*	15
	Swamp Darter	*Etheostoma fusiforme*	15
	Shoal Chub	*Macrhybopsis hyostoma*	15
Insect	Dukes' Skipper	*Euphyes dukesi*	32
	Prairie Mole Cricket	*Gryllotalpa major*	32
	Lace-winged Roadside-Skipper	*Amblyscirtes aesculapius*	27
	Giant Stag Beetle	*Lucanus elephus*	25
	Woodland Tiger Beetle	*Cicindela unipunctata*	23
	Yehl Skipper	*Poanes yehl*	23
	Golden-banded Skipper	*Autochton cellus*	21
	tiger beetle	*Cicindela lepida*	21
	red milkweed beetle	*Tetraopes quinquemaculatus*	21
	Six-banded Longhorn Beetle	*Dryobius sexnotatus*	19
	Dion Skipper	*Euphyes dion*	19
	Gray Comma	*Polygonia progne*	19
	Ant-like Tiger Beetle	*Cicindela cursitans*	17
	Beach-dune Tiger Beetle	*Cicindela hirticollis*	17
	Gorgone Checkerspot	*Chlosyne gorgone*	15
	Monarch	*Danaus plexippus*	15
	Broad-winged Skipper	*Poanes viator*	15
	Twelve-spotted Tiger Beetle	*Cicindela duodecimguttata*	13
	winter stonefly	*Allocapnia malverna*	11
	Bronze Copper	*Lycaena hyllus*	11
Mammal	Northern Long-eared Bat	*Myotis septentrionalis*	63
	Indiana Bat	*Myotis sodalis*	62
	Little Brown Bat	*Myotis lucifugus*	33
	Rafinesque's Big-Eared Bat	*Corynorhinus rafinesquii*	29
	Southeastern Bat	*Myotis austroriparius*	24
	Eastern Harvest Mouse	*Reithrodontomys humulis*	19
	Southern Bog Lemming	*Synaptomys cooperi*	19
	American Badger	*Taxidea taxus*	16
	Long-tailed Weasel	*Mustela frenata*	15
	Western Harvest Mouse	*Reithrodontomys megalotis*	15
Mussel	Scaleshell	*Leptodea leptodon*	95
	Fat Pocketbook	*Potamilus capax*	76
	"Ozark" Fanshell	*Cyprogenia aberti*	52
	Purple Lilliput	*Toxolasma lividum*	52
	Pink Mucket	*Lampsilis abrupta*	46
	Salamander Mussel	*Simpsonaias ambigua*	34
	Rabbitsfoot	*Quadrula cylindrica*	33
	Ohio Pigtoe	*Pleurobema cordatum*	27
	Pink Heelsplitter	*Potamilus alatus*	23
	Ouachita Kidneyshell	*Ptychobranchus occidentalis*	23

	Pondhorn	*Uniomerus tetralasmus*	23
	Elktoe	*Alasmidonta marginata*	19
	Hickorynut	*Obovaria olivaria*	19
	Gulf mapleleaf	*Quadrula nobilis*	19
	Lilliput	*Toxolasma parvum*	19
	Texas Lilliput	*Toxolasma texasiense*	19
	Tapered Pondhorn	*Uniomerus declivis*	19
	Round Pigtoe	*Pleurobema sintoxia*	17
	Rainbow	*Villosa iris*	17
	Little Spectaclecase group	*Villosa sp. Cf lienosa*	17
	Southern Mapleleaf	*Quadrula apiculata*	15
	Fawnsfoot	*Truncilla donaciformis*	15
Reptile	Midwest Worm Snake	*Carphophis amoenus*	19
	Western Chicken Turtle	*Deirochelys reticularia miaria*	19
	Graham's Crayfish Snake	*Regina grahamii*	19
	Ornate Box Turtle	*Terrapene ornata ornata*	19
	Gulf Swampsnake	*Liodytes rigida*	15
	Slender Glass Lizard	*Ophisaurus attenuatus*	15

Table 3.28. Species of greatest conservation need (SGCN) in the Mississippi Alluvial Plain ranked by priority score. A higher priority score indicates a greater need for actions to conserve the species. Of the 377 SGCN, 141 occur in this ecoregion.

Priority Score	Common Name	Scientific Name	Taxa Association
95	Scaleshell	*Leptodea leptodon*	Mussel
76	Fat Pocketbook	*Potamilus capax*	Mussel
63	Northern Long-eared Bat	*Myotis septentrionalis*	Mammal
62	Indiana Bat	*Myotis sodalis*	Mammal
52	Alabama Shad	*Alosa alabamae*	Fish
52	"Ozark" Fanshell	*Cyprogenia aberti*	Mussel
52	Purple Lilliput	*Toxolasma lividum*	Mussel
48	Pallid Sturgeon	*Scaphirhynchus albus*	Fish
46	Pink Mucket	*Lampsilis abrupta*	Mussel
43	Piping Plover	*Charadrius melodus*	Bird
43	Sicklefin Chub	*Macrhybopsis meeki*	Fish
43	Red-cockaded Woodpecker	*Picoides borealis*	Bird
43	Illinois Chorus Frog	*Pseudacris illinoensis*	Amphibian
38	Crystal Darter	*Crystallaria asprella*	Fish
38	Stargazing Darter	*Percina uranidea*	Fish
34	Salamander Mussel	*Simpsonaias ambigua*	Mussel
33	Western Sand Darter	*Ammocrypta clara*	Fish
33	Henslow's Sparrow	*Ammodramus henslowii*	Bird
33	Sprague's Pipit	*Anthus spragueii*	Bird
33	Little Brown Bat	*Myotis lucifugus*	Mammal
33	Bluehead Shiner	*Pteronotropis hubbsi*	Fish
33	Rabbitsfoot	*Quadrula cylindrica*	Mussel
33	King Rail	*Rallus elegans*	Bird
32	Dukes' Skipper	*Euphyes dukesi*	Insect
32	Prairie Mole Cricket	*Gryllotalpa major*	Insect
31	Interior Least Tern	*Sterna antillarum athalassos*	Bird
29	Buff-breasted Sandpiper	*Calidris subruficollis*	Bird
29	Rafinesque's Big-Eared Bat	*Corynorhinus rafinesquii*	Mammal
29	Swallow-tailed Kite	*Elanoides forficatus forficatus*	Bird
29	Rusty Blackbird	*Euphagus carolinus*	Bird
29	Stonecat	*Noturus flavus*	Fish
29	Bewick's Wren	*Thryomanes bewickii*	Bird
27	Lake Sturgeon	*Acipenser fulvescens*	Fish
27	Lace-winged Roadside-Skipper	*Amblyscirtes aesculapius*	Insect
27	Alligator Gar	*Atractosteus spatula*	Fish
27	Plains Minnow	*Hybognathus placitus*	Fish
27	Ohio Pigtoe	*Pleurobema cordatum*	Mussel
25	Giant Stag Beetle	*Lucanus elephus*	Insect
24	American Eel	*Anguilla rostrata*	Fish
24	Ruddy Turnstone	*Arenaria interpres*	Bird
24	Smith's Longspur	*Calcarius pictus*	Bird
24	Common Nighthawk	*Chordeiles minor*	Bird
24	Migrant Loggerhead Shrike	*Lanius ludovicianus migrans*	Bird
24	Southeastern Bat	*Myotis austroriparius*	Mammal
24	Yellow-crowned Night-Heron	*Nyctanassa violacea*	Bird
24	Paddlefish	*Polyodon spathula*	Fish
24	American Woodcock	*Scolopax minor*	Bird
24	Cerulean Warbler	*Setophaga cerulea*	Bird
23	American Bittern	*Botaurus lentiginosus*	Bird

23	Woodland Tiger Beetle	*Cicindela unipunctata*	Insect
23	Blue Sucker	*Cycleptus elongatus*	Fish
23	Willow Flycatcher	*Empidonax traillii*	Bird
23	Crawfish Frog	*Lithobates areolatus*	Amphibian
23	Sabine Shiner	*Notropis sabinae*	Fish
23	Suckermouth Minnow	*Phenacobius mirabilis*	Fish
23	Flathead Chub	*Platygobio gracilis*	Fish
23	Yehl Skipper	*Poanes yehl*	Insect
23	Purple Gallinule	*Porphyrio martinicus*	Bird
23	Pink Heelsplitter	*Potamilus alatus*	Mussel
23	Ouachita Kidneyshell	*Ptychobranchus occidentalis*	Mussel
23	Central mudminnow	*Umbra limi*	Fish
23	Pondhorn	*Uniomerus tetralasmus*	Mussel
21	Le Conte's Sparrow	*Ammodramus leconteii*	Bird
21	Golden-banded Skipper	*Autochton cellus*	Insect
21	tiger beetle	*Cicindela lepida*	Insect
21	Sedge Wren	*Cistothorus platensis*	Bird
21	red milkweed beetle	*Tetraopes quinquemaculatus*	Insect
19	Sharp-shinned Hawk	*Accipiter striatus*	Bird
19	Elktoe	*Alasmidonta marginata*	Mussel
19	Brown Bullhead	*Ameiurus nebulosus*	Fish
19	Grasshopper Sparrow	*Ammodramus savannarum*	Bird
19	American Black Duck	*Anas rubripes*	Bird
19	Anhinga	*Anhinga anhinga*	Bird
19	Eastern Whip-poor-will	*Antrostomus vociferus*	Bird
19	Sanderling	*Calidris alba*	Bird
19	Dunlin	*Calidris alpina*	Bird
19	Stilt Sandpiper	*Calidris himantopus*	Bird
19	Midwest Worm Snake	*Carphophis amoenus*	Reptile
19	Chimney Swift	*Chaetura pelagica*	Bird
19	Yellow-billed Cuckoo	*Coccyzus americanus*	Bird
19	Northern Bobwhite	*Colinus virginianus*	Bird
19	Western Chicken Turtle	*Deirochelys reticularia miaria*	Reptile
19	Six-banded Longhorn Beetle	*Dryobius sexnotatus*	Insect
19	Tricolored Heron	*Egretta tricolor*	Bird
19	Dion Skipper	*Euphyes dion*	Insect
19	Common Gallinule	*Gallinula chloropus*	Bird
19	Purple Finch	*Haemorhous purpureus*	Bird
19	Goldeye	*Hiodon alosoides*	Fish
19	Mooneye	*Hiodon tergisus*	Fish
19	Wood Thrush	*Hylocichla mustelina*	Bird
19	Least Bittern	*Ixobrychus exilis*	Bird
19	American Brook Lamprey	*Lethenteron appendix*	Fish
19	Short-billed Dowitcher	*Limnodromus griseus*	Bird
19	Swainson's Warbler	*Limnothlypis swainsonii*	Bird
19	Pealip Redhorse	*Moxostoma pisolabrum*	Fish
19	Striped Mullet	*Mugil cephalus*	Fish
19	Channel Shiner	*Notropis wickliffi*	Fish
19	Black-crowned Night-Heron	*Nycticorax nycticorax*	Bird
19	Hickorynut	*Obovaria olivaria*	Mussel
19	Gilt Darter	*Percina evides*	Fish
19	Black-bellied Plover	*Pluvialis squatarola*	Bird

19	Gray Comma	*Polygonia progne*	Insect
19	Gulf mapleleaf	*Quadrula nobilis*	Mussel
19	Graham's Crayfish Snake	*Regina grahamii*	Reptile
19	Eastern Harvest Mouse	*Reithrodontomys humulis*	Mammal
19	Eastern Spadefoot	*Scaphiopus holbrookii*	Amphibian
19	Southern Bog Lemming	*Synaptomys cooperi*	Mammal
19	Ornate Box Turtle	*Terrapene ornata ornata*	Reptile
19	Lilliput	*Toxolasma parvum*	Mussel
19	Texas Lilliput	*Toxolasma texasiense*	Mussel
19	Tapered Pondhorn	*Uniomerus declivis*	Mussel
19	Bell's Vireo	*Vireo bellii*	Bird
17	Highfin carpsucker	*Carpiodes velifer*	Fish
17	Ant-like Tiger Beetle	*Cicindela cursitans*	Insect
17	Beach-dune Tiger Beetle	*Cicindela hirticollis*	Insect
17	Trumpeter Swan	*Cygnus buccinator*	Bird
17	Goldstripe Darter	*Etheostoma parvipinne*	Fish
17	Round Pigtoe	*Pleurobema sintoxia*	Mussel
17	Rainbow	*Villosa iris*	Mussel
17	Little Spectaclecase group	*Villosa sp. Cf lienosa*	Mussel
16	American Badger	*Taxidea taxus*	Mammal
15	Mole Salamander	*Ambystoma talpoideum*	Amphibian
15	Gorgone Checkerspot	*Chlosyne gorgone*	Insect
15	Monarch	*Danaus plexippus*	Insect
15	Lake Chubsucker	*Erimyzon sucetta*	Fish
15	Swamp Darter	*Etheostoma fusiforme*	Fish
15	Dwarf Salamander	*Eurycea quadridigitata*	Amphibian
15	American Kestrel	*Falco sparverius*	Bird
15	Bird-voiced Treefrog	*Hyla avivoca*	Amphibian
15	Gulf Swampsnake	*Liodytes rigida*	Reptile
15	Shoal Chub	*Macrhybopsis hyostoma*	Fish
15	Long-tailed Weasel	*Mustela frenata*	Mammal
15	Slender Glass Lizard	*Ophisaurus attenuatus*	Reptile
15	American Golden-Plover	*Pluvialis dominica*	Bird
15	Broad-winged Skipper	*Poanes viator*	Insect
15	Southern Mapleleaf	*Quadrula apiculata*	Mussel
15	Western Harvest Mouse	*Reithrodontomys megalotis*	Mammal
15	Fawnsfoot	*Truncilla donaciformis*	Mussel
13	Twelve-spotted Tiger Beetle	*Cicindela duodecimguttata*	Insect
11	winter stonefly	*Allocapnia malverna*	Insect
11	Bronze Copper	*Lycaena hyllus*	Insect

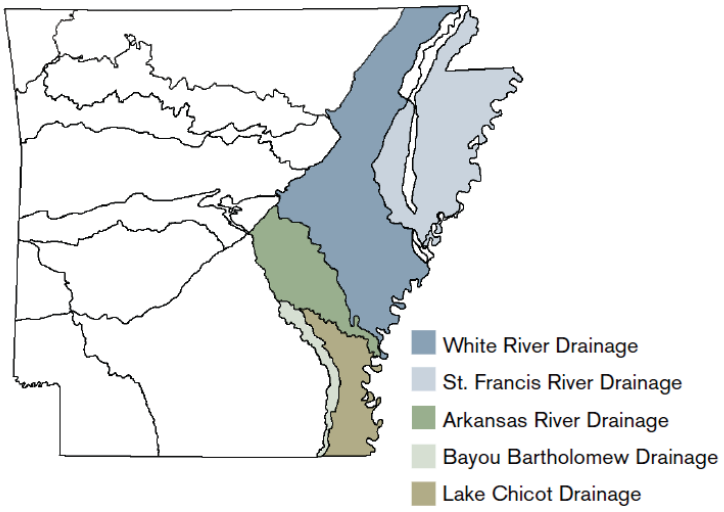
Habitats that occur in the Mississippi Alluvial Plain

Of the 37 terrestrial habitats in Arkansas, 14 occur in the Mississippi Alluvial Plain ecoregion (Table 3.29). Of 18 ecobasins in Arkansas, three occur in the Mississippi Alluvial Plain ecoregion (Figure 3.20). These associations are described in the Section 4. Terrestrial Habitats and Section 5. Aquatic Habitats.

Table 3.29. Terrestrial Habitats in the Mississippi Alluvial Plain.

Habitat Name
Crop Land
Cultivated Forest
Herbaceous Wetland
Lower Mississippi Alluvial Plain Grand Prairie
Lower Mississippi Flatwoods Woodland and Forest
Lower Mississippi River Bottomland Depression
Lower Mississippi River Dune Woodland and Forest
Lower Mississippi River High Bottomland Forest
Lower Mississippi River Low Bottomland Forest
Lower Mississippi River Riparian Forest
Mud Flats
Pasture Land
Ponds, Lakes, and Water Holes
Urban/Suburban

Figure 3.20. Ecobasin Distribution in the Mississippi Alluvial Plain.



Problems faced by Species of Greatest Conservation Need (SGCN)

Taxa association teams listed problems faced by SGCN individually in the Species Reports, pages 44-1113. A summary of the problems faced by SGCN in the Mississippi Alluvial Plain is presented below. Each problem has a score which is a sum of all Species Priority Scores associated with species for which this problem was assigned. A higher score implies a higher quantity of SGCN and/or more greatly imperiled species associated with problems listed here.

Table 3.30. Problems faced by SGCN in the Mississippi Alluvial Plain ecoregion.

Problem faced	Score
Agricultural practices	2149
Dam	1657
Forestry activities	1502
Grazing/Browsing	1025
Channel alteration	959
Resource extraction	909
Channel maintenance	861
Water diversion	684
Road construction	646
Urban development	631
Confined animal operations	465
Fire suppression	450
Conversion of riparian forest	434
Parasites/pathogens	286
Recreation	253
Exotic species	253
Commercial/industrial development	237
Predation	198
Commercial harvest	115
Non-point source pollution	105
unknown	86
Management of/for certain species	74
Municipal/Industrial point source	69

Crossbreeding	48
Interspecific competiton	48
Incidental take	27
Excessive groundwater withdrawal	21

Conservation actions needed in the Mississippi Alluvial Plain

Descriptions of conservation actions linked to individual species on the list of SGCN are presented in the Species Reports, pages 45-1082. Below are categories of conservation actions recommended by the taxa association teams (Figure 3.21). An explanation of the categories follows in Table 3.31.

The score associated with the conservation action category is the sum of all priority scores associated with species for which a conservation action has been assigned, weighted by the importance of the conservation action category to the species. A higher score implies a higher quantity of SGCN and/or more greatly imperiled species would be affected by actions within this conservation action category.

These scores may be used as guides to directing the apportionment of funding toward conservation actions benefiting habitats and species of greatest conservation need.

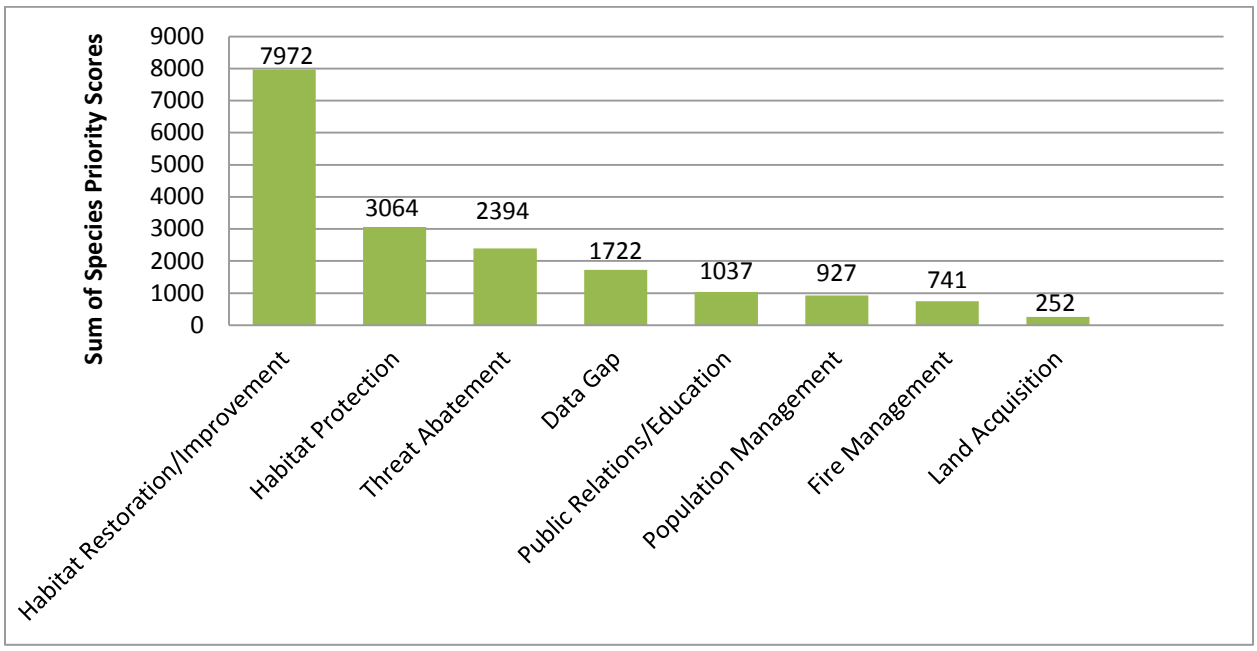


Figure 3.21. Conservation action categories recommended for the Mississippi Alluvial Plain.

Mississippi Valley Loess Plains (Ecoregion 74)

Ecoregion 74 stretches from the Ohio River in western Kentucky all the way to Louisiana. It is characteristically veneered with windblown silt deposits (loess) and underlain by erosion-prone, unconsolidated coastal plain sediments; loess is thicker than in the Southeastern Plains (65). Western areas, including Arkansas, have hills, ridges and bluffs, but further east in Mississippi and Tennessee, the topography becomes flatter. Overall, irregular plains are common.

Ecoregion 74 is lithologically and physiographically distinct from the Ouachita Mountains (36), Boston Mountains (38), Ozark Highlands (39), Interior Plateau (71) and Interior River Valleys and Hills (72).

Figure 3.22. Mississippi Valley Loess Plains ecoregion.

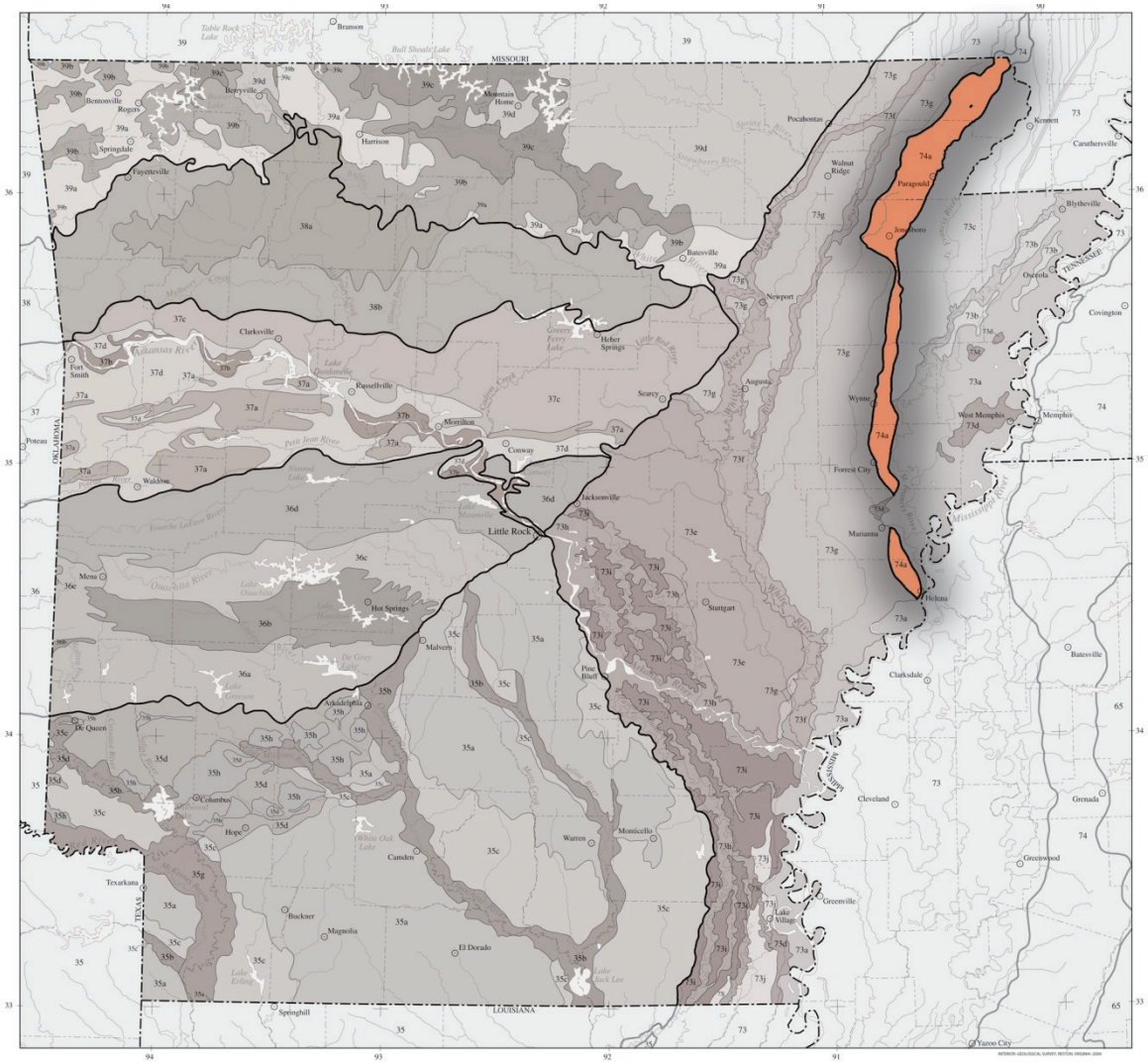


Photo by Tom Foti, AHNC

Mississippi Valley Loess Plains - Crowley's Ridge

Potential natural vegetation is primarily oak–hickory forest or oak–hickory–pine forest and is unlike the southern floodplain forests of the Mississippi Alluvial Plain (73). Streams tend to have gentler gradients and more silty substrates than in the Southeastern Plains (65).

Crowley's Ridge

74a. Crowley's Ridge, the only portion of the Bluff Hills ecoregion in Arkansas, is a disjunct series of loess-capped hills surrounded by the lower, flatter Mississippi Alluvial Plain (73). Crowley's Ridge, with elevations of up to 500 feet, is of sufficient height to have trapped wind-blown silt during the Pleistocene Epoch. It was formed by the aggregation of loess and the subsequent erosion by streams.

The loess is subject to vertical sloughing when wet. Spring-fed streams and seep areas occur on the lower slopes and in basal areas where Tertiary sands and gravels, that were never removed by the Mississippi River, are exposed.

Soils are generally well-drained; they are generally more loamy than those found in the surrounding Northern Pleistocene Valley Trains (73b) and St. Francis Lowlands (73c).

Wooded land and pastureland are common; only limited cropland is found in Ecoregion 74a. Post oak–blackjack oak forest, southern red oak–white oak forest and beech–maple forest occur. Undisturbed ravine vegetation can be rich in meso- phytes, such as beech and sugar maple. Oaks still dominate most of these meso- phytic communities. The forests of the Bluff Hills (74a) are usually classified as oak–beech. They are related to the beech–maple cove forests of the Appalachian Mountains; like the Appalachian cove forests, tulip poplar dominates early successional communities, at least in the southern ridge. In Arkansas, tulip poplar is native only to the Bluff Hills (74a). Shortleaf pine grows on the sandier soils of the northern ridge (adapted from Woods and others 2004).

Mississippi Valley Loess Plains: Species of Greatest Conservation Need (SGCN)

Species of greatest conservation need (SGCN) in the Mississippi Valley Loess Plains are presented by taxa association (Table 3.32). A higher priority score indicates a greater need for actions to conserve the species. A ranked list of all SGCN associated with the ecoregion is presented in Table 3.33.

Table 3.32. SGCN by taxa association.

Taxa Association	Common Name	*Scientific Name*	Priority Score
Amphibian	Spotted Dusky Salamander	*Desmognathus conanti*	23
	Crawfish Frog	*Lithobates areolatus*	23
	Eastern Spadefoot	*Scaphiopus holbrookii*	19
	Mole Salamander	*Ambystoma talpoideum*	15
Bird	Henslow's Sparrow	*Ammodramus henslowii*	33
	Rusty Blackbird	*Euphagus carolinus*	29
	Bewick's Wren	*Thryomanes bewickii*	29
	Common Nighthawk	*Chordeiles minor*	24
	Migrant Loggerhead Shrike	*Lanius ludovicianus migrans*	24
	Yellow-crowned Night-Heron	*Nyctanassa violacea*	24
	American Woodcock	*Scolopax minor*	24
	Cerulean Warbler	*Setophaga cerulea*	24
	American Bittern	*Botaurus lentiginosus*	23
	Willow Flycatcher	*Empidonax traillii*	23
	Le Conte's Sparrow	*Ammodramus leconteii*	21
	Sedge Wren	*Cistothorus platensis*	21
	Sharp-shinned Hawk	*Accipiter striatus*	19
	Grasshopper Sparrow	*Ammodramus savannarum*	19
	Eastern Whip-poor-will	*Antrostomus vociferus*	19
	Dunlin	*Calidris alpina*	19
	Stilt Sandpiper	*Calidris himantopus*	19
	Chimney Swift	*Chaetura pelagica*	19
	Yellow-billed Cuckoo	*Coccyzus americanus*	19
	Northern Bobwhite	*Colinus virginianus*	19
	Purple Finch	*Haemorhous purpureus*	19
	Wood Thrush	*Hylocichla mustelina*	19
	Least Bittern	*Ixobrychus exilis*	19
	Short-billed Dowitcher	*Limnodromus griseus*	19
	Swainson's Warbler	*Limnothlypis swainsonii*	19
	Black-crowned Night-Heron	*Nycticorax nycticorax*	19
	Bell's Vireo	*Vireo bellii*	19
	Trumpeter Swan	*Cygnus buccinator*	17
	American Kestrel	*Falco sparverius*	15

	American Golden-Plover	*Pluvialis dominica*	15
Fish	Goldstripe Darter	*Etheostoma parvipinne*	17
Insect	Giant Stag Beetle	*Lucanus elephus*	25
	Sandy Stream Tiger Beetle	*Cicindela macra*	17
	Cow Path Tiger Beetle	*Cicindela purpurea*	15
	Monarch	*Danaus plexippus*	15
	Bronze Copper	*Lycaena hyllus*	11
Mammal	Little Brown Bat	*Myotis lucifugus*	33
	Rafinesque's Big-Eared Bat	*Corynorhinus rafinesquii*	29
	Southeastern Bat	*Myotis austroriparius*	24
	Eastern Spotted Skunk	*Spilogale putorius*	21
	Eastern Harvest Mouse	*Reithrodontomys humulis*	19
	Southern Bog Lemming	*Synaptomys cooperi*	19
	American Badger	*Taxidea taxus*	16
	Long-tailed Weasel	*Mustela frenata*	15
	Western Harvest Mouse	*Reithrodontomys megalotis*	15
Reptile	Midwest Worm Snake	*Carphophis amoenus*	19

Table 3.33. Species of greatest conservation need (SGCN) in the Mississippi Valley Loess Plains ranked by priority score. A higher priority score indicates a greater need for actions to conserve the species. Of the 377 SGCN, 50 occur in this ecoregion.

Priority Score	Common Name	Scientific Name	Taxa Association
33	Henslow's Sparrow	*Ammodramus henslowii*	Bird
33	Little Brown Bat	*Myotis lucifugus*	Mammal
29	Rafinesque's Big-Eared Bat	*Corynorhinus rafinesquii*	Mammal
29	Rusty Blackbird	*Euphagus carolinus*	Bird
29	Bewick's Wren	*Thryomanes bewickii*	Bird
25	Giant Stag Beetle	*Lucanus elephus*	Insect
24	Common Nighthawk	*Chordeiles minor*	Bird
24	Migrant Loggerhead Shrike	*Lanius ludovicianus migrans*	Bird
24	Southeastern Bat	*Myotis austroriparius*	Mammal
24	Yellow-crowned Night-Heron	*Nyctanassa violacea*	Bird
24	American Woodcock	*Scolopax minor*	Bird
24	Cerulean Warbler	*Setophaga cerulea*	Bird
23	American Bittern	*Botaurus lentiginosus*	Bird
23	Spotted Dusky Salamander	*Desmognathus conanti*	Amphibian
23	Willow Flycatcher	*Empidonax traillii*	Bird
23	Crawfish Frog	*Lithobates areolatus*	Amphibian
21	Le Conte's Sparrow	*Ammodramus leconteii*	Bird
21	Sedge Wren	*Cistothorus platensis*	Bird
21	Eastern Spotted Skunk	*Spilogale putorius*	Mammal
19	Sharp-shinned Hawk	*Accipiter striatus*	Bird
19	Grasshopper Sparrow	*Ammodramus savannarum*	Bird
19	Eastern Whip-poor-will	*Antrostomus vociferus*	Bird
19	Dunlin	*Calidris alpina*	Bird
19	Stilt Sandpiper	*Calidris himantopus*	Bird
19	Midwest Worm Snake	*Carphophis amoenus*	Reptile
19	Chimney Swift	*Chaetura pelagica*	Bird
19	Yellow-billed Cuckoo	*Coccyzus americanus*	Bird
19	Northern Bobwhite	*Colinus virginianus*	Bird
19	Purple Finch	*Haemorhous purpureus*	Bird
19	Wood Thrush	*Hylocichla mustelina*	Bird
19	Least Bittern	*Ixobrychus exilis*	Bird
19	Short-billed Dowitcher	*Limnodromus griseus*	Bird
19	Swainson's Warbler	*Limnothlypis swainsonii*	Bird
19	Black-crowned Night-Heron	*Nycticorax nycticorax*	Bird
19	Eastern Harvest Mouse	*Reithrodontomys humulis*	Mammal
19	Eastern Spadefoot	*Scaphiopus holbrookii*	Amphibian
19	Southern Bog Lemming	*Synaptomys cooperi*	Mammal
19	Bell's Vireo	*Vireo bellii*	Bird
17	Sandy Stream Tiger Beetle	*Cicindela macra*	Insect
17	Trumpeter Swan	*Cygnus buccinator*	Bird
17	Goldstripe Darter	*Etheostoma parvipinne*	Fish
16	American Badger	*Taxidea taxus*	Mammal
15	Mole Salamander	*Ambystoma talpoideum*	Amphibian
15	Cow Path Tiger Beetle	*Cicindela purpurea*	Insect
15	Monarch	*Danaus plexippus*	Insect

15	American Kestrel	*Falco sparverius*	Bird
15	Long-tailed Weasel	*Mustela frenata*	Mammal
15	American Golden-Plover	*Pluvialis dominica*	Bird
15	Western Harvest Mouse	*Reithrodontomys megalotis*	Mammal
11	Bronze Copper	*Lycaena hyllus*	Insect

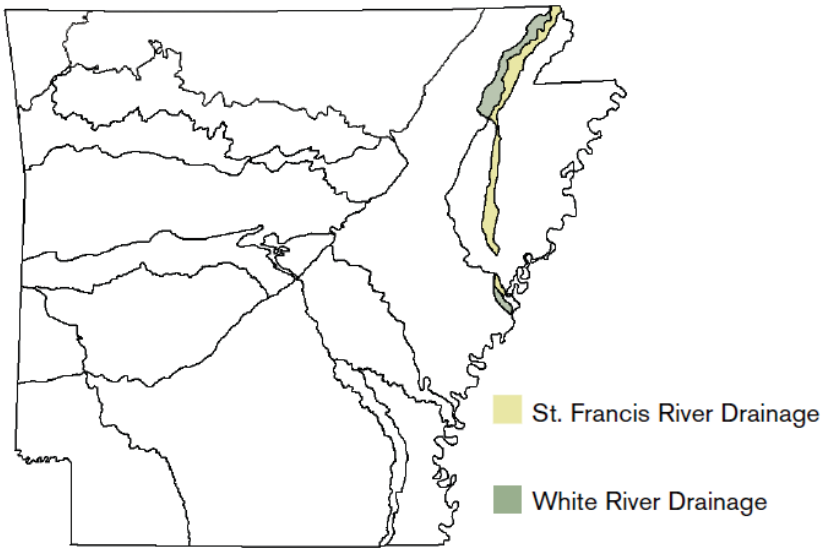
Habitats that occur in the Mississippi Valley Loess Plains

Of the 37 terrestrial habitats in Arkansas, 7 occur in the Mississippi Valley Loess Plains (Table 3.34). Of 18 ecobasins in Arkansas, three occur in the Mississippi Valley Loess Plains ecoregion (Figure 3.23). These associations are described in the Section 4. Terrestrial Habitatsand Section 5. Aquatic Habitats.

Table 3.34. Terrestrial Habitats in the Mississippi River Loess Plains.

Habitat Name
Crop Land
Cultivated Forest
Crowley's Ridge Loess Slope Forest
Mud Flats
Pasture Land
Ponds, Lakes, and Water Holes
Urban/Suburban

Table 3.23. Ecobasin distribution in the Mississippi River Loess Plains.



Problems faced by Species of Greatest Conservation Need (SGCN)

Taxa association teams listed problems faced by SGCN individually in the Species Reports, pages 44-1113. A summary of the problems faced by SGCN in the Mississippi Valley Loess Plains is presented below. Each problem has a score which is a sum of all Species Priority Scores associated with species for which this problem was assigned. A higher score implies a higher quantity of SGCN and/or more greatly imperiled species associated with problems listed here.

Table 3.35. Problems faced by SGCN in the Mississippi River Valley Loess Plains.

Problem faced	Score
Agricultural practices	1026
Forestry activities	665
Urban development	334
Conversion of riparian forest	270
Fire suppression	257
Parasites/pathogens	161
Exotic species	109
Commercial/industrial development	103
Predation	97
Recreation	93
Water diversion	85
Resource extraction	84
Dam	78
Non-point source pollution	67
Grazing/Browsing	61
Confined animal operations	43
Road construction	43
Municipal/Industrial point source	38
Interspecific competiton	29
Excessive groundwater withdrawal	21
Channel alteration	19
Management of/for certain species	17

Conservation actions needed in the Mississippi Valley Loess Plains

Descriptions of conservation actions linked to individual species on the list of SGCN are presented in the Species Reports, pages 44-1113. Below are categories of conservation actions recommended by the taxa association teams (Figure 3.24). An explanation of the categories follows in Table 3.36.

The score associated with the conservation action category is the sum of all priority scores associated with species for which a conservation action has been assigned, weighted by the importance of the conservation action category to the species. A higher score implies a higher quantity of SGCN and/or more greatly imperiled species would be affected by actions within this conservation action category.

These scores may be used as guides to directing the apportionment of funding toward conservation actions benefiting habitats and species of greatest conservation need.

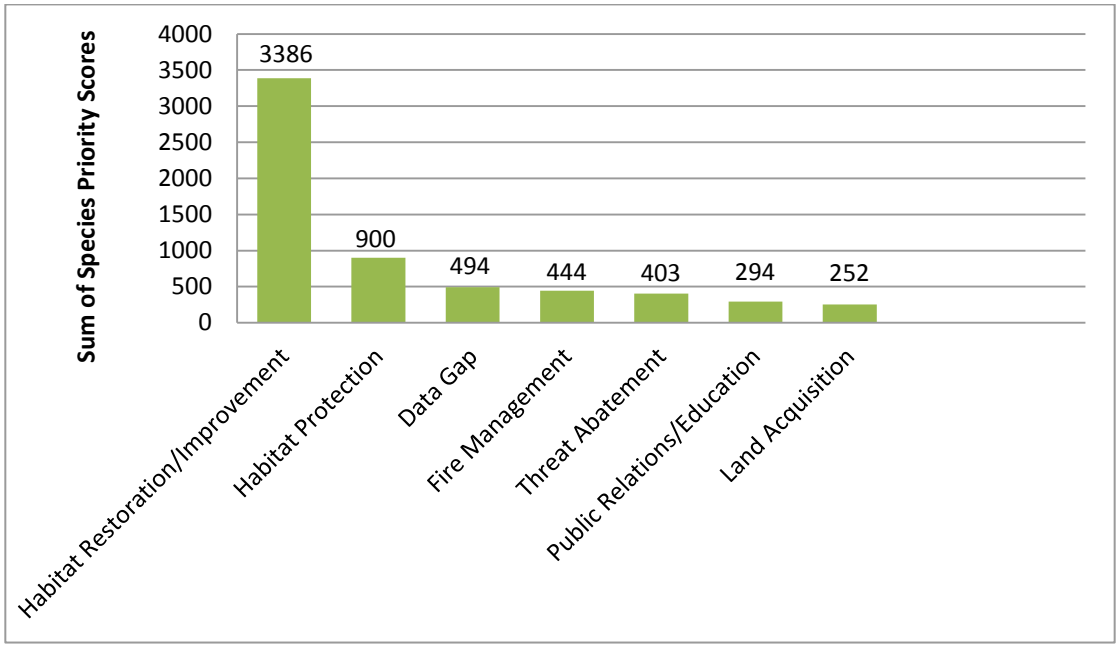


Figure 3.24. Conservation action categories recommended for the Mississippi Valley Loess Plains.

Section 4. Terrestrial Habitats

West Gulf Coastal Plain Pine-Hardwood Flatwoods
West Gulf Coastal Plain Pine-Hardwood Forest/Woodland
West Gulf Coastal Plain Red River Floodplain Forest
West Gulf Coastal Plain Sandhill Oak and Shortleaf
Pine Forest/ Woodland
West Gulf Coastal Plain Seepage Swamp and Baygall
West Gulf Coastal Plain Small Stream/River Forest
West Gulf Coastal Plain Wet Hardwood Flatwoods

Components of Terrestrial Habitat Reports

Definition

The terrestrial habitat team described the terrestrial habitats of Arkansas in 38 types in Table 4.1. Thirty of 37 terrestrial habitat types in Arkansas were adapted from definitions provided by NatureServe (2005). The remaining seven habitat types (marked with an asterisk) were created for this project by the terrestrial habitat team.

Ranking

The Habitat Score (Table 4.1) of each terrestrial habitat is a sum of all Species Priority Scores associated with species for which this habitat is associated. A higher score implies a higher quantity of Species of Greatest Conservation Need (SGCN) and/or more greatly imperiled species occurred in the habitats listed below.

Table 4.1. Terrestrial Habitat Scores.

Habitat Name	**Sum of Species Priority Scores**
Caves, Mines, Sinkholes and other Karst Features	6906
Ozark-Ouachita Prairie and Woodland	3571
Ozark-Ouachita Riparian	3500
Ozark-Ouachita Mesic Hardwood Forest	2635
Ozark-Ouachita Dry Oak and Pine Woodland	2344
Pasture Land	1709
West Gulf Coastal Plain Calcareous Prairie and Woodland	1672
Ozark-Ouachita Pine-Oak Forest/Woodland	1590
Ozark-Ouachita Large Floodplain	1536
Ozark-Ouachita Cliff and Talus	1526
Lower Mississippi Alluvial Plain Grand Prairie	1507
West Gulf Coastal Plain Large River Floodplain Forest	1213
West Gulf Coastal Plain Small Stream/River Forest	1170
Lower Mississippi River High Bottomland Forest	1143
Lower Mississippi River Riparian Forest	1138
Ponds, Lakes, and Water Holes	1089
Ozark-Ouachita Forested Seep	1055
Lower Mississippi Flatwoods Woodland and Forest	1053
Ozark-Ouachita Dry-Mesic Oak Forest/Woodland	1040
Lower Mississippi River Low Bottomland Forest	1034
West Gulf Coastal Plain Red River Floodplain Forest	926
Crop Land	871
Ozark-Ouachita Pine-Bluestem Woodland	827
Interior Highlands Dry Acidic Glade and Barrens	813

Mud Flats	754
West Gulf Coastal Plain Pine-Hardwood Flatwoods	702
Herbaceous Wetland	700
Interior Highlands Calcareous Glade and Barrens	644
West Gulf Coastal Plain Seepage Swamp and Baygall	642
Ouachita Montane Oak Forest	613
Crowley's Ridge Loess Slope Forest	605
Lower Mississippi River Bottomland Depression	564
West Gulf Coastal Plain Pine-Hardwood Forest/Woodland	528
West Gulf Coastal Plain Wet Hardwood Flatwoods	450
West Gulf Coastal Plain Sandhill Oak and Shortleaf Pine	421
Urban/Suburban	399
Cultivated Forest	262
Lower Mississippi River Dune Woodland, Pond, and Forest	229

Key Factors

Each terrestrial habitat type is assigned "Key Factors" which describe those conditions most critical for maintaining the ecological function and viability of associated species. Key Factors (table 4.2) are ecological attributes deemed critical to the long-term integrity of a given habitat. The terrestrial habitat team determined the importance (weight) of the Key Factor to the overall habitat integrity.

Table 4.2. Key Factors.

Fire Regime
No-Activity Protection Zone
Canopy Closure
Composition
Percent Total Herbaceous Ground Coverage
Cave/Mine Accessibility
Disturbance Policy
Spatial Ecology
Remoteness
Recharge Area

Indicators of Terrestrial Habitat Condition

One or more measurable "Indicators" (Table 4.3) are identified for each Key Factor. The Indicator scoring criteria requires that habitat and/or population parameters of all species of conservation concern be expressed in terms that can be quantified, measured, monitored and

influenced. This step also requires that each assumption, assertion and decision be supported by the best science available, including all known literature and expert opinion.

Table 4.3. Indicators of Terrestrial Habitat Condition.

Road density
Spatial extent of buffer
Canopy closure
Percent total herbaceous ground coverage
Exotic forbs and grasses
Exotic shrubs and woody vines
Broomsedge imbalance
Loblolly pine presence
Exotic forbs and grasses
Exotic forbs and grasses
Oak dominance
Red oak/Overcup oak ratio Cottonwood decline
Sugarberry increase
Oak component
Loblolly encroachment
Percent herbaceous groundcover w/minimal woody plants
Shortleaf pine decline
Percent total herbaceous ground coverage
Patch size
Patch proximity
Average block size
Number of blocks
Fire seasonality/intensity
Fire frequency
Road proximity
Percent urban/impervious
Percent forested
Percent pastureland
Point source pollution
Unpaved road density

Ratings for Indicators

For each Indicator, the terrestrial habitat team determined and weighted a range of measurements to assess the relative health of associated Key Factors, which in turn reflect the integrity of the associated habitat:

Poor Level: Rapid declines and/or extirpations imminent.
Fair Level: Gradual, long-term declines and/or extirpations possible.
Good Level: Populations are expected to remain stable indefinitely.
Very Good Level: Populations robust; increases in abundance possible.

Conservation Actions

Conservation actions propose to manage and conserve the identified habitats as determined by the Indicator thresholds. The threshold for viability of the species is defined for each habitat at the 'Good' level. Conservation actions were formulated for each habitat that call for bringing each Indicator's current status up to or above the 'Good' threshold. Using this methodology, 383 measurable conservation actions were formulated for the 38 habitat types using specific, quantified objectives for each Indicator.

Current Status and Monitoring

In addition to species-specific monitoring strategies presented in Section 2, Arkansas' habitat monitoring strategy consists of measuring indicators in the field. In developing the AWAP, we determined one area of weakness is that information on current status, trends and effort to attain goals is lacking. Developing a cost- effective methodology for monitoring status, coordinated with adjacent states and in-state partners, public and stakeholders will be a priority for the near future of AWAP efforts.

Key Factor Name Canopy Closure

Key Factor Description: Combination of stem density, basal area and extent of canopy cover, with intermitent closure as ideal (Surrogate for Horizontal Structure).

Key Factor Weight: Medium

Indicator Name: Canopy Closure

Indicator Description: The percent of the spatial extent of all known occurrences with a percent canopy closure of greater than 80 percent.

Poor Level: <25

Fair Level: 25-50

Good Level: 51-75

Very Good Level: >75

Current_Status: Data Gap

Indicator Weight: Medium

Conservation Action: Maintain or, where necessary, restore the percent of the spatial extent of all known occurrences with a canopy closure of greater than 80 percent to 51 percent or more.

Monitoring Strategy: Monitor percent of the spatial extent of all known occurrences with a percent canopy closure of greater than 80 percent.

Key Factor Name Composition

Key Factor Description: The diversity, species richness, and relative abundance of vegetative elements in this habitat type.

Key Factor Weight: Medium

Indicator Name: Invasive shrubs and woody vines

Indicator Description: The percent of ground cover in non-native woody species

Poor Level: >20

Fair Level: 10-20

Good Level: 5-9

Very Good Level: <5

Current_Status: Data Gap

Indicator Weight: Medium

Conservation Action: Maintain or, where necessary, restore the percent of groundcover in invasive woody species to nine percent or less.

Monitoring Strategy: Monitor the percent of ground cover in non-native woody species.

Indicator Name: Exotic Forbs and Grasses

Indicator Description: The percent of ground cover in non-native herbaceous species

Poor Level: >20

Fair Level: 10-20

Good Level: 5-9

Very Good Level: <5

Current_Status: Data Gap

Indicator Weight: Medium

Conservation Action: Maintain or, where necessary, restore the percent of groundcover in non-native herbaceous vegetation to nine percent or less.

Monitoring Strategy: Monitor the percent of ground cover in non-native herbaceous species.

Key Factor Name Fire Regime

Key Factor Description: Fire Return Interval and Seasonality, including landscape-scale fire in surrounding/adjacent habitats to prevent woody encroachment and allow for distribution and dispersal of obligate species

Key Factor Weight: Medium

Indicator Name: Fire Frequency

Indicator Description: Average percent of all known occurrences burned per 3-7 year interval.

Poor Level: <25

Fair Level: 25-50

Good Level: 51-75

Very Good Level: >75

Current_Status: Data Gap

Indicator Weight: Medium

Conservation Action: Burn at least 51 percent of the spatial extent of all known occurrences of this habitat type every 3-7 years.

Monitoring Strategy: Monitor average percent of all known occurrences burned per 3-7 year interval.

Key Factor Name Fire Regime

Indicator Name:	Fire Seasonality/Intensity
Indicator Description:	The percent of areas burned during either March/April or Aug/Sept, or from leaf-expansion to leaf-fall, depending on project-level goals. In some but not all cases, seasonality is an accurate surrogate for intensity. Since intensity goals will vary from burn to burn it is difficult to "pre-quantify" ideal intensity objectives at a forest-wide scale. It is presumed that restoration, maintenance, fuel-reduction and other prescribed fire goals will be considered at the project level when planning burn intensity.
Poor Level:	<25
Fair Level:	25-50
Good Level:	51-75
Very Good Level:	>75
Current_Status:	Data Gap
Indicator Weight:	Medium
Conservation Action:	When burning, burn during either March/April or August/September, or from leaf-expansion to leaf-fall, depending on project-level goals.
Monitoring Strategy:	Monitor percent of burned areas burned during either March/April or Aug/Sept, or from leaf-expansion to leaf-fall, depending on project-level goals. In some but not all cases, seasonality is an accurate surrogate for intensity. Since intensity goals will vary from burn to burn it is difficult to "pre-quantify" ideal intensity objectives at a forest-wide scale. It is presumed that restoration, maintenance, fuel-reduction and other prescribed fire goals will be considered at the project level when planning burn intensity.

Key Factor Name Remoteness

Key Factor Description: Mean density of roads (miles per square mile) within this community type at the landscape scale.

Key Factor Weight: Medium

Indicator Name: Road Density

Indicator Description: Average number of road miles per square mile across all known occurrences of this target.

Poor Level: >2 miles

Fair Level: 1-2 miles

Good Level: 0.5-1 mile

Very Good Level: <0.5 mile

Current_Status: Data Gap

Indicator Weight: Medium

Conservation Action: Maintain or, where necessary, restore the average number of road miles per square mile to one or less across all known occurrences of this target.

Monitoring Strategy: Monitor average number of road miles per square mile across all known occurrences of this target.

Key Factor Name Spatial Ecology

Key Factor Description: The relative spatial abundance, proximity, distribution, and arrangement of this habitat type on the landscape.

Key Factor Weight: Medium

Indicator Name:	Number of Blocks
Indicator Description:	Total number of blocks statewide
Poor Level:	<4
Fair Level:	4-7
Good Level:	7-10
Very Good Level:	>10
Current_Status:	Data Gap
Indicator Weight:	Medium
Conservation Action:	Maintain or, where necessary, restore number of blocks to seven or more. (Block is defined by the minimum convex polygon bounded by known occurrences of this habitat type in which the median patch size is above the fair level for patch size, and in which each of the patches score fair or better on the patch proximity threshold.)
Monitoring Strategy:	Monitor total number of blocks statewide.
Indicator Name:	Patch Proximity
Indicator Description:	Median nearest distance between patches.
Poor Level:	>.5 mile
Fair Level:	.25-.5 miles
Good Level:	.1-.25 miles
Very Good Level:	<.1 mile
Current_Status:	Data Gap
Indicator Weight:	Medium
Conservation Action:	Maintain or, where necessary, restore the median nearest distance between patches of this habitat type to .25 mile or less.
Monitoring Strategy:	Monitor median nearest distance between patches.

Key Factor Name Spatial Ecology

Indicator Name:	Patch Size
Indicator Description:	Average patch size across all known occurrences (acres)
Poor Level:	<50 acres
Fair Level:	50-100 acres
Good Level:	100-250 acres
Very Good Level:	>250 acres
Current_Status:	Data Gap
Indicator Weight:	Medium
Conservation Action:	Maintain or, where necessary, restore the average patch size of this habitat type to 100 acres or more across all known occurrences.
Monitoring Strategy:	Monitor average patch size across all known occurrences (acres).
Indicator Name:	Average Block Size
Indicator Description:	Block is defined by the minimum convex polygon bounded by known occurrences of this habitat type in which the median patch size is above the fair level for patch size, and in which each of the patches score fair or better on the patch proximity threshold.
Poor Level:	<500 acres
Fair Level:	500-1,000 acres
Good Level:	1,000-2,500 acres
Very Good Level:	>2,500 acres
Current_Status:	Data Gap
Indicator Weight:	Medium
Conservation Action:	Maintain or, where necessary, restore average block size to 1,000 acres or more. (Block is defined by the minimum convex polygon bounded by known occurrences of this habitat type in which the median patch size is above the fair level for patch size, and in which each of the patches score fair or better on the patch proximity threshold.)
Monitoring Strategy:	Monitor block size.

Habitat Name West Gulf Coastal Plain Wet Hardwood Flatwoods

Ecoregions where the habitat occurs:

Ozark Highlands ☐	Boston Mountains ☐	Mississippi Valley Loess Plains ☐	Arkansas Valley ☐
Ouachita Mountains ☐	South Central Plains ☑	Mississippi Alluvial Plain ☐	

Description

These habitats are found on Pleistocene terraces usually outside the floodplains. The local landscape may be a series of ridges and swales. Vegetation composition and structure varies with elevation, soil texture and moisture, and disturbance history. Soils are fine-textured and hardpans may be present in the subsurface. The limited permeability of these soils contributes to shallowly perched water tables during portions of the year when precipitation is greatest and evapotranspiration is lowest. Soil moisture fluctuates widely throughout the growing season, from saturated to very dry, a condition sometimes referred to as hydroxeric moisture regime. Saturation is primarily influenced by precipitation rather than overbank flooding. Quercus phellos, Quercus lyrata, Quercus laurifolia, and Quercus nigra occur often with Sabal minor and a sparse groundlayer. Prairie mounds with am ore mesophytic vegetation may be present. Dry seasonal conditions make fire a natural process in the system. As a result, this system was

typically a woodland, although recent fire suppression and forest management have caused a conversion of most sites to forest. Some swales support pockets of cypress-tupelo.

(adapted from NatureServe 2005)

Species associated with this habitat type (and the weight or importance of the habitat to each species) include:
American Woodcock (Scolopax minor) Weight: Optimal
Eastern Whip-poor-will (Antrostomus vociferus) Weight: Optimal
American Black Duck (Anas rubripes) Weight: Suitable
Mole Salamander (Ambystoma talpoideum) Weight: Suitable
Purple Finch (Haemorhous purpureus) Weight: Suitable
Rafinesque's Big-Eared Bat (Corynorhinus rafinesquii) Weight: Suitable
Western Chicken Turtle (Deirochelys reticularia miaria) Weight: Suitable
Wood Thrush (Hylocichla mustelina) Weight: Suitable
Yellow-billed Cuckoo (Coccyzus americanus) Weight: Suitable
Southeastern Bat (Myotis austroriparius) Weight: Marginal
Swainson's Warbler (Limnothlypis swainsonii) Weight: Marginal
Long-tailed Weasel (Mustela frenata) Weight: Data Gap

Habitat Team

ANHC Mr. Tom Foti, TNC Mr. Doug Zollner, AGFC Ms. Elizabeth Murray, Audubon Arkansas Mr. Ken Smith, Conservation Southeast Mr. Jeff Holmes, AGFC Mr. Jeff Johnston, AGFC Ms. Jane Anderson, FTN Associates Mr. Don Catenzaro

Habitat Priority Score: 450

Key Factor Name Composition

Key Factor Description: The diversity, species richness, and relative abundance of vegetative elements in this habitat type.

Key Factor Weight: Medium

Indicator Name: Exotic Forbs and Grasses

Indicator Description: The percent of ground cover in non-native herbaceous species

Poor Level: >20

Fair Level: 10-20

Good Level: 5-9

Very Good Level: <5

Current_Status: Data Gap

Indicator Weight: Medium

Conservation Action: Maintain or, where necessary, restore the percent of groundcover in non-native herbaceous vegetation to nine percent or less.

Monitoring Strategy: Monitor the percent of ground cover in non-native herbaceous species.

Indicator Name: Invasive shrubs and woody vines

Indicator Description: The percent of ground cover in non-native woody species

Poor Level: >20

Fair Level: 10-20

Good Level: 5-9

Very Good Level: <5

Current_Status: Data Gap

Indicator Weight: Medium

Conservation Action: Maintain or, where necessary, restore the percent of groundcover in invasive woody species to nine percent or less.

Monitoring Strategy: Monitor the percent of ground cover in non-native woody species.

Key Factor Name Fire Regime

Key Factor Description: Fire Return Interval and Seasonality, including landscape-scale fire in surrounding/adjacent habitats to prevent woody encroachment and allow for distribution and dispersal of obligate species

Key Factor Weight: Medium

Indicator Name: Fire Seasonality/Intensity

Indicator Description: The percent of areas burned during either March/April or Aug/Sept, or from leaf-expansion to leaf-fall, depending on project-level goals. In some but not all cases, seasonality is an accurate surrogate for intensity. Since intensity goals will vary from burn to burn it is difficult to "pre-quantify" ideal intensity objectives at a forest-wide scale. It is presumed that restoration, maintenance, fuel-reduction and other prescribed fire goals will be considered at the project level when planning burn intensity.

Poor Level: <25

Fair Level: 25-50

Good Level: 51-75

Very Good Level: >75

Current_Status: Data Gap

Indicator Weight: Medium

Conservation Action: When burning, burn during either March/April or August/September, or from leaf-expansion to leaf-fall, depending on project-level goals.

Monitoring Strategy: Monitor percent of burned areas burned during either March/April or Aug/Sept, or from leaf-expansion to leaf-fall, depending on project-level goals. In some but not all cases, seasonality is an accurate surrogate for intensity. Since intensity goals will vary from burn to burn it is difficult to "pre-quantify" ideal intensity objectives at a forest-wide scale. It is presumed that restoration, maintenance, fuel-reduction and other prescribed fire goals will be considered at the project level when planning burn intensity.

Key Factor Name Fire Regime

Indicator Name:	Fire Frequency
Indicator Description:	Average percent of all known occurrences burned per 3-7 year interval.
Poor Level:	<25
Fair Level:	25-50
Good Level:	51-75
Very Good Level:	>75
Current_Status:	Data Gap
Indicator Weight:	Medium
Conservation Action:	Burn at least 51 percent of the spatial extent of all known occurrences of this habitat type every 3-7 years.
Monitoring Strategy:	Monitor average percent of all known occurrences burned per 3-7 year interval.

Key Factor Name Remoteness

Key Factor Description: Mean density of roads (miles per square mile) within this community type at the landscape scale.

Key Factor Weight: Medium

Indicator Name: Road Density

Indicator Description: Average number of road miles per square mile across all known occurrences of this target.

Poor Level: >2 miles

Fair Level: 1-2 miles

Good Level: 0.5-1 mile

Very Good Level: <0.5 mile

Current_Status: Data Gap

Indicator Weight: Medium

Conservation Action: Maintain or, where necessary, restore the average number of road miles per square mile to one or less across all known occurrences of this target.

Monitoring Strategy: Monitor average number of road miles per square mile across all known occurrences of this target.

Key Factor Name Spatial Ecology

Key Factor Description: The relative spatial abundance, proximity, distribution, and arrangement of this habitat type on the landscape.

Key Factor Weight: Medium

Indicator Name: Patch Size

Indicator Description: Average patch size across all known occurrences (acres)

Poor Level: <10 acres

Fair Level: 10-30 acres

Good Level: 31-100 acres

Very Good Level: >100 acres

Current_Status: Data Gap

Indicator Weight: Medium

Conservation Action: Maintain or, where necessary, restore the average patch size of this habitat type to 31 acres or more across all known occurrences.

Monitoring Strategy: Monitor average patch size across all known occurrences (acres).

Key Factor Name Spatial Ecology

Indicator Name:	Average Block Size
Indicator Description:	Block is defined by the minimum convex polygon bounded by known occurrences of this habitat type in which the median patch size is above the fair level for patch size, and in which each of the patches score fair or better on the patch proximity threshold.
Poor Level:	<500 acres
Fair Level:	500-1,000 acres
Good Level:	1,001-2,000 acres
Very Good Level:	>2,000 acres
Current_Status:	Data Gap
Indicator Weight:	Medium
Conservation Action:	Maintain or, where necessary, restore average block size to 1,001 acres or more. (Block is defined by the minimum convex polygon bounded by known occurrences of this habitat type in which the median patch size is above the fair level for patch size, and in which each of the patches score fair or better on the patch proximity threshold.)
Monitoring Strategy:	Monitor block size.
Indicator Name:	Patch Proximity
Indicator Description:	Median nearest distance between patches.
Poor Level:	>2.5 miles
Fair Level:	1-2.5 miles
Good Level:	0.5-1 mile
Very Good Level:	<0.5 mile
Current_Status:	Data Gap
Indicator Weight:	Medium
Conservation Action:	Maintain or, where necessary, restore the median nearest distance between patches of this habitat type to one mile or less.
Monitoring Strategy:	Monitor median nearest distance between patches.

Key Factor Name Spatial Ecology

Indicator Name:	Number of Blocks
Indicator Description:	Total number of blocks statewide
Poor Level:	0-1
Fair Level:	2
Good Level:	3
Very Good Level:	>3
Current_Status:	Data Gap
Indicator Weight:	Medium
Conservation Action:	Maintain or, where necessary, restore number of blocks to three or more. (Block is defined by the minimum convex polygon bounded by known occurrences of this habitat type in which the median patch size is above the fair level for patch size, and in which each of the patches score fair or better on the patch proximity threshold.)
Monitoring Strategy:	Monitor total number of blocks statewide.

Section 5. Aquatic Habitats

Definition

Ecobasins are a version of the seven (level III) ecoregions (Woods and others 2004) further subdivided by six major river basins to form 18 ecobasins to describe aquatic habitats in Arkansas.

Ranking

Arkansas ranked which ecobasins have more species of greatest conservation concern and/or more greatly imperiled species. Ecoregion Scores (Table 5.1) equal the sum of all Species Priority Scores within an ecoregion. A higher score implies a larger total number of species of greatest conservation need and/or species with a greater need for conservation.

Table 5.1. Aquatic habitats ranked by priority scores.

Ecobasin	Sum of Priority Scores
Ozark Highlands - White River	2471
Ouachita Mountains - Ouachita River	1589
South Central Plains - Ouachita River	1523
Boston Mountains - White River	1398
South Central Plains - Red River	1329
Ozark Highlands - Arkansas River	1234
Mississippi River Alluvial Plain - White River	1214
Arkansas Valley - Arkansas River	1098
Boston Mountains - Arkansas River	1028
Mississippi River Alluvial Plain - St. Francis River	933
Ouachita Mountains - Red River	624
Ouachita Mountains - Arkansas River	481
Mississippi River Alluvial Plain (Lake Chicot) - Mississippi River	430
Mississippi River Alluvial Plain - Arkansas River	426
Mississippi River Alluvial Plain (Bayou Bartholomew) - Ouachita River	314
Mississippi Valley Loess Plains - White River	312
Arkansas Valley - White River	128
Mississippi Valley Loess Plains - St. Francis River	50

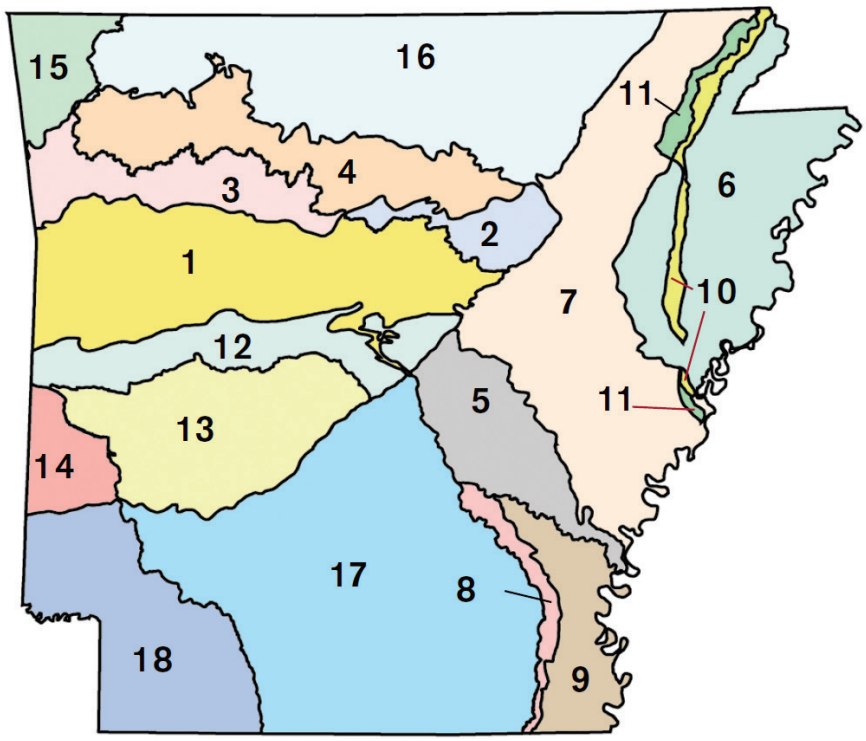


Figure 5.1 Arkansas Ecobasins.

Key	Ecobasin
1	Arkansas Valley - Arkansas River
2	Arkansas Valley - White River
3	Boston Mountains - Arkansas River
4	Boston Mountains - White River
5	Mississippi Alluvial Plain - Arkansas River
6	Mississippi Alluvial Plain - St. Francis River
7	Mississippi Alluvial Plain - White River
8	Mississippi Alluvial Plain (Bayou Bartholomew) - Ouachita River
9	Mississippi Alluvial Plain (Lake Chicot) - Mississippi River
10	Mississippi River Loess Plains - St. Francis River
11	Mississippi River Loess Plains - White River
12	Ouachita Mountains - Arkansas River
13	Ouachita Mountains - Ouachita River
14	Ouachita Mountains - Red River
15	Ozark Highlands - Arkansas River
16	Ozark Highlands - White River
17	South Central Plains - Ouachita River
18	South Central Plains - Red River

Arkansas Valley Ecobasins

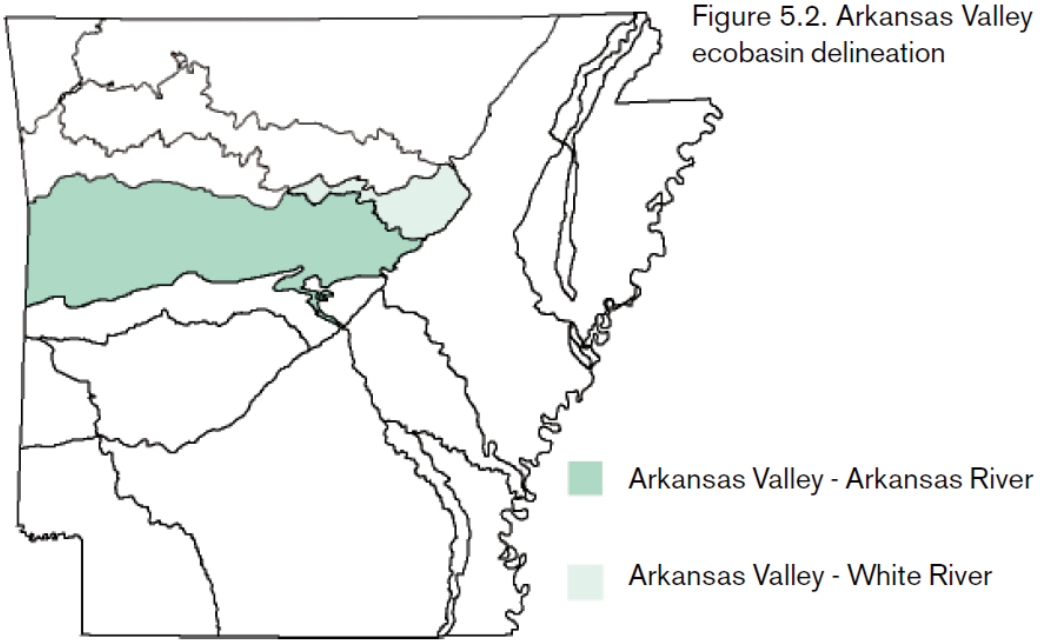


Figure 5.2. Arkansas Valley ecobasin delineation

Arkansas Valley - Arkansas River ecobasin

Streams in this ecobasin (Figure 5.2) vary from slow, meandering streams following major valley floors to smaller, riffle and pool types in the smaller watersheds. Arkansas Valley – Arkansas River streams generally flow over moderately permeable soils having sandy to clayey consistency in the lower gradient valleys to those same soils underlain by sandstones and shales in the upper, smaller watersheds. Stream substrates range widely from silt, gravel, shale, rubble to solid bedrock depending on the valley gradient and localized stream gradient. Many streams in this region are somewhat turbid due to erosion of the soils and shales. Representative streams include the Fourche la Fave, Petit Jean and Poteau Rivers and Dutch Creek.

Table 5.3. Land cover types in Arkansas Valley - Arkansas River ecobasin (percentage).

Arkansas Valley - Arkansas River	Water	Urban	Forest*	Pasture	Crop
2004	3	1	55	36	5
2011	3	7	48	33	3

* Includes forested wetlands

Photo: MAWPT

Arkansas Valley - Arkansas River from Petit Jean Mountain

Table 5.4. Species of Greatest Conservation Need associated with Arkansas Valley - Arkansas River ecobasin.

Common Name	Scientific Name	Priority Score
Magazine stripetail	*Isoperla szczytkoi*	80
Nearctic paduniellan caddisfly	*Paduniella nearctica*	80
mayfly	*Paraleptophlebia calcarica*	65
Boston Mountains Crayfish	*Cambarus causeyi*	62
Alabama Shad	*Alosa alabamae*	52
Purple Lilliput	*Toxolasma lividum*	52
Arkansas River Shiner	*Notropis girardi*	50
Elevated Spring Amphipod	*Stygobromus elatus*	50
Queen Snake	*Regina septemvittata*	29
Alligator Gar	*Atractosteus spatula*	27
Plains Minnow	*Hybognathus placitus*	27
isopod	*Lirceus bicuspidatus*	27
Longnose Darter	*Percina nasuta*	27
American Eel	*Anguilla rostrata*	24
Paddlefish	*Polyodon spathula*	24
Blue Sucker	*Cycleptus elongatus*	23
Bluntface Shiner	*Cyprinella camura*	23
microcaddisfly	*Paucicalcaria ozarkensis*	23

Suckermouth Minnow	*Phenacobius mirabilis*	23
Elktoe	*Alasmidonta marginata*	19
Brown Bullhead	*Ameiurus nebulosus*	19
Sunburst Darter	*Etheostoma mihileze*	19
Goldeye	*Hiodon alosoides*	19
Mooneye	*Hiodon tergisus*	19
Pealip Redhorse	*Moxostoma pisolabrum*	19
Striped Mullet	*Mugil cephalus*	19
Slenderhead Darter	*Percina phoxocephala*	19
Bismark Burrowing Crayfish	*Procambarus parasimulans*	19
Lilliput	*Toxolasma parvum*	19
Highfin carpsucker	*Carpiodes velifer*	17
Round Pigtoe	*Pleurobema sintoxia*	17
Little Spectaclecase group	*Villosa sp. Cf lienosa*	17
Lake Chubsucker	*Erimyzon sucetta*	15
Highland Darter	*Etheostoma teddyroosevelt*	15
Fatmucket	*Lampsilis siliquoidea*	15
"Arkoma" Fatmucket	*Lampsilis sp. A*	15
Saddleback Darter	*Percina vigil*	15
Fawnsfoot	*Truncilla donaciformis*	15

Arkansas Valley - White River

While some streams in this ecobasin, especially those near the main stem White River and lower Little Red River, are lower gradient, meandering streams flowing over moderately permeable soils, many of the streams in this ecobasin flow over moderate gradient channels underlain primarily by sandstone, shale and silt- stone. Higher in the subwatersheds, the terrain is mountainous with well-drained rockier soils. Stream substrates range from silt, sand, gravel, shale, rubble, boulders to bedrock ledges. Streams in the lower gradient valleys still retain some of the brownish turbidity of the Arkansas Valley ecoregion, while more upland streams have lower turbidity values due to stony, rockier soils. Representative streams include the Little Red River and Tenmile Creek.

Table 5.5. Land cover types in Arkansas Valley - White River ecobasin (percentage).

Arkansas Valley - White River	Water	Urban	Forest*	Pasture	Crop
2004	5	1	67	25	2
2011	5	5	61	25	1

* Includes forested wetlands

Table 5.6. Species of Greatest Conservation Need associated with Arkansas Valley - White River ecobasin.

Common Name	Scientific Name	Priority Score
Hubricht's Long-tailed Amphipod	*Allocrangonyx hubrichti*	42
isopod	*Caecidotea dimorpha*	42
isopod	*Lirceus bicuspidatus*	27
Highfin carpsucker	*Carpiodes velifer*	17

Boston Mountains Ecobasins

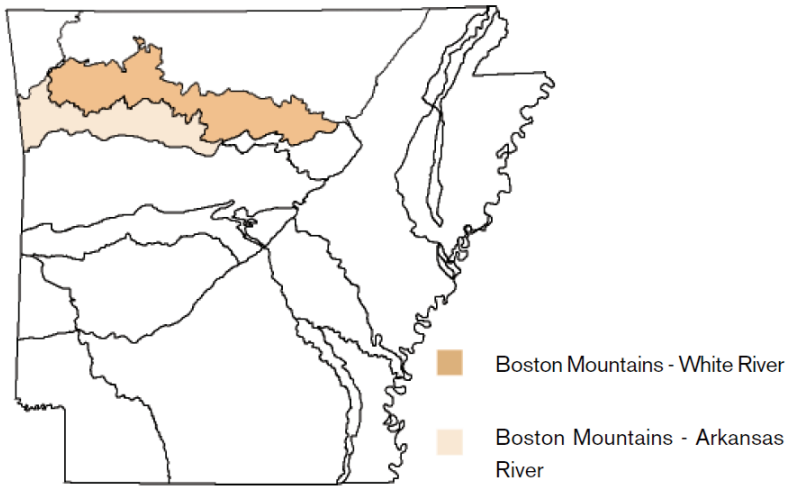


Figure 5.3. Boston Mountains ecobasin delineation

Boston Mountains - White River

Water quality is high in this ecobasin (Figure 5.3) due the predominant land use, which is generally forested except for some pasture land and small farms. Streams have a moderate gradient consisting of riffle/pool complexes flowing over slow to moderately permeable soils. Stream substrates vary from gravel, rubble, boulder to bedrock. Because of the rugged to precipitous local relief, runoff is rapid allowing stream levels to rise quickly, causing seasonal scouring of stream channels. This ecobasin is the source of several of the highest quality streams in the state including the Buffalo, White and Kings Rivers.

Table 5.7. Land cover types in Boston Mountains - White River ecobasin (percentage).

Boston Mountains - White River	Water	Urban	Forest*	Pasture	Crop
2004	1	0	82	15	1
2011	1	4	78	16	1

* Includes forested wetlands

Table 5.8. Species of Greatest Conservation Need associated with Boston Mountain - White River ecobasin.

Common Name	**Scientific Name**	**Priority Score**
Yellowcheek Darter	*Etheostoma moorei*	100
Bowed Snowfly	*Allocapnia oribata*	80
White Hickorynut	*Obovaria sp. Cf arkansasensis*	80
Speckled Pocketbook	*Lampsilis streckeri*	76
Boston Mountains Crayfish	*Cambarus causeyi*	62
"Ozark" Fanshell	*Cyprogenia aberti*	52
Purple Lilliput	*Toxolasma lividum*	52
winter stonefly	*Allocapnia jeanae*	50
winter stonefly	*Allocapnia ozarkana*	50
isopod	*Caecidotea dimorpha*	42
isopod	*Caecidotea oculata*	42
cave obligate planarian	*Dendrocoelopsis americana*	42
Williams' Crayfish	*Orconectes williamsi*	34
Salamander Mussel	*Simpsonaias ambigua*	34
Ozark Shiner	*Notropis ozarcanus*	33
Rabbitsfoot	*Quadrula cylindrica*	33
isopod	*Caecidotea ancyla*	30
isopod	*Caecidotea stiladactyla*	30
Midget Crayfish	*Orconectes nana*	30
Queen Snake	*Regina septemvittata*	29
Hubbs' Crayfish	*Cambarus hubbsi*	27
isopod	*Lirceus bicuspidatus*	27
Longnose Darter	*Percina nasuta*	27
Ozark Cave Amphipod	*Stygobromus ozarkensis*	27
American Eel	*Anguilla rostrata*	24
Paddlefish	*Polyodon spathula*	24
Ouachita Kidneyshell	*Ptychobranchus occidentalis*	23
Pondhorn	*Uniomerus tetralasmus*	23
Bleedingtooth Mussel	*Venustaconcha pleasii*	23
Elktoe	*Alasmidonta marginata*	19
Autumn Darter	*Etheostoma autumnale*	19

predaceous diving beetle	*Heterosternuta phoebeae*	19
Ouachita Diving Beetle	*Hydroporus ouachitus*	19
American Brook Lamprey	*Lethenteron appendix*	19
Gilt Darter	*Percina evides*	19
Lilliput	*Toxolasma parvum*	19
Rainbow	*Villosa iris*	17
Little Spectaclecase group	*Villosa sp. Cf lienosa*	17
Fatmucket	*Lampsilis siliquoidea*	15

Boston Mountains - Arkansas River

Streams in this ecobasin (Figure 5.3) generally have a moderate gradient and consist of typical pool/riffle complexes flowing through pastureland, small farms and large blocks of forest. Soils are slow/moderately permeable with a significant shale component, giving the water a greenish-blue tinge due to weathering, erosion and sedimentation. Stream substrates vary from sand, gravel, rubble, to car-sized boulders and bedrock. Due to their moderate gradient, rocky/bedrock substrates and streamside areas with high bluffs, these are high quality streams, from a water quality, recreational, as well as, an aquatic biota standpoint. Representative streams include the Mulberry River, part of Big Piney Creek, Lee Creek, forks of the Little Red River and Illinois Bayou.

Table 5.9. Land cover types in Boston Mountains - Arkansas River ecobasin (percentage).

Boston Mountains - Arkansas River	Water	Urban	Forest*	Pasture	Crop
2004	1	0	90	9	0
2011	1	3	87	9	0

* Includes forested wetlands

Table 5.10. Species of Greatest Conservation Need associated with Boston Mountains - Arkansas River ecobasin.

Common Name	Scientific Name	Priority Score
winter stonefly	*Allocapnia warreni*	80
Nearctic paduniellan caddisfly	*Paduniella nearctica*	80
Boston Mountains Crayfish	*Cambarus causeyi*	62
bat cave isopod	*Caecidotea macropropoda*	57
Neosho Mucket	*Lampsilis rafinesqueana*	57
"Ozark" Fanshell	*Cyprogenia aberti*	52
Purple Lilliput	*Toxolasma lividum*	52
winter stonefly	*Allocapnia jeanae*	50
Spectaclecase	*Cumberlandia monodonta*	48
cave obligate isopod	*Caecidotea simulator*	42
cave obligate planarian	*Dendrocoelopsis americana*	42

isopod	*Caecidotea ancyla*	30
mayfly	*Dannella provonshai*	30
Midget Crayfish	*Orconectes nana*	30
Queen Snake	*Regina septemvittata*	29
Ozark Clubtail Dragonfly	*Gomphus ozarkensis*	27
Longnose Darter	*Percina nasuta*	27
Ozark Cave Amphipod	*Stygobromus ozarkensis*	27
Ellipse	*Venustaconcha ellipsiformis*	27
American Eel	*Anguilla rostrata*	24
"Elongate" Pigtoe	*Fusconaia sp. Cf. sampsoniana*	24
Bluntface Shiner	*Cyprinella camura*	23
Elktoe	*Alasmidonta marginata*	19
Sunburst Darter	*Etheostoma mihileze*	19
Ouachita Diving Beetle	*Hydroporus ouachitus*	19
Gulf mapleleaf	*Quadrula nobilis*	19
Little Spectaclecase group	*Villosa sp. Cf lienosa*	17
Highland Darter	*Etheostoma teddyroosevelt*	15

Mississippi Alluvial Plain Ecobasins

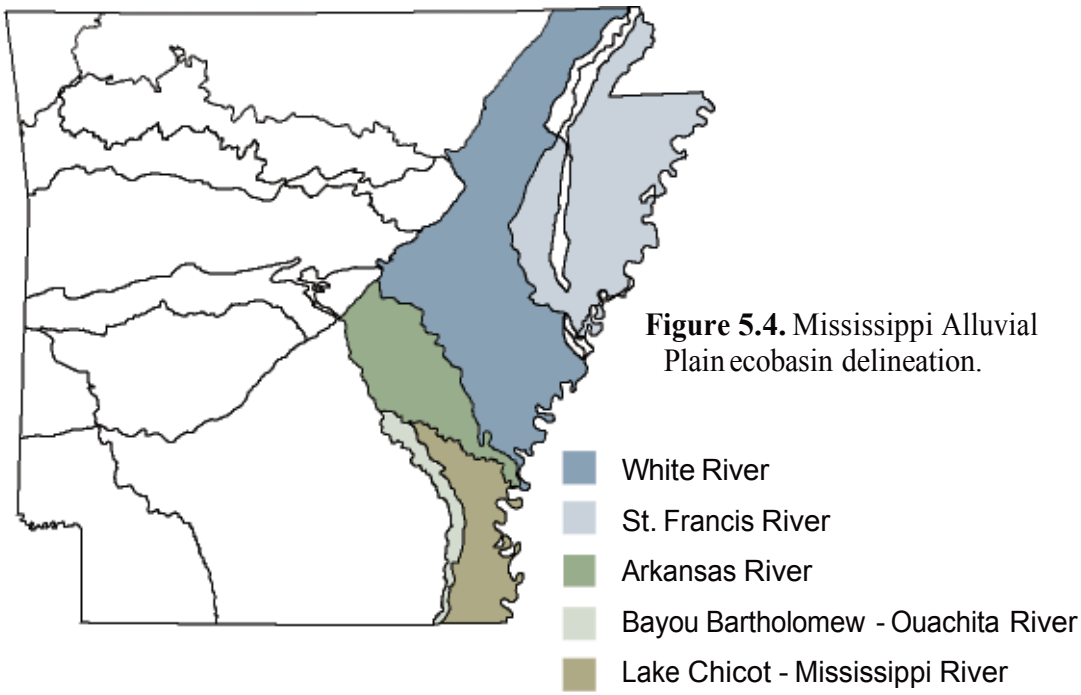


Figure 5.4. Mississippi Alluvial Plain ecobasin delineation.

Mississippi Alluvial Plain (Bayou Bartholomew) - Ouachita River

This is a very narrow ecobasin (Figure 5.4) with varying gradient ranging from essentially flat to low hills. Streams in this ecobasin reflect this varying gradient and range from incised channels to meandering, flat channels with extensive flood- plain benches. Sedimentation in this ecobasin can be high depending on land use practices and extensiveness of the localized riparian zone. Besides Bayou Bartholomew, few streams flow or carry water year round. Bayou Bartholomew is aquatic

species rich with much fish habitat, including large woody debris and instream cypress and tupelo brakes. Representative streams include Bayou Bartholomew and Cut-Off Creek.

Table 5.11. Land cover types in Mississippi Alluvial Plain (Bayou Bartholomew) - Ouachita River ecobasin (percentage).

MAP (Bayou Bartholomew) - Ouachita River	Water	Urban	Forest*	Pasture	Crop
2004	2	1	22	9	65
2011	2	5	26	1	66

* Includes forested wetlands

Table 5.12. Species of Greatest Conservation Need associated with Mississippi Alluvial Plain (Bayou Bartholomew) - Ouachita River ecobasin.

Common Name	Scientific Name	Priority Score
Texas Pigtoe	*Pleurobema riddellii*	57
Crystal Darter	*Crystallaria asprella*	38
Bluehead Shiner	*Pteronotropis hubbsi*	33
Purple Pimpleback	*Quadrula refulgens*	30
Alligator Gar	*Atractosteus spatula*	27
American Eel	*Anguilla rostrata*	24
Brown Bullhead	*Ameiurus nebulosus*	19
Goldeye	*Hiodon alosoides*	19
Tapered Pondhorn	*Uniomerus declivis*	19
Goldstripe Darter	*Etheostoma parvipinne*	17
Lake Chubsucker	*Erimyzon sucetta*	15
Southern Mapleleaf	*Quadrula apiculata*	15
Texas Pigtoe	*Pleurobema riddellii*	57
Crystal Darter	*Crystallaria asprella*	38
Bluehead Shiner	*Pteronotropis hubbsi*	33
Purple Pimpleback	*Quadrula refulgens*	30
Alligator Gar	*Atractosteus spatula*	27
American Eel	*Anguilla rostrata*	24
Brown Bullhead	*Ameiurus nebulosus*	19
Goldeye	*Hiodon alosoides*	19
Tapered Pondhorn	*Uniomerus declivis*	19
Goldstripe Darter	*Etheostoma parvipinne*	17
Lake Chubsucker	*Erimyzon sucetta*	15
Southern Mapleleaf	*Quadrula apiculata*	15

Mississippi Alluvial Plain (Lake Chicot) - Mississippi River

This ecobasin (Figure 5.4) includes the main stem of the Mississippi River in the Lake Chicot area of extreme SE Arkansas. Soils are alluvial deposits of clay, sand and gravel and permeability is generally low, making drainage poor. Stream substrates mirror the soils in the area but have higher embeddedness values than else- where in the state. Stream gradients here are very flat, with numerous meandering and braided channels. Channel scar lakes (oxbows), abandoned channels and wet- lands are common. Water resources here include marshes, swamps, sloughs and seasonally inundated wetlands. Oxbows and backwaters off larger rivers provide acceptable lentic habitat. Smaller lotic systems are incised, turbid, with generally low water quality and often low aquatic species diversity. Representative water bodies include the Mississippi River, Lake Chicot and Bayou Macon.

Table 5.13. Land cover types in Mississippi Alluvial Plain (Lake Chicot) - Mississippi River ecobasin (percentage).

MAP (Lake Chicot) - Mississippi River	Water	Urban	Forest*	Pasture	Crop
2004	5	1	16	7	71
2011	6	5	15	1	73

* Includes forested wetlands

Table 5.14. Species of Greatest Conservation Need associated with Mississippi Alluvial Plain - Lake Chicot ecobasin.

Common Name	Scientific Name	Priority Score
Alabama Shad	*Alosa alabamae*	52
Sicklefin Chub	*Macrhybopsis meeki*	43
Stonecat	*Noturus flavus*	29
Lake Sturgeon	*Acipenser fulvescens*	27
Alligator Gar	*Atractosteus spatula*	27
Plains Minnow	*Hybognathus placitus*	27
American Eel	*Anguilla rostrata*	24
Paddlefish	*Polyodon spathula*	24
Blue Sucker	*Cycleptus elongatus*	23
Flathead Chub	*Platygobio gracilis*	23
Ouachita Kidneyshell	*Ptychobranchus occidentalis*	23
Pondhorn	*Uniomerus tetralasmus*	23
Goldeye	*Hiodon alosoides*	19
Mooneye	*Hiodon tergisus*	19
Striped Mullet	*Mugil cephalus*	19
Channel Shiner	*Notropis wickliffi*	19
Highfin carpsucker	*Carpiodes velifer*	17
Lake Chubsucker	*Erimyzon sucetta*	15
Swamp Darter	*Etheostoma fusiforme*	15
Shoal Chub	*Macrhybopsis hyostoma*	15

Mississippi Alluvial Plain - Arkansas River

This ecobasin (Figure 5.4) is the lower Arkansas River section of the Mississippi Alluvial Plain. It has fairly low stream gradients with decreases in elevation of only a few feet per mile. Underlying soils are composed of alluvial deposits of clay, sand and gravel, are deep and generally impermeable. As a result, natural streams in this ecobasin meander strongly, are deeply incised with bottoms composed of silt or clays. Conversion of native forests/vegetation to agricultural fields has decreased riparian zones next to streams and plowed land has added heavy loads of sediment to ecobasin streams. Representative streams in this ecobasin include the lower Arkansas River on one end of the size scale and Bayou Meto and Bayou Two Prairie on the other end of the scale.

Table 5.14. Land cover types in Mississippi Alluvial Plain - Arkansas River ecobasin (percentage).

Mississippi Alluvial Plain – Arkansas River	Water	Urban	Forest*	Pasture	Crop
2004	6	2	23	5	63
2011	7	6	26	2	59

* Includes forested wetlands

Table 5.15. Species of Greatest Conservation Need associated with Mississippi Alluvial Plain - Arkansas River ecobasin.

Common Name	Scientific Name	Priority Score
Pallid Sturgeon	*Scaphirhynchus albus*	48
Sicklefin Chub	*Macrhybopsis meeki*	43
Lake Sturgeon	*Acipenser fulvescens*	27
Alligator Gar	*Atractosteus spatula*	27
American Eel	*Anguilla rostrata*	24
Paddlefish	*Polyodon spathula*	24
Blue Sucker	*Cycleptus elongatus*	23
Flathead Chub	*Platygobio gracilis*	23
Brown Bullhead	*Ameiurus nebulosus*	19
Goldeye	*Hiodon alosoides*	19
Pealip Redhorse	*Moxostoma pisolabrum*	19
Striped Mullet	*Mugil cephalus*	19
Channel Shiner	*Notropis wickliffi*	19
Highfin carpsucker	*Carpiodes velifer*	17
Lake Chubsucker	*Erimyzon sucetta*	15
Swamp Darter	*Etheostoma fusiforme*	15
Shoal Chub	*Macrhybopsis hyostoma*	15

Mississippi Alluvial Plain - White River (Bayou DeView)

AGFC File Photo

Mississippi Alluvial Plain - White River

Streams in this ecobasin (Figure 5.4) are some of the most productive, speciose, bottomland hardwood, low gradient systems in the state. Natural channels in this ecobasin were tortuously meandering, having silt, sand and gravel substrates and abundant cover consisting of mainly large, woody debris. Riparian zones were dense, having some of the largest hardwood trees in the state. Currently, land use changes have decreased riparian zones significantly and caused substantial increases in turbidity due to sedimentation. While stream and connected oxbow lakes are still some of the most productive in the state, native fish fauna, especially large river fishes, have decreased due to upstream flow and thermal modifications from numerous impoundments. Soils in some subwatersheds have high levels of magnesium and sodium, contributing to higher total dissolved solids. Representative streams include the lower White River, the Cache River and Boat Gunwale Slash.

Table 5.16. Land cover types in Mississippi Alluvial Plain - White River ecobasin (percentage).

Mississippi Alluvial Plain - White River	Water	Urban	Forest*	Pasture	Crop
2004	3	1	23	5	68
2011	3	5	25	2	65

* Includes forested wetlands

Table 5.17. Species of Greatest Conservation Need associated with Mississippi Alluvial Plain - White River ecobasin.

Common Name	Scientific Name	Priority Score
Fat Pocketbook	*Potamilus capax*	76
Alabama Shad	*Alosa alabamae*	52
"Ozark" Fanshell	*Cyprogenia aberti*	52
Purple Lilliput	*Toxolasma lividum*	52
Pallid Sturgeon	*Scaphirhynchus albus*	48
Pink Mucket	*Lampsilis abrupta*	46
Sicklefin Chub	*Macrhybopsis meeki*	43
Crystal Darter	*Crystallaria asprella*	38
Stargazing Darter	*Percina uranidea*	38
Salamander Mussel	*Simpsonaias ambigua*	34
Western Sand Darter	*Ammocrypta clara*	33
Rabbitsfoot	*Quadrula cylindrica*	33
Lake Sturgeon	*Acipenser fulvescens*	27
Alligator Gar	*Atractosteus spatula*	27
Ohio Pigtoe	*Pleurobema cordatum*	27
American Eel	*Anguilla rostrata*	24
Paddlefish	*Polyodon spathula*	24
Blue Sucker	*Cycleptus elongatus*	23
Sabine Shiner	*Notropis sabinae*	23
Flathead Chub	*Platygobio gracilis*	23

Ouachita Kidneyshell	*Ptychobranchus occidentalis*	23
Pondhorn	*Uniomerus tetralasmus*	23
Elktoe	*Alasmidonta marginata*	19
Brown Bullhead	*Ameiurus nebulosus*	19
Goldeye	*Hiodon alosoides*	19
Mooneye	*Hiodon tergisus*	19
American Brook Lamprey	*Lethenteron appendix*	19
Pealip Redhorse	*Moxostoma pisolabrum*	19
Striped Mullet	*Mugil cephalus*	19
Channel Shiner	*Notropis wickliffi*	19
Hickorynut	*Obovaria olivaria*	19
Gilt Darter	*Percina evides*	19
Lilliput	*Toxolasma parvum*	19
Texas Lilliput	*Toxolasma texasiense*	19
Highfin carpsucker	*Carpiodes velifer*	17
Goldstripe Darter	*Etheostoma parvipinne*	17
Round Pigtoe	*Pleurobema sintoxia*	17
Rainbow	*Villosa iris*	17
Little Spectaclecase group	*Villosa sp. Cf lienosa*	17
Lake Chubsucker	*Erimyzon sucetta*	15
Swamp Darter	*Etheostoma fusiforme*	15
Shoal Chub	*Macrhybopsis hyostoma*	15
Southern Mapleleaf	*Quadrula apiculata*	15
Fawnsfoot	*Truncilla donaciformis*	15

Mississippi Alluvial Plain - St. Francis River

The topography within this ecobasin (Figure 5.4) has only small differences in elevation with some stream gradients of less than a foot per mile. Natural streams within this ecobasin are low gradient, meandering, incised channels with extensive riparian zones and forested floodplains. Oxbows and backwater areas are abundant on natural channel areas and are home to a variety of aquatic species. However, many of the streams in this ecobasin are extensively modified, including channelization and flood way modification. Stream sedimentation is extreme, reflected in decreased diversity of aquatic fauna. Representative streams include the main stem St. Francis River, L'Anguille River and Second Creek.

Table 5.18. Land cover types in Mississippi Alluvial Plain – St. Francis River ecobasin (percentage).

Mississippi Alluvial Plain - St. Francis	Water	Urban	Forest*	Pasture	Crop
2004	2	1	10	3	83
2011	2	7	8	1	81

* Includes forested wetlands

Table 5.19. Species of Greatest Conservation Need associated with Mississippi Alluvial Plain – St. Francis River ecobasin.

Common Name	Scientific Name	Priority Score
Scaleshell	*Leptodea leptodon*	95
Fat Pocketbook	*Potamilus capax*	76
"Ozark" Fanshell	*Cyprogenia aberti*	52
Purple Lilliput	*Toxolasma lividum*	52
Pallid Sturgeon	*Scaphirhynchus albus*	48
Sicklefin Chub	*Macrhybopsis meeki*	43
Western Sand Darter	*Ammocrypta clara*	33
Lake Sturgeon	*Acipenser fulvescens*	27
Alligator Gar	*Atractosteus spatula*	27
Ohio Pigtoe	*Pleurobema cordatum*	27
American Eel	*Anguilla rostrata*	24
Paddlefish	*Polyodon spathula*	24
Blue Sucker	*Cycleptus elongatus*	23
Sabine Shiner	*Notropis sabinae*	23
Suckermouth Minnow	*Phenacobius mirabilis*	23
Flathead Chub	*Platygobio gracilis*	23
Pink Heelsplitter	*Potamilus alatus*	23
Central mudminnow	*Umbra limi*	23
Pondhorn	*Uniomerus tetralasmus*	23
Bleedingtooth Mussel	*Venustaconcha pleasii*	23
Goldeye	*Hiodon alosoides*	19
Pealip Redhorse	*Moxostoma pisolabrum*	19
Hickorynut	*Obovaria olivaria*	19
Gulf mapleleaf	*Quadrula nobilis*	19
Lilliput	*Toxolasma parvum*	19
Tapered Pondhorn	*Uniomerus declivis*	19
Little Spectaclecase group	*Villosa sp. Cf lienosa*	17
Lake Chubsucker	*Erimyzon sucetta*	15
Swamp Darter	*Etheostoma fusiforme*	15
Southern Mapleleaf	*Quadrula apiculata*	15
Fawnsfoot	*Truncilla donaciformis*	15

Mississippi Valley Loess Plains Ecobasins

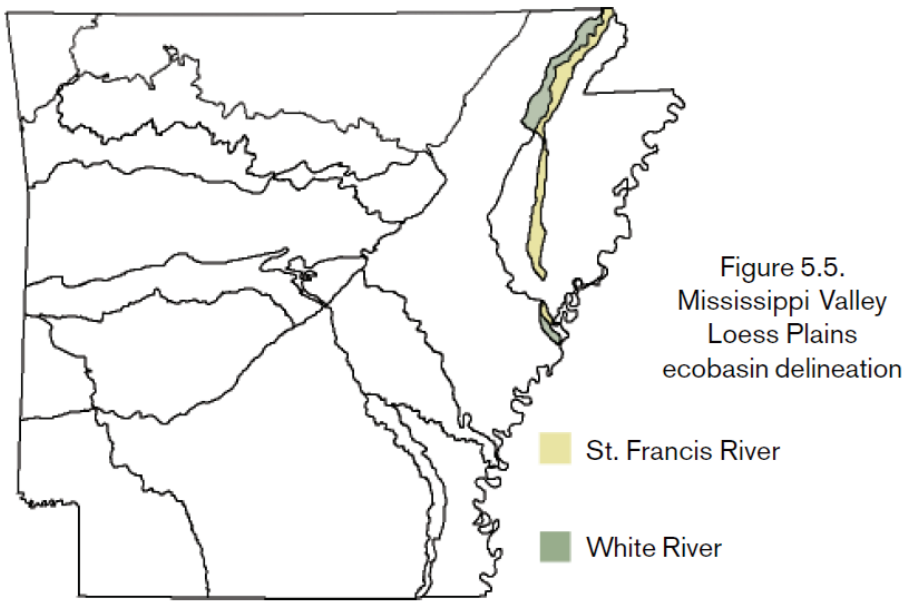


Figure 5.5. Mississippi Valley Loess Plains ecobasin delineation

Mississippi Valley Loess Plains – White River

This narrow ecobasin in northeast Arkansas (Figure 5.5) is veneered with windblown silt deposits (loess) and underlain by erosion-prone, unconsolidated coastal plain sediments. The topography includes hills and ridges. Streams tend to have lower gradients and more silty substrates than the loess plains draining into the St. Francis River. Includes the headwaters of Bayou deView but few other large, perennial streams.

Table 5.20. Land cover types in Mississippi River Loess Plains - White River ecobasin (percentage).

Mississippi River Loess Plains - White River	Water	Urban	Forest	Pasture	Crop
2004	1	4	53	14	28
2011	1	11	52	18	18

* Includes forested wetlands

Table 5.21. Species of Greatest Conservation Need associated with Mississippi River Loess Plains – White River ecobasin.

Common Name	Scientific Name	Priority Score
Alligator Gar	*Atractosteus spatula*	27
Grotto Salamander "eastern clade"	*Eurycea spelaea*	19

Mississippi Valley Loess Plains - St. Francis River

This Northeast Arkansas ecobasin (Figure 5.5) is narrow and a disjunct series of loess-capped hills surrounded by lower elevation Mississippi Alluvial Plain. Spring- fed streams and seep areas occur on the lower slopes and basal areas. Soils are generally well drained and larger creeks deeply incised into the soft substrates. Along with silt and sandy substrates, there are some gravel-bottomed streams in this ecobasin, replete with sensitive fish species. Several of the larger creeks in this ecobasin (Storm Creek, Bear Creek) are impounded by federal and state agencies.

Table 5.22. Land cover types in Mississippi River Loess Plains - St. Francis River ecobasin (percentage).

Mississippi River Loess Plains - St. Francis River	Water	Urban	Forest	Pasture	Crop
2004	1	4	55	15	25
2011	1	12	53	19	15

* Includes forested wetlands

Table 5.23. Species of Greatest Conservation Need associated with Mississippi River Loess Plains - St. Francis River ecobasin.

Common Name	Scientific Name	Priority Score
Goldstripe Darter	*Etheostoma parvipinne*	17
Round Pigtoe	*Pleurobema sintoxia*	17
Shoal Chub	*Macrhybopsis hyostoma*	15

Ouachita Mountains ecobasins

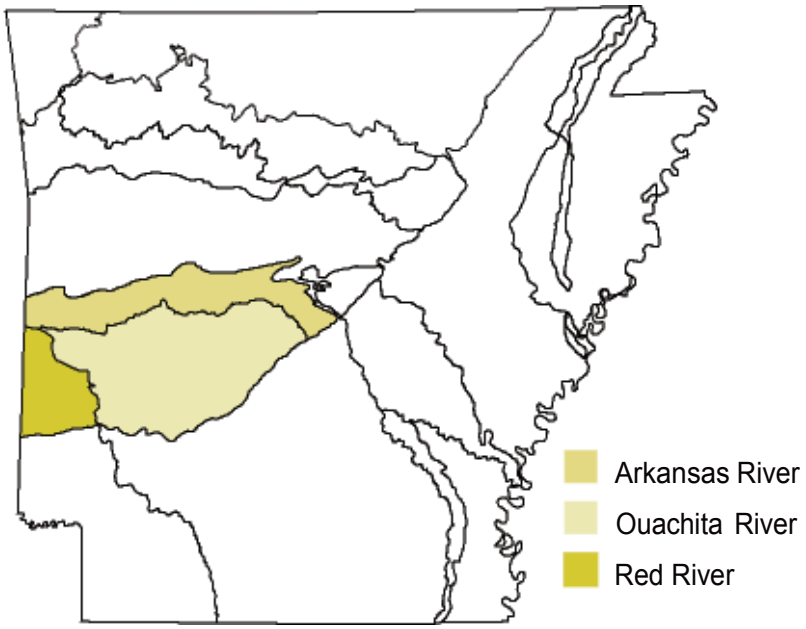


Figure 5.6. Ouachita Mountains ecobasin delineation.

Ouachita Mountains - Ouachita River

Streams in this ecobasin (Figure 5.6) usually follow the east-west valleys in this rugged, interior highland mountain range although occasionally they will cut across the ridges, producing cascades, rapids and waterfalls. Perennial springs and seeps are common. Stream substrates are composed of gravel, cobble, boulder and bedrock. Water quality, in general, is very high in this ecobasin with dissolved solids, turbidity, total phosphorous and biological oxygen demand lower than in most ecobasins and dissolved oxygen levels higher. Some of the state's most sensitive aquatic communities are found in this ecobasin. Stream fish populations are dominated by sensitive species including minnows, sunfish, darters and bass, especially smallmouth bass. Most of the larger rivers in this ecobasin have been dammed, forming large, deep reservoirs with high quality sport fisheries. Representative streams include the Ouachita River, Caddo River, Big Mazarn Creek and Prairie Bayou.

Table 5.24. Land cover types in Ouachita Mountains - Ouachita River ecobasin (percentage).

Ouachita Mountains - Ouachita River	Water	Urban	Forest	Pasture	Crop
2004	3	1	86	10	0
2011	3	6	83	8	0

* Includes forested wetlands

Table 5.25. Species of Greatest Conservation Need associated with Ouachita Mountains – Ouachita River ecobasin.

Common Name	Scientific Name	Priority Score
Ouachita Streambed Salamander	*Eurycea subfluvicola*	80
Caddo Madtom	*Noturus taylori*	80
Irons Fork Burrowing Crayfish	*Procambarus reimeri*	80
Arkansas Fatmucket	*Lampsilis powellii*	76
Saline Burrowing Crayfish	*Fallicambarus strawni*	65
Alabama Shad	*Alosa alabamae*	52
"Ouachita" Fanshell	*Cyprogenia sp. Cf aberti*	52
Purple Lilliput	*Toxolasma lividum*	52
Caddo Sallfly	*Alloperla caddo*	50
stonefly	*Leuctra paleo*	50
Spectaclecase	*Cumberlandia monodonta*	48
Paleback Darter	*Etheostoma pallididorsum*	46
Ouachita Burrowing Crayfish	*Fallicambarus harpi*	46
Daisy Burrowing Crayfish	*Fallicambarus jeanae*	46
Ouachita Madtom	*Noturus lachneri*	46
Ouachita Darter	*Percina brucethompsoni*	46
Crystal Darter	*Crystallaria asprella*	38
Stargazing Darter	*Percina uranidea*	38
Kiamichi Shiner	*Notropis ortenburgeri*	33
Peppered Shiner	*Notropis perpallidus*	33
Rabbitsfoot	*Quadrula cylindrica*	33
Ozark Snaketail Dragonfly	*Ophiogomphus westfalli*	32
Ouachita Mountain Crayfish	*Procambarus tenuis*	30
Ozark Clubtail Dragonfly	*Gomphus ozarkensis*	27
Mena Crayfish	*Orconectes menae*	27
American Eel	*Anguilla rostrata*	24
Paddlefish	*Polyodon spathula*	24
isopod	*Caecidotea fonticulus*	23
Ouachita Shore Bug	*Pentacora ouachita*	23
Ouachita Kidneyshell	*Ptychobranchus occidentalis*	23
Pondhorn	*Uniomerus tetralasmus*	23
Elktoe	*Alasmidonta marginata*	19
Brown Bullhead	*Ameiurus nebulosus*	19
Southern Pocketbook	*Lampsilis ornata*	19
Redspot Chub	*Nocomis asper*	19
Redspotted Stream Crayfish	*Orconectes acares*	19
Bismark Burrowing Crayfish	*Procambarus parasimulans*	19
Lilliput	*Toxolasma parvum*	19

Texas Lilliput	*Toxolasma texasiense*	19
Round Pigtoe	*Pleurobema sintoxia*	17
Little Spectaclecase group	*Villosa sp. Cf lienosa*	17
Beaded Darter	*Etheostoma clinton*	15
Fatmucket	*Lampsilis siliquoidea*	15
Saddleback Darter	*Percina vigil*	15
Arkansas agapetus caddisfly	*Agapetus medicus*	8

Ouachita Mountains - Arkansas River

The Ouachita Mountain ecoregion, in general, is generally composed of sandstones, shales and novaculite, with the Arkansas River basin part of it (Fourche Mountains) having characteristic long east-west ridges (even longer in this ecobasin). This ecobasin (Figure 5.6) also has a higher component of silts and sands, causing north-draining streams to be more turbid due to smaller sediments than other areas of the Ouachitas. Stream gradients are moderate and nutrient, mineral and biochemical water quality parameters are low in the surface waters here. Streams have a typical riffle/pool pattern and structure with silt, sand, gravel, boulder and shale bedrock substrates. Representative streams include the Fourche la Fave, upper Petit Jean River and Little Maumelle Creek.

Table 5.26. Land cover types in Ouachita Mountains - Arkansas River ecobasin (percentage).

Ouachita Mountains - Arkansas River	Water	Urban	Forest	Pasture	Crop
2004	2	3	85	9	1
2011	2	8	81	8	1

* Includes forested wetlands

Table 5.27. Species of Greatest Conservation Need associated with Ouachita Mountains - Arkansas River ecobasin.

Common Name	Scientific Name	Priority Score
Scaleshell	*Leptodea leptodon*	95
Mountain Cave Amphipod	*Stygobromus montanus*	65
Purple Lilliput	*Toxolasma lividum*	52
Kiamichi Shiner	*Notropis ortenburgeri*	33
isopod	*Lirceus bicuspidatus*	27
Longnose Darter	*Percina nasuta*	27
American Eel	*Anguilla rostrata*	24
Blue Sucker	*Cycleptus elongatus*	23
microcaddisfly	*Ochrotrichia robisoni*	23
Suckermouth Minnow	*Phenacobius mirabilis*	23
Ouachita Kidneyshell	*Ptychobranchus occidentalis*	23
Lilliput	*Toxolasma parvum*	19

Little Spectaclecase group	*Villosa sp. Cf lienosa*	17
Highland Darter	*Etheostoma teddyroosevelt*	15
"Arkoma" Fatmucket	*Lampsilis sp. A*	15
Fawnsfoot	*Truncilla donaciformis*	15

Ouachita Mountains - Red River

This western ecobasin (Figure 5.6) in the Ouachita ecoregion has medium to occasionally high gradients reflected in the streams coursing through this ecobasin. Due to these higher gradients, substrates are coarser than in other ecobasins with more gravels, cobbles, boulders and bedrock and less silts and sands. Turbidity is very low because of the higher gradient and lower fine sediments and riparian zones are generally fairly intact, except for some intensively logged areas. Channel structure is generally riffle/pool/run and rocky, boulder substrates and bedrock ledges provide adequate cover for a variety of sensitive fish and other aquatic species (i.e. leopard darter, a federally-listed threatened species). Representative streams include the Cossatot River, the Rolling Fork Creek and Board Camp Creek.

Table 5.28. Land cover types in Ouachita Mountains - Red River ecobasin (percentage).

Ouachita Mountains - Red River	Water	Urban	Forest	Pasture	Crop
2004	1	0	88	11	0
2011	1	5	84	10	0

* Includes forested wetlands

Table 5.29. Species of Greatest Conservation Need associated with Ouachita Mountains - Red River ecobasin.

Common Name	Scientific Name	Priority Score
Saline Burrowing Crayfish	*Fallicambarus strawni*	65
Leopard Darter	*Percina pantherina*	62
Purple Lilliput	*Toxolasma lividum*	52
Ouachita Needlefly	*Zealeuctra wachita*	50
Kiamichi Shiner	*Notropis ortenburgeri*	33
Rabbitsfoot	*Quadrula cylindrica*	33
Ozark Snaketail Dragonfly	*Ophiogomphus westfalli*	32
Ouachita Mountain Crayfish	*Procambarus tenuis*	30
Ouachita Mountain Shiner	*Lythrurus snelsoni*	27
Rocky Shiner	*Notropis suttkusi*	27
Mena Crayfish	*Orconectes menae*	27
American Eel	*Anguilla rostrata*	24
Lowland Topminnow	*Fundulus blairae*	23
Ouachita Shore Bug	*Pentacora ouachita*	23
Ouachita Kidneyshell	*Ptychobranchus occidentalis*	23
Ouachita Diving Beetle	*Hydroporus ouachitus*	19

Little River Creek Crayfish	*Orconectes leptogonopodus*	19
Lilliput	*Toxolasma parvum*	19
Little Spectaclecase group	*Villosa sp. Cf lienosa*	17
Fatmucket	*Lampsilis siliquoidea*	15
Arkansas agapetus caddisfly	*Agapetus medicus*	8

Ozark Highlands Ecobasins

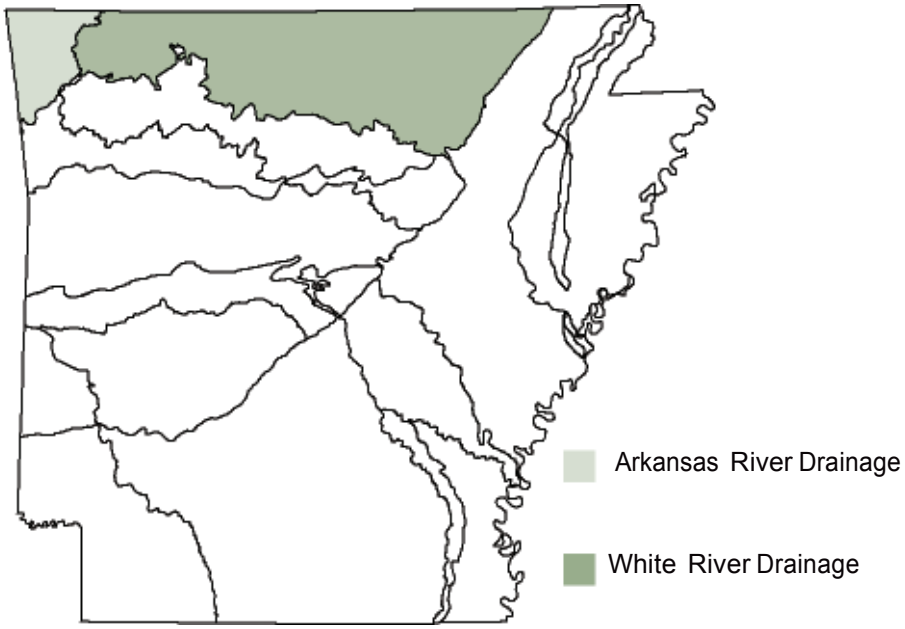


Figure 5.7. Ozark Highlands ecobasin delineation.

Ozark Highlands - Arkansas River

This ecobasin (Figure 5.7) is underlain by cherty limestone with karst features making sinkholes, caves, and cold, spring-fed streams common. Gaining or losing streams are common due to the springs and sinkholes in the region. Streams are composed of riffles and pools with chert gravel and rubble common. Bedrock is also common, forming overhead cover in the way of bedrock ledges for fish, salamanders and aquatic invertebrates. Stream gradients are moderate to high. Ambient natural turbidity is low. Nutrient input from various anthropogenic activities in the watersheds here can be significant and impact aquatic biota in a number of ways. Representative streams here include the Illinois River and Spavinaw Creek.

Table 5.30. Land cover types in Ozark Highlands - Arkansas River ecobasin (percentage).

Ozark Highlands - Arkansas River	Water	Urban	Forest	Pasture	Crop
2004	1	5	30	57	7
2011	1	16	32	50	1

* Includes forested wetlands

Table 5.30. Species of Greatest Conservation Need associated with Ozark Mountains - Arkansas River ecobasin.

Common Name	Scientific Name	Priority Score
Sulphur Springs Hydroporus Diving Beetle	*Hydroporus sulphurius*	80
bat cave isopod	*Caecidotea macropropoda*	57
Neosho Mucket	*Lampsilis rafinesqueana*	57
Purple Lilliput	*Toxolasma lividum*	52
Ozark Cavefish	*Amblyopsis rosae*	43
Arkansas Darter	*Etheostoma cragini*	43
cave obligate planarian	*Dendrocoelopsis americana*	42
Bristly Cave Crayfish	*Cambarus setosus*	34
Williams' Crayfish	*Orconectes williamsi*	34
Ozark Shiner	*Notropis ozarcanus*	33
Rabbitsfoot	*Quadrula cylindrica*	33
isopod	*Caecidotea ancyla*	30
isopod	*Caecidotea steevesi*	30
isopod	*Caecidotea stiladactyla*	30
Meek's Short Pointed Crayfish	*Orconectes meeki brevis*	30
Midget Crayfish	*Orconectes nana*	30
Least Darter	*Etheostoma microperca*	29
Oklahoma Salamander	*Eurycea tynerensis*	27
Ozark Pigtoe	*Fusconaia ozarkensis*	27
Ozark Cave Amphipod	*Stygobromus ozarkensis*	27
Ellipse	*Venustaconcha ellipsiformis*	27

Ozark Highlands - White River (Buffalo River)

Ozark Highlands - White River

Streams in the White River ecobasin (Figure 5.7) of the Ozarks Highlands ecoregion are some of the most productive yet have some of the highest water quality in the state. Underlain generally by dolomite and highly fractured and soluble limestone, these streams have alkalinity, total dissolved solids (TDS), and total hardness that are all relatively high. Streams are mostly clear, cold, highly oxygenated, perennial, and often spring-fed, typically with gravel, cobble, boulder, and bedrock substrates. Limestone bluffs arching up from streams are indicative of this ecobasin. Gradients are usually at least moderate. All of the above characteristics meld together to produce aquatic habitat conducive to an aquatic community with many sensitive species. For example, the fish community is dominated by minnows, sunfish, darters, and catostomids. Conversely, significant human and confined animal population growth in areas within this ecobasin in the past decade have caused increases in nitrates, fecal coliform bacteria, orthophosphorous, sedimentation and other water quality metrics that typically have a negative impact on sensitive aquatic species of vertebrates and invertebrates. Representative streams include the middle and lower Buffalo River, upper White River, Spring River, Kings River, Crooked Creek and Yokum Creek.

Table 5.31. Land cover types in Ozark Highlands - White River ecobasin (percentage).

Ozark Highlands - White River	Water	Urban	Forest	Pasture	Crop
2004	3	1	68	26	2
2011	2	5	66	26	1

* Includes forested wetlands

Table 5.32. Species of Greatest Conservation Need associated with Ozark Mountains – White River ecobasin.

Common Name	Scientific Name	Priority Score
Ozark Hellbender	*Cryptobranchus bishopi*	100
Curtis Pearlymussel	*Epioblasma florentina curtisi*	100
Turgid Blossom	*Epioblasma turgidula*	100
Scaleshell	*Leptodea leptodon*	95
Hell Creek Cave Crayfish	*Cambarus zophonastes*	80
isopod	*Lirceus bidentatus*	80
White Hickorynut	*Obovaria sp. Cf arkansasensis*	80
Foushee Cavesnail	*Amnicola cora*	65
"Ozark" Fanshell	*Cyprogenia aberti*	52
Purple Lilliput	*Toxolasma lividum*	52
winter stonefly	*Allocapnia jeanae*	50
Coldwater Crayfish	*Orconectes eupunctus*	50
Pink Mucket	*Lampsilis abrupta*	46
Mammoth Spring Crayfish	*Orconectes marchandi*	46
Ozark Cavefish	*Amblyopsis rosae*	43
Snuffbox	*Epioblasma triquetra*	43
amphipod	*Bactrurus pseudomucronatus*	42
isopod	*Caecidotea dimorpha*	42
cave obligate planarian	*Dendrocoelopsis americana*	42
Crystal Darter	*Crystallaria asprella*	38
Stargazing Darter	*Percina uranidea*	38
Bristly Cave Crayfish	*Cambarus setosus*	34
Williams' Crayfish	*Orconectes williamsi*	34
Salamander Mussel	*Simpsonaias ambigua*	34
Western Sand Darter	*Ammocrypta clara*	33
Ozark Shiner	*Notropis ozarcanus*	33
Rabbitsfoot	*Quadrula cylindrica*	33
Ozark Snaketail Dragonfly	*Ophiogomphus westfalli*	32
Slippershell Mussel	*Alasmidonta viridis*	31
isopod	*Caecidotea ancyla*	30
isopod	*Caecidotea steevesi*	30
isopod	*Caecidotea stiladactyla*	30

Midget Crayfish	*Orconectes nana*	30
Strawberry River Darter	*Etheostoma fragi*	29
Silver Redhorse	*Moxostoma anisurum*	29
Hubbs' Crayfish	*Cambarus hubbsi*	27
Ozark Pigtoe	*Fusconaia ozarkensis*	27
isopod	*Lirceus bicuspidatus*	27
Longnose Darter	*Percina nasuta*	27
Ohio Pigtoe	*Pleurobema cordatum*	27
Ozark Cave Amphipod	*Stygobromus ozarkensis*	27
Southern Cavefish	*Typhlichthys subterraneus*	27
American Eel	*Anguilla rostrata*	24
Paddlefish	*Polyodon spathula*	24
Spotfin Shiner	*Cyprinella spiloptera*	23
Sabine Shiner	*Notropis sabinae*	23
Ouachita Kidneyshell	*Ptychobranchus occidentalis*	23
Bleedingtooth Mussel	*Venustaconcha pleasii*	23
Gapped Ringed Crayfish	*Orconectes neglectus*	20
Elktoe	*Alasmidonta marginata*	19
Autumn Darter	*Etheostoma autumnale*	19
Current Darter	*Etheostoma uniporum*	19
predaceous diving beetle	*Heterosternuta phoebeae*	19
Mooneye	*Hiodon tergisus*	19
Ouachita Diving Beetle	*Hydroporus ouachitus*	19
American Brook Lamprey	*Lethenteron appendix*	19
Pealip Redhorse	*Moxostoma pisolabrum*	19
Striped Mullet	*Mugil cephalus*	19
Channel Shiner	*Notropis wickliffi*	19
Hickorynut	*Obovaria olivaria*	19
Gilt Darter	*Percina evides*	19
Slenderhead Darter	*Percina phoxocephala*	19
Lilliput	*Toxolasma parvum*	19
Highfin carpsucker	*Carpiodes velifer*	17
Rainbow	*Villosa iris*	17
Little Spectaclecase group	*Villosa sp. Cf lienosa*	17
Fatmucket	*Lampsilis siliquoidea*	15
Least Brook Lamprey	*Lamptera aepyptera*	15
Saddleback Darter	*Percina vigil*	15
Arkansas agapetus caddisfly	*Agapetus medicus*	8
isopod	*Caecidotea salamensis*	8

South Central Plains Ecobasins

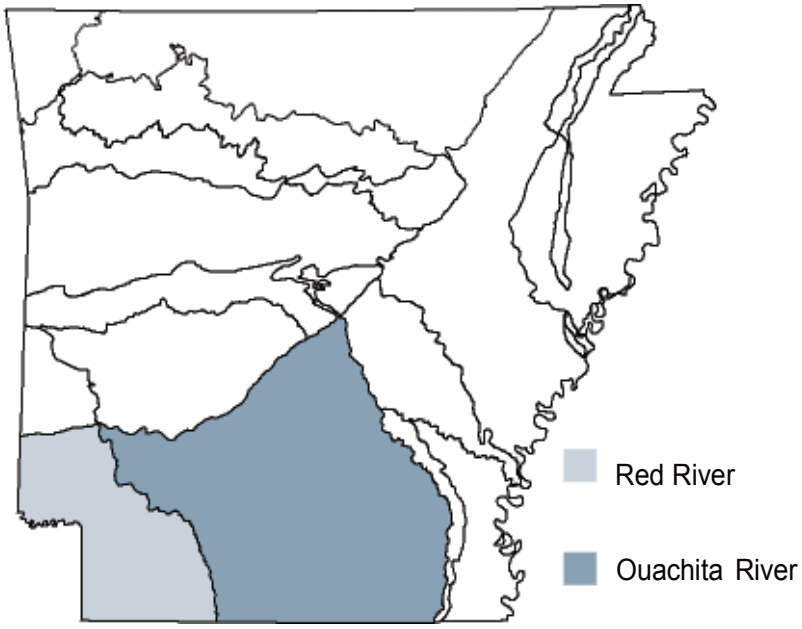


Figure 5.8. South Central Plains ecobasins delineation.

South Central Plains - Red River

Underlain by coastal plain deposits (this ecoregion is sometimes called the Gulf Coastal Plain) and marginal marine sediments, the landscape in this ecobasin (Figure 5.8) of the South Central Plains is dominated by the Red River, which is highly turbid with high suspended sediment loads, hardness and conductivity. The aquatic species in the Red River are those of a large river community including blue suckers and paddlefish, catfishes and minnows. The underlying alluvium allows the formation of oxbow lakes, low terraces, meander scars, backswamps, natural river levees, and tortuous meandering of the main stem Red River. Gradients are typically low to moderate. Smaller streams in this ecobasin are highly incised, either turbid or tannen stained due to predominant pine watersheds, mildly acidic from the tannic acid, with low levels of alkalinity, hardness, pH and often dissolved oxygen. Summer flow in these smaller streams is limited to non-existent with en- during pools forming between dewatered shoal areas. Fish communities are composed of a fairly diverse fish complex with limited sensitive species but having a high proportion of sunfishes with darters and minnows common. Representative streams in this ecobasin include the Red River, the Little River, western Saline River and McKinney Creek.

Table 5.33. Land cover types in South Central Plains - Red River ecobasin (percentage) .

South Central Plains - Red River	Water	Urban	Forest	Pasture	Crop
2004	3	1	65	23	8
2011	3	6	66	18	6

* Includes forested wetlands

Table 5.34. Species of Greatest Conservation Need associated with South Central Plains - Red River ecobasin.

Common Name	Scientific Name	Priority Score
Scaleshell	*Leptodea leptodon*	95
Ouachita Rock Pocketbook	*Arcidens wheeleri*	80
Saline Burrowing Crayfish	*Fallicambarus strawni*	65
Louisiana Pearlshell	*Margaritifera hembeli*	65
Texas Pigtoe	*Pleurobema riddellii*	57
Bayou Bodcau Crayfish	*Bouchardina robisoni*	50
Blair's Fencing Crayfish	*Faxonella blairi*	46
Pink Mucket	*Lampsilis abrupta*	46
Crystal Darter	*Crystallaria asprella*	38
Regal Burrowing Crayfish	*Procambarus regalis*	36
Western Sand Darter	*Ammocrypta clara*	33
Bluehead Shiner	*Pteronotropis hubbsi*	33
Rabbitsfoot	*Quadrula cylindrica*	33
Alligator Gar	*Atractosteus spatula*	27
Ozark Clubtail Dragonfly	*Gomphus ozarkensis*	27
Plains Minnow	*Hybognathus placitus*	27
Ouachita Mountain Shiner	*Lythrurus snelsoni*	27
Red River Shiner	*Notropis bairdi*	27
Brown Madtom	*Noturus phaeus*	27
American Eel	*Anguilla rostrata*	24
Paddlefish	*Polyodon spathula*	24
Blue Sucker	*Cycleptus elongatus*	23
Lowland Topminnow	*Fundulus blairae*	23
Chub Shiner	*Notropis potteri*	23
Ouachita Kidneyshell	*Ptychobranchus occidentalis*	23
Pondhorn	*Uniomerus tetralasmus*	23
Brown Bullhead	*Ameiurus nebulosus*	19
Goldeye	*Hiodon alosoides*	19
"Red River" Mucket	*Lampsilis sp. B*	19
Blackspot Shiner	*Notropis atrocaudalis*	19
Hickorynut	*Obovaria olivaria*	19
Slenderhead Darter	*Percina phoxocephala*	19
Bismark Burrowing Crayfish	*Procambarus parasimulans*	19
Gulf mapleleaf	*Quadrula nobilis*	19
Lilliput	*Toxolasma parvum*	19
Texas Lilliput	*Toxolasma texasiense*	19
Tapered Pondhorn	*Uniomerus declivis*	19
Highfin carpsucker	*Carpiodes velifer*	17
Goldstripe Darter	*Etheostoma parvipinne*	17
Round Pigtoe	*Pleurobema sintoxia*	17
Lake Chubsucker	*Erimyzon sucetta*	15

Swamp Darter	*Etheostoma fusiforme*	15
Fatmucket	*Lampsilis siliquoidea*	15
Shoal Chub	*Macrhybopsis hyostoma*	15
Southern Mapleleaf	*Quadrula apiculata*	15
Fawnsfoot	*Truncilla donaciformis*	15

South Central Plains - Ouachita River (Lower L'Eau Frais Creek)

South Central Plains - Ouachita River

Marine and ocean-bed sediments and alluvium are the base for stream substrates in this ecobasin (Figure 5.8). Streams are typically of a riffle/pool configuration with medium sinuousity and low to medium gradient. Stream substrates are generally sand, gravel, and silt. The water color in the smaller stream systems is often tannic acid stained (brown, coffee-colored) with fairly high levels of total organic carbon and biochemical oxygen demand. Large areas of this ecobasin are frequently inundated adding to the BOD. Streams with sandy bottoms and spring-fed will often have lower TDS, total suspended solids, alkalinity and hardness values. Although dissolved oxygen values can be fairly low in the early morning hours, fish populations often may have 5-6 species of darters represented along with numerous minnows, sunfishes, and suckers albeit not necessarily many sensitive species. Representative streams include the lower Ouachita River, Dorcheat Bayou, the lower Saline River, L'Aigle Creek and Moro Creek.

Table 5.36. Land cover types in South Central Plains - Ouachita River ecobasin (percentage).

South Central Plains - Ouachita River	Water	Urban	Forest	Pasture	Crop
2004	1	1	87	7	3
2011	1	6	86	6	1

* Includes forested wetlands

Table 5.37. Species of Greatest Conservation Need associated with South Central Plains - Ouachita River ecobasin.

Common Name	Scientific Name	Priority Score
Ouachita Rock Pocketbook	*Arcidens wheeleri*	80
Slenderwrist Burrowing Crayfish	*Fallicambarus petilicarpus*	80
Arkansas Fatmucket	*Lampsilis powellii*	76
Winged Mapleleaf	*Quadrula fragosa*	76
Texas Pigtoe	*Pleurobema riddellii*	57
Alabama Shad	*Alosa alabamae*	52
"Ouachita" Fanshell	*Cyprogenia sp. Cf aberti*	52
Purple Lilliput	*Toxolasma lividum*	52
Jefferson County Crayfish	*Fallicambarus gilpini*	50
Spectaclecase	*Cumberlandia monodonta*	48
Pink Mucket	*Lampsilis abrupta*	46
Ouachita Darter	*Percina brucethompsoni*	46
Crystal Darter	*Crystallaria asprella*	38
Stargazing Darter	*Percina uranidea*	38
Western Sand Darter	*Ammocrypta clara*	33
Peppered Shiner	*Notropis perpallidus*	33
Bluehead Shiner	*Pteronotropis hubbsi*	33
Rabbitsfoot	*Quadrula cylindrica*	33
Pine Hills Digger	*Fallicambarus dissitus*	32
Alligator Gar	*Atractosteus spatula*	27
Ohio Pigtoe	*Pleurobema cordatum*	27
American Eel	*Anguilla rostrata*	24
Paddlefish	*Polyodon spathula*	24
Blue Sucker	*Cycleptus elongatus*	23
Ouachita Kidneyshell	*Ptychobranchus occidentalis*	23
Pondhorn	*Uniomerus tetralasmus*	23
Elktoe	*Alasmidonta marginata*	19
Brown Bullhead	*Ameiurus nebulosus*	19
Goldeye	*Hiodon alosoides*	19
Mooneye	*Hiodon tergisus*	19
American Brook Lamprey	*Lethenteron appendix*	19
Striped Mullet	*Mugil cephalus*	19
Hickorynut	*Obovaria olivaria*	19
Bismark Burrowing Crayfish	*Procambarus parasimulans*	19
Gulf mapleleaf	*Quadrula nobilis*	19
Lilliput	*Toxolasma parvum*	19
Texas Lilliput	*Toxolasma texasiense*	19
Highfin carpsucker	*Carpiodes velifer*	17

Goldstripe Darter	*Etheostoma parvipinne*	17
Round Pigtoe	*Pleurobema sintoxia*	17
Little Spectaclecase group	*Villosa sp. Cf lienosa*	17
Lake Chubsucker	*Erimyzon sucetta*	15
Swamp Darter	*Etheostoma fusiforme*	15
Fatmucket	*Lampsilis siliquoidea*	15
Shoal Chub	*Macrhybopsis hyostoma*	15
Saddleback Darter	*Percina vigil*	15
Southern Mapleleaf	*Quadrula apiculata*	15
Fawnsfoot	*Truncilla donaciformis*	15
winter stonefly	*Allocapnia malverna*	11

Aquatic Habitat Health

Aquatic habitats differ from terrestrial habitats in that the mobility of associated aquatic species is often limited to these habitats. Habitat alteration is the major cause of decline of aquatic diversity in the South. Channelization, impoundment, sedimentation and flow alterations are the most common physical habitat alterations associated with the decline of aquatic species (Walsh and others 1995, Etnier 1997, Burkhead and others 1997). Other human-induced impacts to aquatic species include pollution, introduced species and over-harvesting (Miller 1989). Habitat quality within a fresh- water ecosystem is determined by activities within the watershed (Abell and others 2000; Scott and Helfman 2002). Therefore, the influence of these activities upon habitats, or waterbodies, can be described to determine the condition of the habitat. Arkansas chose to use six measures as markers of aquatic health. As a general rule, better aquatic health usually means fewer dams, fewer roads and road crossings, and more forested areas. Healthier riparian corridors have more forest buffer and fewer roads.

The GIS methodology used to develop this information is provided in Appendix 5.1.

Indicators of Aquatic Condition

Dams in ecobasins

Table 5.37 shows the size of the ecobasin in square miles and the number of dams within the ecobasin, calculates the density of dams per square mile and ranks their density using Jenks Optimization. A lower numerical rank (1) indicates a higher density of dams in the ecobasin.

Ecobasin	Total Area (square miles)	Dam Count	Dam Density	Dam Density Rank
Mississippi River Loess Plains - St. Francis River	477	62	0.130	1
Mississippi River Loess Plains - White River	313	34	0.108	1
Ozark Highlands - Arkansas River	984	30	0.030	1
Arkansas Valley - White River	850	23	0.027	2
Ouachita Mountains - Ouachita River	3367	84	0.025	2
South Central Plains - Red River	3466	79	0.023	2
Mississippi Alluvial Plain - Arkansas River	1962	39	0.020	2
Ouachita Mountains - Red River	889	12	0.013	2
Mississippi Alluvial Plain (Bayou Bartholomew) - Ouachita River	491	6	0.012	3
Boston Mountains - Arkansas River	1758	21	0.012	3
Boston Mountains - White River	2876	25	0.009	3
Ouachita Mountains - Arkansas River	2051	12	0.006	4
Mississippi Alluvial Plain (Lake Chicot) - Mississippi River	1520	7	0.005	4
Arkansas Valley - Arkansas River	5285	20	0.004	4
South Central Plains - Ouachita River	9512	18	0.002	4

Ozark Highlands - White River	6553	11	0.002	5
Mississippi Alluvial Plain - White River	6403	10	0.002	5
Mississippi Alluvial Plain - St. Francis River	4123	5	0.001	5

Hydrologic modification is the manipulation or change of stream flow conditions. The altering of flow can be permanent and significant (such as a large impoundment) that creates a physical barrier to migration and movement of aquatic species. For many species of greatest conservation need, dams pose a significant threat to their viability. In addition to impeding flow, dams also affect physical attributes (such as water temperature, width, depth, instream flow) with corresponding impacts on SGCN.

The GIS dam layer was taken from EPA Basins and includes every impounding structure greater than six feet high within the state. This number was normalized by converting it to dams per square mile for each ecobasin. Table 5.37 ranks dam densities to indicate the relative degree of hydrologic disturbance among ecobasins.

Roads in ecobasins

Table 5.38 shows the size of the ecobasin in square miles and the calculated density of road miles per square mile area of ecobasin. The density is ranked using Jenks Optimization. A lower numerical rank (1) indicates a greater number of road miles in the ecobasin.

Road density was calculated using the Tiger Census road data. The data was normalized by calculating miles of road per square mile.

Roads have a much greater influence on sediment production than do most landuse activities (cultivated lands are an exception). The range of road densities by ecobasin is broadly indicative of disturbance associated with increases in sediment. In Table 5.38, a lower numerical rank (1) indicates greater disturbance within an ecobasin.

Ecobasin	Total Area (square miles)	Road Density	Road Density
Ozark Highlands - Arkansas River	984	4.102	1
Mississippi River Loess Plains - St. Francis River	477	3.424	1
Mississippi River Loess Plains - White River	313	3.268	1
Arkansas Valley - Arkansas River	5,285	2.570	1
Ouachita Mountains - Red River	889	2.544	2
Ouachita Mountains - Ouachita River	3,367	2.490	2
Ouachita Mountains - Arkansas River	2,051	2.420	2
Ozark Highlands - White River	6,553	2.336	3
Arkansas Valley - White River	850	2.270	3
Mississippi Alluvial Plain - St. Francis River	4,123	2.231	3
Mississippi Alluvial Plain - Arkansas River	1,962	2.219	3
South Central Plains - Ouachita River	9,512	2.157	4

South Central Plains - Red River	3,466	2.102	4
Mississippi Alluvial Plain - White River	6,403	1.906	4
Mississippi Alluvial Plain (Lake Chicot) - Miss. River	1,520	1.887	5
Boston Mountains - White River	2,876	1.853	5
Mississippi Alluvial Plain (Bayou Bartholomew) - Ouachita River	491	1.848	5
Boston Mountains - Arkansas River	1,758	1.665	5

Roads within riparian zones

The riparian zone includes 100 meters on each side of the stream reach. Table 5.39 shows the total area of the riparian zone in square miles within the ecobasin, calculates the density of road miles within the riparian zone and ranks the density using Jenks Optimization. A lower numerical rank (1) indicates a higher density of roads within the riparian zone in each ecobasin.

The Tiger Census roads data were clipped using the riparian shapefile created from the RF3s. From this, the road density within riparian areas was calculated for each ecobasin. This was normalized by calculating the miles of road per square mile of riparian area for each ecobasin.

The effects of road density within riparian areas are similar to those of ecobasin road density: general increases in sediment but may also include flowage disturbance and impediment to movement and migration of aquatic species. In table 5.39, a lower numerical rank (1) expresses greater hydrologic disturbance indicative of a more direct effect of roads within a sensitive riparian area.

Table 5.39

Ecobasin	Total Riparian Area (Sq. Miles)	Road Density	Riparian Road Density Rank
Ozark Highlands - Arkansas River	177	3.38	1
Ouachita Mountains - Ouachita River	730	2.37	1
Mississippi Alluvial Plain (Lake Chicot) - Miss. River	412	2.37	2
Mississippi River Loess Plains - St. Francis River	113	2.29	2
Mississippi Alluvial Plain - St. Francis River	914	2.27	2
Mississippi River Loess Plains - White River	79	2.26	2
Ouachita Mountains - Arkansas River	451	2.24	2
Mississippi Alluvial Plain - Arkansas River	534	2.07	2
Ouachita Mountains - Red River	127	1.93	3
Arkansas Valley - Arkansas River	1,221	1.91	3
Mississippi Alluvial Plain (Bayou Bartholomew) - Ouachita River	151	1.90	3
Ozark Highlands - White River	1,364	1.85	3
Mississippi Alluvial Plain - White River	1,578	1.73	3
Boston Mountains - White River	506	1.69	4
Arkansas Valley - White River	207	1.66	4
Boston Mountains - Arkansas River	309	1.41	5
South Central Plains - Red River	734	1.30	5
South Central Plains - Ouachita River	2,211	1.29	5

Road crossings in ecobasins

Table 5.40 shows the size of the ecobasin in square miles and the calculated density of road crossings of waterways per square mile area of ecobasin. The density is ranked using Jenks Optimization. A lower numerical rank (1) indicates a greater number of road crossings in the ecobasin.

Road crossing within ecobasins are an indicator of hydrologic modification with manipulation or change of stream flow conditions. The altering of flow can be temporal as in a stream crossing that limits the migration and movement of many aquatic species, in part or completely. In many cases, increased sedimentary loads or poorer water quality are associated with road crossings.

Roads and crossings were calculated by intersecting the Tiger roads layer with the RF3 layer. This number was normalized by converting it to crossings per square mile for each ecobasin. Table 5.40 indicates the relative degree of hydrologic disturbance associated with road crossings (among ecobasins).

Table 5.40

Ecobasin	Total Area (Sq. Miles)	Crossing density	Road Crossing Density Rank
Ozark Highlands - Arkansas River	984	2.05	1
Mississippi River Loess Plains - White River	313	1.91	1
Mississippi River Loess Plains - St. Francis River	477	1.76	1
Arkansas Valley - Arkansas River	5,285	1.61	1
Ouachita Mountains - Arkansas River	2,051	1.43	2
Ouachita Mountains - Ouachita River	3,367	1.42	2
Arkansas Valley - White River	850	1.40	2
South Central Plains - Ouachita River	9,512	1.19	3
Mississippi Alluvial Plain - St. Francis River	4,123	1.17	3
Ozark Highlands - White River	6,553	1.09	3
Mississippi Alluvial Plain (Lake Chicot) - Miss. River	1,520	1.08	4
Mississippi Alluvial Plain - White River	6,403	1.05	4
Mississippi Alluvial Plain - Arkansas River	1,962	1.00	4
South Central Plains - Red River	3,466	1.00	4
Ouachita Mountains - Red River	889	0.80	5
Mississippi Alluvial Plain (Bayou Bartholomew) - Ouachita River	491	0.77	5
Boston Mountains - White River	2,876	0.77	5
Boston Mountains - Arkansas River	1,758	0.67	5

Forested areas in ecobasins

Table 5.41 shows the size of the ecobasin in square miles, percent of forested area per square mile and ranks their density using Jenks Optimization. A lower numerical rank (1) indicates a lower percentage of forested area in the ecobasin.

The percent of each ecobasin that was forested was calculated using the 1994 National Land Cover Database (NLCD). Though somewhat dated, it is the most current available. A newer NLCD version should be available in the near future, when it can be compared to the existing NLCD as a monitoring exercise.

The percent of forest in ecobasins was used as a watershed condition parameter because Scott and Helfman (2002) demonstrated that as watersheds become less forested, the relative abundance of native endemic species decline. This measure broadly addresses aquatic condition based on landuse. A lower numerical rank (1) in table 5.41 indicates a poorer condition and a lower percentage of forested area in the ecobasin.

Table 5.41

Ecobasin	Total Area (Sq. Miles)	Percent forested	Rank
Mississippi Alluvial Plain - St. Francis River	4,123	11	1
Mississippi Alluvial Plain (Lake Chicot) - Miss. River	1,520	17	1
Mississippi Alluvial Plain (Bayou Bartholomew) - Ouachita River	491	23	2
Mississippi Alluvial Plain - Arkansas River	1,962	25	2
Ozark Highlands - Arkansas River	984	31	3
Mississippi Alluvial Plain - White River	6,403	24	2
Mississippi River Loess Plains - White River	313	53	3
Mississippi River Loess Plains - St. Francis River	477	56	3
Arkansas Valley - Arkansas River	5,285	56	4
South Central Plains - Red River	3,466	66	4
Ozark Highlands - White River	6,553	70	4
Arkansas Valley - White River	850	70	4
Boston Mountains - White River	2,876	83	5
Ouachita Mountains - Arkansas River	2,051	87	5
Ouachita Mountains - Ouachita River	3,367	89	5
South Central Plains - Ouachita River	9,512	88	5
Ouachita Mountains - Red River	889	89	5
Boston Mountains - Arkansas River	1,758	90	5

Forested areas within riparian zones

The riparian zone includes 100 meters on each side of the stream reach. The data presented here (Table 5.42) shows the total area of riparian zone within an ecobasin, the calculated percentage of forest occurring within the riparian zone and ranks the percentage using Jenks Optimization. A lower numerical rank (1) indicates a lower percentage of forest within the riparian zone in each ecobasin.

Disturbance within areas immediately adjacent to streams or lakes is generally associated with direct disturbance to aquatic integrity. This measure assumes that a forested riparian area is less likely to be impaired than an urbanized or cultivated riparian area. Forested riparian areas provide shading over a stream, affecting water temperature; provide habitat for vertebrates and invertebrates; provide bank stability and thus, better sediment control and filtering capability and provide an energy source for the aquatic species ecosystem.

Within the GIS data, riparian areas were created by buffering (100 feet) the EPA RF3 data layer (lakes and streams). This area was then overlain with the landuse layer. The percent of the riparian area that was forested (not pasture, cultivated, mined or urban) was determined for each ecobasin.

Table 5.42 compares the extent of direct disturbance to aquatic systems within ecobasins. A higher numerical rank (5) indicates a higher percentage of forest (better condition) within the riparian zone of each ecobasin.

Ecobasin	Total Riparian Area (Sq. Miles)	Percent Forested	Rank
Mississippi Alluvial Plain - St. Francis River	914	16	1
Mississippi Alluvial Plain (Lake Chicot) - Miss. River	412	18	1
Mississippi Alluvial Plain (Bayou Bartholomew) - Ouachita	151	29	2
Mississippi Alluvial Plain - Arkansas River	534	32	2
Ozark Highlands - Arkansas River	177	32	2
Mississippi Alluvial Plain - White River	1,578	33	2
Mississippi River Loess Plains - White River	79	51	3
Mississippi River Loess Plains - St. Francis River	113	54	3
Arkansas Valley - Arkansas River	1,221	58	3
South Central Plains - Red River	734	68	4
Ozark Highlands - White River	1,364	70	4
Arkansas Valley - White River	207	72	4
Boston Mountains - White River	506	83	5
Ouachita Mountains - Arkansas River	451	85	5
Ouachita Mountains - Ouachita River	730	88	5
South Central Plains - Ouachita River	2,211	89	5
Ouachita Mountains - Red River	127	89	5
Boston Mountains - Arkansas River	309	90	5

Ranking and overall condition

Each of these criteria (dams in ecobasins, roads in ecobasins, roads within riparian zones, road crossings in ecobasins, forested areas in ecobasins, and forested areas within riparian zones) is unique. The effects of road density within riparian areas cannot be directly compared with the percent of the ecobasin that is forested. By calculating a total of the rankings by ecobasin, it is possible to express an overall ecobasin condition to provide an extremely broad measure to monitor. These indicators can be re- run for the biennial AWAP symposia to evaluate trends.

The Ozark Highlands - Arkansas River ecobasin Habitat Score (9 out of a possible 30) demonstrate the greatest degree of anthropogenic impacts. This is an area that is urbanizing rapidly under considerable development pressure. A lower overall score implies greater disturbance and impaired waters.

In contrast, the Boston Mountains - Arkansas River ecobasin (with a 28 score out of a possible 30), an ecobasin that lies adjacent to the Ozark Highlands - Arkansas River, is far more undeveloped with much of the land protected within the Ozark National Forest. This ecobasin is known for high quality streams from water quality, recreational and aquatic biota standpoints.

In table 5.43, the sum of ranks is an indicator of overall aquatic habitat condition. A higher score implies a less disturbed aquatic condition. The lowest (least disturbed) possible score is 5, the highest (most disturbed) possible score is 30.

Table 5.43. Aquatic Habitat Scores.

Ecobasin	Dam Density Rank	Road Density Rank	Riparian Road Density Rank	Crossing Density Rank	Percent Forest Rank	% Forest in Riparian Rank	Sum of Ranks
Ozark Highlands - Arkansas River	1	1	1	1	3	2	9
Mississippi Valley Loess Plains - St. Francis River	1	1	2	1	3	3	11
Mississippi Valley Loess Plains - White River	1	1	2	1	3	3	11
Mississippi R. Alluvial Plain - Arkansas River	2	3	2	4	2	2	15
Mississippi R. Alluvial Plain - St. Francis River	5	3	2	3	1	1	15
Arkansas Valley - Arkansas River	4	1	3	1	4	3	16
Mississippi River Alluvial Plain - Mississippi River	4	5	2	4	1	1	17
Ouachita Mountains - Ouachita River	2	2	1	2	5	5	17
Arkansas Valley - White River	2	3	4	2	4	4	19
Mississippi River Alluvial Plain - Ouachita River	3	5	3	5	2	2	20
Mississippi R. Alluvial Plain - White River	5	4	3	4	2	2	20
Ouachita Mountains - Arkansas River	4	2	2	2	5	5	20
Ouachita Mountains - Red River	2	2	3	5	5	5	22
Ozark Highlands - White River	5	3	3	3	5	4	23
South Central Plains - Red River	2	4	5	4	4	4	23
South Central Plains - Ouachita River	4	4	5	3	5	5	26
Boston Mountains - White River	3	5	4	5	5	5	27
Boston Mountains - Arkansas River	3	5	5	5	5	5	28

Boston Mountains - White River (Cave Creek)

Photo by Jane Anderson

Section 6. Informing and Engaging the Public

Prelude to a public meeting in Fayetteville, Arkansas

Early Efforts

Public involvement in the development of Arkansas' Comprehensive Wildlife Conservation Strategy

Congress identified eight required elements to be addressed in the comprehensive wildlife conservation strategy (CWCS). The strategy must identify and be focused on the "species in greatest need of conservation," yet address the "full array of wildlife" and wildlife-related issues. Congress also affirmed in legislation that broad public participation is an essential element of developing and implementing these plans, the projects that are carried out while these plans are developed, and the Species in Greatest Need of Conservation that Congress has indicated such programs and projects are intended to emphasize. This section describes how Arkansas has involved the public in the development of its strategy and summarizes public input.

Public involvement goals

The broad goals for involving the public in the planning process are threefold:

➢ To produce a set of conservation priorities for Arkansas that will serve as a blueprint for strategic investments and activities that reflect the public interest regarding conservation.

➢ To build partnerships with agencies, organizations and businesses with an interest in and capacity to conserve wildlife and habitat, in order to improve the quality of the strategy and increase the level of commitment to and ownership of the implementation.

➢ To inform the public about the planning process and provide opportunities for them to share ideas in order to recruit new constituencies for conservation actions.

The goal is not to reach consensus on every plan element within the limited time available for the process. The most important outcome will be for planners to understand different perspectives, allay fears where possible, and build broad-based public support. Building relationships and bringing diverse constituencies together to gain mutual understanding is a sound investment in establishing trust that will pay off in streamlining future decisions.

The early communications efforts included news releases (pages 1616-23), a brochure (pages 1624-25), a website (pages 1626-27) and a powerpoint presentation (Appendix 5.2, pages 1851-1880).

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Lincoln speaks in favor of conservation funding


Sen. Blanche Lincoln

WASHINGTON D.C. - As the 108th Congress convenes, funding for conservation programs is at the top of the list for Sen. Blanche Lincoln, D-Ark. Lincoln said last week that increased funding provides states with the resources critically needed for wildlife conservation and restoration efforts.

Congress is debating whether to reduce funding for conservation programs. If passed, the Arkansas Game and Fish Commission could lose some grant money, compared to last year's funding level, under the FY 2003 Interior Department appropriations bill headed for a vote in the U.S. Senate.

The Senate bill would cut the state wildlife grants to $45 million this year, down from the $100 million included in the Senate's original version of the legislation and the $85 million actually appropriated in FY 2002.

On the floor of the Senate, Lincoln said the loss of the funds would endanger many programs. "These funds will enable the states to proactively plan and implement their wildlife management strategies for game and nongame species in cooperation with landowners to their mutual benefit," she said. Lincoln added that she would ask the managers of the bill "to give serious consideration to significantly increase the funding for this critical program."

In Arkansas, the proposed funding amount would be less than half from a year ago, according to the AGFC's grants administrator Kris Rutherford. "Basically, this would mean that Arkansas would receive an apportionment of about $450,000 out of this round of grants. This is half of last year's $906,000 out of state wildlife grants and even less than our Wildlife Conservation and Restoration Program apportionment of $565,000 from two years ago," Rutherford said.

The bill under consideration does not allow education or recreation-related projects, so the AGFC may have severe federal funding cuts to research and habitat restoration projects. This would include those species that do not normally receive funding consideration under traditional federal aid programs.

A few examples of AGFC projects that were funded with last year's grant money that could be affected by the reduced funding include studies on habitat change on the Arkansas and White Rivers, an endangered bat monitoring project and a study of songbirds.

The state wildlife grant program was part of a compromise measure Congress authorized in 2001, in what at the time was called a compromise for not passing the Conservation and Reinvestment Act (CARA) that would have guaranteed annual conservation funding of $2 billion, the majority of it flowing directly to the states and local communities.

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Lincoln champions state wildlife grant funding

Blanche Lincoln accepting an award from "Teaming with Wildlife"

WASHINGTON, D.C. - Senator Blanche Lincoln has again championed full funding for State Wildlife Grants.

She joined Senator Warner (D-VT) and Representatives Jim Saxton (R-NJ) and Mike Thompson (D-CA), in initiating "dear colleague" letters that attracted bipartisan support by 32 Senate members and 73 House members for a $125 million FY04 appropriation for State Wildlife Grants.

Senator Mark Pryor signed on to the Lincoln-Warner letter and Representatives Vic Snyder, Faye Boozman and Mike Ross signed on the Saxton-Thompson letter. This important new funding is in addition to that for game species and sport fish, and would amount to nearly $1 million to the Arkansas Game and Fish Commission for nongame species.

Senator Lincoln, along with the other leaders, received an award at a recent Teaming With Wildlife Summit in Washington, DC. AGFC deputy director David Goad attended and presented information on Arkansas' use of State Wildlife Grants funding.

A lifelong proponent of wildlife conservation, Senator Lincoln said "State-based conservation is important because it helps preserve wildlife and the outdoors for our children and our children's children. I'm pleased to work each year on behalf of the many wildlife conservation programs that depend on these vital U.S. Fish and Wildlife Service funds."

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Congress gives boost to state's wildlife programs


Sen. Blanche Lincoln

LITTLE ROCK - New federal funds amounting to $718,409 will flow into Arkansas as its 2004 share of State Wildlife Grants, the nation's core program for preventing wildlife from becoming endangered.

The funding is within the Interior Appropriations Bill, signed by President Bush on Nov. 10, according Sen. Blanche Lincoln. "As an advocate for the outdoors and an avid sportswoman myself, I recognize the importance of promoting and preserving wildlife along with Arkansas' rich tradition of outdoor recreation," Lincoln said. "Wildlife and our nation's lands and waters are the foundation for our outdoor recreation as well as the ecosystems in which we survive. These important grants will protect our ability to hunt, fish, and pursue outdoor activities for years to come," she added.

"We're grateful for the efforts of our Congressional delegation and our many supporters in securing a victory for wildlife during these difficult budget times," said Scott Henderson, AGFC Director. "Putting these dollars to work now will save taxpayers money in the future. It's much cheaper and more successful to keep wildlife off the Endangered Species List," he explained.

Congress awarded $70 million to State Wildlife Grants, a $10 million increase above the President's budget request and $5 million above the 2003 allocation.

Seventy-three members of the House of Representatives and 33 Senators signed letters seeking a substantial increase in funding. Congressmen Boozman, Ross and Snyder supported full funding for State Wildlife Grants (as an appropriator Congressman Berry typically does not sign on to funding initiatives). Senators Lincoln and Pryor supported full funding for State Wildlife Grants and the Conservation Trust Fund, with Senator Lincoln again championing State Wildlife Grants by co-authoring a Dear Colleague letter with Senator Warner (R-VA).

A coalition of 3000 groups called Teaming With Wildlife has been instrumental in gaining key bipartisan support for State Wildlife Grants. Coalition members range from sportsmen and women to birdwatchers and outdoor-related businesses.

Only in its fourth year, State Wildlife Grants are providing critical funding for hundreds of species in Arkansas not hunted or fished for. Like most states, the AGFC was funded chiefly through sportsmen and women's dollars from hunting and fishing license sales and excise taxes on gear—not enough to safeguard the full spectrum of wildlife and the habitats they depend on. With passage of the 1/8 cent Conservation Sales Tax, and funding from State Wildlife Grants AGFC can focus additional effort on species of greatest conservation need.

The new funds for conserving declining species require a match that stretches federal taxpayer dollars and in Arkansas has led to a growing number of partnerships with Arkansas Natural Heritage Commission, US Forest Service, Arkansas Nature Conservancy and others.

Projects funded so far include wildlife viewing blinds and brochures, a new book on Arkansas herpetology, Quail/Pine Blue Stem ecosystem research, nesting and habitat use by Swallow-Tailed Kites, and identification of Arkansas crayfish.

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Arkansas' congressional leaders take a stand for state's wildlife

Sen. Blanche Lincoln, Rep. Vic Snyder, Rep. Mike Ross, Sen. Mark Pryor

WASHINGTON, D.C. - In a strong show of support for America's wildlife, Sen. Blanche Lincoln, Sen. Mark Pryor, Rep. Vic Snyder, and Rep. Mike Ross joined a bipartisan group of 111 members of the U.S. House of Representatives and 52 senators in signing letters to key congressional leaders urging a substantial increase in funding for wildlife conservation. The letters, to the Chairman and Ranking Member of the Interior Appropriations Committee in both the House and Senate, support a funding level of $100 million for the State Wildlife Grants Program in Fiscal Year 2005. Last year the program secured $70 million in funding. The President's Fiscal Year 2005 budget proposed increasing the program to $80 million. This letter by members of Congress recognizes the need is even greater by requesting an even greater increase. Created by Congress in 2001, the State Wildlife Grants program is the nation's core program for preventing wildlife from becoming endangered in every state. By making early strategic investments to conserve wildlife and habitat, the program helps states recover declining wildlife, saving both wildlife and taxpayer dollars and reducing costs and conflicts over endangered species listings. A matching requirement leverages federal funding from state and private sources, often doubling the impact of every dollar of federal funding. In its first few years, the program has already helped restore degraded habitat, reintroduce native species, and encourage the effective stewardship of private lands.

"We are extremely grateful to our Representatives and Senators who have joined together in this strong show of support for wildlife conservation. In a tight budget year, this bipartisan group of leaders is standing up for a program that works," Arkansas Game and Fish Commission director Scott Henderson said. "These conservation leaders have demonstrated that they are true champions for America's fish and wildlife," he added.

The campaign for the letters was led by a bipartisan group of congressional leaders from across the nation. In the Senate, the letter was led by Senator Blanche Lincoln (D-Arkansas) and Senator John Warner (R-Virginia). In the House of Representatives by Rep. Mike Thompson (D-California), Rep. Jim Saxton (R-New Jersey), Rep. Ron Kind (D-Wisconsin) and Rep. Robin Hayes (R-North Carolina). Senator Lincoln and Representatives Thompson and Hayes are co-chairs of the Congressional Sportsmen's Caucus, a bipartisan group of members of Congress who support hunting, fishing and conservation. This caucus, the largest in Congress, includes Representatives Kind and Saxton, Senator Warner, and many other supporters of the State Wildlife Grants letter. Teaming With Wildlife, a national coalition of more than 3000 groups representing sportsmen, environmentalists, wildlife management professionals, and outdoor-related businesses, supports the State Wildlife Grants program. Copies of the final House and Senate letters, along with additional information on the State Wildlife Grants program and the Teaming With Wildlife campaign is available at www.teaming.com.

#

Following pages:

Putting the Pieces Together for the Next Generation of Conservation

Each state strategy will create a dynamic vision for the future of wildlife conservation. To get America's wildlife on sure-footing the strategy will…

- Address the broad array of wildlife.
- Be fiscally responsible by proactively conserving wildlife, saving taxpayer dollars, and spurring strategic investments into conservation.
- Create partnerships, so the strategy's broad perspective works through local actions and builds on past efforts for the benefit of all wildlife.
- Not introduce new regulations or constraints.
- Have the long-term goal of keeping common species common for the benefit of all Americans.

Comprehensive Wildlife Conservation Strategy

How Do I Get Involved?

This is your opportunity to shape the direction of current and future wildlife conservation efforts. State wildlife agencies will coordinate the best thinking about wildlife for their design – yet they will need your help. Your experience, expertise, and ideas are important and you should consult with your state so that your interests have been considered.

For more information

- Visit the Teaming with Wildlife at **www.teaminq.com.** or
- Arkansas Game and Fish Comission at **www.agfc.com**

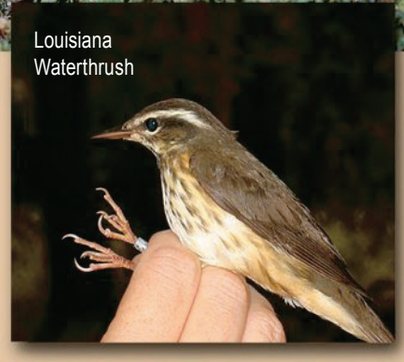
Arkansas Game and Fish Comission
2 Natural Resources Drive
Little Rock, AR 72205
501-223-6300 • www.agfc.com

Marbled Salamander

Designing a Future for America's Wildlife

On the cover
Top photo:
Rough Green Snake
Bottom photo:
Bald Eagle

This page Bottom right: Crayfish (Fallicambarus)



Louisiana Waterthrush

Red-eared Slider

Some Species of America's Wildlife are on Shaky Ground

More and more, there are stories about our rare animals, the troubles facing fish and wildlife, and the increasing loss of their habitat. What about in your own neighborhood or community? Have you seen a change in the landscape, fewer trees and wetlands, more houses and fewer places for wildlife?

If you have, you're not alone. Despite our efforts, America's wildlife is declining – today there are more than 6,000 wildlife species at risk of extinction.

Many Arkansans are concerned about our wildlife and recognize the need to close the gaps in wildlife conservation.

Prothonotary Warbler

We Need to Keep Common Species Common

Conservation efforts, made possible by our state's sportsmen and women, and the federal government have done much, but more needs to be done. Much has been learned from the successes and the challenges of these efforts. We now know to prevent further wildlife declines and endangerment, proactive conservation efforts built upon existing efforts are needed for the broad array of wildlife.

We Need Cost-effective Prevention of Wildlife Declines

Recovery of imperiled species is expensive and often controversial. It is more cost effective and practical to prevent their decline in the first place.

Wood Frog

Barred Owl

American Alligator

We Need Innovation and Efficiency through Partnerships Working on Common Goals

Through decades of trial and error government agencies, conservation organizations, local businesses and individuals have learned that conservation cannot be achieved alone. With partnerships and cooperation, resources can be pooled and creative solutions forged to confront the complex challenges facing wildlife.

A strategy is needed for long-term wildlife conservation that articulates a clear vision for the future, while remaining locally driven, proactive, flexible, and integrated with the work of others. Today there is a unique opportunity before us to do just this…

Putting America's Wildlife on Sure-footing

The U.S. Congress has responded to the problem facing America's wildlife by enacting a visionary program to keep common species common and chart a future for wildlife conservation – State Wildlife Grants. This is the solution to America's wildlife woes, creating a new way of doing conservation business complementing the strengths of previous and ongoing efforts.

- The Arkansas Game and Fish Commission, along with all other state fish and wildlife agencies will produce a comprehensive wildlife conservation vision or strategy for their state by October 2005.

The intent is to focus on those wildlife species in each state with the greatest conservation need and their habitats.

- These strategies, designed uniquely for each state and eco-region, will address the threats facing the broad array of wildlife nationally with flexible and meaningful solutions. Specific actions with measurable results will be identified by each state.
- Through matching grants, federal state and private resources will be leveraged to focus on local challenges.
- Partnerships will be crucial to these strategies, so the past efforts and plans of agencies and conservation organizations can be integrated to work together and create new efficiencies. For example, the strategies will coordinate on-the-ground conservation from diverse funding sources, including State Wildlife Grants, the Farm Bill, and other programs.

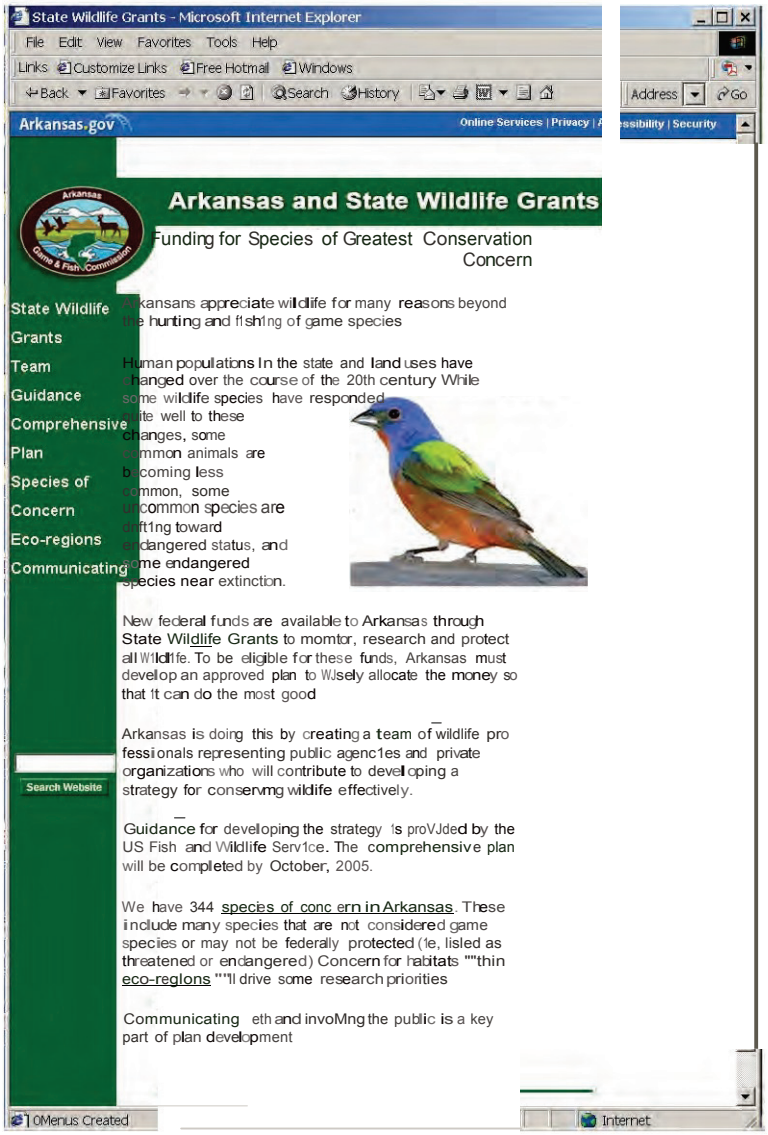
Where do you fit in?

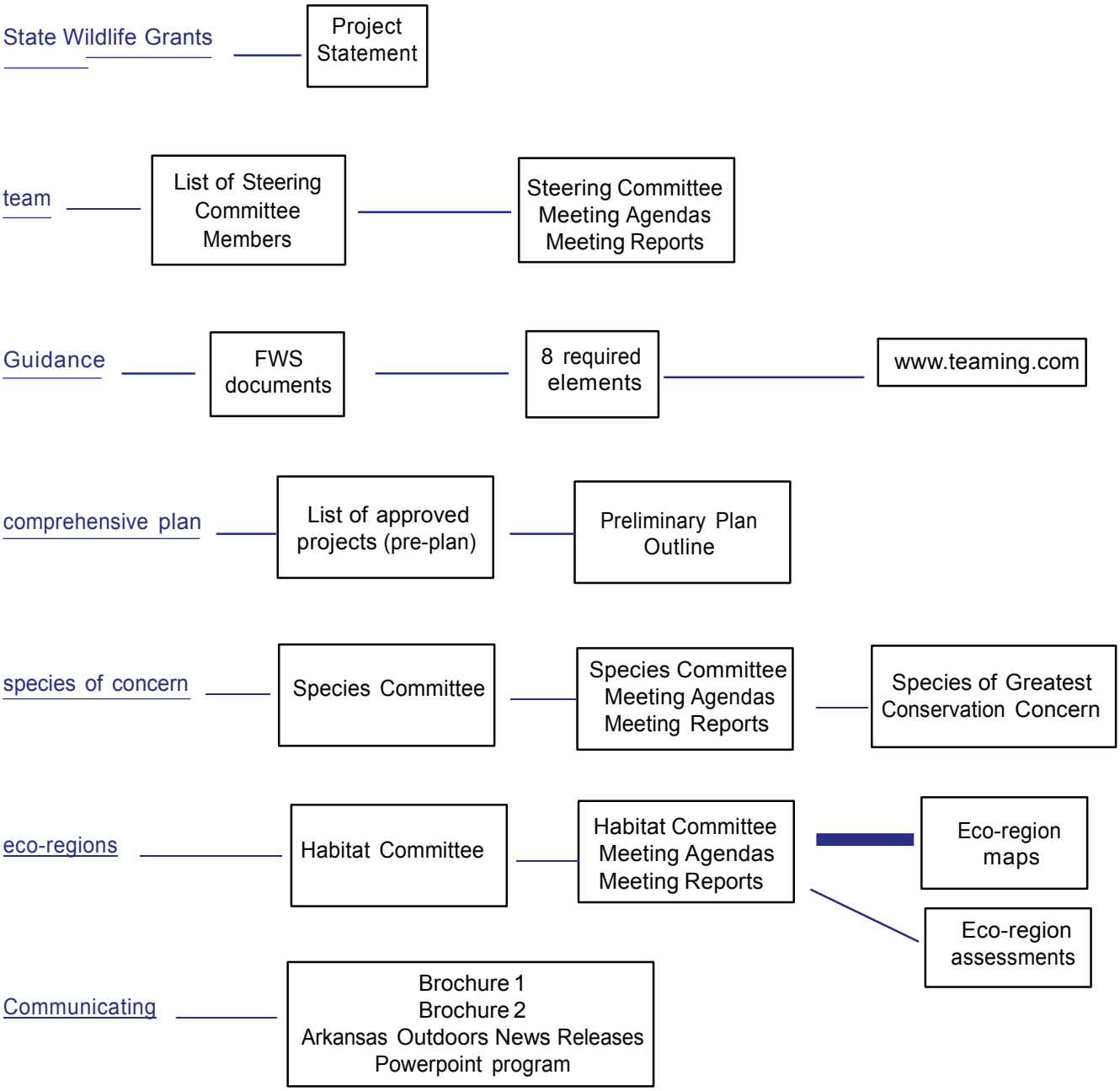
Partnerships and your input are essential to Arkansas' vision for the future conservation of your wildlife. Together these pieces form a complete picture that is the strategy.

- Information: The distribution and abundance of wildlife, the condition of their habitats, the threats facing them.
- Funding: Federal, state, and private funding, including a state and private match.
- Partnerships: Federal, state, and local agencies, conservation organizations, businesses, and individuals should be involved in the development and implementation of the strategy.

Informational Website (early versions)

Arkansas maintained an informational website during the stages of strategy development. This served as an adaptable means to inform partners and public about the processes involved in creating the Comprehensive Wildlife Conservation Strategy.




State Wildlife Grants
Project Statement
team
List of Steering Committee Members
Steering Committee Meeting Agendas Meeting Reports
Guidance
FWS documents
8 required elements
www.teaming.com
comprehensive plan
List of approved projects (pre-plan)
Preliminary Plan Outline
species of concern
Species Committee
Species Committee Meeting Agendas Meeting Reports
Species of Greatest Conservation Concern
eco-regions
Habitat Committee
Habitat Committee Meeting Agendas Meeting Reports
Eco-region maps
Eco-region assessments
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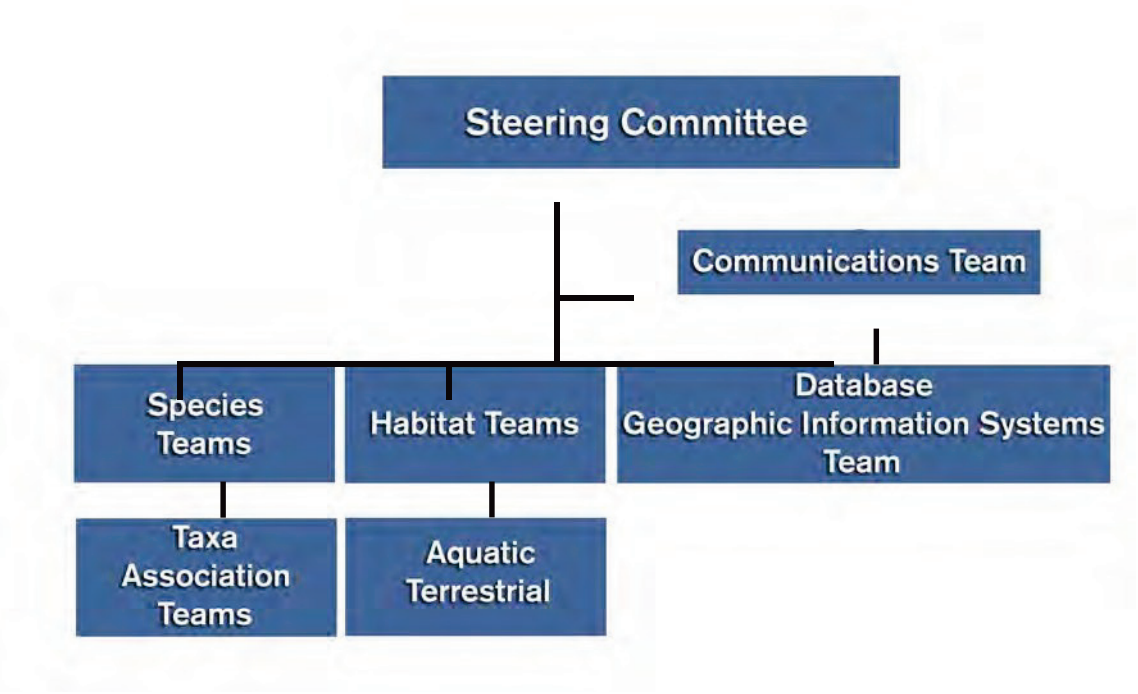
Powerpoint program

Reaching Out to the Scientific Community

Arkansas Game and Fish Commission is the lead agency for development of the Comprehensive Wildlife Conservation Strategy. Arkansas Game and Fish Commission (AGFC) began its public involvement from the outset, reaching out to agency and nonprofit partners to form a broadly representative steering committee. This steering committee in turn reached out to additional partners to create working teams of scientists and technical experts. Figure 6.1 shows the relationship of the organization of the steering committee and its work teams. Tables 6.1 and 6.2 list members of the steering committee and scientific expert teams.

Figure 6.1. CWCS Steering Committee and Work Teams.



The species and habitat teams recruited 79 scientists representing 21 institutions to review the species, ecoregion, ecobasin and habitat reports, significantly expanding both individual and institutional partnerships to carry out wildlife conservation in the decades ahead.

Table 6.1. Members of the Original Steering Committee, Species Teams and Habitat Teams.

CWCS Steering Committee Team Members	
Allan Mueller	US Fish and Wildlife Service
Ken Smith	Audubon Arkansas
Bill Holimon	Arkansas Natural Heritage Commission
Doyle Shook	Arkansas Game and Fish Commission
Lucy Moreland	Arkansas Game and Fish Commission
Steve Filipek	Arkansas Game and Fish Commission
Kris Rutherford	Arkansas Game and Fish Commission
Mike Fuhr	The Nature Conservancy
Lane Patterson	The Nature Conservancy
Kay McQueen	The Nature Conservancy
Betty Crump	US Forest Service and Arkansas Academy of Sciences
Jim Baker	Natural Resources Conservation Service
John Sunderland	Arkansas Game and Fish Commission
Jeff Johnston	Arkansas Game and Fish Commission
Jane Anderson	Arkansas Game and Fish Commission

CWCS Species Team	
Bill Holimon (Team Leader)	Arkansas Natural Heritage Commission
Michael Warriner	Arkansas Natural Heritage Commission
Catherine Rideout	Arkansas Game and Fish Commission
Mike Fuhr	The Nature Conservancy
Blake Sasse	Arkansas Game and Fish Commission
Kelly Irwin	Arkansas Game and Fish Commission
Bill Posey	Arkansas Game and Fish Commission
Brian Wagner	Arkansas Game and Fish Commission
Steve Filipek	Arkansas Game and Fish Commission

CWCS Habitat Team	
Steve Filipek (Team Leader)	Arkansas Game and Fish Commission
Jeff Holmes	Conservation Southeast
Betty Crump	US Forest Service
Ken Smith	Audubon Arkansas
Tom Foti	Arkansas Natural Heritage Commission
Mike Fuhr	The Nature Conservancy
Bill Keith	Arkansas Department of Environmental Quality
Elizabeth Murray	Multi-Agency Wetland Planning Team

Jeff Quinn	Arkansas Game and Fish Commission
Doyle Shook	Arkansas Game and Fish Commission
Allen Clingenpeel	US Forest Service
Doug Zollner	The Nature Conservancy
Don Catenzaro	FTN Associates

CWCS Database Team

Jeff Johnston (Team Leader)	Arkansas Game and Fish Commission
Cindy Osborne	Arkansas Natural Heritage Commission
Lane Patterson	The Nature Conservancy
Kaushik Mysorekar	The Nature Conservancy
Sagar Mysorekar	The Nature Conservancy

Table 6.2. Members of Taxa Association Teams during AWAP formation.

Bird Taxa Association Team	
ANHC	Bill Holimon
USFS	Steve Duzan
USFWS	Allan Mueller
AGFC	Catherine Rideout
AGFC	Karen Rowe
Audubon Arkansas	Dan Scheiman

Mammal Taxa Association Team	
AGFC	Blake Sasse
UALR	Bob Sikes
UAM	Don White
UALR	Gary Heidt
ASU	J. D. Wilhide
HSU	Renn Tumlison
ATU	Tom Nupp
ASU	Thomas Risch
USFS	David Saugey
ASU	Stephen Brandenbura

Mussel Taxa Association Team	
AGFC	Bill Posey
USFWS-ES	Chris Davidson
ASU	Alan Christian
TNC	Doug Zollner
AHTD/ASU	John Harris

Crayfish Taxa Association Team	
AGFC	Brian Wagner

Reptile and Amphibian Taxa Association Team	
ASU	Stan Trauth
AGFC	Kelly Irwin

Fish Taxa Association Team	
AGFC	Steve Filipek
SAU	Henry Robison
UA/Ft. Smith	Tom Buchanan
AGFC	Jeff Quinn
AGFC	Brian Wagner
AGFC	Bill Posey
USFS	Betty Crump

ADEQ	Jim Wise
USFS	Alan Clingenpeel

Invertebrate Taxa Association Team

ANHC	Michael Warriner

Karst Species SubTeam

TNC	Tim Snell
TNC	Michael Slay
TNC	Ethan Inlander
AGFC	Brian Wagner

Reaching Out To the Public

Developing a working partnership with the Cooperative Extension Service:

In 2004, AGFC formed a working partnership with the University of Arkansas, Cooperative Extension Service to plan and implement a comprehensive public involvement strategy. The goal was to reach out to private landowners through Extension's network of 75 county offices to build state outreach capacity that would carry over into future implementation. The Cooperative Extension Service retained ComMetrics, Inc., a consulting firm with experience in leading public involvement processes, to assist in the effort. With this partnership in place, a communications team was recruited to lead the public involvement process (Table 6.3)

Table 6.3. CWCS Communications Team.

Becky McPeake	University of Arkansas, Cooperative Extension Service
Sandra Miller	ComMetrics, Inc.
Jane Anderson	Arkansas Game and Fish Commission
Elizabeth Murray	Multi-Agency Wetland Planning Team
Arlene Green	Arkansas Game and Fish Commission
Nancy Ledbetter	Arkansas Game and Fish Commission
Ellen Fennell	Audubon Arkansas
Steve Filipek	Arkansas Game and Fish Commission
Lucy Moreland	Arkansas Game and Fish Commission
Cindy Boland	University of Arkansas at Little Rock
Karen Ballard	University of Arkansas Cooperative Extension Service

Gauging Perceptions of Rural Landowners and the General Public[1]

Public Opinion Survey Summary

To begin the process of engaging the public in the CWCS planning process, the communications team retained the University of Arkansas at Little Rock, Institute of Government, to conduct a public opinion survey. The objective of this survey was to gain a better understanding of two different groups' perceptions and values on species and habitat conservation, conservation practices and comprehensive planning.

Two groups were surveyed: the general population of adults over the age of 18 years and rural landowners with more than five acres. The methodology is de- scribed in the introduction to this report. The bullets below provide a quick over- view of the most relevant findings. The survey instrument and report can found in Appendix 6.2 (pages 1881-1910) or at: http://www.WildlifeArkansas.com/materi- als/cwcsfinalreport.pdf

The majority of respondents are very interested in wild animals that live in Arkansas. Rural landowners (64%) were significantly more interested in the state's wild animals than statewide respondents (49%). When asked how important it is for Arkansans to maintain healthy populations of nongame wildlife, support remains high. Fifty-six percent of rural landowners and 60% of the general public find it very important that Arkansans maintain healthy populations of nongame wildlife, a finding that validates Congressional support for the State Wildlife Grants program.

➢ When respondents were asked how much effort should be invested in maintaining healthy populations of specific types of nongame wildlife, support varied. Birds, such as songbirds and owls, received the highest level of support with 78% of both rural landowners and the general population indicating that a lot of effort is warranted. While mammals, such as bats and field mice, received the lowest level of support, 30% of rural landowners and 35% of the general public support a lot of effort to conserve mammals. Perhaps surprisingly, support for maintaining healthy populations of insects such as butterflies and dragonflies was higher than expected with 63% of rural landowners and 61% of the general public stating that a lot of effort should be invested in maintaining healthy populations. Broad support for bird conservation sets the stage for effective public discussion of the need to coordinate conservation efforts among states up and down the Mississippi River flyway. Support for charismatic insects, such as butterflies and dragonflies, creates a firm foundation on which to build support for bees and other pollinators. Lackluster support for mammal conservation suggests the need for increased education.

➢ Respondents were asked a similar series of questions about how much effort should be invested in conserving different types of habitats. Support for a lot of effort varied from 90% of rural landowners and 89% of the general public supporting a lot of effort to maintain rivers, streams and lakes to 67% of rural land- owners and 64% of the general public supporting a lot of

effort to maintain pastures, fencerows, and other agricultural lands as habitat for wildlife.

➢ Respondents were asked about the acceptability of two illustrative management practices to gauge support for different types of conservation action, pre- scribed burning and selective thinning of timber. Altogether, 89% of rural land- owners and 88% of the general public find controlled fires to be an acceptable practice for improving wildlife habitat. Just over half of both groups find this practice to be very acceptable. Eighty percent of both groups think thinning timber tracts is an acceptable way to make wildlife habitat more suitable while not quite half — 44% of rural landowners and 39% of the general public — find thinning very acceptable. Three-quarters of both groups find it acceptable to pay private landowners to engage in practices to improve habitat.

➢ Respondents in both groups tend to be only somewhat concerned about the impact of human activities on nongame wildlife. Fifty-three percent of rural land- owners and 51% of the general population are somewhat concerned. More than a third of each group is very concerned with 35% of rural landowners and 38% of the general population very concerned. These findings may disappoint some and encourage others. To be sure, they highlight the need for all of us to make the connection between our lifestyles and their impact on wildlife and critical habitats and suggest a need to find creative ways to identify practices that lessen our human footprint without reducing our quality of life.

➢ A majority of both groups of respondents, 83% of both rural landowners and the general population, support Arkansas seeking federal funding for wildlife conservation efforts and activities through the State Wildlife Grant program. How- ever, 16% or rural landowners and 17% of the general population either oppose or are unsure about whether Arkansas should seek federal funding to conserve non- game wildlife and their habitats. A clear majority of both groups, 86% of rural landowners and 89% of the general population of adults, support efforts of the Arkansas Game and Fish Commission and its partners to develop an action plan to manage nongame wildlife with public input. About half, 50% of rural landowners and 53% of the general public, strongly support these planning efforts.

With the survey clearly demonstrating that the vast majority of Arkansans in general and rural landowners in specific supported taking action to conserve species and their habitats, the communications team moved forward to involve the public in a dialogue.

[1]Survey Conducted by Survey Research Center for CWCS Institute of Government
University of Arkansas at Little Rock
2801 South University Avenue
Little Rock Arkansas 72204
Release Date: February 2005

Informing and Engaging

The communications team employed a multi-pronged, integrated strategy to in- form and engage the general public, scientific peers, targeted special interest and professional groups and landowners.

"Designing A Future For Arkansas Wildlife" Website

A website was developed as a central clearinghouse for posting and soliciting public and peer comment on the draft strategy, registering the public for stakeholder meetings, and providing background information. The website was purposefully designed to meet the needs of the general public as well as scientists and technical reviewers. The website can be found at: www.WildlifeArkansas.com or through a link at the AGFC website.

Contacting leaders of interested organizations

A letter was sent under the signature of Scott Henderson, Director, Arkansas Game and Fish Commission to leaders of 107 key intermediary organizations that represent or provide information to individuals and landowners with an interest in species and habitat conservation. The letter introduced these key leaders to the CWCS process and invited them to submit names of individuals who could ably represent their interests in a series of stakeholder meetings. A list of the organizations who received this letter follows.

- Agricultural Council of Arkansas
- American Bass Association, Arkansas Chapter
- American Fisheries Society, Arkansas Chapter
- Arkansas Assn. of Conservation Districts
- Arkansas Cattlemen's Association
- Arkansas Chapter, Associated General Contractors
- Arkansas Dairy Cooperative Association
- Arkansas Delta Byways
- Arkansas Dept. of Environmental Quality
- Arkansas Dept. of Parks and Tourism
- Arkansas Environmental Federation
- Arkansas Farm Bureau
- Arkansas Fly Fishers
- Arkansas Forestry Association
- Arkansas Forestry Commission
- Arkansas Geological Commission
- Arkansas Great Southwest Association
- Arkansas Highway and Transportation Department
- Arkansas Home Builders Association
- Arkansas Horse Council
- Arkansas Hospitality Association
- Arkansas Land of Legends Travel Association
- Arkansas Municipal League
- Arkansas Natural Heritage Commission
- Arkansas Office of the Governor
- Arkansas Oil and Gas Commission
- Arkansas Pork Producers Association
- Arkansas Public Policy Panel
- Arkansas Rice Council
- Arkansas Rice Producers Group
- Arkansas River Valley RCandD Council
- Arkansas River Valley Tri-Peaks Region
- Arkansas Rural Water Association
- Arkansas Soil and Water Conservation Commission
- Arkansas South Tourism Association
- Arkansas State Plant Board
- Arkansas State University
- Arkansas Tech University

- Arkansas Travel Council
- Arkansas Water Resource Center
- Arkansas Wildlife Federation
- Association of Arkansas Counties
- Audubon Arkansas
- Bayou Bartholomew Alliance
- Beaver Lake Watershed Partnership
- Cache River Watershed Partnership
- Central Arkansas Planning and Development District
- Central Arkansas RCandD Council
- Central Arkansas Water
- Diamond Lakes Association
- Ducks Unlimited
- East Arkansas Planning and Development District
- East Arkansas RCandD Council
- Farm Service Agency
- Friends of North Fork/White River
- Green Bay Packaging
- Greers Ferry Lake/Little Red River Association
- Heart of Arkansas Travel Association
- Kings River Watershed Group
- Lake Fayetteville Watershed Partnership
- L'Anguille River Watershed Coalition
- Leatherwood Creek Watershed
- Little Red River Action Team
- Livestock and Poultry Commission
- Lower Little River Watershed Coalition
- National Park Service
- National Wild Turkey Federation
- Northwest Arkansas Economic Development District
- Northwest Arkansas RCandD Council
- Northwest Arkansas Tourism Association
- Ouachita Society of American Foresters
- Ouachita Watch League
- Ozark Foothills RCandD Council
- Ozark Gateway Tourist Council
- Ozark Mountain Region
- Plum Creek Timber Company
- Potlatch Corporation
- Quail Unlimited
- Razorback Chapter Soil and Water Conservation Society
- Scott County Organization to Protect the Environment
- Sierra Club, Arkansas Chapter
- Southeast Arkansas RCandD Council
- Southern Arkansas University
- Southwest Arkansas Planning and Development District
- Southwest Arkansas RCandD Council

- Soybean Promotion Board
- Strawberry River Watershed Group
- The Nature Conservancy
- The Poultry Federation
- The Wildlife Society, Arkansas Chapter
- Trout Unlimited
- University of Arkansas
- University of Arkansas at Monticello
- University of Arkansas at Pine Bluff
- University of Arkansas, Cooperative Extension Service
- Upper White River Basin Foundation
- US Fish and Wildlife Service
- US Geological Survey
- USDA Forest Service
- USDA Natural Resource Conservation Service
- West Central Arkansas Planning and Development District
- West Fork - White River Watershed
- Western Arkansas Mountain Frontier
- Western Arkansas Planning and Development District
- Weyerhaeuser
- White County Conservation District
- White River Planning and Development District
- Wildlife Management Institute

Additional contact methods

CWCS informational brochure

A general informational brochure was developed to inform rural landowners and the general public about the CWCS process, its relationship to the State Wildlife Grants program and to promote public involvement through the website. Five thousand copies of the brochure have been distributed.

Developing a mailing list of key opinion leaders

The organizations listed above, communications team and county extension agents submitted names and addresses of individuals and key opinion leaders with a stake in how habitats and wildlife are managed. These were compiled into a segmented mailing list of some 3,700 individuals.

Informational mailing to landowners

An informational mailing was sent to 2,600+ individuals, primarily landowners and members of hunting clubs who participate in the Acres for Wildlife program. This mailing included the informational brochure, an invitation to register online for one of five stakeholder meetings, and links to the website.

Invitation to participate in stakeholder meetings

Individualized letters were sent under the signature of Scott Henderson to 1100+ key opinion leaders inviting them to participate in the stakeholder meetings. These letters included the informational brochure, website address and a mail-in response card.

Email distribution list

Email addresses were collected from the website, response to the stakeholder meeting invitation and other sources to develop an email distribution list. The email distribution list was used to confirm meeting registration, send email reminders, notify individuals of updates to the website and conduct a meeting evaluation after the stakeholder meeting. The email distribution list currently includes 250 individuals.

Native American contact

Although there are no recognized tribes in the state of Arkansas, we have a rich heritage shaped by the cultural mores of the many tribes that occurred in the state and whose members still live here. A letter was sent to recognized tribes in adjoining Oklahoma.

Poster for professional meetings

For a poster session at the Partners In Flight regional meeting (or similar meetings), we created a 4 ft. x 5 ft. poster that described the CWCS planning process and relationships of scientific information to the database.

Engaging staff of key institutional partners

Institutional partnerships are most effective when county staff from different agencies decide to work together to leverage resources and coordinate technical assistance. Recognizing this, a significant component of the public involvement process was "in-reach" to local field staff of key institutional partners. To accomplish this goal, about 40 local staff from three key agencies was recruited to facilitate, record, host and staff the registration table. Staff included NRCS district conservationists, county Extension agents, and AGFC wildlife biologists and Stream Team coordinators. These individuals participated in a special briefing before the stakeholder meetings and received additional briefing materials by email.

Completing the information cycle

Feedback from the website, public meetings, public surveys and public comment was provided to the Taxa Association Teams, Habitat Teams and Peer Reviewers for their use in revising the later drafts of the CWCS database.

Following pages:

Putting the Pieces Together for the Next Generation of Conservation

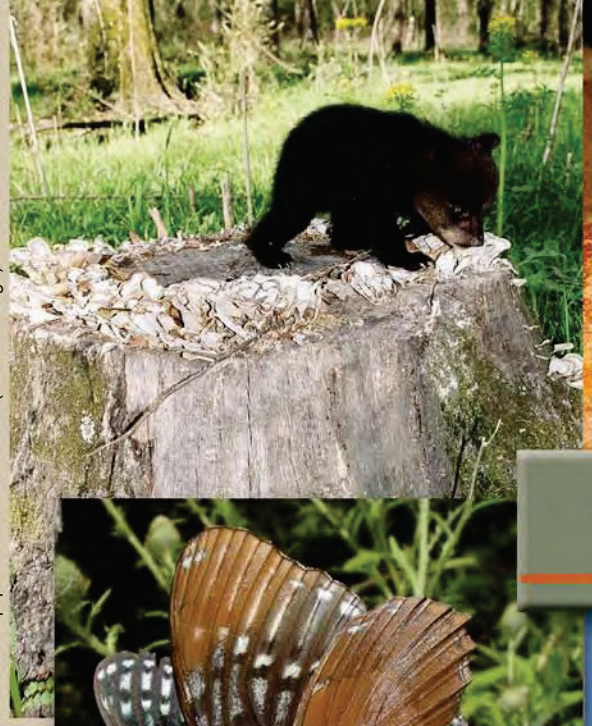
Each state strategy will create a dynamic vision for the future of wildlife conservation. To get America's wildlife on sure-footing, the strategy will…

- Address a wide variety of wildlife.
- Be fiscally responsible by proactively conserving wildlife, saving taxpayer dollars, and spurring strategic investments into conservation.
- Create partnerships, so the strategy's broad perspective works through local voluntary actions and builds on past efforts for the benefit of all wildlife.
- Have the long-term goal of keeping common species common for the benefit of all.

How Do I Get Involved?

This is your opportunity to shape the direction of current and future wildlife conservation efforts. State wildlife agencies are coordinating the best thinking about wildlife for their design and they will need your help. Your experience, expertise, and ideas are important.

For information and updates:
www.WildlifeArkansas.com

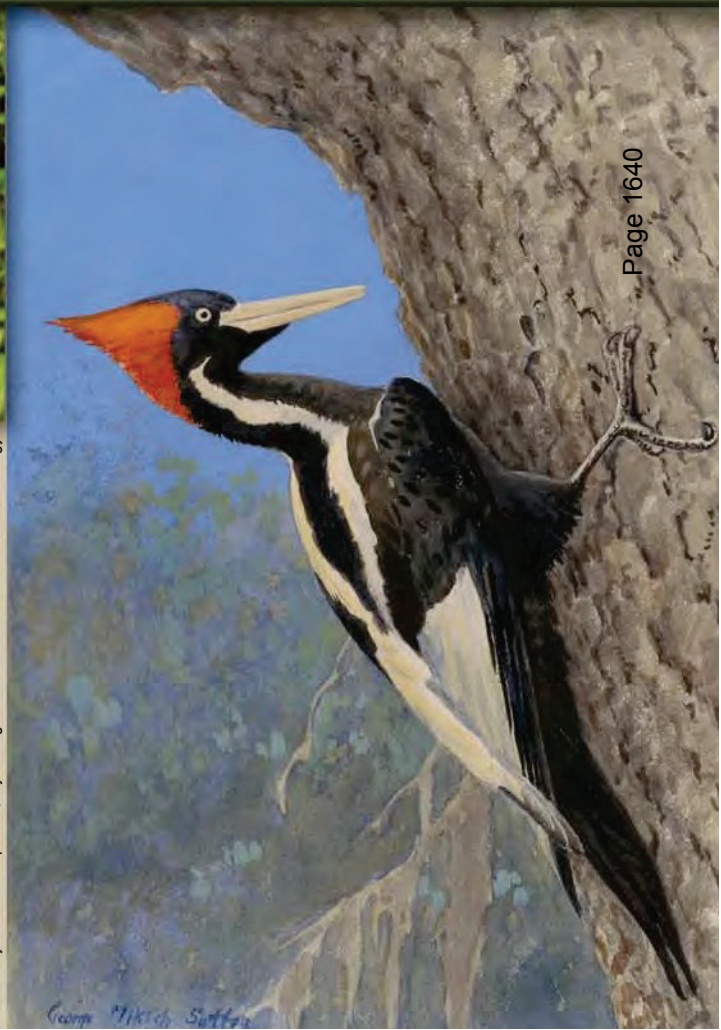


White River population of Black Bears (Rick Eastridge)

Diana Butterfly
(Herschel Raney)

Eastern Spadefoot Toad
(Suzanne L. Collins)

Designing a Future for Arkansas Wildlife



Ivory-billed Woodpecker, by George M. Sutton/Cornell Lab of Ornithology

Arkansas Game and Fish Comission • 2 Natural Resources Drive • Little Rock, AR 72205
501-223-6300 • www.agfc.com

Partners

Audubon

Arkansas Game & Fish Commission

UofA University of Arkansas Division of Agriculture Cooperative Extension Service

The Arkansas Academy of Science 1917

Arkansas State Parks

Forest Service US Department of Agriculture

Arkansas Natural Heritage Commission

U.S. Fish & Wildlife Service Department of the Interior

The Nature Conservancy Saving the last great places on earth

Arkansans Value Wildlife

Many Arkansans are concerned about our wildlife and recognize the need to close the gaps in wildlife conservation. While some wildlife species in Arkansas are prospering, such as white-tailed deer and wild turkey, many others are declining.

Have you seen a change in the landscape, fewer trees and wetlands, more houses and fewer places for wildlife to live? If you have, you're not alone.

This partnership to develop a comprehensive wildlife conservation strategy for Arkansas is seeking to achieve a balanced and practical approach to conserving our natural resources..

Ornate box turtle
(Suzanne L. Collins)

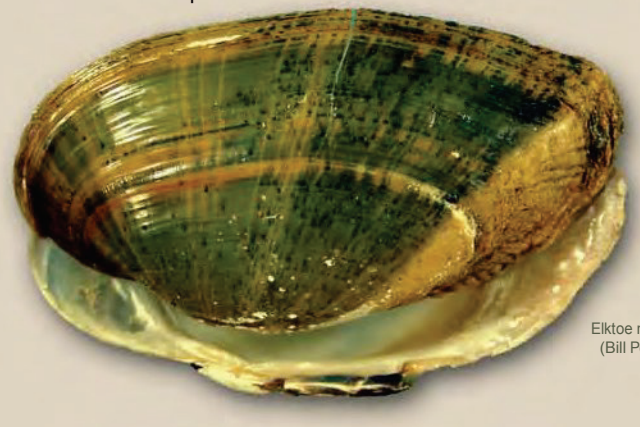
We Need to Prevent the Decline of our Wildlife

Conservation efforts, made possible by our state's sportsmen and women, and the federal government have done much, but more needs to be done. Much has been learned from the successes and the challenges of these efforts. We now know to prevent further wildlife declines and endangerment, proactive conservation efforts built upon existing efforts are needed for the broad array of wildlife.

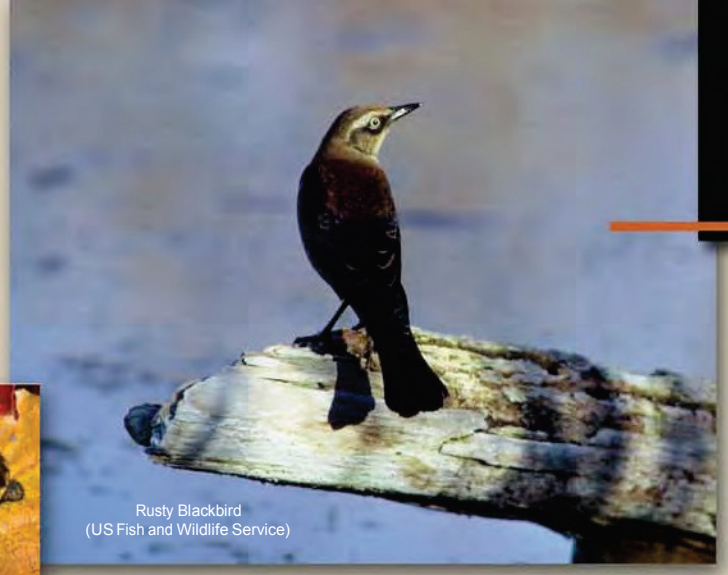
Ozark Cave Amphipod
(Jason Gunter)

We need Voluntary Actions and Cost-effective Measures

Recovery of imperiled species is expensive and often controversial. It is more cost effective and practical to prevent their decline in the first place.



Elktoe mussel
(Bill Posey)



Rusty Blackbird
(US Fish and Wildlife Service)

Goldstripe Darter
(G.W. Sneegas)

Innovation and Efficiency through Partnerships Working Together

Through decades of trial and error government agencies, conservation organizations, local businesses and individuals have learned that conservation cannot be achieved alone. With partnerships and cooperation, resources can be pooled and creative solutions forged to confront the complex challenges facing wildlife.

A strategy is needed for long-term wildlife conservation that articulates a clear vision for the future, while remaining locally driven, proactive, flexible, and integrated with the work of others. Today there is a unique opportunity before us to do just this…

Putting America's Wildlife on Sure Footing

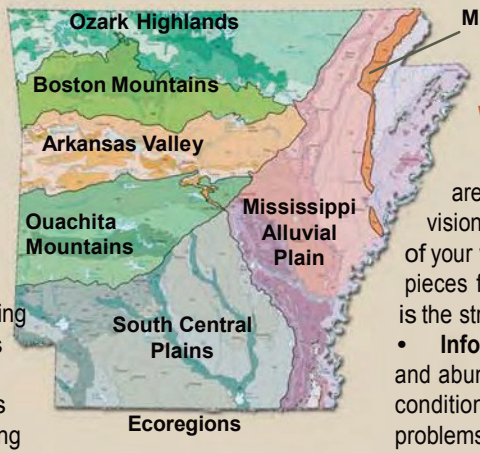
The U.S. Congress has responded to the problem facing America's wildlife by enacting a visionary program to keep common species common and chart a future for wildlife conservation – **State Wildlife Grants**. This is one solution to America's wildlife woes, creating a new way of doing conservation business building on the strengths of previous and ongoing efforts.

- The Arkansas Game and Fish Commission, along with its partner agencies and organizations, will produce a comprehensive wildlife conservation strategy by October 2005.

Comprehensive Wildlife Conservation Strategy

The intent is to focus on those wildlife species with the greatest conservation need and their habitats.

- The strategy, designed uniquely for Arkansas and its ecoregions, will address the problems facing wildlife with flexible and meaningful solutions. Specific actions with measurable results will be identified.
- Through matching grants, federal state and private resources will be leveraged to focus on local solutions to problems.
- Partnerships will be crucial to these strategies, so the past efforts and plans of agencies and conservation organizations can be integrated to work together and create new efficiencies. For example, the strategies will coordinate on-the-ground conservation research and work from diverse funding sources, including State Wildlife Grants, the Farm Bill and other programs.



Ecoregions

Where do you fit in?

Partnerships and your input are essential to Arkansas' vision for the future conservation of your wildlife. Together these pieces form a complete picture that is the strategy.

- **Information:** The distribution and abundance of wildlife, the condition of their habitats, the problems facing them.
- **Funding:** Federal, state, and private funding, including a state and private match.
- **Partnerships:** Federal, state, and local agencies, conservation organizations, businesses, and individuals will be involved in the development and implementation of the strategy.

A letter was sent under the signature of Scott Henderson, Director, Arkansas Game and Fish Commission to leaders of 107 key intermediary organizations that represent or provide information to individuals and landowners with an interest in species and conservation.

Name>
<Organization>
<Address>
<City>, <STATE> <Zip>
Dear <Name>:

As a leader in your community and a representative of <organization>, I am writing today to invite you to participate in a regional stakeholder meeting where we will discuss *Designing A Future for Arkansas Wildlife*. The meeting will be held <date> at <place, address>. Registration will start at 5:00 p.m. A light buffet dinner will be served. The meeting will start at 6:00 p.m. and end at 8:30 p.m.

Registration will be limited to 60 participants. In order to participate, please return the enclosed response card or email Sandra.miller@conwaycorp.net or call 501-327-5898. If you call or email, leave a message with your name, full contact information and the location of the meeting you will attend.

Many species of nongame wildlife are declining in Arkansas and every state across the country. Recognizing this, Congress has created the *State Wildlife Grants Program* to provide states with funds for conserving "species of greatest conservation need." To be eligible for these funds, states are developing *Comprehensive Wildlife Conservation Strategies* to fund research and conservation efforts. Arkansas is in line to receive nearly a million federal dollars a year from the *State Wildlife Grants Program* if we prepare a strategy approved by the Fish and Wildlife Service.

The Arkansas Game and Fish Commission is the lead in pulling together the Comprehensive Wildlife Conservation Strategy. Our partners in this effort include U.S. Fish and Wildlife Service, Nature Conservancy, Audubon Society, Cooperative Extension Service, U.S. Forest Service, Natural Heritage Commission and others. We are requesting your participation in this meeting to incorporate your review and suggestions in the strategy.

These groups are determining ways to promote voluntary conservation strategies that maintain or restore habitats where 'species of greatest conservation need' live. In the meantime, we want to share our draft strategy with stakeholders in a series of regional meetings and get input from you about what conservation actions make the most sense-and what will be needed to get private landowners to implement them.

Enclosed you will find a brochure with more information. You can also go to www.wildlifearkansas.org for more information.

We hope you will be able to join us on <date>.

Sincerely,

Scott Henderson
Director

An informational mailing was sent to 2,600+ individuals, primarily landowners and members of hunting clubs who participate in the Acres for Wildlife program.

May 2005

Dear Acres for Wildlife Participant:

As a participant in the Acres for Wildlife program, you know firsthand how simple voluntary conservation actions can help improve wildlife habitat. We need your input to help develop a statewide plan for conservation of non-game wildlife. Let me explain.

Recognizing the effectiveness of Acres for Wildlife and other voluntary efforts, Congress has created the State Wildlife Grants Program to provide states with funds for conserving species of greatest conservation need. Arkansas is in line to receive nearly a million federal dollars a year for research and designing conservation actions. To be eligible for these funds, states must submit a Comprehensive Wildlife Conservation Strategy to the federal government for approval by October 1 this year.

There are two ways you can participate in this planning process. You can share your thoughts online by going to www.wildlifearkansas.com or you can participate in one of five regional stakeholder meetings.

Regional stakeholder meetings are scheduled: June 7 in **Hope**, June 9 in **Jonesboro**, June 14 in **Fayetteville**, June 20 in **Lake Village**, and June 30 in **Little Rock**. At these meetings, we will share the draft strategy. Working in small groups, participants will discuss ways to promote voluntary conservation strategies that maintain or restore habitats where "species of greatest conservation need" live, sharing ideas about what conservation actions make the most sense in the context of today's complex production practices and what efforts will be needed to get private landowners to implement them.

If you would like to attend a regional stakeholder meeting, go to www.WildlifeArkansas.com. Click on "news & announcements" and "attend a stakeholder meeting." Tell us which meeting you want to attend and your name, mailing address, and telephone number so we can get in touch with you! If you don't have internet access, contact your local county Extension office and provide them the website information, so they can sign you up. Registration will be limited to 60 participants so let us know soon if you want to participate. Advance registration is required.

I encourage you to read the enclosed brochure or go to the Designing A Future for Arkansas Wildlife website at www.WildlifeArkansas.com to learn more. Your input is important.

Sincerely,

Scott Henderson

Scott Henderson
Director

Individualized letters were sent under the signature of Scott Henderson to 1100+ key opinion leaders inviting them to participate in the stakeholder meetings. These letters included the informational brochure, website address and a mail-in response card.

May 19, 2005

«MM» «FirstName» «LastName»
«Organization»
«Address» «Address_2»
«City», «State» «Zip»

Dear Friend:

As someone with an interest in how Arkansas wildlife is managed, you know firsthand how voluntary conservation actions can help improve wildlife habitat. Recognizing the effectiveness of voluntary conservation measures, Congress has created the State Wildlife Grants Program to provide states with funds for conserving species of greatest conservation need. Arkansas can receive nearly a million federal dollars a year for research and designing conservation actions. To be eligible for these funds, states must submit a Comprehensive Wildlife Conservation Strategy to the federal government by October 1. We need your input in developing this action plan.

You are invited to participate in a regional stakeholder meeting where we will share the draft strategy prepared by the Arkansas Game & Fish Commission and its partners. Working in small groups, participants will discuss ways to promote voluntary conservation strategies that maintain or restore habitats where wildlife live, sharing ideas about what conservation actions make the most sense and what efforts will be needed to get private landowners to implement them voluntarily.

Whether someone from your organization has already talked to you about participating or this is the first you've heard about it, we hope you will participate in one of the following meetings.

June 7 University of Arkansas Community College, 2500 South Main, **Hope**
June 9 Forrest L. Wood Crowley's Ridge Nature Center, 600 E. Lawson Rd, **Jonesboro**
June 14 University of Arkansas Center for Continuing Education, 2 East Center St., **Fayetteville**
June 20 Lakeside High School Commons, Hwy 82 West, **Lake Village**
June 30 University of Arkansas Cooperative Extension Service, 2301 S. University, **Little Rock**

A light buffet dinner will be served at 5:00 p.m. The meeting will start at 6:00 p.m. and end at 8:00 p.m. Meeting participation is limited to 60 participants so advance registration is required. To register, return the enclosed response card or register online at www.WildlifeArkansas.com. Click on "news & announcements" and "attend a stakeholder meeting." Tell us which meeting you will attend and your name, mailing address, and telephone number.

To learn more, read the enclosed brochure or go to the **Designing A Future For Arkansas Wildlife** website at www.WildlifeArkansas.com. Your input is important to us.

Sincerely,

Scott Henderson

Scott Henderson
Director

Stakeholder Meeting Agenda

Comprehensive Wildlife Conservation Strategy

Schedule of Meetings

June 7	Hope
June 9	Jonesboro
June 14	Fayetteville
June 20	Lake Village
June 30	Morrilton

Meeting Agenda

5:00 p.m. Registration

5:30 p.m. Light Buffet Dinner

6:00 p.m. **Welcome**
Local Host, County Extension Agent

Recalling Our Connection To Wildlife
An interactive exercise

6:35 **Why Are We Here?**
A PowerPoint Presentation that explains the goal of the Comprehensive Wildlife Conservation Strategy, the planning process laid out by Congress, and a concise summary of where we are in the process.

7:05 **Small Group Discussions**

What do you think about the list of species of greatest conservation need? What is missing? What should be removed? Why?

What conservation practices will be most attractive to private landowners? Why are they attractive?

What prevents landowners from implementing conservation practices that benefit wildlife? Why?

7:50 **Where Do We Go From Here?**

8:00 **Adjourn**

Stakeholder Meetings

Registration at the meeting in Hope

Nearly 250 individuals attended five evening stakeholder meetings in Hope, Jonesboro, Fayetteville, Lake Village and Little Rock in June 2005. To start each meeting, a local host told a story about a species and/or habitat that hold special childhood memories that children of today are less likely to experience. Participants were asked to add species that they used to see but rarely see today to the list.

Local Jonesboro host and storyteller, Jodi Morris, collects names of species from participants

Presentation

In addition to the informal survey, the stakeholder meeting included a PowerPoint presentation (Appendix 6.3, pages 1911-1962) on the federal requirements for the Comprehensive Wildlife Conservation Strategy and the current status of the planning process in Arkansas.

John Sunderland presents illustrated talk about CWCS in Fayetteville.

Small Discussion Groups

During the stakeholder meetings, facilitated small group discussions were held, giving participants an opportunity to discuss what they had just heard about the scope and direction of the Comprehensive Wildlife Conservation. Participants were asked to discuss three questions. Recorders captured the range of participant perspectives and suggestions. The three discussion questions were:

➢ What do you think about the list of species of greatest conservation need? Why?

➢ What conservation practices will be most attractive to private landowners? Why are they attractive?

➢ What prevents landowners from implementing conservation practices that benefit wildlife? Why?

Small group discussion in Lake Village, Arkansas

A summary of the types of comments collected from the small group discussions can be found below. This summary is meant to provide a general sense of the range of ideas and common themes expressed by participants. The steering committee and work teams have used input from these stakeholder meetings to revise and refine the CWCS. This feedback will provide a framework to help guide and evaluate how Arkansas presents species and habitat information to the public and how it promotes voluntary conservation actions.

Lively discussion preceded ...

... and followed each meeting.

Summary of Small Group Discussions

The goal of the small group discussions was to surface the range of opinions, not to come to consensus. Ideas are grouped into general themes, some themes also have sub-themes. In many instances, ideas and suggestions conflict, which reflects the range of opinions expressed in small group discussions. Quotations that capture the essence of the discussion are included in italic, where appropriate.

While discussions were organized by region, regional differences in the group discussions were minimal and largely reflected the predominant land uses of the region. Urban development was more of an issue in Fayetteville and Little Rock. Row crop agriculture was a focus of discussion in Jonesboro and Lake Village. Animal agriculture was discussed in Fayetteville and Hope. Industrial forestry was discussed at Hope and Lake Village. Participants in Fayetteville and Hope talked about the need to change eligibility requirements for cost-share programs to increase participation of livestock and poultry farmers. Participants in Lake Village and Jonesboro made suggestions about tweaking cost-share programs to make them more attractive to row crop farmers.

The content of discussions also varied based on who participated. More academics participated in Fayetteville and Jonesboro. Landowners predominated in Hope and Lake Village. Land managers with industrial forestry firms participated in the discussions at Hope and Lake Village. While federal and state agencies, industry groups and environmental organizations were represented at all of the stakeholder meetings, they predominated at the Little Rock meeting. With notable exceptions, all participants were more likely to offer suggestions about what others could/should do to conserve wildlife and habitats rather than identifying things that they can/will do.

The following questions and comments summarize participant responses during the stakeholder meetings.

Question #1: What do you think about the list of species of greatest conservation need? Why?

Theme #1: The list of species of greatest conservation need coupled with the overall strategy will enrich environmental outreach and education programs.

➢ Many participants commented that the list was almost overwhelming due to the number of species included.

➢ Need to explore ways to package the information in ways that reduce the complexity and make the information more user-friendly. Suggestions include:

➢ Pick "poster-child" species that create hold special feelings for the general public. Use these species to generate interest in and understanding of the concepts (e.g., Bobwhite Quail).

➢ Organize species by habitat.

➢ Develop a series of habitat posters that illustrate the species that live in the habitat and their relationships to each other.

➢ Organize species by conservation actions (e.g., pick a conservation action and list all of the species/habitats that will benefit from that conservation action)

➢ Start education in the early elementary grades. Involve 4-H, Scouts, and other youth programs in conservation education and hands-on projects (e.g., build a salamander pond). The list creates the opportunity for expanded partnerships with educators.

➢ The *Designing A Future For Arkansas Wildlife* website provides useful information on individual species and habitats.

➢ "I didn't know there were so many types of mussels." "How do we know how many of a species makes a healthy population?" "Why is [fill-in-the-blank] on the list?" "Why are coral snakes, mice, bats, (or some other species that some people feel are unwanted) on they list?" "Too much emphasis on birds, once again." These kinds of responses create teachable moments for conservation education.

Theme #2: The list and strategy will provide information to support and improve planning by industry, nonprofit, local, county state and federal groups.

➢ While nearly all participants acknowledged the value of the list for planning and decision-making, some expressed concern that the list might generate pockets of fear of new regulation and erosion of private property rights. Suggestions offered to allay such fears included:

> When communicating with the public about species of greatest conservation need, stress that the list will only be used to allocate funding for the State Wildlife Grants program and has no other purpose

To foster trust, continually remind public and private land owners and land managers that the State Wildlife Grant program calls for *voluntary* conservation. It is not a regulatory program.

Some expressed concern that managing habitats to protect species on the list of species of greatest conservation need might affect how habitat for game species are managed (e.g., ivory billed woodpecker was found in duck habitat) or result in limitations on hunting and fishing.

➢ Linking species and habitats in the CWCS database to specific conservation actions (e.g., NRCS Technical Manual) will provide a practical tool to promote implementation of best management practices (BMPs).

➢ Threats to a species may differ in different ecoregions. Species reports could identify where specific threats are an issue.

➢ Explain to the public how the list was developed, including who was involved, what sources of information were used, the criteria for selecting species to be included.

➢ Consider adding endangered plants that are critical to habitat restoration to the list.

➢ Landowners need a dynamic website where they can point to the location of their land and get a list of habitats, species of greatest conservation need and specific conservation practices that they should consider based on information they enter about their current land uses and practices,

Theme #3: The list of species of greatest conservation need and related information (in the database) can improve natural resource management by providing information for application by resource professionals in industry, public and non-profit organizations.

➢ The list will help managers more effectively manage natural resources in several ways:

By helping to set priorities for conservation actions (e.g., land acquisition, management projects, inventory needs).

By helping fill gaps or make connections between projects and work already underway.

By supporting habitat restoration.

By providing information that enhances funding applications (to the extent that funders and cost-share providers consider the list in making funding decisions).

➢ The list will help groups compete for additional funds for stream work.

Theme #4: The list of species of greatest conservation need is a flexible list that will change over time as new information is obtained.

➢ Many participants suggested species to be added or deleted. These suggestions were forwarded to the taxa teams and peer reviewers for consideration.

➢ Consider making the list shorter in order to more effectively focus resources.

➢ Consider adding some additional game species to the list that will generate popular interest, such as Mottled Duck, Fulvis Whistling Duck, and Black-bellied Whistling Duck.

➢ Questions were raised about why species on the edge of their historic range are included on the Arkansas list. Some thought the list should focus on species currently found in Arkansas while others believed the list should also include species that were plentiful in this part of their historic range.

➢ Consider dividing the list of species of greatest conservation need between species with declining populations and species where little is known about their population trends.

➢ Consider adding indicator species to the list even if their population is not declining.

➢ Consider including invasive species like zebra mussels, fire ants, feral dogs and cats, brown algae, and other invasive species that will need to be managed to protect desirable species on the list.

➢ Consider excluding species that are common in other states but rare in Arkansas.

➢ Some participants want the list to only include native species while others recommend including desirable non native species, such as trout.

➢ Some participants laud the breadth of the list while others question why insects and other invertebrates are included.

➢ Some participants want to exclude migratory species while others want to include migratory species.

➢ The list needs to be consistent with other programs/regulations. How can you have species on the list that are hunted, for example, purple gallinule and American woodcock? Some of the species on the list are also on depredation permits (e.g., double breasted cormorant).

➢ There will need to be a formal process for adding/deleting species from the list. The website should provide for continuous comment so that the public can easily suggest species to add or delete anytime.

➢ Some participants expressed concern at the number of species on the list. They wondered whether it wouldn't be more effective to focus on 5, 10 or 50 priority species in order to more effectively target scarce resources and capture the hearts and minds of a sometimes fickle public.

➢ Some participants raised concern about the number and complexity of terrestrial habitats. They wondered whether our ability to identify habitats at this level of specificity matched our ability to describe them.

Theme #5: The critical question is "how will the list be prioritized for practical use?"

➢ Some participants asked how prioritization would balance scientific analysis and public perception in prioritization and who would be setting priorities.

➢ As we prioritize, we shouldn't get caught up with individual species; rather we should promote biodiversity within habitats.

➢ We need to find balance between species and habitats. Too much emphasis on the list of species may inadvertently trivialize the importance of habitats.

➢ Stakeholders want to be involved in selecting the criteria for how the list will be prioritized and which conservation actions will be promoted (much the way the forest industry was involved in developing best management practice guidelines for water quality).

➢ Participants identified particular habitats in which species are at particular risk and should be given high priority, stating "Aquatic species are most at risk. Most streams in central and Northwest Arkansas have been impacted by urban sprawl." "Another group of species that are at risk are grassland dependent birds." Early successional species also are at risk."

"We don't need a shotgun approach! We need to find and focus on the sweet spots where our actions can make the most difference."

Question #2: What conservation practices will be most attractive to private landowners? Why are they attractive?

Theme #1: It's all about managing habitats. Habitat affects everything.

➢ When it comes to habitats, quality matters. Resources should be directed toward promoting quality habitat.

➢ We should decide on the scale and outcomes we desire and then set goals for restoring whole systems (e.g., restoration of bottomland hardwood forests encompasses water quality, species diversity of plants and wildlife, wetland hydrology, and other considerations).

➢ Farm bill funds set aside for habitat restoration should be targeted to carefully targeted goals instead of distributed scatter-shot in order to establish corridors or restore systems.

➢ Organizing technical assistance and education strategies around habitats reduces the complexity of the species list and will make the strategy more understandable to landowners and the general public.

➢ If we have to choose between spending State Wildlife Grants (SWG) funds on population studies or habitat restoration, Arkansas needs to focus on habitat restoration.

➢ Need to measure the net loss/gain of habitat. One new development or hardwood timber harvest or new pasture can destroy more habitat than WRP or CRP restores in a year.

➢ In rapidly urbanizing areas, we will need to manage land development more effectively in order to slow habitat loss (e.g., incorporate mitigation as an integral part of development projects such as Mud Creek in Fayetteville where quail and great blue heron can be seen in 18 mitigated wetlands behind Wal-Mart, Home Depot and other commercial developments).

➢ Develop education programs that are targeted not only by ecoregion but also by landownership patterns (e.g., there are many landowners in Northwest Arkansas with 40 acres who do not farm. These landowners may be more amenable to planting food plots without expectation of cost share if approached effectively).

"If you bring back the quail population, you will clean up the water and increase the amphibians. Everything is connected to everything else in the ecosystem."

Theme #2: Many landowners are interested in "simple" actions they can take, such as prescribed burning, buffers and food plots, recognizing that even seemingly simple conservation actions may not be so simple to implement.

➢ Few private landowners know how to do prescribed burning. There is no where they can go to learn how to do prescribed burning. They are not sure who to hire to do prescribed burning for them. They are concerned about liability with respect to their neighbors. So while there is a desire to do prescribed burning, few landowners actually do prescribed burning.

Increase the supply of private vendors who can provide services to private landowners (e.g., prescribed burning).

Provide a directory of private vendors who can provide services to private landowners.

➢ Cost share for alternative water sources for pastured livestock would create more interest in establishing riparian buffers.

➢ Many landowners want "clean" fencerows and "cleared" land down to the water's edge because "messy" or "weedy" looking buffers may lead neighbors and others to view them as poor managers. Implement a creative broad-based public awareness campaigns to re-shape public values

➢ Identify or develop sources of low-cost native seed and plant stock accessible to the public (e.g., native shrub/tree bundles that provide berries and nuts with instructions for developing a food plot and examples of species likely to visit the food plot).

➢ Identify conservation practices that can easily be incorporated into existing management systems for different size landowners.

➢ Provide access to equipment for planting food plots or other "simple" conservation actions will help promote voluntary action, particularly among "weekend" and "hobby" farmers.

➢ Plant native grasses for pasture, rather than introduced species.

➢ Eradicate Bermuda grass and fescue.

➢ Take floodplains out of crop production and restore riparian buffers.

➢ Replant mixed species of bottomland hardwoods.

➢ Re-establish shelterbelts and fencerows.

➢ Increase conservation tillage and implementation of other practices that reduce soil erosion and stormwater runoff.

➢ Provide ponds for wildlife watering.

➢ Let fields lie fallow.

➢ Manage forests for multiple benefits, including wildlife (e.g., create small openings, species diversity, etc)

Theme #3: Tie conservation recommendations to popular or widely accepted goals.

"I have to go to Texas to quail hunt, I would much rather go out my back door. If I leave a strip and then start seeing quail and Baltimore Orioles, I would do that. But there has to be somebody to personally contact people like me."

➢ Promote habitat restoration for quail. By focusing on a popular game species, landowners will restore habitats for other upland wildlife species of conservation need.

➢ Promote protection of water quality in order to restore riparian buffers and streambank restoration. Since nearly all citizens value clean water, landowners will be more likely to implement wildlife conservation measures that improve water quality.

➢ Focus on one or two "poster child" species that affect a large number of other species in the most vulnerable habitats.

Theme #4: Landowners don't always know what conservation actions to take to generate the desired outcomes.

➢ Identify conservation actions that do not greatly restrict use or potential use of the land.

➢ Identify conservation actions that could enhance revenue for the private landowner (e.g., seasonal flooding for duck hunting, bird-watching, butterflies).

➢ For landowners who have never implemented a wildlife conservation project, provide a list of simple projects to get them started.

➢ Identify conservation practices that benefit multiple species.

➢ Pesticide education is needed. Landowners do not realize the impact of pesticides on nesting bird eggs and invertebrates and other aquatic species.

➢ Differentiate annual and permanent conservation practices. Identify practices that have relatively small labor requirements. Promote practices that achieve multiple purposes.

➢ Identify conservation practices that landowners with small holdings can take to benefit wildlife to dispel the notion that only landowners with large holdings can make a difference.

"The problem is if I don't know what it takes to attract a chimney sweep, how can I implement the plan? Certain kinds of foliage attract certain kinds of birds. How do we get over that hump – of persons not knowing what to do?"

Theme #5: Don't limit education and programs to rural landowners. Work with urban landowners, developers, county officials and others to promote voluntary conservation actions.

➢ In Northwest Arkansas and Central Arkansas, land values are rising. Developers are buying up land adjacent to urban centers. Developers are not focused on wildlife. Arkansas needs to engage developers in wildlife conservation.

➢ Develop education programs that engage urban landowners (e.g., promote butterfly weed and other native plants, distribute the Building Backyard Habitat book by the National Wildlife Federation, etc)

➢ Bring back the Bird Sanctuary program where neighborhoods can declare their neighborhood or subdivision as a bird sanctuary and get assistance from AGFC.

➢ Work with county road crews and developers to ensure adequate maintenance and stormwater management on unpaved roads.

➢ Need incentives for cities to implement effective wildlife conservation practices, establish greenways, plan for open space.

➢ Establish conservation partnerships. Involve volunteers, churches and civic groups. Organize urban constituency for wildlife conservation.

Question #3: What prevents landowners from implementing conservation practices that benefit wildlife? Why?

Theme #1: Most landowners expect cost share in order to implement voluntary conservation actions. Arkansas needs a strategy to invest cost-share in a way that achieves the most with limited resources.

➢ Many conservation actions are expensive, not only in terms of monetary costs for implementation and maintenance but also the time and complexity involved in management.

➢ More money is needed for cost-sharing.

➢ Cost-sharing needs to be adequate (e.g., a landowner may not be motivated if cost share is 25% but if cost share is 75% they will be more willing to implement conservation practices).

➢ If technical assistance providers place more emphasis on the benefits of conservation practices to the landowner (e.g., "what's in it for me?), landowners may not require as much cost share to implement conservation practices.

➢ The period over which cost share subsidies are provided often is too short to make a meaningful difference.

➢ Some landowners are unwilling to sign long contracts because of worries about giving up property rights. Consider using shorter contracts in some situations.

➢ Requirements to fence out livestock make farmers reluctant to apply for cost share to implement some conservation practices.

➢ Recommended conservation practices need to be cost-effective and fit into the landowners' operations.

➢ The volume of reporting and paperwork associated with cost-share can be a disincentive.

➢ Promote creative use of existing programs, not only WHIP but also wetland reserve program, 319(h), Environmental Quality Improvement Program, Forestland Enhancement Program, Grassland Reserve Program, etc.

Theme #2: Fragmentation and non-local land ownership create special challenges for implementing meaningful conservation practices for some species, particularly those that require large areas of contiguous habitat.

➢ Species differ in the scale of the land area that must be managed to reverse declining populations. Species reports could identify the relevant size of the land area that will need to be managed and whether the land area must be contiguous in order to make improvements.

➢ Give priority in allocating cost share and technical assistance to creating corridors and contiguous tracts of habitat. Funding currently gives preference to small projects.

➢ Develop special pools of cost share for landowners that hold/manage large tracts of land to promote conservation of carefully selected priority species and/or habitats.

➢ Priority for Farm Bill funds should be given to groups of landowners working together to implement conservation measures on a larger scale (e.g., landscape or watershed). This would give small landowners confidence that their individual actions can add up to some relevant, effective scale.

➢ We need to negotiate more land swaps in order to aggregate contiguous land at a relevant scale.

➢ Allow in-kind services as cost-share in order to provide incentive for more projects.

➢ Develop mechanisms to reach non-resident landowners who lease their land.

"We have to identify the 'sweet spots' where there are multiple species in vulnerable habitats. Landowners will respond more positively if they know that the work they do will benefit many species."

Theme #3: More technical assistance is needed to develop wildlife management plans for privately owned lands.

➢ Improve coordination of technical assistance and education programs across state and federal agencies to reduce confusion and mixed messages to landowners.

➢ Some landowners fear letting a professional develop a wildlife management plan because of what they might find (e.g., a threatened or endangered species).

➢ Increase the number of private lands biologists.

➢ Expand the acres managed under conservation easements so that private lands can be managed by professional resource managers.

➢ Help landowners identify what species can be adapted to current habitat and what habitat can be added to attract other species.

➢ Identify mechanisms to enforce provisions of voluntary conservation agreements.

➢ Go to farmers and landowners with practical suggestions rather than waiting for them to ask for a wildlife conservation plan.

➢ Technical assistance should help farmers maximize points on cost share applications by addressing multiple goals.

➢ Focus plans on species that fit into current land use, rather than trying to conserve species that may have been historically present but are no more (e.g., don't promote quail in rice production areas.

➢ Many farmers reluctant to invest the time required to complete applications for cost share because denial rates are so high.

➢ Changing farming practices are affecting migratory waterfowl. Today's combines are more efficient so less food for migratory waterfowl. Hunting leaseholders complain about reduced number of birds. Winter wheat provides higher returns than hunting leases so some farmers no longer winter flooding fields to create habitat for migratory waterfowl.

"It's difficult for landowners to learn about all of the programs out there. A one-stop 'shopping experience' where landowners could talk to one person about all of the programs would make conservation more attractive."

Theme #4: Landowners are more likely to implement conservation practices when the benefits are explained in terms of things the landowner values.

➢ Use landowner interest in game species as entrée to benefit species on the list of greatest conservation need and their habitats.

➢ User public concern for drinking water quality as entrée for education and technical assistance aimed at increasing implementation of conservation measures.

➢ Present recommended conservation actions in terms of how they will impact the landowners' bottom line. Focus on soil erosion, water quality, hunting and fishing, whatever the landowner cares about.

➢ Involve landowners in the evaluation of conservation actions before promoting them in order to foster a sense of ownership.

➢ One of the most effective and lowest cost mechanisms to influence landowners to implement conservation practices is peer pressure. To create peer pressure, technical assistance providers and educators should work together to set up contests, offer rewards and prizes, give public recognition to landowners who implement wildlife conservation practices. "When landowners realize that they are drinking the water they are protecting then they begin to understand "what's in it for me?"

"We have to show the landowner the bottom line. Show them the positive effects of a practice that will benefit these species. Don't tell them about saving a bird. Tell them about how much erosion they will stop, how much soil they will save. Tell them how much better the water quality will be."

Theme #5: Effective, coordinated education is critical. It matters how education is delivered, who delivers the education and how education is integrated with technical assistance.

➢ Education should inform landowners not only what can be done but also how it will benefit both the habitat and species of greatest conservation need as well as social and economic benefits to landowners.

➢ Education is most likely to be acted on when it is delivered by local institutions landowners trust.

➢ Education should target specific audiences with specific messages (e.g., realtors and developers would benefit from education on the role of riparian buffer strips)

➢ Integrate education across agencies and disciplines (e.g., the educator providing information about pasture management also can provide information about vegetative buffers, agencies hold joint meetings at the local level)

➢ Involve people of all ages and walks of life in implementing conservation actions (e.g., Stream Team program) in order to increase knowledge and build constituency.

➢ Use trusted spokespersons and mass media (e.g., television and radio) to deliver simple educational messages to general population

➢ Coordination and collaboration among technical assistance providers and educators is critical. When landowners don't know where to go to get information or they get conflicting advice from different providers, landowners often decide that the best course of action is to do nothing.

➢ Educate the public about conservation easements, transfer of development rights, purchase of development rights and other creative mechanisms to compensate landowners for voluntary conservation.

➢ Educate the public by involving them in action-oriented projects, including monitoring (e.g., nature mapping) or streambank restoration (e.g., stream teams).

➢ Educate landowners through local and regional demonstration projects.

➢ Target education where it will have the greatest impact (e.g., specific landowners in a particularly vulnerable habitat where targeted conservation actions can effect multiple species).

➢ Integrate wildlife conservation education into existing programs (e.g., 4-H, stream teams, Master Gardeners, Urban*A*Syst)

➢ Consider developing a Master Conservationist program for rural landowners, patterned after the Master Gardener program.

➢ Use more demonstration and more testimonials to show landowners the benefits of implementing wildlife conservation actions.

➢ Many species are seeing population increases after years of decline. Promote these successes to give landowners and the public a sense that their actions can make a difference. Give private landowners credit for what they are already doing to dispel landowners' perception that they are always taking blame.

➢ Don't rely on websites to convey information to landowners. Strategies are needed to do proactive outreach to landowners.

➢ Consider targeting education and technical assistance to the younger generation of landowners.

"If we all preached the same sermon, we could get a lot done. Right now, it is very difficult to figure out who's doing what where."

Theme #6: In some cases, public policy may need to be changed in order to expand voluntary implementation of conservation measures.

➢ State employees cannot do prescribed burning on private lands. Private landowners would be willing to pay for this service if state employees could do prescribed burning to reduce the fuel load on their private lands.

➢ It might be beneficial if State Wildlife Grant implementation funds could be spent for education.

➢ Implement tax incentives for land taken out of production for habitat protection.

➢ Consider using a tax on tourism to increase funds available for cost share for voluntary conservation actions.

➢ Local ordinances are needed in rapidly urbanizing areas requiring developers mitigate damage to habitats (e.g., zoning, required set aside for green space).

➢ Evaluate existing ordinances that may inadvertently negatively affect wildlife conservation (e.g., requirements that lawns be mowed to a certain height)

➢ Consider enacting "right to burn" laws that limit liability of landowners who do prescribed burning in some specific situations.

➢ Consider property tax relief for landowners that implement voluntary conservation actions.

➢ Consider increasing USDA funding for Wildlife Habitat Incentive Program (WHIP).

➢ Expand the Grassland Reserve Program to upland farmers with pasture.

➢ Arkansas should find the match to participate fully in all federal conservation programs (e.g., CREP).

➢ Cumbersome regulations concerning landlord/renter participation need to be simplified.

➢ Indemnify landowners against the effect of changes in regulations and cost-share program requirements.

➢ Improve mechanisms for interstate cooperation to conserve migratory birds.

➢ Change funding criteria and funding formulas for cost-share programs to distribute funds more equitably between farmers of different sizes, increase funding for smaller scale projects, and between regions of the state.

Theme #7: Some landowners are afraid to participate in voluntary conservation programs for fear of increased regulation, erosion of property rights or loss of privacy.

➢ Address landowners' fear of regulation and loss of property rights through education and demonstration projects. Education should proactively assure farmers that species can be helped without shutting down their operations.

➢ Develop a mechanism so that landowners can report finding species of greatest conservation need on their land without fear of media coverage or loss of privacy.

➢ Some landowners unwilling to participate in cost-share programs that require them to open their lands to public use.

➢ Clarify the relationship between threatened and endangered species relative to the list of species of greatest conservation need to alleviate fears.

➢ Encourage landowners who participate in cost-share programs to share their success stories with other landowners to ease fears of government programs and build trust.

➢ Partner with local institutions that landowners trust to promote wildlife conservation (e.g., Cooperative Extension Service).

"I only have a small acreage, but what if the* [Ivory-billed] *woodpecker turned up on my land? It makes me concerned."

Continuing Efforts for Informing and Engaging the Public

Since the approval of the first version of the Wildlife Action Plan, Arkansas has continued to foster public and scientific community involvement in planning and implementation in a number of ways.

Engaging the Scientific Community

Continued Representation by Partners on the Steering Committee, Implementation Committee, and Taxa Teams. The process of developing the Arkansas Wildlife Action Plan resulted in strong partner relationships and support for implementing the plan. Partners from various agencies continue to serve on committees and taxa teams that determine the highest priority actions and projects for state wildlife grant funding. In addition, these partners were heavily involved in the revision and update of the Plan.

Biennial Wildlife Action Plan Symposium.

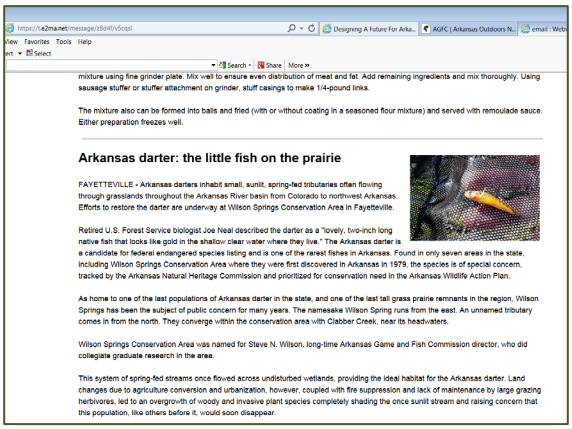
Since 2006, a Wildlife Action Plan Symposium has been held every 2 years to bring together partners. At the Symposium, results from state wildlife grant funded projects are presented. Also, the taxa teams and habitat teams meet to review the top needs for species and habitats. They select the highest conservation actions, research, and monitoring priorities to be funded with state wildlife grant dollars. Attendance at the symposium has increased each time and a number of partners from state and federal agencies, non-governmental organizations, and universities are represented.

2014 AWAP Symposium

Wildlife Arkansas Website. The website continues to serve as the primary clearinghouse for wildlife action plan information and news. State wildlife grant apportionment amounts and requests for proposals are available on the website. Final reports from state wildlife grant funded projects are also distributed on the website. In addition, digital versions of the Wildlife Action Plan and AWAP database are available for download.

Engaging the Public

Use of Media. Every opportunity to relay information on species of greatest conservation need to the public is taken. Presentations on SGCN have been given to Boy Scout and school groups. Success stories for SGCN as a result of state wildlife grants are disseminated as often as possible, typically through AGFC's weekly Arkansas Outdoors newsletter.



Arkansas Outdoors newsletter story on successful SWG project

2015 AWAP Revision Public Input. As part of the required public input process for the revision of the Plan, a draft of the updated plan was made available to the public. A notice of the review/comment period was disseminated via newspaper notice, the AGFC website, and the AGFC Arkansas Outdoors newsletter. In addition, an email to partner organizations with a link to the draft plan was sent out. A period of 30 days was given for the public to provide suggestions and comments for the Plan.

Section 7. Climate Change in Arkansas

Introduction

In the last several years, evidence suggesting detrimental effects from changing climate patterns has increased and stirred concern within the conservation community. In 2010, Arkansas cited climate change as an emerging threat to species and habitats within the Arkansas Wildlife Action Plan (AWAP). The incorporation of climate change into the AWAP, as part of the required revision process, is a recommended best practice from The Association of Fish and Wildlife Agencies (AFWA 2012). Incorporating climate change into the AWAP provides us an opportunity to be proactive in our approach, consistent with other state's wildlife action plans and efforts, and to be included in funding opportunities that may arise for addressing climate change impacts. This chapter will provide a general overview of climate science, a synopsis of projected changes to Arkansas's climate, a discussion of anticipated impacts to Arkansas's habitats and species of greatest conservation need, and a strategy to adapt to predicted changes.

Background

In regards to climate change, it is important to understand the distinction between climate and weather. Weather is a set of the meteorological conditions for a given point in time in one particular place, while climate is the average, long-term (30 years or more) meteorological conditions and patterns for a geographic area (Brandt and others 2014). Climate change is defined as a change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties, that persists for an extended period, and that is attributed to either natural variability or human-related activities (IPCC 2007).

Analyses of climate data from as long ago as 1880, show that the Earth's surface temperature has increased by more than 1.4°F over the past 100 years, with much of the increase taking place over the past 35 years (National Research Council 2012). Warming temperatures are often attributed to an increase in greenhouse gas emissions, particularly carbon dioxide, which increased 80% between 1970 and 2004 (IPCC 2007).

To model future climate change, scientists utilize various general circulation models (GCM). Climate change analysis becomes more complex for the future than the past because there is not one time-series of climate, but rather many future projections from different GCMs run with a range of CO^2 emissions scenarios (IPCC 2007). It is important not to analyze only one GCM for any given emission scenario, but rather to use ensemble analysis to combine the analyses of

multiple GCMs and quantify the range of possibilities for future climates under different emissions scenarios. Human population growth and related greenhouse gas emissions and changes in land cover have been modeled under various scenarios (SRES) in order to project future trends for global temperature and precipitation.

SRES refers to the scenarios described in the IPCC Special Report on Emissions Scenarios (IPCC 2007). The SRES scenarios are grouped into four scenario categories (A1, A2, B1 and B2) that characterize various urban development pathways, covering a wide range of demographic, economic and technological driving forces and resulting GHG emissions. These emissions projections are widely used in the assessments of future climate change.

Under the A2 scenario, we see rapid economic growth, a global population that peaks in mid-century and no reduction in emission levels. The B1 scenario also describes a global population that peaks mid-century, but with a shift toward sustainable energy and a significant reduction in global emissions. The A1B scenario describes a moderate reduction in emissions levels.

Projected Changes for Arkansas

The Nature Conservancy's climate wizard is a widely accepted, interactive web tool that incorporates data from IPCC climate models and can be used to assess how climate has changed over time and to project what future changes are likely to occur in a given area. It uses a non-parametric quantile-rank approach that maps out the 0 (minimum), 20, 40, 50 (median), 60, 80, and 100th (maximum) percentiles. Here we display maps produced by the Climate Wizard for changes in mean temperature and precipitation for Arkansas using an ensemble of GCMs and the 3 more widely accepted emissions scenarios (A2, A1B, and B1) for 50 years into the future (Girvetz and others 2009).

Temperature

The average annual temperature for Arkansas over the past 50 years was 60.2°F (Figure 7.1). Between 1951 and 2006, average annual temperature remained fairly constant with a slight decrease of 0.003°F.

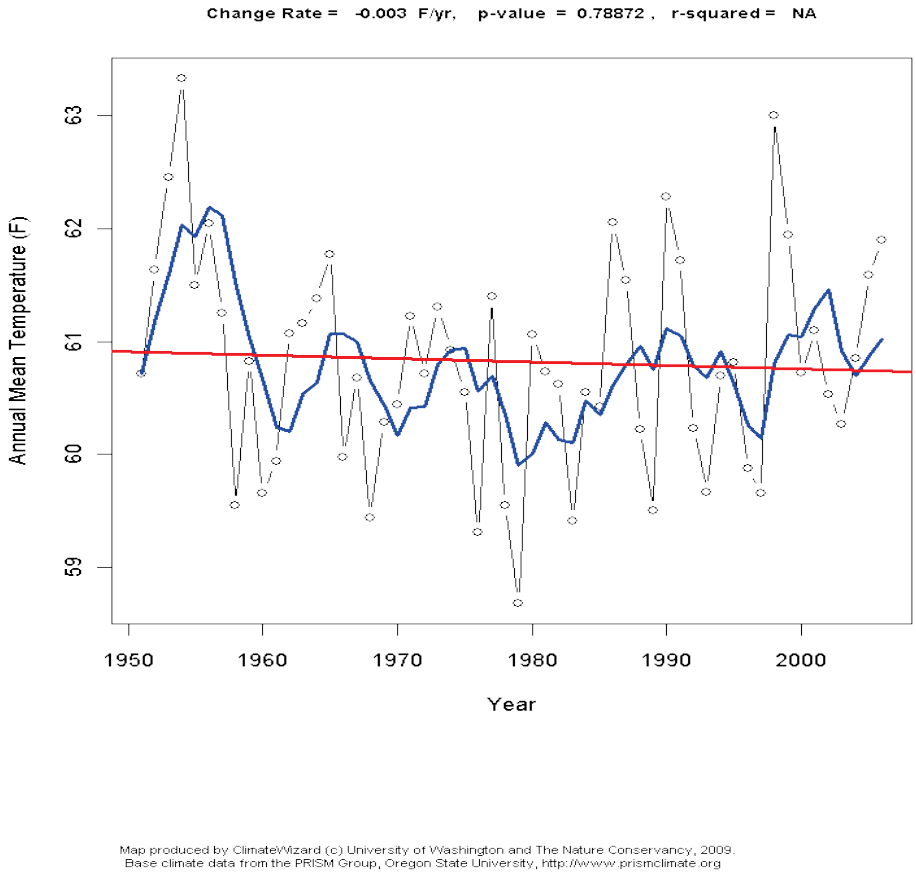


Figure 7.1. Mean annual temperature for years 1951-2006 for Arkansas.

Average annual temperature by mid-century (2050) is expected to increase under each emissions scenario. The most significant increase is predicted under the moderate emissions scenario (5.1°F). Under this scenario, the change in temperature is more widespread across the state (Figure 7.2). Under the high emissions scenario, an average increase of 4.9°F is anticipated, with a higher increase in the northwest part of the state (Figure 7.3). Even with a dramatic decrease in emissions under the B1 scenario, the average annual temperature is predicted to increase by 3.6°F (Figure 7.4).

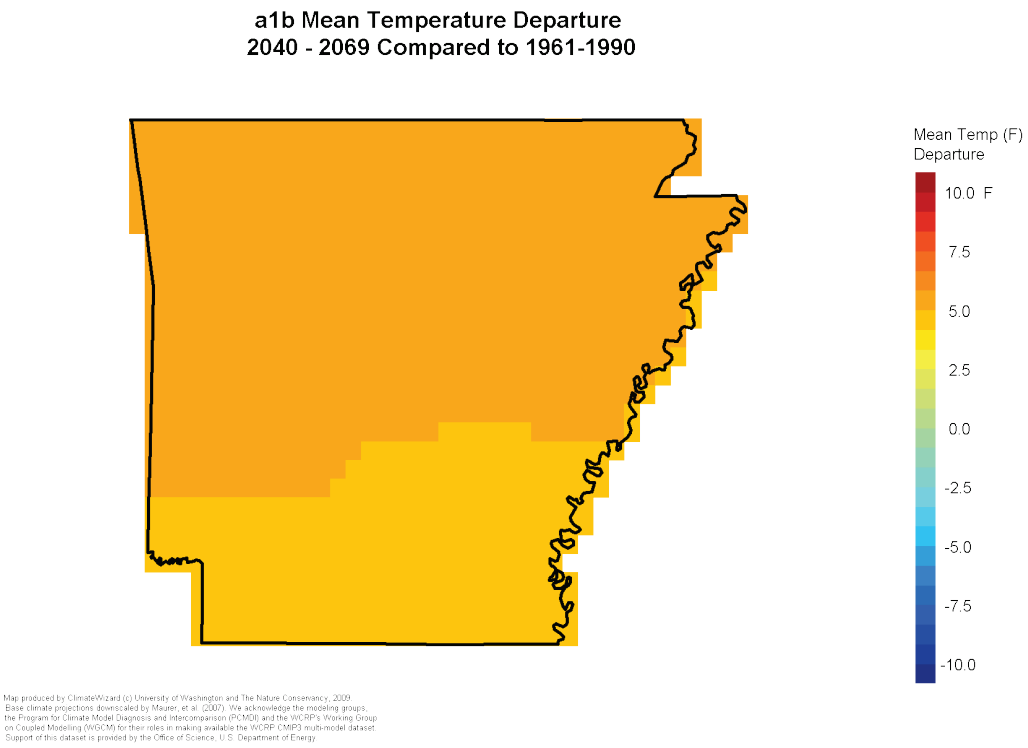


Figure 7.2. Predicted change in mean temperature in the next 50 years for Arkansas under the moderate emissions scenario (A1B).

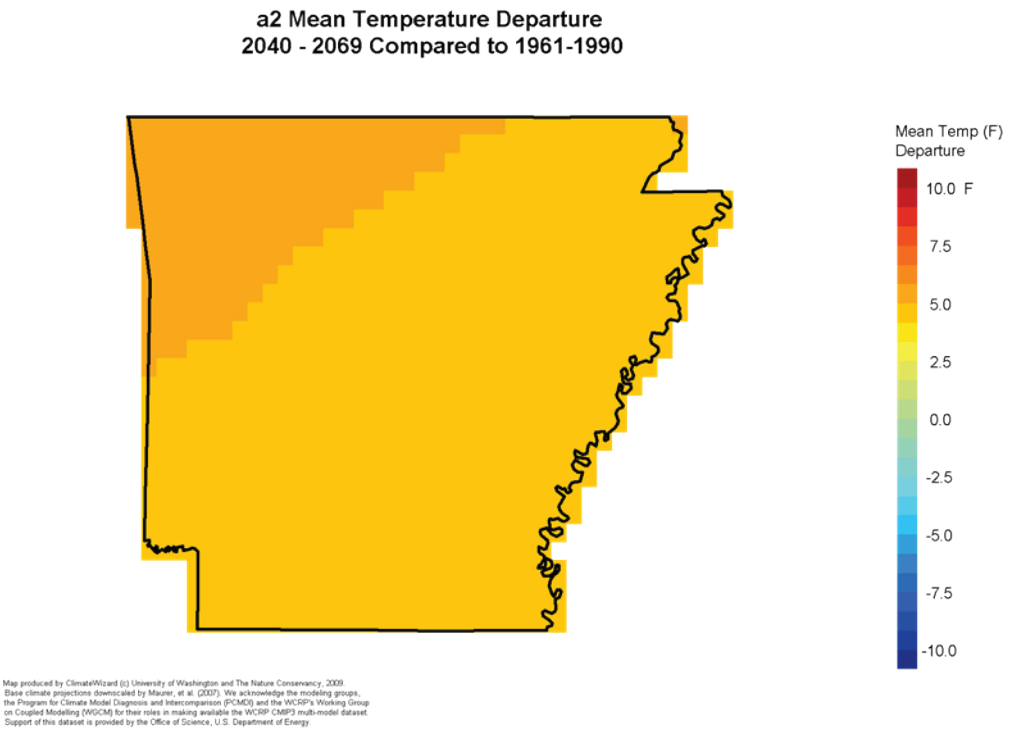


Figure 7.3. Predicted change in mean temperature in the next 50 years for Arkansas under the high emissions scenario (A2).

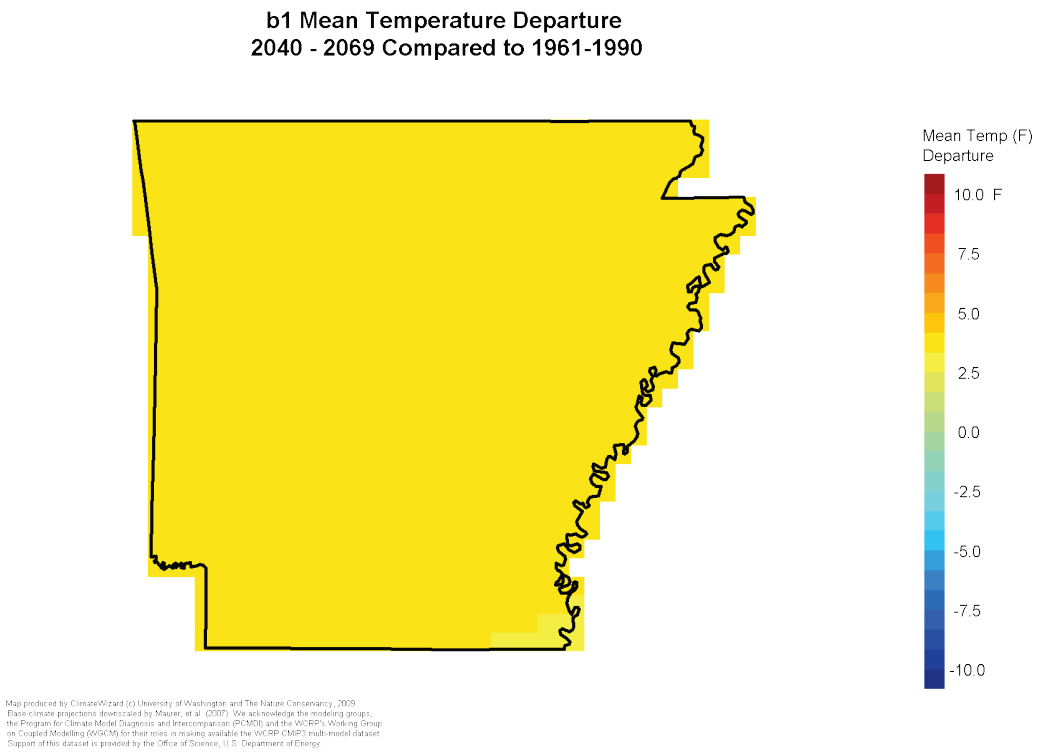


Figure 7.4. Predicted change in mean temperature in the next 50 years for Arkansas under the low emissions scenario (B1).

Precipitation

The average annual precipitation for Arkansas from 1951 to 2006 was 49.4 inches. During this timeframe, the average increased by a rate of 0.101% per year. Global predictions for precipitation changes into the future point to an overall decrease. This may be because the Southeast is located in the transition zone between projected wetter conditions to the north and drier conditions to the southwest. The average change in precipitation for Arkansas by mid-century is predicted to be +1.65%, - 0.79%, and +1.74% under the A2, A1B, and B1 scenarios, respectively (Figures 7.6, 7.7, and 7.8). Under each scenario, the southern portion of the state would see the greatest decrease in precipitation. Though there is uncertainty among the scenarios in projected precipitation amounts, rising temperatures will account for an increased rate of evapotranspiration, and a decrease in available water. Further, climate change models project that precipitation will be produced in fewer and heavier rainfall events. If so, this could lead to a decrease in aquifer recharge because more rainfall would be lost to runoff and could also result in an increase in both drought and flooding events. The southeast region is thus predicted to see a significant reduction in water availability (Carter and others 2014).

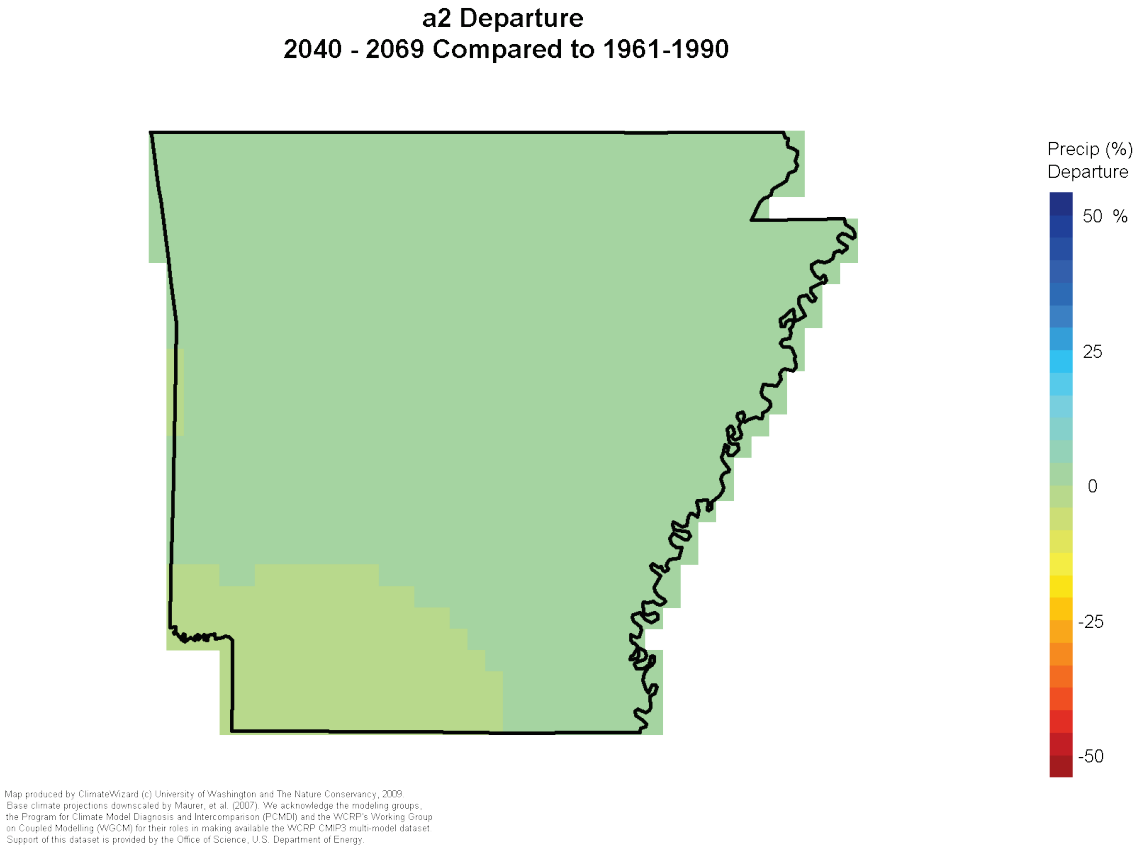


Figure 7.5. Predicted change in mean precipitation in the next 50 years for Arkansas under the high emissions scenario (A2).

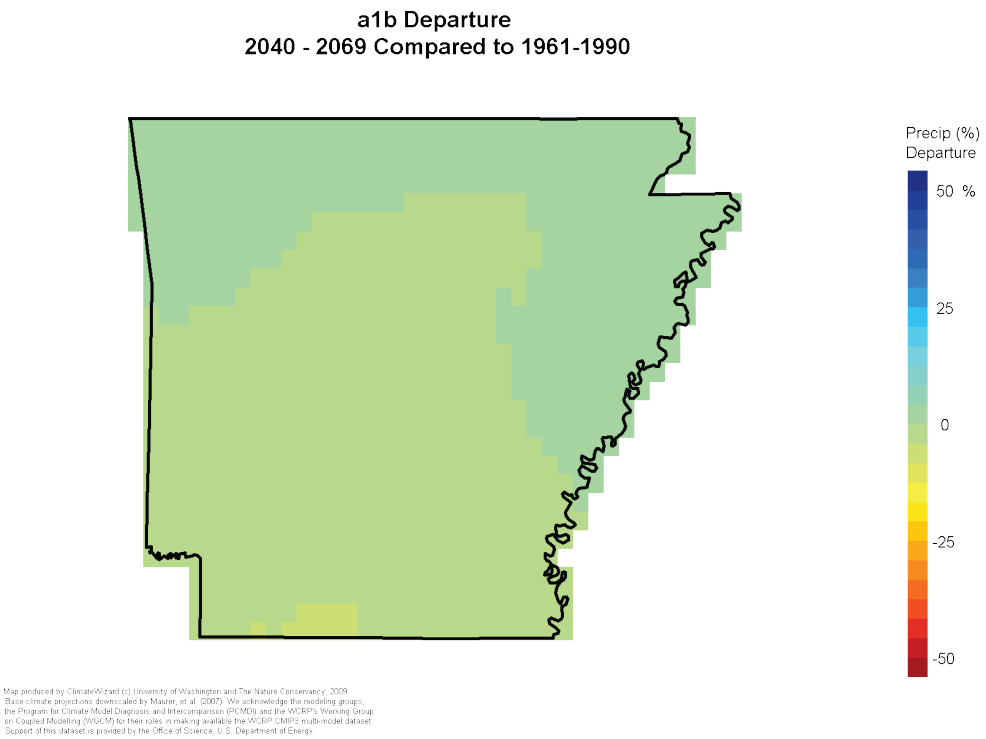


Figure 7.6. Predicted change in mean precipitation in the next 50 years for Arkansas under the moderate emissions scenario (A1B).

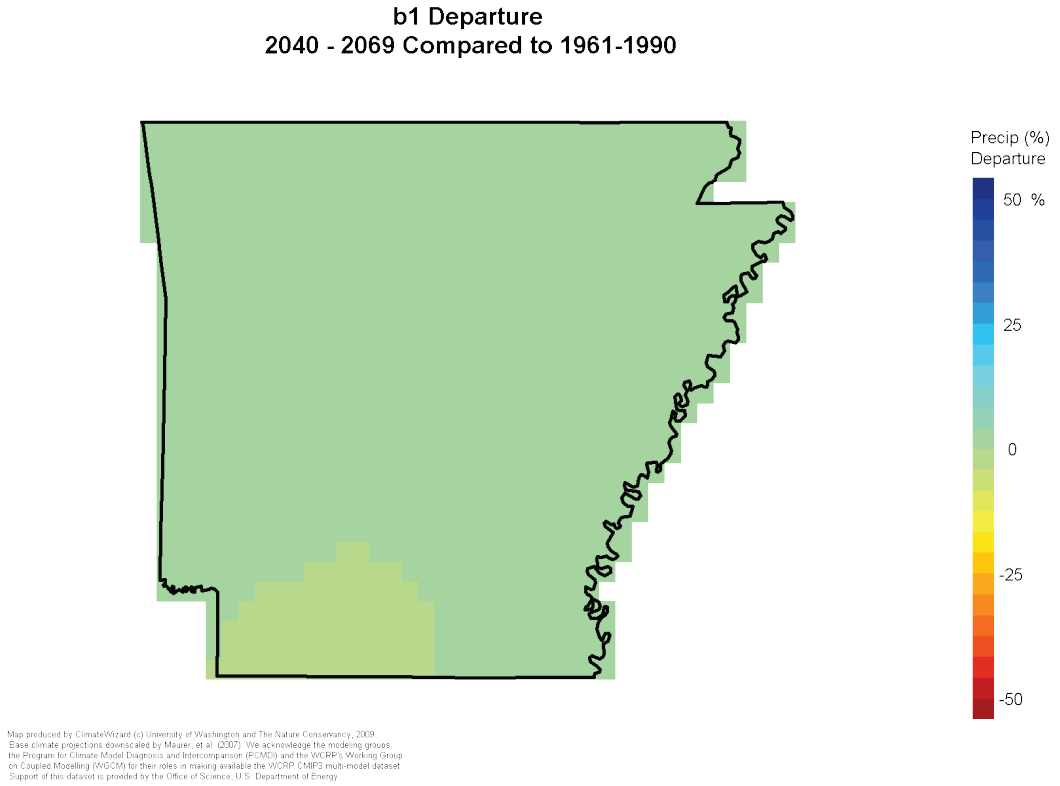


Figure 7.4. Predicted change in mean precipitation in the next 50 years for Arkansas under the low emissions scenario (B1).

Potential Impacts to Habitats

The Arkansas Wildlife Action Plan identifies 37 terrestrial and 18 aquatic habitat types that occur within the state. These habitats are threatened by many factors, including fire suppression, habitat alteration and fragmentation, invasive species, and diversion of water. Changes to climate could potentially exacerbate existing threats within many habitats.

Terrestrial Habitats

With an anticipated increase in temperature and overall drier conditions, habitats that are drought-tolerant could fare better under future projected climate scenarios. In Arkansas, these habitats would include glades and barrens, dry upland forests, and open woodlands/savannas. These conditions could also favor more wildfires on the landscape, thus potentially expanding these communities.

Mesic forests would be more at risk to compositional changes due to drier conditions. Some of the species associated with these forests, such as sugar maple, would be expected to decrease (Brandt and others 2014). The dominance in these communities would shift to more tolerant species, such as sweetgum, white oak, and red maple. Forests in general could experience a decrease in basal area and canopy cover if trees are stressed by higher temperatures or rates of pest outbreaks increase.

Bottomland systems could be negatively impacted by the reduction of water coverage and altered hydrology. Forest cover in this system would be expected to increase with extended periods of dry weather and reduced water coverage. Seasonal/herbaceous wetlands and ephemeral ponds would especially be at risk for contraction and reduced habitat quality. In agricultural areas, such as the Mississippi Alluvial Plain, flood events could introduce herbicide and pesticide run-off into wetlands. Flood events would also increase sedimentation in wetlands and streams.

With overall warmer temperatures, conditions would be favorable for more non-native plant species to invade communities. This would be especially true in areas where native species decline. Invasive non-native species would be an increased threat to all terrestrial habitats.

Aquatic Habitats

Aquatic systems could see substantial impacts from a changing climate. A reduction in available water, either due to decreased precipitation or increased evapotranspiration, would result in reduced stream flows and altered hydrology. Warmer air temperatures would result in increased water temperatures and reduced dissolved oxygen. Flood events would result in increased sedimentation and turbidity, as well as increased nutrient loading and agricultural run-off.

Potential Impacts to Species

There are 377 species listed as species of greatest conservation need in Arkansas. Because these species are already stressed by existing threats and because these threats will be further exacerbated by changes in climate, these species are more vulnerable to climate change impacts than other species.

Several factors determine how well a species will fare in light of a changing climate or, in other words, a species' degree of vulnerability to climate change. Vulnerability consists of three

primary factors; exposure, sensitivity, and adaptive capacity (Stein and others 2014). Exposure is a measure of the character, magnitude, and rate of climatic changes a species may experience (i.e, direct climatic variables such as air temperatures, precipitation, water temperatures, etc.). Sensitivity is the degree to which a species is likely to be affected by climatic change and is related to life-history traits of the species (phenology, physiological factors, etc.). Adaptive capacity refers to the ability of a species to cope with climate change impacts. These 3 factors are utilized in vulnerability assessments which can rate the degree to which a species or system will be impacted. We have not completed formal vulnerability assessments for species of greatest conservation need in Arkansas, though it is our intent to do so in the future as more data and appropriate resources become available. Completing vulnerability assessments would allow us to prioritize conservation actions and adaptation strategies to benefit the most at-risk species.

Below, we provide generalizations on how each species group may be impacted by the predicted changes in climate and factors that would influence response.

Mammals

In general, due to their high ability to disperse and generalized habitat and diet requirements, mammals would have a higher adaptive capacity to respond to altered climate and shifts in suitable habitat. However, bat species would be at risk for a number of reasons. Increases in air temperature could cause warming of roosts beyond what is tolerable for some species, causing them to abandon previously suitable roosts. Data for Brazilian free-tailed bats show that bats emerge earlier from hibernation during drought years, increasing competition for resources and the risk of predation (Frick and others 2012). Bat species that forage for insects over water would be negatively impacted by decreased prey availability and water coverage during drought events.

Birds

Birds have high dispersal ability, allowing them to shift their ranges to more suitable habitats and climatic conditions.

Many species of birds rely on insect availability for prey and migrant species may time their arrival to breeding grounds to occur with insect emergence. Increases in drought may decrease availability of insect prey and could potentially decrease reproductive success of birds. Degraded conditions on wintering grounds in the tropics (due to habitats becoming drier) may reduce the

health of neotropical migrants as they migrate north to breeding grounds. This could result in decreased reproductive success and increased predation risk. Species that rely on wetlands (marshbirds) and mud flats (shorebirds) would be negatively impacted by a reduction in available habitat due to increased drought events.

Reptiles

Reptiles that require aquatic, wetland, or mesic habitats would be most impacted by predicted changes in climate. Available habitat in these systems would be degraded or reduced with increasing drought events. In their favor, reptiles have a moderate capability to disperse to more suitable habitats. Increases in habitat fragmentation and barriers to movements (i.e., roads) would reduce the adaptive capacity of this group.

Amphibians

Amphibians typically prefer cool, moist microhabitats under logs and other downed woody debris. With increases in temperatures and a decrease in available moisture, these microhabitats would be degraded or lost. In addition, many amphibians rely on ephemeral wetlands within forests for breeding and early stages of life. These ephemeral ponds may exist for shorter periods of time or be lost altogether during these critical life history stages due to warmer temperatures and increased drought.

Amphibians have a limited ability to disperse, which would reduce their adaptive capacity. Aquatic amphibians, such as the Ozark Hellbender and stream salamanders, would be negatively impacted by warmer stream temperatures and increased turbidity and sedimentation.

Fishes

Warming stream temperatures will negatively impact fish by lowering dissolved oxygen levels and disrupting spawning timing. Increased siltation and agricultural run-off due to flood events will decrease suitability of habitat for many species. Fish species that rely on shallow pools and small streams would be most impacted by altered flows and drier conditions. Fish have dispersal capability, but only in systems without man-made barriers (i.e., dams).

Crayfish

Both aquatic and terrestrial species of crayfish would be negatively impacted by warmer, drier conditions. Aquatic species would be impacted by warmer stream temperatures, increased turbidity due to flood events, and a potential increase in the abundance of non-native crayfish species. Terrestrial, burrowing crayfish prefer cool, moist habitats. Drought events and higher temperatures would relocate the water table, altering available habitat.

Mussels

Increased sedimentation and turbidity in streams due to flood events would negatively impact many mussel species. Altered stream flows could also negatively impact species that require fast flowing streams. Because mussels are dependent on fish hosts for reproduction, any negative impacts to host fish become negative impacts to the mussel species.

Insects and Invertebrates

Insects and invertebrates that rely on aquatic systems for all or a portion of their life cycle would be impacted by warmer temperatures and drier conditions. Species with specialized habitat requirements and/or host plants could also be negatively impacted if populations of the obligate host plant are reduced. Most insects have the ability to disperse and some may migrate northward as climatic conditions shift (Parmesan and others 1999).

Adaptation Strategy

Because climate change has the potential to irrevocably alter species and habitat compositions across the landscape, it is imperative that natural resource managers strategize on the best approaches for adaptation (Mawdsley and others 2009). Incorporating climate change considerations into natural resource and wildlife management plans is an important first step. In Arkansas, our overarching goal will be to implement the wildlife action plan, which will increase adaptive capacity and affords our best chance of reducing threats to species and ensuring healthy, stable populations of SGCN that will be more resilient in the face of climate change.

Goal 1: Restore and maintain habitats to support healthy species populations and ecosystem functions. Loss and degradation of habitat is one of the most predominant threats for species of greatest conservation need. Restoring fully functioning habitats not only alleviates the threat to

SGCN, but also provides alternative areas for species to shift their ranges onto if needed and available.

- Objective 1: Restore habitats to desired condition. It may be possible to ameliorate the effects of climate change through direct management activities. For instance, restoring a natural fire regime to grasslands and open woodlands will reduce fuel loads and lessen the potential for catastrophic wildfires.
- Objective 2: Provide connectivity between habitats. Providing stepping-stones between tracts of habitats will improve the ability of species to migrate to more suitable conditions. Providing additional refugia for species will improve species' chances for survival.

Goal 2: Protect key areas or habitats. Increasing the amount of lands protected from urbanization, fragmentation, and degradation increases the opportunity to provide restored habitats for species. In addition, some species have very specific, narrow habitat requirements. Protecting particular habitats where these species occur will decrease the risk of extinction for these species.

- Objective 1: Create a network of protected lands that meets the needs for a diversity of wildlife. The Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative is currently working to develop comprehensive conservation strategies for the each of the sub-geographies within the region. This would include the Arkansas ecoregions Ozark Highlands, Mississippi Alluvial Plain, and West Gulf Coastal Plain. The product of this effort will be the identification of conservation opportunity areas that, if protected and restored, could sustain the needs for wildlife species. Climate change impacts, as well as other threats, are included in this planning process.
- Objective 2: Identify and protect critical habitats for specialist species and/or narrow endemics. Identifying high-priority caves and their recharge areas has been a priority conservation action under the wildlife action plan. Protecting important hibernacula will help ensure the long-term sustainability of cave bat populations. Also, identifying and protecting habitats that are home to endemics, such as salamanders and darters, should remain a high priority.

Goal 3: Increase adaptive management capacity. Climate change information and tools are developing rapidly. In order to be proactive in our management, it is crucial to remain up-to-date on information and tools available to us.

- Objective 1: Continue to coordinate with the Landscape Conservation Cooperatives, Climate Science Centers, and other entities regarding the latest science and tools for use in conservation planning and wildlife management.
- Objective 2: Incorporate climate change considerations into species and habitat management plans, where feasible.

Goal 4: Monitor the response of species and habitats to climate change. Monitoring programs provide information that natural resource managers can use to adjust their activities. Monitoring becomes particularly important when changes are anticipated to occur at a fast rate, such as with climate change.

- Objective 1: Continue to implement monitoring priorities as outlined in the Wildlife Action Plan. This includes breeding bird surveys, Christmas bird count surveys, pollinator surveys, etc. These long-term data are important for determining population trends and will be especially important for detecting any changes in species phenology or distribution as a result of climate change.
- Objective 2: Participate in other regional and national monitoring programs as they are developed.

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Appendix 1.1 — Acronyms

Terminology

AWAP – Arkansas Wildlife Action Plan
CWCS — Comprehensive Wildlife Conservation Strategy
EO — Element Occurrence
GIS — Geographic Information Systems
SGCN — Species of Greatest Conservation Need
LIP — Landowner Incentive Program
MOA — Memorandum of Agreement
ACWCS — Arkansas Comprehensive Wildlife Conservation Strategy
SWG — State Wildlife Grant
LTA — Land Type Association
WNS — White-nose Syndrome

Organizations

ADEQ — Arkansas Department of Environmental Quality
AGFC — Arkansas Game and Fish Commission
AHTD — Arkansas Highway and Transportation Department
ANHC — Arkansas Natural Heritage Commission
ASU — Arkansas State University
ATU — Arkansas Technical University
FWS — Fish and Wildlife Service
HSU — Henderson State University
NRCS — Natural Resources Conservation Service
SAU — Southern Arkansas University
TNC — The Nature Conservancy
UA — University of Arkansas (Fayetteville)
UA/Ft. Smith — University of Arkansas at Fort Smith
UALR — University of Arkansas at Little Rock
UAM — University of Arkansas at Monticello
UCA — University of Central Arkansas
USFS — United States Forest Service

Appendix 2.1 SGCN List

List of species of greatest conservation need ranked by Species Priority Score. A higher score implies a greater need for conservation concern and actions.

Priority Score	Common Name	Scientific Name	Taxa Association
100	Ozark Hellbender	*Cryptobranchus bishopi*	Amphibian
100	Yellowcheek Darter	*Etheostoma moorei*	Fish
100	Curtis Pearlymussel	*Epioblasma florentina curtisi*	Mussel
100	Turgid Blossom	*Epioblasma turgidula*	Mussel
95	Scaleshell	*Leptodea leptodon*	Mussel
80	Ouachita Streambed Salamander	*Eurycea subfluvicola*	Amphibian
80	Benton County Cave Crayfish	*Cambarus aculabrum*	Crayfish
80	Hell Creek Cave Crayfish	*Cambarus zophonastes*	Crayfish
80	Slenderwrist Burrowing Crayfish	*Fallicambarus petilicarpus*	Crayfish
80	Irons Fork Burrowing Crayfish	*Procambarus reimeri*	Crayfish
80	Caddo Madtom	*Noturus taylori*	Fish
80	Bowed Snowfly	*Allocapnia oribata*	Insect
80	winter stonefly	*Allocapnia warreni*	Insect
80	Magazine Mountain mold beetle	*Arianops sandersoni*	Insect
80	Sulphur Springs Hydroporus Diving Beetle	*Hydroporus sulphurius*	Insect
80	Magazine stripetail	*Isoperla szczytkoi*	Insect
80	Nearctic paduniellan caddisfly	*Paduniella nearctica*	Insect
80	ground beetle	*Rhadine ozarkensis*	Insect
80	beetle	*Rimulincola divalis*	Insect
80	Magazine Mountain Shagreen	*Inflectarius magazinensis*	Invertebrate - other
80	isopod	*Lirceus bidentatus*	Invertebrate - other
80	Striate Supercoil	*Paravitrea aulacogyra*	Invertebrate - other
80	Ozark Pyrg	*Pyrgulopsis ozarkensis*	Invertebrate - other
80	Ouachita Pebblesnail	*Somatogyrus amnicoloides*	Invertebrate - other
80	Thicklipped Pebblesnail	*Somatogyrus crassilabris*	Invertebrate - other
80	Channelled Pebblesnail	*Somatogyrus wheeleri*	Invertebrate - other
80	Ozark Big-eared Bat	*Corynorhinus townsendii ingens*	Mammal
80	Ouachita Rock Pocketbook	*Arcidens wheeleri*	Mussel
80	White Hickorynut	*Obovaria sp. Cf arkansasensis*	Mussel
76	Arkansas Fatmucket	*Lampsilis powellii*	Mussel
76	Speckled Pocketbook	*Lampsilis streckeri*	Mussel
76	Fat Pocketbook	*Potamilus capax*	Mussel
76	Winged Mapleleaf	*Quadrula fragosa*	Mussel
65	Saline Burrowing Crayfish	*Fallicambarus strawni*	Crayfish
65	Ouachita Spiketail	*Cordulegaster talaria*	Insect

65	Rattlesnake-Master Borer Moth	*Papaipema eryngii*	Insect
65	mayfly	*Paraleptophlebia calcarica*	Insect
65	Foushee Cavesnail	*Amnicola cora*	Invertebrate - other
65	cave obligate pseudoscorpion	*Apochthonius diabolus*	Invertebrate - other
65	cave obligate pseudoscorpion	*Apochthonius titanicus*	Invertebrate - other
65	cave obligate harvestman	*Crosbyella distincta*	Invertebrate - other
65	cave obligate harvestman	*Crosbyella roeweri*	Invertebrate - other
65	Calico Rock Oval	*Patera clenchi*	Invertebrate - other
65	cave obligate springtail	*Schaefferia alabamensis*	Invertebrate - other
65	Mountain Cave Amphipod	*Stygobromus montanus*	Invertebrate - other
65	cave obligate millipede	*Trigenotyla parca*	Invertebrate - other
65	Arkansas Wedge	*Xolotrema occidentale*	Invertebrate - other
65	Louisiana Pearlshell	*Margaritifera hembeli*	Mussel
63	Northern Long-eared Bat	*Myotis septentrionalis*	Mammal
62	Boston Mountains Crayfish	*Cambarus causeyi*	Crayfish
62	Leopard Darter	*Percina pantherina*	Fish
62	Indiana Bat	*Myotis sodalis*	Mammal
57	bat cave isopod	*Caecidotea macropropoda*	Invertebrate - other
57	Ozark Pocket Gopher	*Geomys bursarius ozarkensis*	Mammal
57	Neosho Mucket	*Lampsilis rafinesqueana*	Mussel
57	Texas Pigtoe	*Pleurobema riddellii*	Mussel
52	Alabama Shad	*Alosa alabamae*	Fish
52	"Ozark" Fanshell	*Cyprogenia aberti*	Mussel
52	"Ouachita" Fanshell	*Cyprogenia sp. Cf aberti*	Mussel
52	Purple Lilliput	*Toxolasma lividum*	Mussel
50	Sequoyah Slimy Salamander	*Plethodon sequoyah*	Amphibian
50	Bayou Bodcau Crayfish	*Bouchardina robisoni*	Crayfish
50	Jefferson County Crayfish	*Fallicambarus gilpini*	Crayfish
50	Coldwater Crayfish	*Orconectes eupunctus*	Crayfish
50	Arkansas River Shiner	*Notropis girardi*	Fish
50	winter stonefly	*Allocapnia jeanae*	Insect
50	winter stonefly	*Allocapnia ozarkana*	Insect
50	Caddo Sallfly	*Alloperla caddo*	Insect
50	stonefly	*Leuctra paleo*	Insect
50	springtail	*Pseudosinella dubia*	Invertebrate - other
50	Elevated Spring Amphipod	*Stygobromus elatus*	Invertebrate - other
50	Ouachita Needlefly	*Zealeuctra wachita*	Invertebrate - other
48	Pallid Sturgeon	*Scaphirhynchus albus*	Fish
48	Spectaclecase	*Cumberlandia monodonta*	Mussel
46	Fourche Mountain Salamander	*Plethodon fourchensis*	Amphibian
46	Kiamichi Slimy Salamander	*Plethodon kiamichi*	Amphibian
46	Ouachita Burrowing Crayfish	*Fallicambarus harpi*	Crayfish

46	Daisy Burrowing Crayfish	*Fallicambarus jeanae*	Crayfish
46	Blair's Fencing Crayfish	*Faxonella blairi*	Crayfish
46	Mammoth Spring Crayfish	*Orconectes marchandi*	Crayfish
46	Paleback Darter	*Etheostoma pallididorsum*	Fish
46	Ouachita Madtom	*Noturus lachneri*	Fish
46	Ouachita Darter	*Percina brucethompsoni*	Fish
46	Rich Mountain Slitmouth	*Stenotrema pilsbryi*	Invertebrate - other
46	Pink Mucket	*Lampsilis abrupta*	Mussel
43	Illinois Chorus Frog	*Pseudacris illinoensis*	Amphibian
43	Piping Plover	*Charadrius melodus*	Bird
43	Red-cockaded Woodpecker	*Picoides borealis*	Bird
43	Ozark Cavefish	*Amblyopsis rosae*	Fish
43	Arkansas Darter	*Etheostoma cragini*	Fish
43	Sicklefin Chub	*Macrhybopsis meeki*	Fish
43	Snuffbox	*Epioblasma triquetra*	Mussel
42	Caddo Mountain Salamander	*Plethodon caddoensis*	Amphibian
42	Texas Frosted Elfin	*Callophrys irus hadros*	Insect
42	American Burying Beetle	*Nicrophorus americanus*	Insect
42	Hubricht's Long-tailed Amphipod	*Allocrangonyx hubrichti*	Invertebrate - other
42	amphipod	*Bactrurus pseudomucronatus*	Invertebrate - other
42	isopod	*Caecidotea dimorpha*	Invertebrate - other
42	isopod	*Caecidotea oculata*	Invertebrate - other
42	cave obligate isopod	*Caecidotea simulator*	Invertebrate - other
42	cave obligate planarian	*Dendrocoelopsis americana*	Invertebrate - other
42	Shelled Cave Springtail	*Pseudosinella testa*	Invertebrate - other
38	Rich Mountain Salamander	*Plethodon ouachitae*	Amphibian
38	Crystal Darter	*Crystallaria asprella*	Fish
38	Stargazing Darter	*Percina uranidea*	Fish
38	Linda's Roadside-Skipper	*Amblyscirtes linda*	Insect
38	Indiana Phlox Moth	*Schinia indiana*	Insect
36	Regal Burrowing Crayfish	*Procambarus regalis*	Crayfish
34	Bristly Cave Crayfish	*Cambarus setosus*	Crayfish
34	Williams' Crayfish	*Orconectes williamsi*	Crayfish
34	Swamp Metalmark	*Calephelis muticum*	Insect
34	Ozark Emerald	*Somatochlora ozarkensis*	Insect
34	White Liptooth	*Millerelix peregrina*	Invertebrate - other
34	Ouachita Slitmouth	*Stenotrema unciferum*	Invertebrate - other
34	Eastern Small-Footed Bat	*Myotis leibii*	Mammal
34	Salamander Mussel	*Simpsonaias ambigua*	Mussel
33	Henslow's Sparrow	*Ammodramus henslowii*	Bird
33	Sprague's Pipit	*Anthus spragueii*	Bird
33	Bachman's Sparrow	*Peucaea aestivalis*	Bird

33	King Rail	*Rallus elegans*	Bird
33	Western Sand Darter	*Ammocrypta clara*	Fish
33	Kiamichi Shiner	*Notropis ortenburgeri*	Fish
33	Ozark Shiner	*Notropis ozarcanus*	Fish
33	Peppered Shiner	*Notropis perpallidus*	Fish
33	Bluehead Shiner	*Pteronotropis hubbsi*	Fish
33	Little Brown Bat	*Myotis lucifugus*	Mammal
33	Rabbitsfoot	*Quadrula cylindrica*	Mussel
32	Pine Hills Digger	*Fallicambarus dissitus*	Crayfish
32	Dukes' Skipper	*Euphyes dukesi*	Insect
32	Prairie Mole Cricket	*Gryllotalpa major*	Insect
32	Ozark Snaketail Dragonfly	*Ophiogomphus westfalli*	Insect
31	Interior Least Tern	*Sterna antillarum athalassos*	Bird
31	Slippershell Mussel	*Alasmidonta viridis*	Mussel
30	Meek's Short Pointed Crayfish	*Orconectes meeki brevis*	Crayfish
30	Midget Crayfish	*Orconectes nana*	Crayfish
30	Ouachita Mountain Crayfish	*Procambarus tenuis*	Crayfish
30	mayfly	*Dannella provonshai*	Insect
30	Ozark Swallowtail	*Papilio joanae*	Insect
30	isopod	*Caecidotea ancyla*	Invertebrate - other
30	isopod	*Caecidotea steevesi*	Invertebrate - other
30	isopod	*Caecidotea stiladactyla*	Invertebrate - other
30	Purple Pimpleback	*Quadrula refulgens*	Mussel
29	Buff-breasted Sandpiper	*Calidris subruficollis*	Bird
29	Swallow-tailed Kite	*Elanoides forficatus forficatus*	Bird
29	Rusty Blackbird	*Euphagus carolinus*	Bird
29	Bewick's Wren	*Thryomanes bewickii*	Bird
29	Strawberry River Darter	*Etheostoma fragi*	Fish
29	Least Darter	*Etheostoma microperca*	Fish
29	Silver Redhorse	*Moxostoma anisurum*	Fish
29	Stonecat	*Noturus flavus*	Fish
29	Mottled Duskywing	*Erynnis martialis*	Insect
29	Meske's Skipper	*Hesperia meskei*	Insect
29	Rafinesque's Big-Eared Bat	*Corynorhinus rafinesquii*	Mammal
29	Queen Snake	*Regina septemvittata*	Reptile
27	Oklahoma Salamander	*Eurycea tynerensis*	Amphibian
27	Louisiana Slimy Salamander	*Plethodon kisatchie*	Amphibian
27	Hubbs' Crayfish	*Cambarus hubbsi*	Crayfish
27	Mena Crayfish	*Orconectes menae*	Crayfish
27	Lake Sturgeon	*Acipenser fulvescens*	Fish
27	Alligator Gar	*Atractosteus spatula*	Fish
27	Plains Minnow	*Hybognathus placitus*	Fish

27	Ouachita Mountain Shiner	*Lythrurus snelsoni*	Fish
27	Red River Shiner	*Notropis bairdi*	Fish
27	Rocky Shiner	*Notropis suttkusi*	Fish
27	Brown Madtom	*Noturus phaeus*	Fish
27	Longnose Darter	*Percina nasuta*	Fish
27	Southern Cavefish	*Typhlichthys subterraneus*	Fish
27	Lace-winged Roadside-Skipper	*Amblyscirtes aesculapius*	Insect
27	Carolina Roadside-Skipper	*Amblyscirtes carolina*	Insect
27	Appalachian Azure	*Celastrina neglectamajor*	Insect
27	Baltimore Checkerspot	*Euphydryas phaeton ozarkae*	Insect
27	Ozark Clubtail Dragonfly	*Gomphus ozarkensis*	Insect
27	Georgia Satyr	*Neonympha areolata areolata*	Insect
27	land snail	*Gastrocopta rogersensis*	Invertebrate - other
27	isopod	*Lirceus bicuspidatus*	Invertebrate - other
27	Ozark Cave Amphipod	*Stygobromus ozarkensis*	Invertebrate - other
27	Ozark Pigtoe	*Fusconaia ozarkensis*	Mussel
27	Ohio Pigtoe	*Pleurobema cordatum*	Mussel
27	Ellipse	*Venustaconcha ellipsiformis*	Mussel
25	Giant Stag Beetle	*Lucanus elephus*	Insect
25	Diana	*Speyeria diana*	Insect
25	springtail	*Arrhopalites clarus*	Invertebrate - other
24	Ruddy Turnstone	*Arenaria interpres*	Bird
24	Smith's Longspur	*Calcarius pictus*	Bird
24	Common Nighthawk	*Chordeiles minor*	Bird
24	Migrant Loggerhead Shrike	*Lanius ludovicianus migrans*	Bird
24	Yellow-crowned Night-Heron	*Nyctanassa violacea*	Bird
24	American Woodcock	*Scolopax minor*	Bird
24	Cerulean Warbler	*Setophaga cerulea*	Bird
24	American Eel	*Anguilla rostrata*	Fish
24	Paddlefish	*Polyodon spathula*	Fish
24	Southeastern Bat	*Myotis austroriparius*	Mammal
24	"Elongate" Pigtoe	*Fusconaia sp. Cf. sampsoniana*	Mussel
24	Collared Lizard	*Crotaphytus collaris*	Reptile
23	Spotted Dusky Salamander	*Desmognathus conanti*	Amphibian
23	Squirrel Treefrog	*Hyla squirella*	Amphibian
23	Crawfish Frog	*Lithobates areolatus*	Amphibian
23	Plains Spadefoot	*Spea bombifrons*	Amphibian
23	Rufous-crowned Sparrow	*Aimophila ruficeps*	Bird
23	American Bittern	*Botaurus lentiginosus*	Bird
23	Willow Flycatcher	*Empidonax traillii*	Bird
23	Purple Gallinule	*Porphyrio martinicus*	Bird
23	Neosho Midget Crayfish	*Orconectes macrus*	Crayfish

23	Blue Sucker	*Cycleptus elongatus*	Fish
23	Bluntface Shiner	*Cyprinella camura*	Fish
23	Spotfin Shiner	*Cyprinella spiloptera*	Fish
23	Lowland Topminnow	*Fundulus blairae*	Fish
23	Chub Shiner	*Notropis potteri*	Fish
23	Sabine Shiner	*Notropis sabinae*	Fish
23	Suckermouth Minnow	*Phenacobius mirabilis*	Fish
23	Flathead Chub	*Platygobio gracilis*	Fish
23	Central mudminnow	*Umbra limi*	Fish
23	lace bug	*Acalypta susanae*	Insect
23	Copeland's Mold Beetle	*Arianops copelandi*	Insect
23	Northern Metalmark	*Calephelis borealis*	Insect
23	Lincoln Underwing	*Catocala lincolnana*	Insect
23	Woodland Tiger Beetle	*Cicindela unipunctata*	Insect
23	Outis Skipper	*Cogia outis*	Insect
23	microcaddisfly	*Ochrotrichia robisoni*	Insect
23	microcaddisfly	*Paucicalcaria ozarkensis*	Insect
23	Ouachita Shore Bug	*Pentacora ouachita*	Insect
23	Yehl Skipper	*Poanes yehl*	Insect
23	Byssus Skipper	*Problema byssus*	Insect
23	Ouachita Pseudactium	*Pseudactium magazinensis*	Insect
23	Ozark Pseudactium	*Pseudactium ursum*	Insect
23	ground beetle	*Scaphinotus inflectus*	Insect
23	King's Hairstreak	*Satyrium kingi*	Insect
23	ground beetle	*Scaphinotus parisiana*	Insect
23	anthophorid bee	*Tetraloniella albata*	Insect
23	millipede	*Abacion wilhelminae*	Invertebrate - other
23	isopod	*Caecidotea fonticulus*	Invertebrate - other
23	pseudoscorpion	*Microcreagris ozarkensis*	Invertebrate - other
23	pseudoscorpion	*Pseudozaona occidentalis*	Invertebrate - other
23	Plains Harvest Mouse	*Reithrodontomys montanus*	Mammal
23	Pink Heelsplitter	*Potamilus alatus*	Mussel
23	Ouachita Kidneyshell	*Ptychobranchus occidentalis*	Mussel
23	Pondhorn	*Uniomerus tetralasmus*	Mussel
23	Bleedingtooth Mussel	*Venustaconcha pleasii*	Mussel
23	Great Plains Skink	*Plestiodon obsoletus*	Reptile
23	Ground Snake	*Sonora semiannulata*	Reptile
23	Lined Snake	*Tropidoclonion lineatum*	Reptile
21	Le Conte's Sparrow	*Ammodramus leconteii*	Bird
21	Sedge Wren	*Cistothorus platensis*	Bird
21	Bell's Roadside-Skipper	*Amblyscirtes belli*	Insect
21	Golden-banded Skipper	*Autochton cellus*	Insect

21	tiger beetle	*Cicindela lepida*	Insect
21	Scrubland Tiger Beetle	*Cicindela obsoleta*	Insect
21	King's Hairstreak	*Satyrium kingi*	Insect
21	red milkweed beetle	*Tetraopes quinquemaculatus*	Insect
21	Texas milkweed beetle	*Tetraopes texanus*	Insect
21	Black-tailed Jackrabbit	*Lepus californicus*	Mammal
21	Eastern Spotted Skunk	*Spilogale putorius*	Mammal
20	Gapped Ringed Crayfish	*Orconectes neglectus chaenodactylus*	Crayfish
19	Ringed Salamander	*Ambystoma annulatum*	Amphibian
19	Grotto Salamander "western clade"	*Eurycea spelaea*	Amphibian
19	Grotto Salamander "eastern clade"	*Eurycea spelaea*	Amphibian
19	Grotto Salamander "northern clade"	*Eurycea spelaea*	Amphibian
19	Great Plains Narrowmouth Toad	*Gastrophryne olivacea*	Amphibian
19	Four-toed Salamander	*Hemidactylium scutatum*	Amphibian
19	Boreal Chorus Frog	*Pseudacris maculata*	Amphibian
19	Strecker's Chorus Frog	*Pseudacris streckeri*	Amphibian
19	Eastern Spadefoot	*Scaphiopus holbrookii*	Amphibian
19	Hurter's Spadefoot	*Scaphiopus hurterii*	Amphibian
19	Sharp-shinned Hawk	*Accipiter striatus*	Bird
19	Grasshopper Sparrow	*Ammodramus savannarum*	Bird
19	American Black Duck	*Anas rubripes*	Bird
19	Anhinga	*Anhinga anhinga*	Bird
19	Eastern Whip-poor-will	*Antrostomus vociferus*	Bird
19	Sanderling	*Calidris alba*	Bird
19	Dunlin	*Calidris alpina*	Bird
19	Stilt Sandpiper	*Calidris himantopus*	Bird
19	Chimney Swift	*Chaetura pelagica*	Bird
19	Yellow-billed Cuckoo	*Coccyzus americanus*	Bird
19	Northern Bobwhite	*Colinus virginianus*	Bird
19	Tricolored Heron	*Egretta tricolor*	Bird
19	Common Gallinule	*Gallinula chloropus*	Bird
19	Purple Finch	*Haemorhous purpureus*	Bird
19	Wood Thrush	*Hylocichla mustelina*	Bird
19	Least Bittern	*Ixobrychus exilis*	Bird
19	Short-billed Dowitcher	*Limnodromus griseus*	Bird
19	Swainson's Warbler	*Limnothlypis swainsonii*	Bird
19	Black-crowned Night-Heron	*Nycticorax nycticorax*	Bird
19	Black-bellied Plover	*Pluvialis squatarola*	Bird
19	Bell's Vireo	*Vireo bellii*	Bird
19	Redspotted Stream Crayfish	*Orconectes acares*	Crayfish
19	Little River Creek Crayfish	*Orconectes leptogonopodus*	Crayfish
19	Bismark Burrowing Crayfish	*Procambarus parasimulans*	Crayfish

19	Brown Bullhead	*Ameiurus nebulosus*	Fish
19	Autumn Darter	*Etheostoma autumnale*	Fish
19	Sunburst Darter	*Etheostoma mihileze*	Fish
19	Current Darter	*Etheostoma uniporum*	Fish
19	Goldeye	*Hiodon alosoides*	Fish
19	Mooneye	*Hiodon tergisus*	Fish
19	American Brook Lamprey	*Lethenteron appendix*	Fish
19	Pealip Redhorse	*Moxostoma pisolabrum*	Fish
19	Striped Mullet	*Mugil cephalus*	Fish
19	Redspot Chub	*Nocomis asper*	Fish
19	Blackspot Shiner	*Notropis atrocaudalis*	Fish
19	Channel Shiner	*Notropis wickliffi*	Fish
19	Gilt Darter	*Percina evides*	Fish
19	Slenderhead Darter	*Percina phoxocephala*	Fish
19	lace bug	*Acalypta lillianus*	Insect
19	Arogos Skipper	*Atrytone arogos iowa*	Insect
19	Six-banded Longhorn Beetle	*Dryobius sexnotatus*	Insect
19	Dion Skipper	*Euphyes dion*	Insect
19	Leonard's Skipper	*Hesperia leonardus*	Insect
19	Cobweb Skipper	*Hesperia metea*	Insect
19	predaceous diving beetle	*Heterosternuta phoebeae*	Insect
19	Ouachita Diving Beetle	*Hydroporus ouachitus*	Insect
19	Small-eyed Mold Beetle	*Ouachitychus parvoculus*	Insect
19	Gray Comma	*Polygonia progne*	Insect
19	Oak Hairstreak	*Satyrium favonius ontario*	Insect
19	Crawford's Gray Shrew	*Notiosorex crawfordi*	Mammal
19	Eastern Harvest Mouse	*Reithrodontomys humulis*	Mammal
19	Southeastern Shrew	*Sorex longirostris*	Mammal
19	Southern Bog Lemming	*Synaptomys cooperi*	Mammal
19	Elktoe	*Alasmidonta marginata*	Mussel
19	Southern Pocketbook	*Lampsilis ornata*	Mussel
19	"Red River" Mucket	*Lampsilis sp. B*	Mussel
19	Hickorynut	*Obovaria olivaria*	Mussel
19	Gulf mapleleaf	*Quadrula nobilis*	Mussel
19	Lilliput	*Toxolasma parvum*	Mussel
19	Texas Lilliput	*Toxolasma texasiense*	Mussel
19	Tapered Pondhorn	*Uniomerus declivis*	Mussel
19	Midwest Worm Snake	*Carphophis amoenus*	Reptile
19	Western Chicken Turtle	*Deirochelys reticularia miaria*	Reptile
19	Texas Coral Snake	*Micrurus tener*	Reptile
19	Southern Prairie Skink	*Plestiodon obtusirostris*	Reptile
19	Graham's Crayfish Snake	*Regina grahamii*	Reptile

19	Ornate Box Turtle	*Terrapene ornata ornata*	Reptile
17	Trumpeter Swan	*Cygnus buccinator*	Bird
17	Highfin carpsucker	*Carpiodes velifer*	Fish
17	Goldstripe Darter	*Etheostoma parvipinne*	Fish
17	Ant-like Tiger Beetle	*Cicindela cursitans*	Insect
17	Big Sand tiger beetle	*Cicindela formosa pigmentosignata*	Insect
17	Beach-dune Tiger Beetle	*Cicindela hirticollis*	Insect
17	Sandy Stream Tiger Beetle	*Cicindela macra*	Insect
17	earthworm	*Diplocardia meansi*	Invertebrate - other
17	Round Pigtoe	*Pleurobema sintoxia*	Mussel
17	Rainbow	*Villosa iris*	Mussel
17	Little Spectaclecase group	*Villosa* sp. Cf *lienosa*	Mussel
17	Western Diamondback Rattlesnake	*Crotalus atrox*	Reptile
16	Gray Bat	*Myotis grisescens*	Mammal
16	American Badger	*Taxidea taxus*	Mammal
15	Mole Salamander	*Ambystoma talpoideum*	Amphibian
15	Eastern Tiger Salamander	*Ambystoma tigrinum*	Amphibian
15	Dwarf Salamander	*Eurycea quadridigitata*	Amphibian
15	Bird-voiced Treefrog	*Hyla avivoca*	Amphibian
15	Wood Frog	*Lithobates sylvaticus*	Amphibian
15	American Kestrel	*Falco sparverius*	Bird
15	American Golden-Plover	*Pluvialis dominica*	Bird
15	Lake Chubsucker	*Erimyzon sucetta*	Fish
15	Beaded Darter	*Etheostoma clinton*	Fish
15	Swamp Darter	*Etheostoma fusiforme*	Fish
15	Highland Darter	*Etheostoma teddyroosevelt*	Fish
15	Least Brook Lamprey	*Lamptera aepyptera*	Fish
15	Shoal Chub	*Macrhybopsis hyostoma*	Fish
15	Saddleback Darter	*Percina vigil*	Fish
15	Dusky Azure	*Celastrina nigra*	Insect
15	Gorgone Checkerspot	*Chlosyne gorgone*	Insect
15	Cow Path Tiger Beetle	*Cicindela purpurea*	Insect
15	Monarch	*Danaus plexippus*	Insect
15	robberfly	*Microstylum morosum*	Insect
15	Broad-winged Skipper	*Poanes viator*	Insect
15	Long-tailed Weasel	*Mustela frenata*	Mammal
15	Western Harvest Mouse	*Reithrodontomys megalotis*	Mammal
15	Fatmucket	*Lampsilis siliquoidea*	Mussel
15	"Arkoma" Fatmucket	*Lampsilis sp. A*	Mussel
15	Southern Mapleleaf	*Quadrula apiculata*	Mussel
15	Fawnsfoot	*Truncilla donaciformis*	Mussel
15	Gulf Swampsnake	*Liodytes rigida*	Reptile

15	Slender Glass Lizard	*Ophisaurus attenuatus*	Reptile
13	Twelve-spotted Tiger Beetle	*Cicindela duodecimguttata*	Insect
11	winter stonefly	*Allocapnia malverna*	Insect
11	Bronze Copper	*Lycaena hyllus*	Insect
8	Arkansas agapetus caddisfly	*Agapetus medicus*	Insect
8	contorted ochrotrichian microcaddisfly	*Ochrotrichia contorta*	Insect
8	isopod	*Caecidotea salamensis*	Invertebrate - other

Appendix 2.2 Potential Habitat GIS Methodology

Approach: Use GAP Vegetation Map in combination with ancillary layers (polygons from Level III Omernik Ecoregions, STATSGO soils, 1:500,000 Arkansas Geology, Saucier Geomorphology. These were used to clip the GAP Vegetation Raster map to define areas of existing vegetation associated with particular ecological systems). Future phases will add to and improve this map. In the Ozark-Ouachita (Interior Highlands) region, systems are not generally defined in such a way that the data layers available for Phase 1 added any ability to map ecological systems. Therefore in these areas GAP vegetation units were selected without using any other layers.

The 2ha aggregate GAP Vegetation Map was the base vegetation layer – Initial efforts used the finer 30-m pixel size that was the base GAP map resulting from image classification. After doing some clipping of this map it was apparent that the selected areas of vegetation included many single-pixel or few-pixel "speckles" that would have to be aggregated with larger areas before a useful polygon map could be created. The GAP project had already produced aggregated raster maps of 2ha, 10ha and 100ha. It would simplify the current project to use one of these. After inspecting the alternatives the 2ha was chosen as the base vegetation map since it would be easy to "polygonize" but would retain considerable detail. This was a smaller area than would be tracked by the CWCS planning effort for large patch or matrix communities but might be useful for some small patch communities.

Factors involved in selecting clipping layer – GAP used STATSGO map to constrain spectral classification, that is, spectral classification was often done within certain STATSGO polygons within a certain satellite scene. Therefore the vegetation map overlays better on the STATSGO map than on the other maps and is the preferred clipping file unless another is preferred for a specific reason. The STATSGO map was most useful in the Coastal Plain because systems there are closely associated with soils. The Saucier map was preferred in the Mississippi Alluvial Plain because it better represents the definitions of those alluvial systems. The Ecoregion map did not exactly overlay the other maps but CWCS has already made the decision to use that map to define ecoregions so it was used for that purpose. The Geology map was used as a backup to these.

Map Accuracy: The ecological systems map can be no more accurate than the maps used in creating it. The GAP project did an accuracy assessment and found wide variations in accuracy depending on the vegetation type. The highest accuracy was forest vs. non-forest at 75%. In creating the ecological systems map, unless it was essential to do otherwise, all natural vegetation types within a clipping polygon were selected as representing the system, even if, for example, wetland types along streams were known to be a different system from the dominant upland system. The wetland pixels were usually scattered and occurred both along defined stream courses and in inappropriate sites as well, indicating that there would have been as much error in placing them into a different system as including them in the prevalent system. Thus overall accuracy was improved by selecting all forested types as belonging to the system. Although this resulted in a decrease in detail within any given system polygon, the number of systems so defined, at about 20, is not greatly different from the total number of vegetation types defined in the original GAP map, 31.

Map Units Organized by Ecoregion

OZARK-OUACHITA (INTERIOR HIGHLANDS) REGION (comprised of Omernik Level 3 ecoregions Ozark Highlands, Boston Mountains, Arkansas Valley, Ouachita Mountains)

Method: Select vegetation types from the 2 ha. Gap vegetation map (no clip polygons are used).

Ozark-Ouachita Dry-mesic Oak Forest habitat (and same ecological system)

GAP types:

8 T.1.B.3.a.II, *Quercus alba*, white oak - mixed hardwoods

9 T.1.B.3.a.III, *Quercus rubra* - Quercus spp., northern red oak - oak

10 T.1.B.3.a.IV, *Quercus falcata* - Quercus spp., south-

ern red oak - oak 15 T.2.B.4.a.I, *Quercus* spp. - *Carya texana*, oak - black hickory

"Interior Highlands Glade-Barrens" type includes three habitats: Central Interior Highlands Dry Acidic Glade and Barrens (and same ecological system)

Central Interior Highlands Calcareous Glade and Barrens (and same ecological system)

Ozark-Ouachita Dry Oak Woodland (and same ecological system)

GAP types:

3 T.1.A.9.c.I, *Juniperus virginiana*, eastern red cedar

6 T.1.B.2.b.IV, *Juniperus virginiana*, eastern red cedar

11 T.1.B.3.a.V, *Quercus stellata*, post oak

12 T.2.A.2.b.I, *Juniperus virginiana* - Quercus spp., eastern red cedar - oak

14 T.2.B.3.a.II, *Juniperus ashei* - *Quercus* spp., white cedar - oak

"Ozark-Ouachita Pine-Oak Forest and Woodland" type includes pine-hardwood co-dominated sites in three habitats:

Ozark-Ouachita Pine-Oak Forest habitat Ozark-

Ouachita Pine-Oak Woodland habitat Ozark-

Ouachita Pine/Bluestem Woodland habitat

All of which make up Ozark-Ouachita Shortleaf Pine-Oak Forest and Woodland ecological system. (This map unit is probably more comparable to the first two habitats, depending on structure, either forest or woodland, not distinguished by GAP).

GAP types:

4 T.1.B.2.b.II, *Quercus* spp. - *Pinus echinata* - *Carya* spp., oak - shortleaf pine - hickory 13 T.2.B.3.a.I, *Pinus echinata* - *Quercus* spp., shortleaf pine - oak

"Ozark-Ouachita Pine" type includes pine-dominated sites in three habitats:

Ozark-Ouachita Pine-Oak Forest habitat Ozark-

Ouachita Pine-Oak Woodland habitat Ozark-

Ouachita Pine/Bluestem Woodland habitat

All of which make up Ozark-Ouachita Shortleaf Pine-Oak Forest and Woodland ecological system. (This may be comparable to the third habitat if structure is very open, and may also be a distinct habitat from the first two, even if fairly dense.)

GAP types:

1 T.1.A.9.b.I, *Pinus echinata*, shortleaf pine

Ozark-Ouachita Mesic Hardwood Forest habitat (and same ecological system)

GAP types:

7 T.1.B.3.a.I, *Fagus grandifolia*, american beech (The GAP map shows very few areas of this type in only part of the highlands – the type is under-represented in that map.)

"Ozark-Ouachita Riparian" type includes two habitats:

Ozark-Ouachita Riparian habitat (and same ecological system)

South-Central Interior Large Floodplain habitat (and same ecological system)

GAP types:

23 P.1.B.3.c.VII, *Quercus phellos*, willow oak

24 P.1.B.3.c.VIII, *Liquidambar styraciflua*, sweetgum

30 R.1.B.3.c.I, *Salix* - *Populus*, willow - cottonwood

31 R.1.B.3.c.II, *Betula* - *Platanus* - Acer, birch - sycamore - maple

CROWLEY'S RIDGE ECOREGION (defined by Omernik Level 3 map)

"Crowley's Ridge Dry-Mesic Forest" type is a part of Mississippi River Alluvial Plain Loess Slope Forest habitat (and same ecological system)

GAP types:

8 T.1.B.3.a.II, *Quercus alba*, white oak - mixed hardwoods

9 T.1.B.3.a.III, *Quercus rubra* - Quercus spp., northern red oak - oak

10 T.1.B.3.a.IV, *Quercus falcata* - Quercus spp., southern red oak - oak

15 T.2.B.4.a.I, *Quercus* spp. - *Carya texana*, oak - black hickory

"Crowley's Ridge Pine" type is a part of Mississippi River Alluvial Plain Loess Slope Forest habitat (and same ecological system)

GAP types:

1 T.1.A.9.b.I, *Pinus echinata*, shortleaf pine

MISSISSIPPI ALLUVIAL PLAIN ECOREGION defined by Omernik Level 3 map.

Method: Clip 2 ha. GAP vegetation map with appropriate geomorphology polygons defined by Saucier's map.

Lower Mississippi River Dune Woodland and Forest habitat (equivalent to Lower Mississippi River Dune Woodland and Forest and Lower Mississippi River Dune Pond ecological systems).

Saucier types:

Ps sand dune fields and eolian deposits on valley trains

GAP types - All except:

32 R.6.A.1.a.I, Bare, bare

33 W, Water, water

34 AGW, Agriculture, Agriculture (wet crops)

35 AGD, Agriculture, Agriculture (dry crops)

36 AGP, Agriculture, Agriculture (pasture)

37 URC, Urban, Urban Commercial-Industrial

38 URR, Urban, Urban Residential

"Mississippi River Low Bottomland and Depression" map unit includes Lower Mississippi River Low Bottomland Forest and Lower Mississippi River Bottomland Depression habitats (equivalent to Mississippi River Low Floodplain (Bottomland) Forest and Lower Mississippi River Bottomland Depression ecological systems).

Saucier types:

Hb Backswamp (floodbasin) deposits

Hal Alluvial fans and aprons along valley margins

Hchm Abandoned channels (neck and chute cutoffs) of the Mississippi River

Hcom Abandoned courses of the Mississippi River

Pdch Abandoned channels (cutoffs) of the Deweyville Complex

Pdp Point bar (meander scroll) deposits of the Deweyville Complex

Pdu Undifferentiated fluvial deposits of the Deweyville Complex

Ptc Undifferentiated fluvial deposits of the Cache River Terrace

Pvcl Relict channels of late Wisconsin Stage Valley Train

GAP types – All except:

32 R.6.A.1.a.I, Bare, bare

33 W, Water, water

34 AGW, Agriculture, Agriculture (wet crops)

35 AGD, Agriculture, Agriculture (dry crops)

36 AGP, Agriculture, Agriculture (pasture)

37 URC, Urban, Urban Commercial-Industrial

38 URR, Urban, Urban Residential

"Mississippi River Riparian and High Bottomland" map unit includes Lower Mississippi River Riparian Forest and Lower Mississippi River High Bottomland Forest habitats (equivalent to Lower Mississippi River Riparian Forest and Lower Mississippi River High Floodplain (Bottomland) Forest.

Saucier types:

Hpa 1-7 Point bar (meander scroll) deposits of Arkansas meander belts

Hps Point bar (meander scroll) deposits of small streams

GAP types – All except:

32 R.6.A.1.a.I, Bare, bare

34 AGW, Agriculture, Agriculture (wet crops)

35 AGD, Agriculture, Agriculture (dry crops)

36 AGP, Agriculture, Agriculture (pasture)

37 URC, Urban, Urban Commercial-Industrial

38 URR, Urban, Urban Residential

Lower Mississippi Alluvial Plain Grand Prairie habitat (equivalent to Lower Mississippi Alluvial Plain Grand Prairie ecological system).

Saucier types:

Ppu Undifferentiated fluvial deposits of the Prairie Complex. Mostly natural levee and backswamp deposits of the Mississippi, Arkansas and Red rivers.

Pdp Point bar (meander scroll) deposits of the Deweyville Complex. Note-some prairie occurred on Pdp but it is primarily in flatwoods, below.

Pi The part adjacent to Ppu

GAP types – all except:

25 Baldcypress – mixed hardwoods (moved to Mississippi River Low Bottomland and Depression.

32 R.6.A.1.a.I, Bare, bare

33 W, Water, water

34 AGW, Agriculture, Agriculture (wet crops)

35 AGD, Agriculture, Agriculture (dry crops)

36 AGP, Agriculture, Agriculture (pasture)

37 URC, Urban, Urban Commercial-Industrial

38 URR, Urban, Urban Residential

Lower Mississippi River Flatwoods Woodland and Forest habitat (equivalent to Lower Mississippi River Flatwoods ecological system).

Saucier types:

Had Principal abandoned deltaic distributaries.

Pdp Point bar (meander scrolls) of the Deweyville Complex.

Pve 1-4 Early Wisconsin Stage valley trains.

Pvl Late Wisconsin Stage valley trains where levels are not separately delineated.

Pvl 1-2 Late Wisconsin Stage valley trains Levels 1 and 2.

GAP types – all except:

25 Baldcypress – mixed hardwoods (moved to Mississippi River Low Bottomland and Depression.

32 R.6.A.1.a.I, Bare, bare

33 W, Water, water 34 AGW, Agriculture, Agriculture (wet crops)

35 AGD, Agriculture, Agriculture (dry crops)

36 AGP, Agriculture, Agriculture (pasture)

37 URC, Urban, Urban Commercial-Industrial

38 URR, Urban, Urban Residential

WEST GULF COASTAL PLAIN ECOREGION defined by Omernik Level 3 map.

Method: Clip 2 ha. GAP vegetation map with appropriate polygons defined by NRCS STATSGO soil map.

"West Gulf Coastal Plain Flatwoods" includes two habitats:

West Gulf Coastal Plain Dry Pine-Hardwood Flatwoods (and same ecological system)

West Gulf Coastal Plain Wet Hardwood Flatwoods (and same ecological system)

STATSGO types:

Adaton-Felker-Gore AR035

Amy-Pheba-Guyton AR040

Calloway-Henry-Grenada AR038

Bussy-Tullou-Guyton

Sacul-Savannah-Sawyer

Smithdale-Savannah-Sacul (only that area of Sacul lying within the 1:500,000 geology Qt-Quaternary Terrace)

Wrightsville-Acadia-Louin

GAP types – all except:

32 R.6.A.1.a.I, Bare, bare

33 W, Water, water

34 AGW, Agriculture, Agriculture (wet crops)

35 AGD, Agriculture, Agriculture (dry crops)

36 AGP, Agriculture, Agriculture (pasture)

37 URC, Urban, Urban Commercial-Industrial 3

8 URR, Urban, Urban Residential

"West Gulf Coastal Plain Sandhill" equivalent to West Gulf Coastal Plain Sandhill Oak and Shortleaf Pine Forest and Woodland habitat (and same ecological system)

STATSGO types:

Briley-Alaga

GAP types – all except:

32 R.6.A.1.a.I, Bare, bare

33 W, Water, water34 AGW, Agriculture, Agriculture (wet crops)

35 AGD, Agriculture, Agriculture (dry crops)

36 AGP, Agriculture, Agriculture (pasture)

37 URC, Urban, Urban Commercial-Industrial

38 URR, Urban, Urban Residential

"Red River" equivalent to West Gulf Coastal Plain Red River Floodplain Forest habitat and Red River Large Floodplain Forest ecological system.

STATSGO types:

Severn-Billyhaw

Billyhaw-Perry

Rilla-Hebert

GAP types – all except:

32 R.6.A.1.a.I, Bare, bare

33 W, Water, water

34 AGW, Agriculture, Agriculture (wet crops)

35 AGD, Agriculture, Agriculture (dry crops)

36 AGP, Agriculture, Agriculture (pasture)

37 URC, Urban, Urban Commercial-Industrial

38 URR, Urban, Urban Residential

"Blackland" equivalent to West Gulf Coastal Plain Calcareous Prairie habitat (and same ecological system)

STATSGO types:

Oktibbeha-Sumter (But eliminated areas south of I-40 and north of the main belt of these soils.

GAP types – all except:

32 R.6.A.1.a.I, Bare, bare

33 W, Water, water

34 AGW, Agriculture, Agriculture (wet crops)

35 AGD, Agriculture, Agriculture (dry crops)

36 AGP, Agriculture, Agriculture (pasture)

37 URC, Urban, Urban Commercial-Industrial

38 URR, Urban, Urban Residential

ALSO within a TNC conservation site boundary, included

36 AGP, Agriculture, Agriculture (pasture): This was done because there is a substantial amount of native prairie pasture within this area. However, it is properly beyond Phase 1.

West Gulf Coastal Plain Large River Floodplain Forest habitat (and same ecological system)

STATSGO Types:

Guyton-Amy-Ouachita (but only those areas along the Ouachita, Saline, Little Missouri, Little and Cossatot Rivers.)

GAP types – all except:

32 R.6.A.1.a.I, Bare, bare

34 AGW, Agriculture, Agriculture (wet crops)

35 AGD, Agriculture, Agriculture (dry crops)

36 AGP, Agriculture, Agriculture (pasture)

37 URC, Urban, Urban Commercial-Industrial

38 URR, Urban, Urban Residential

West Gulf Coastal Plain Small Stream/River Forest habitat (and same ecological system)

STATSGO Types:

Guyton-Amy-Ouachita (but only those areas other than the Ouachita, Saline, Little Missouri, Little and Cossatot Rivers.)

GAP types – all except:

32 R.6.A.1.a.I, Bare, bare

34 AGW, Agriculture, Agriculture (wet crops)

35 AGD, Agriculture, Agriculture (dry crops)

36 AGP, Agriculture, Agriculture (pasture)

37 URC, Urban, Urban Commercial-Industrial

38 URR, Urban, Urban Residential

West Gulf Coastal Plain Pine-Hardwood Forest habitat (and same ecological system)

STATSGO types:

All, except those listed above

GAP types – all except:

32 R.6.A.1.a.I, Bare, bare33 W, Water, water

34 AGW, Agriculture, Agriculture (wet crops)

35 AGD, Agriculture, Agriculture (dry crops)

36 AGP, Agriculture, Agriculture (pasture)

37 URC, Urban, Urban Commercial-Industrial

38 URR, Urban, Urban Residential

MOSAICKING IMAGES

The purpose of mosaicking was to stitch all the different images that were produced during different spatial operations into one continuous reclassified image.

Each one of those map units discussed earlier in the draft were output as a raster image and each raster image ended up with pixels representing two classes. One class would be the appropriate gap type or types aggregated into one and other class would the classes that weren't taken into consideration from the original GAP 2Ha data due to their inappropriacy; hence were classified under single class as unclassified. The unclassified classes from all the images were given a consistent number "0" and each class was given a unique number depending on its order in the mosaic operation. At end there were 21 images (21 classes) to be mosaicked.

Mosaic rule: Since there was lot of clipping operations done on the STASGO soil layer there were likely overlaps amongst the raster layers (most expectedly at the borders) while mosaicking all of them together. As a general rule, the classes having smaller spatial extents were given higher priority in the overlap areas over the classes having bigger spatial extents. For instance, if there is a classification conflict due to pixel overlap between the red river and the uplands image then the overlapping pixels will be classified as red river and not the uplands since the red river has much smaller geographical extent than the uplands which are widespread in the UWGCP. To implement this general rule, the "Maximum" overlap function was set while mosaicking all these images together into one contiguous raster. What the maximum overlap function does is in any instance of overlapping pixels for the classification purpose the priority will be given to the pixel or class having higher order. Again as an example; in an overlap between Sandhills- class 3 and Blackland- class 4; according to our rule the overlapping pixel will classified as blacklands since it has higher order than Sandhills and hence will get the preference. Setting the same rule, all the images were mosaicked together and were output as a single image representing all the classes including unclassified pixels.

ERDAS Imagine 8.7 remote sensing software was used to do all the raster operations including mosaicking and the other spatial data were produced, edited and displayed in ESRI software suite.

MOSAICKING ORDER

Upper West Gulf Coastal Plain

0- Unclassified
1- Uplands
2- Flatwoods
3- Sandhills
4- Blacklands
5- Red River
6- Large River
7- Small River

Interior Highlands

8- Dry Mesic Uplands Oak
9- Pine
10- Pine Hardwoods
11- Glade Barrens
12- Riparian
13- Mesic Forest

Crowley's Ridge

14- Mesic Uplands Oak
15- Pine Hardwoods

Mississippi River Alluvial Plain

16- Riparian
17- Grand Prairie
18- Low bottomland
19- Flatwoods
20- Sand Dunes

Appendix 2.3. Crosswalk of Terrestrial Habitat Changes.

The following table summarizes the terrestrial habitat team revisions to terrestrial habitat types from the original plan to the 2015 revised plan. The final updated list includes 37 terrestrial habitats.

Original Habitat Name	Change	New Habitat Name
Arkansas Valley Prairie and Woodland	name change; combine with Southeast tallgrass prairie	Ozark-Ouachita Prairie and Woodland
Caves, Mines & Karst Habitat	name change	Caves, Mines, Sinkholes and other Karst Features
Central Interior Acidic Cliff and Talus	combined acidic and calcareous	Ozark-Ouachita Cliff and Talus
Central Interior Calcareous Cliff and Talus	combined acidic and calcareous	Ozark-Ouachita Cliff and Talus
Central Interior Highlands and Appalachian Sinkhole and Depression Pond	combined into caves, mines, karst	Caves, Mines, Sinkholes and other Karst Features
Central Interior Highlands Calcareous Glade and Barrens	name change, delete 'central'	Interior Highlands Calcareous Glade and Barrens
Central Interior Highlands Dry Acidic Glade and Barrens	name change, delete 'central'	Interior Highlands Dry Acidic Glade and Barrens
Crop Land	no change	Crop Land
Cultivated Forest	no change	Cultivated Forest
Lower Mississippi Alluvial Plain Grand Prairie	no change	Lower Mississippi Alluvial Plain Grand Prairie
Lower Mississippi Flatwoods Woodland and Forest	no change	Lower Mississippi Flatwoods Woodland and Forest
Lower Mississippi River Bottomland Depression	no change	Lower Mississippi River Bottomland Depression
Lower Mississippi River Dune Pond Woodland and Forest	no change	Lower Mississippi River Dune Pond Woodland and Forest
Lower Mississippi River High Bottomland Forest	no change	Lower Mississippi River High Bottomland Forest
Lower Mississippi River Low Bottomland Forest	no change	Lower Mississippi River Low Bottomland Forest
Lower Mississippi River Riparian Forest	no change	Lower Mississippi River Riparian Forest
Mississippi River Alluvial Plain Loess Slope Forest	name change	Crowley's Ridge Loess Slope Forest

Mud Flats	no change	Mud Flats
Ouachita Montane Oak Forest	no change	Ouachita Montane Oak Forest
Ouachita Mountain Forested Seep	name change, include Ozarks	Ozark-Ouachita Forested Seep
Ouachita Novaculite Glade and Woodland	combined with Interior Highlands dry acidic glade and barrens	Interior Highlands Dry Acidic Glade and Barrens
Ozark-Ouachita Dry Oak Woodland	name change, include pine	Ozark-Ouachita Dry Oak and Pine Woodland
Ozark-Ouachita Dry-Mesic Oak Forest	no change	Ozark-Ouachita Dry-Mesic Oak Forest
Ozark-Ouachita Mesic Hardwood Forest	no change	Ozark-Ouachita Mesic Hardwood Forest
Ozark-Ouachita Pine/Bluestem Woodland	no change	Ozark-Ouachita Pine/Bluestem Woodland
Ozark-Ouachita Pine-Oak Forest	combine with Ozark-Ouachita Pine-oak Woodland	Ozark-Ouachita Pine-Oak Forest/Woodland
Ozark-Ouachita Pine-Oak Woodland	combine with Ozark-Ouachita Pine-oak Forest	Ozark-Ouachita Pine-Oak Forest/Woodland
Ozark-Ouachita Riparian	no change	Ozark-Ouachita Riparian
Pasture Land	no change	Pasture Land
Ponds, Lakes, and Water Holes	no change	Ponds, Lakes, and Water Holes
South-Central Interior Large Floodplain	name change	Ozark-Ouachita Large Floodplain
Southeastern Great Plains Tallgrass Prairie	combine with Arkansas Valley Prairie- rename	Ozark-Ouachita Prairie and Woodland
Urban/Suburban	no change	Urban/Suburban
West Gulf Coastal Plain Calcareous Prairie	no change	West Gulf Coastal Plain Calcareous Prairie
West Gulf Coastal Plain Dry Pine-Hardwood Flatwoods	name change, delete the word dry	West Gulf Coastal Plain Pine-Hardwood Flatwoods
West Gulf Coastal Plain Large River Floodplain Forest	no change	West Gulf Coastal Plain Large River Floodplain Forest
West Gulf Coastal Plain Mesic Hardwood Forest	combined with West Gulf Coastal Plain Pine-Hardwood Forest/Woodland	West Gulf Coastal Plain Pine-Hardwood Forest/Woodland
West Gulf Coastal Plain Nepheline Syenite Glade	combined with Central Interior Highland Calcareous Glades and Barrens	Interior Highlands Calcareous Glades and Barrens
West Gulf Coastal Plain Pine-Hardwood Forest	combined with West Gulf Coastal Plain Pine-Hardwood Forest/Woodland	West Gulf Coastal Plain Pine-Hardwood Forest/Woodland

West Gulf Coastal Plain Red River Floodplain Forest	no change	West Gulf Coastal Plain Red River Floodplain Forest
West Gulf Coastal Plain Saline Glade	combined with West Gulf Coastal Plain Pine-Hardwood Flatwoods	West Gulf Coastal Plain Pine-Hardwood Flatwoods
West Gulf Coastal Plain Sandhill Oak and Shortleaf Pine Forest and Woodland	name change, delete the word "and"	West Gulf Coastal Plain Sandhill Oak and Shortleaf Pine Forest/Woodland
West Gulf Coastal Plain Seepage Swamp and Baygall	no change	West Gulf Coastal Plain Seepage Swamp and Baygall
West Gulf Coastal Plain Small Stream/River Forest	no change	West Gulf Coastal Plain Small Stream/River Forest
West Gulf Coastal Plain Wet Hardwood Flatwoods	no change	West Gulf Coastal Plain Wet Hardwood Flatwoods
	New Habitat	Herbaceous Wetland

Appendix 3.2 Ouachita Mountains Ecoregional Assessment

Note: The boundaries used in this assessment differ somewhat from those of Woods and others (2004) used elsewhere in this document. They most closely approximate the boundaries of the Ouachita Mountains combined with the Arkansas Valley ecoregions.

Ouachita Mountains Ecoregional Assessment

December 2003

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Executive Summary

In 1996 The Nature Conservancy developed an ecoregional approach to conservation, outlined in *Conservation by Design: A Framework for Mission Success*, stating that biodiversity conservation requires working at larger scales and along ecological instead of geopolitical lines. Ecoregions, large units of land and water delineated by characteristic biotic and abiotic factors, provide a better geographic basis than state boundaries for organizing our conservation priorities and actions. Strategic planning on an ecoregional scale encourages review of many species and ecological communities at once, providing a structure for capturing genetic and ecological variability within species or communities.

The major products of an ecoregional assessment include: 1) identification of a portfolio of sites that, if protected, collectively conserve the biodiversity of the ecoregion, 2) an implementation strategy to protect the sites, including strategies and conservation partners, and 3) identification of data gaps to improve the quality of future conservation decision-making and ensure ecoregional assessment updates capture relevant and useful data. A critical element of the conservation areas is the data captured through the plan, which not only provides a science-based foundation for ecoregional assessments but also provides a starting point for site conservation planning in the implementation phase.

This plan serves as an update of sorts to the 1994 Ouachita Mountains Conservation Initiative plan, which included many of the analyses, information and strategies that are integral to the ecoregional assessments that are the basis for the Conservancy's conservation efforts today.

The Ouachita Mountain Ecoregion includes parts of Arkansas and Oklahoma, and comprises a landscape of approximately 11.48 million acres of rugged mountain ridges, broad valleys, and the headwaters of several large river systems. The complex geological formations and soils of this forested landscape have created a tremendous diversity of habitat reflected in a biodiversity of ancient lineage; the Ouachitas have been available for continuous occupation by terrestrial and aquatic life for 225 million years, and are a center for endemism in North America, particularly in the realm of aquatic species.

The Ouachita Ecoregion is home to 48 endemic species and 68 species with limited ranges. More than one-third of the endemic species are aquatic. There are fourteen federally listed species and 28 others that are recognized as potentially endangered by the United States Fish and Wildlife Service (USFWS) in the ecoregion. There are 79 terrestrial communities identified in the ecoregion, 9 of which are endemic. Most of the remaining communities are shared only with the Ozark Ecoregion within the area collectively referred to as the Interior Highlands.

This ecoregional assessment identified 40 portfolio conservation areas as integral to conservation of the Ouachita's biodiversity. In this iteration of the plan, the aquatic, landscape scale and small patch conservation areas cover a total of 6,068,258 acres, or 53% of the ecoregion. This number, however, can be misleading due to the fact that the watershed area of aquatic conservation areas was used in its calculation. Terrestrial sites alone total 2,494,920 acres or approximately 21% of the ecoregion. Currently, 2,280,231 acres or 38% of conservation areas include land managed under some type of public conservation ownership. This figure increases to 91% when only the area of terrestrial conservation areas is used in the calculation. Of all the conservation areas that are managed for

conservation, 2,120,340 acres or 35 % are federally owned; 159,890 acres or 3% are state or locally owned; and 4,028 acres or 0.07% are privately owned.

Terrestrial ecosystems in Ouachitas are stressed by habitat destruction/conversion, habitat fragmentation, and alteration of natural fire regimes. These stresses have incompatible forestry practices, development, conversion and agriculture, and fire suppression as their sources. Aquatic systems are stressed by incompatible land use practices leading to sedimentation and runoff, and other nonpoint source pollution. Conversion includes land uses associated with grazing and plantation forestry. Habitat alteration and incompatible land use include incompatible agricultural (grazing, confined animal feeding operations) and commercial timber use, as well as development.

The portfolio conservation areas depicted in this iteration of the Ouachita ecoregional assessment are intended as a prioritization management tool for conservation action and resources. This plan also contains the supporting data for each portfolio conservation area, as well as an ecoregional management strategy applicable to the portfolio management areas. Portfolio management action areas are prioritized by biodiversity, threats, complementarity, and potential leverage. Results and data from this ecoregional assessment process should be used to create working site conservation plans as part of the initial implementation phase of the plan.

Introduction

The mission of The Nature Conservancy is to preserve the plants, animals, and natural communities that represent the diversity of life on Earth by protecting the lands and waters they need to survive (TNC, 2001). The Nature Conservancy has worked to fulfill this mission for over 50 years through land acquisition and management, creating partnerships and involving stakeholders and communities in the conservation process. As the threats to biodiversity and their corresponding immediacy increase, TNC has been growing and changing to better fulfill its mission; one key change has been the movement from an opportunistic approach towards strategic conservation management. Strategic conservation is represented here in the ecoregional assessment. *Conservation by Design* (TNC, 1996) defined the framework on which this ecoregional assessment is based by planning for biodiversity at the landscape scale.

An ecoregion is generally defined as relatively large areas containing geographically distinct assemblages of natural communities, where communities share a large majority of their species, dynamics, and environmental conditions, and the communities also function together as a conservation unit at large scales (Ricketts, et al. 1999). TNC based initial ecoregion design on the efforts of the US forest Service (Bailey, 1995) and further refined to sub-ecoregions (Keys, et al., 1995).

Ecoregional assessments endeavor to set the groundwork for regional, state, local, and community based conservation through strategic, long-term priorities and strategies. An ecoregional assessment should:

- Prioritize TNC resources and management action,
- Provide a scientific basis for community based conservation action by delineating geographic areas that should be managed for conservation and biodiversity,
- Provide a general conservation strategy for those sites, and
- Clearly illustrate data gaps discovered during the planning and implementation process, and provide a roadmap for reconciling those gaps.

A complete ecoregional assessment contains not only the ecological sites, but tools for the conservation planners and practitioners:

- Data to support those sites and priorities,
- Strategy to implement the plan, and
- A mechanism to review, update and measure the success of a plan.

The portfolio conservation areas, supporting data, and the applicable management and conservation strategies are based on the best available science, and therefore provide a roadmap for the best use of TNC and partner resources. An ecoregional assessment is also useful as a data bank and data gap analysis. As such, it is a living document that requires review and updates as necessary.

Note that while the goal of an ecoregional assessment effort is to delineate the minimum or priority areas necessary to conserve an ecoregion's biodiversity, different conservation areas represent different goals and not all sites represent functional landscapes. Plan users should carefully review each site description and strategy to ensure plan success.

Within ecoregions, portfolio conservation areas are designed to conserve biodiversity by managing viable native community, zoology and botany targets identified during the planning process. Protection of high quality sites that conserve multiple, unprotected or nontarget occurrences are preferred conservation strategies. To best fulfill the conservation goals of the plan, practitioners need to restore and maintain ecosystem patterns and processes that species and communities need to survive (Turner, 2000).

While conservation area boundaries were conceptually drawn based on element occurrences and not the location of public lands, several of these conservation areas are located entirely within federal ownership based on necessity. For instance, the Ouachita Novaculite Glade ecological system is located entirely within the Ouachita National Forest acquisition boundaries. Therefore, there can be no private lands component to a site like this one except for privately owned inholdings to the Forest which are insignificant in size. This scenario repeated itself for several systems entirely or for large parts of them. As a result, the plan may appear to have a bias toward publicly owned land.

This document represents a 2002 update of sorts to the 1994 plan completed by Douglas Zollner, called the Ouachita Mountains Conservation Initiative, because many of the components of this earlier plan are the very parts required under the Conservancy's ecoregional assessment guidelines. The plan will provide a portfolio of conservation areas, including priority or action areas, the data compiled and created during this planning effort, methodology, the data gaps identified, and a strategies for plan implementation. It is hoped that conservation planners, site-based conservation staff, and TNC partners use this plan to effectively manage the biodiversity of the ecoregion. Successful use, however, will require a commitment of cooperation, resources and time, as well as the sharing of responsibility and effort.

Background

Ecoregional Boundary Delineation

The Ouachita Ecoregion is approximately 11.48 million acres or 17,937 square miles in size, and encompasses parts of Arkansas and Oklahoma. It is bordered by 4 other ecoregions. To the north, the boundary meets the Ozark Ecoregion with which the Ouachitas are often lumped together as the "Interior Highlands," despite their distinct differences in geology. The Ouachita Mountains share much of its diversity with the Ozark ecoregion. To the east, the ecoregion borders the Mississippi River Alluvial Plain, and the Crosstimbers and Southern Tallgrass Prairie Ecoregion to the west. Finally, the Ouachitas are bordered by the Upper West Gulf Coastal Plain to the south.

The northern part of the ecoregion includes an area north of the Arkansas River in Pulaski, Faulkner and White Counties, Arkansas, which is geologically related to the Ouachita Mountains and has the typical east-west ridge lines. However, the terrestrial communities of this area actually have a more Ozark ecoregion character than the rest of the Ouachitas. In this iteration of the plan the Arkansas River Valley is included in the Ouachita Mountains Ecoregion despite its landscape of isolated mountains and oak-hickory forest which is unlike those found in the Ouachitas. Bailey (1982) actually included this area with the Upper West Gulf Coastal Plain ecoregion despite the fact that the two are separated by at least 20 miles. The Arkansas River Valley should perhaps be more appropriately included within the Mississippi River Alluvial Plain ecoregion because of its alluvial geology and similarities in the associated bottomland plant communities.

To the west, the boundary follows the geology as the Ouachitas disappear under the western plains. Vegetationally, the western edge is dynamic; the pine-oak, tallgrass prairie, oak savanna (cross timbers) ecoregions meet along this edge. The boundaries of these floristic association intergrade, advance and retreat with historic changes in climate.

To the south, the boundary follows the divide between the Upper West Gulf Coastal Plain (UWGCP) and Ouachita Mountains. High levels of faunal diversity are found in the rivers that flow south out of the Ouachitas and into the Red River system. The upland forest ecosystem also extends south in this area to where it intergrades with the vegetation types found on the Coastal Plain.

A portion of the Coastal Plain was incorrectly included within the Conservancy's boundary of the Ouachita Mountains Ecoregion. The characteristics of this subsection include deep alluvial deposits (sand, silt, clay) of Pleistocene age which contrasts strongly with the geology of the Ouachitas. It is an irregular plain with low relief (100-300 feet elevation), historically vegetated by oak woodlands and flatwoods. This area will be assessed as part of an UWGCP ecoregional assessment update, and its removal from the Ouachita ecoregional boundary will be addressed in a future iteration of the Ouachita plan.

Geology

The Ouachita Mountains Physiographic Subprovince covers 11.48 million acres in central and western Arkansas and southeast Oklahoma, extending in a broad belt eastward from Atoka county, Oklahoma to the vicinity of Little Rock, Arkansas. The Ouachitas form the southern section of the Interior Highlands, which includes the Ozark Plateau. These geologic features were created 345 million years ago by the same geophysical action that formed the Appalachian Mountains and Central Plateau of Texas. To the east, structural and stratigraphic features are buried by Cretaceous and Tertiary rocks and deposits of the Mississippi Embayment and to the west the structural trend curves south and is buried by Cretaceous strata of the Central Plains (Bryan Tapp, pers. comm., 1992; Miser, 1929). This process has left the Ouachitas isolated from other mountain systems.

The landform of the Ouachita Mountains is an accretionary prism composed of intensely folded and deformed sandstone, shale and chert units that form one of the major fold-belt mountain ranges of the North American continent. Initial sedimentation occurred in deeply submerged ocean troughs. Silty oceanic ooze was metamorphosed into thin layers of shale and chert during Paleozoic times. Occasional units of sandstone occur in the succession, probably emplaced by ocean currents and as fans at the heads of submarine canyons. Strata of Ordovician, Silurian, Devonian and Mississippian ages are exposed in the Ouachitas and represent this early phase of sedimentation. During late Mississippian and early Pennsylvanian periods huge deposits of sand entered the ocean from rivers which had their deltas in the area of present day Poteau, Oklahoma. These rivers deposited great volumes of sand and mud in the basin with accumulations reaching thicknesses of 45,000 feet. These strata are represented by the Stanley, Jackfork, Johns Valley and Atoka formations (Bryan Tapp pers. comm., 1992; Miser, 1929).

The collision of Lanoria with the North American plate resulted in a mountain building process referred to as the Ouachita Orogeny. Metamorphosed oceanic oolithic and deltaic deposits were intensely deformed by compressive forces which were directed north toward the stable interior of the American continent. Twisted, warped and overturned folds and thrust faults reflect this violent collision (Bryan Tapp pers. comm., 1992; Miser, 1929). Deformed Paleozoic rocks were intruded during the Cretaceous by veins of

igneous rock. The hot springs of Hot Springs National Park and the diamond-bearing Kimberlite formation near Murfreesboro, Arkansas are results of this activity (Croneis, 1930).

Erosion has been the dominant geological force over the last 300 million years. Soft shales have been eroded away or deposited in valleys while resistant sandstones, cherts and novaculites have been formed into the dominant ridges we see today. This ridge and valley formation is characterized by long, hogback ridges with relief as great as 1600 feet above the valley floors and total elevations of between 600 and 2,750 feet above sea level. These ridges run east-west and generally have long north and south facing slopes. Because of the way the rock strata fractured north facing slopes tend to be steeper than south facing slopes. Surface rocks are sandstones, shales and cherts (Croneis, 1930).

The Ouachita Mountains can be divided into four geologically distinct subsections (Croneis, 1930; Bryan Tapp, per. comm., 1992):

1) Northern Hogback Frontal Belt (Fourche Mountains): Includes the rugged sandstone ridges of Fourche, Poteau, Winding Stair, Kiamichi, Rich, Black and Boktukola Mountains. These ridges are composed of massive formations of sandstone underlain in places by various shales.
2) Broken Bow-Benton Novaculite Uplift (Central Ouachita Mountains): The most rugged terrain in Arkansas with sharp narrow ridges piled close together, shallow soils and narrow stony valleys. The ridges are capped with fractured novaculite, a hard, resistant siliceous rock which has influenced the formation of glade communities. This area is noted for its numerous springs and seeps.
3) Athens Plateau (Piedmont): The novaculite formation gives way in the south to a gentler topography. Rivers turn south and drop over the fall line to the Gulf Coastal Plain. This is an area of low ridges 150-220 feet high. Uplifted toward the end of the Ouachita orogeny, this plateau was dissected by downcutting rivers.
4) Arkansas River Valley: Divides the geologically simple Ozarks from the geologically complex Ouachitas, with elements of each, was formed between 320 – 286 Ma during the Pennsylvanian era. The river valley is a typical alluvial plain characterized by rapid infilling of clastic sediments and development of growth faults along northern basin margin. As the basin shallowed, plant debris accumulated in nearshore swampy areas (AGC, 1997).

Soils

The Ouachita Mountains are very diverse in terms of aspect, slope and bedrock. The valleys between the ridges are underlain by shale and have a gentle relief. The ridges are composed of sandstone and chert and extremely steep slopes with numerous rock exposures. The ridge tops often have very shallow soils and rock glaciers have formed the steepest slopes.

Most soils of the Ouachita Mountains Natural Division are assigned to the Ultisol order, with a few Inceptisols and Alfisols. Ultisols are intensively weathered soils and characterized by low fertility. They are low in base saturation, and therefore acidic, due to long periods of weathering during the Pleistocene and Holocene epochs. Soils in this order form in humid climates under pine-hardwood forests. They are generally moist throughout the year. Westward, the soils are subject to an annual dry period during the hot season of the year. The soils are deep, strongly leached, generally of medium texture and moderate permeability (Steila, 1989).

This mixture of bedrock, slope, aspect and soils has created unique plant assemblages across rather small areas of mountain ridge. Together with the many small seeps and springs these small areas of

biodiversity form an important part of the total biodiversity of the Ouachita Mountains. The low soil fertility led to the failure of most homesteading efforts in the Ouachita Mountains. Crop farming rapidly diminishes the already low fertility of the soils and it was mostly abandoned early in this century. Cleared land would not easily support a farmer and his family let alone make a profitable excess (Smith, 1986). For this reason most of the landscape has remained or returned to forest. Farmers today raise small livestock (chickens/hogs) in intensive feeding operations or graze cattle on mostly improved pastures. Several large wood product corporations have established large plantations (tree farms) in areas with gentler relief.

In the Arkansas River Valley, soils are from the Quaternary Period, Holocene Epoch and include Steprock, Taft, Roxana, Eram, Spadra, Okay, and Stigler.. Alluvial deposits of present streams include gravels, sands, silts, clays, and mixtures of any and all of these clastic materials. The partition of this unit from other Holocene alluvial deposits was on the basis of geomorphic considerations rather than age or lithology. Fossils are rare and modern. The lower contact is unconformable and the thickness is variable (McFarland, 1998).

Climate

The Ouachita Mountains are located in the humid subtropical zone. Hot, sultry summers and moderately cool winters with some snow, but no accumulations, are normal. The climate is controlled by two different air masses. Warm, moist air from the Gulf of Mexico generally dominates especially in the spring and summer. Cooler, dryer air from the Central Plains enters the area in the winter. (Stroud and Hanson, 1981)

Precipitation is well distributed throughout the year. As one moves from east to west spring rainfall becomes more important with doughty conditions likely in the summer. Total precipitation ranges from 1100mm-1500mm decreasing from east to west. The taller mountains ranges receive additional rainfall due to orographic effects (Smith, 1989). Droughts occur most likely during late summer and fall (Stroud and Hanson, 1981). Moderate droughts occur at 15-20 year intervals with sever, multi-year droughts even less frequent. Tornadoes and floods may occur in any month but are most likely during the spring. Strong winter winds with sleet and freezing rains occur in late December, January and February.

Temperatures average from 4-10 degrees Celsius in January to 21-32 degrees Celsius in July. The peak high temperatures usually occur in August. Elevation can be an important factor influencing temperatures in the mountains.

Ecological Systems

TERRESTRIAL SYSTEMS

The Ouachita Highlands terrestrial community targets were updated from original lists kept by Doug Zollner and Milo Pyne. Descriptions for each community as it is represented in the ecoregion are attached as an appendix. System names have been generalized to conform to the Southern Resource Office's and Association for Biodiversity Information's database. Though system complex names may be used across ecoregions, the composition of each as it occurs in the ecoregion is unique and endemic to the ecoregion. Further, community associations as they are described for this ecoregion that belong to a terrestrial community complex are endemic to the Ouachitas; therefore even though some groups

are noted for not containing localized endemic or rare species, the associations themselves may be rare or endemic. The systems and the associated communities are:

Forest And Woodland Systems

Ozark-Ouachita Fen
This small patch fen community type is found in the Interior Highlands region of the United States. Stands occur on the sideslopes of hills in narrow valleys, bases of bluffs, rock ledges, and terraces of streams and rivers, where the soil or substrate is saturated by calcareous groundwater seepage. Soils are moist to wet, mucky peat or mineral, with pH above 6.5, and vary from shallow (0-40 cm) to moderately deep (40-100 cm), depending on natural disturbance and slope. The parent material is a mixture of gravel and dolomite with fragments of deeply weathered bedrock present, or colluvium over bedrock. The bedrock strata are exposed, especially in hanging fens where the slope is greater than 35 degrees. Hydrophytic plants dominate the fen, which varies from mixed grass or sedge fen with complex zonation to more tallgrass prairie species mixed with calciphiles. Fires are possible in some of the larger prairie fens.

Central Interior Highlands Dry Acidic Glade and Barrens
This small patch system is found in the Interior Highlands of the Ozark, Ouachita, and Interior Low Plateau regions. It occurs along moderate to steep slopes or valley walls of rivers along most aspects. Parent material includes chert, igneous and/or sandstone bedrock with well- to excessively well-drained, shallow soils interspersed with rock and boulders. These soils are typically dry during the summer and autumn, becoming saturated during the spring and winter. Grasses such as *Schizachyrium scoparium* and *Sorghastrum nutans* dominate this system with stunted oak species (*Quercus stellata, Quercus marilandica*) and shrub species such as *Vaccinium* spp. occurring on variable depth soils. This system is influenced by drought and infrequent to occasional fires. Prescribed fires help manage this system by maintaining an open glade structure.

Ouachita Montane Oak Forest
This large patch system represents hardwood forests of the highest elevations of the Ouachita Mountains, including Mount Magazine. Vegetation consists of either forests or open woodlands dominated by *Quercus alba* or *Quercus stellata*. Canopy trees are often stunted due to the effects of ice, wind and cold conditions, in combination with fog, shallow soils over rock, and periodic severe drought. Some stands form almost impenetrable thickets.

Ozark-Ouachita Dry Oak Woodland
This small patch system occurs in the Ozark and Ouachita Highlands and far western portions of the Interior Low Plateau regions along gentle to steep slopes and over bluff escarpments with southerly to westerly aspects. Parent material can range from calcareous to acidic with very shallow, well- to excessively well-drained soils, sometimes with a fragipan that causes "xero-hydric" moisture conditions. This system was historically woodland in structure, composition, and process but now includes areas of more closed canopy. Oak species such as *Quercus stellata, Quercus marilandica*, and *Quercus coccinea* dominate this system with an understory of grassland species such as *Schizachyrium scoparium* and shrub species such as *Vaccinium arboreum*. Drought stress is the major

dynamic influencing and maintaining this system. On flatwoods with fragipans, *Quercus stellata* is the major dominant.

Ozark-Ouachita Dry-Mesic Oak Forest
This matrix system is found throughout the Ozark and Ouachita Highlands ranging to the western edge of the Interior Low Plateau. It is the matrix system of this region and occurs on dry-mesic to mesic gentle to moderately steep slopes. Soils are typically moderately to well-drained and more fertile than those associated with oak woodlands. A closed canopy of oak species (*Quercus rubra* and *Quercus alba*) often associated with hickory species (*Carya* spp.) typify this system. *Acer saccharum* (or *Acer barbatum* to the south) may occur on more mesic examples of this system. Wind, drought, lightening, and occasional fires can influence this system.

Ozark-Ouachita Mesic Hardwood Forest
This small patch system is found on toeslopes and valley bottoms within the Ozark and Ouachita regions, as well as on north slopes. In the Ozarks, *Quercus rubra* increases in abundance compared to dry-mesic habitats, and *Acer saccharum* is sometimes a leading dominant. On more alkaline moist soils *Quercus muehlenbergii, Tilia americana*, and *Cercis canadensis* may be common. In the Boston Mountains, mesic forests may also be common on protected slopes and terraces next to streams. Here *Fagus grandifolia* may be the leading dominant, with codominants of *Acer saccharum, Liquidambar styraciflua, Tilia americana, Magnolia acuminata*, and others. Similar habitats occur in the western Ouachita Mountains.

Ozark-Ouachita Shortleaf Pine-Oak Forest and Woodland
This matrix system represents forests and woodlands of the Ouachita and Ozark mountains region of Arkansas, adjacent Oklahoma, and southern Missouri in which *Pinus echinata* is an important or dominant component. Although examples of this system occur throughout this region, there is local variation in the extent to which they were present. For example, this system was historically prominent only in the southeastern part of the Ozark Highlands where sandstone derived soils were common (USFS 1999); being limited from other areas by inadequate winter precipitation, and non-conducive soils. In contrast, pine was "virtually ubiquitous in the historical forests of the Ouachitas" (USFS 1999). In nearly all cases (at least in the Ouachitas), *Pinus echinata* occurs with a variable mixture of hardwood species. The exact composition of the hardwoods is much more closely related to aspect and topographic factors than is the pine component (Dale and Ware 1999). In some examples of this system, the aggregate importance of hardwoods may be greater than pine, especially on subxeric and mesic sites (Dale and Ware 1999).

Steppe ans Savanna Systems

Central Interior Highlands Calcareous Glade and Barrens
This small patch system is found primarily in the Interior Highlands of the Ozark, Ouachita, and Interior Low Plateau regions along moderate to steep slopes and steep valleys on primarily southerly to westerly facing slopes. Limestone and/or dolomite bedrock typify this system with shallow, moderately to well-drained soils interspersed with rocks. These soils often dry out during the summer and autumn, and then become saturated during the winter and spring. *Schizachyrium scoparium*

dominates this system and is commonly associated with *Andropogon gerardii, Bouteloua curtipendula*, and calcium-loving plant species. Stunted woodlands primarily dominated by *Quercus muehlenbergii* interspersed with *Juniperus virginiana* occur on variable-depth-to-bedrock soils. Fire is the primary natural dynamic, and prescribed fires help manage this system by restricting woody growth and maintaining the more open glade structure.

Ouachita Novaculite Glade and Woodland
This small patch system represents a mosaic of glades and woodlands found on novaculite geology in the central Ouachita Mountains of western Arkansas. Novaculite is a weakly metamorphosed rock of sedimentary origin that is primarily composed of microcrystalline quartz and chalcedony. Examples of this system generally occupy ridgetops at 450-640 m (1476-2100 feet) elevation. They are a mosaic of small woodlands scattered on ridges and upper slopes with outcrops and patches of talus scattered throughout. Some woodland or forest patches may appear as almost linear strips interspersed with grassy openings. Wooded patches have a variable, often patchy, structure with some areas of dense canopy interspersed with more open canopies and open grassy patches. In general, the grassy openings occur on shallow soils with exposed bedrock, while the woodlands occur on somewhat deeper soils. In all cases, these are fairly extreme growing conditions due to droughty, rocky soils.

Herbaceous Systems

Arkansas Valley Prairie and Woodland
This small patch system of prairies and associated woodlands is found in the Arkansas River Valley region of Arkansas and adjacent Oklahoma. This region is distinctly bounded by the Boston Mountains to the north and the Ouachita Mountains to the south, although it has been considered part of the Ouachita Ecoregion (TNC Ecoregion 39). The valley is characterized by broad, level to gently rolling uplands derived from shales and is much less rugged and more heavily impacted by Arkansas River erosional processes than the adjacent mountainous regions. In addition, the valley receives annual precipitation total of 2-6 inches less than the surrounding regions due to a rainshadow produced by a combination of prevailing western winds and mountain orographic effects. The shale-derived soils associated with the prairies are thin and droughty. The combined effect of droughty soils, reduced precipitation, and prevailing level topography create conditions highly conducive to the ignition and spread of fires. Stands are typically dominated by *Andropogon gerardii, Sorghastrum nutans, Panicum virgatum*, and *Schizachyrium scoparium*.

Southeastern Great Plains Tallgrass Prairie
This large patch system is found primarily within the Flint Hills of Kansas and the Osage Plains of Oklahoma; however, it can range into the Ozarks of Missouri, the Arbuckle Mountains of Oklahoma, and the Arkansas River Valley. It is distinguished from Central Tallgrass Prairie (CES205.683) by having more species with western geographic affinities and the presence of a thin soil layer over limestone beds ranging to more acidic substrates, although some areas of deeper soils are found within the region, especially on lower slopes. Because of the presence of the rocky substrate close to the surface and the rolling topography, this area is relatively unsuitable for agriculture. The Flint Hills contain one of the largest remaining, relatively intact pieces of tallgrass prairie. The vegetation in this system is typified by tallgrass species such as *Andropogon gerardii, Panicum virgatum, Schizachyrium scoparium*, and *Sorghastrum nutans* forming a dense cover. A moderate to high density of forb species

such as *Oligoneuron rigidum (= Solidago rigida), Liatris punctata, Symphyotrichum ericoides, Lespedeza capitata*, and *Viola pedatifida* also occur. Areas of deeper soil, especially lower slopes along draws, slopes and terraces, can include *Baptisia alba var. macrophylla, Liatris pycnostachya*, and *Vernonia missurica*. Shrub and tree species are relatively infrequent and, if present, constitute less than 10% cover in the area. Fire and grazing constitute the major dynamic processes for this region. Although many of the native common plant species still occur, grazing does impact this region. Poor grazing practices can lead to soil erosion and invasion by cool-season grasses such as *Bromus inermis*.

Wetland Systems

Central Interior Highlands and Appalachian Sinkhole and Depression Pond

This small patch system is found in the Interior Highlands of the Ozark, Ouachita, and Interior Low Plateau regions, as well as the adjacent Appalachian region. Stands occur in basins of sinkholes or other isolated depressions on uplands. Soils are very poorly drained, and surface water may be present for extended periods of time, rarely becoming dry. Water depth may vary greatly on a seasonal basis, and may be a meter deep or more in the winter. Some examples become dry in the summer. Soils may be deep (100 cm or more), consisting of peat or muck, with parent material of peat, muck or alluvium. Ponds vary from open water to herb-, shrub-, or tree-dominated systems. Tree-dominated examples typically contain *Quercus* species or *Nyssa* species, or a combination of these. In addition, *Liquidambar styraciflua* may be present in southern examples. *Cephalanthus occidentalis* is a typical shrub component.

Ouachita Mountain Forested Seep

This small patch system of forested seeps occurs in the Ouachita Mountains of central Arkansas. Examples may be found along the bottom slopes of smaller valleys where rock fractures allow water to seep out of the mountainsides and in the riparian zones of larger creeks, sometimes extending upslope along small ephemeral drainages. The soil remains saturated to very moist throughout the year. The vegetation is typically forested with highly variable canopy composition. *Acer rubrum var. trilobum, Nyssa sylvatica, Liquidambar styraciflua*, and *Quercus alba* are common and typical. Other canopy species may include *Fagus grandifolia* and *Magnolia tripetala*. Canopy coverage can be moderately dense to quite open. The subcanopy is often well-developed and characteristically includes *Ilex opaca var. opaca, Magnolia tripetala, Carpinus caroliniana*, and *Ostrya virginiana*.

Mixed Upland and Wetland Systems

Ozark-Ouachita Riparian

This linear system is found along streams and small rivers within the Ozark and Ouachita regions. In contrast to larger floodplain systems, this system has little to no floodplain development and often contains cobble bars and steep banks. It is traditionally higher gradient than larger floodplains and experiences periodic, strong flooding. It is often characterized by a cobble bar with forest right adjacent with little to no marsh development. Canopy cover can vary within examples of this system, but typical tree species include *Liquidambar styraciflua, Platanus occidentalis, Betula nigra*, maples

species (*Acer* spp.), and oaks (*Quercus* spp.). The richness of the herbaceous layer can vary significantly, ranging from species-rich to species-poor. Likewise, the shrub layer can vary considerably, but typical species may include *Lindera benzoin, Alnus serrulata*, and *Hamamelis vernalis*. Small seeps and fens can often be found within this system, especially at the headwaters and terraces of streams. These areas are typically dominated by primarily wetland obligate species of sedges (*Carex* spp.), ferns (*Osmunda* spp.), and other herbaceous species such as *Impatiens capensis*. Flooding and scouring strongly influence this system and prevent the floodplain development found on larger rivers.

South-Central Interior Large Floodplain
This linear floodplain system is found throughout the Interior low Plateau, Cumberlands, Southern Ridge and Valley, Western Allegheny Plateau, and lower elevations of the Southern Blue Ridge. Examples occur along large rivers where topography and alluvial processes have resulted in a well-developed floodplain. A single occurrence may extend from river's edge across the outermost extent of the floodplain or to where it meets a wet meadow or upland system. Many examples of this system will contain well-drained levees, terraces and stabilized bars, and some will include herbaceous sloughs and shrub wetlands resulting, in part, from beaver activity. A variety of soil types may be found within the floodplain from very well-drained sandy substrates to very dense clays. It is this variety of substrates in combination with different flooding regimes that creates the mix of vegetation. Most areas, except for the montane alluvial forests, are inundated at some point each spring; microtopography determines how long the various habitats are inundated. Although vegetation is quite variable in this broadly defined system, examples may include *Acer saccharinum, Platanus occidentalis, Liquidambar styraciflua*, and *Quercus* spp. Understory species are mixed, but include shrubs, such as *Cephalanthus occidentalis* and *Arundinaria gigantea ssp. gigantea*, and sedges (*Carex* spp.). This system likely floods at least once annually and can be altered by occasional severe floods. Impoundments and conversion to agriculture can also impact this system.

Barren Systems

Central Interior Calcareous Cliff and Talus
This small patch system is found primarily in non-Appalachian portions of the Central Interior Division. It ranges from the Ouachitas east to the Cumberlands and north into the Western Allegheny Plateau and Lake states. Limestone and dolomite outcrops and talus distinguish this system. Examples range from moist to dry and from sparsely to moderately well-vegetated. Woodland species such as *Thuja occidentalis* can establish along the ridgetops. Understory species can range from grassland species such as *Andropogon gerardii* on drier slopes to more mesic species in areas with higher moisture and more soil development. Wind and water erosion along with fire are the primary natural dynamics influencing this system.

AQUATIC SYSTEMS

All watersheds within the Ouachita Ecoregion are located within the Mississippi River basin, although the rivers may not drain directly into the Mississippi itself. The ecoregion can be divided into three main drainages: the Arkansas, the Ouachita, and the Red River systems. Aside from the Arkansas River and the Red Rivers proper, all other stream systems originate within the ecoregion, flowing into either the Mississippi River Alluvial Plain or the Upper West Gulf Coastal Plain ecoregions. Aquatic

systems represented in the Ouachita Ecoregion include riverine systems as high-order/big rivers, and low-order/small headwater streams, sloughs and swamps, and seeps. Man-made lakes and impoundments are not included in this summary.

A total of 24 fish families are represented in the ecoregion, with most species located within the minnow (Cyprinidae), perch (Percidae), sucker (Catistomidae), sunfish (Centrarchidae), and catfish (Ictaluridae) families. The Ouachitas host a total of 8 ecoregionally endemic fish species, most of which are limited in geographic range within the ecoregion. The aquatic invertebrate diversity of the ecoregion is also quite impressive; twelve crayfish and three mussels are found nowhere else except the Ouachita Mountains. Collectively, the Interior Highlands are home to at least 190 native species of fish, 18 percent of all native freshwater fishes on the continent.. This diversity is due in large part to the complex drainage history of the region which started in the Pleistocene Age and involved multiple mixing, division, and isolation of fish faunas (Pell, Clingenpeel, et al., 1999). The result of these changes and continual occupation of aquatic species for 225 million years is a region that is a center of aquatic endemism for North America.

Low-order/small streams and rivers

Small streams originate in the ecoregion through surface and sheetflow-fed seeps and through sheetflow, groundflow, and surface flow drainage. Reaches of low-order streams and rivers originating in the Ouachitas are considered more typical upland cool low-order streams, and offer the most diverse fish communities in the ecoregion. Substrates can be composed of sand, gravel, cobble, or exposed bedrock. Pool/riffle/run systems are a common feature of these systems. Water is commonly clear and cool with medium to high gradients. These systems provide critical habitat for mussel communities and beds, many of which are species targets, and flow into higher-order/big rivers which have lower gradients. Fish target species found in low-order streams include catfish, shiners, and darters (Robison, 1988, Smith, 1992). Ecological processes in many small streams and rivers have been affected by dams.
In fact, all rivers within the Ouachitas have mainstem dams except for the Glover and Saline. The Middle Fork of the Saline River has many of its tributaries dammed with the remaining free-flowing stream targeted for future impoundment.

High-order/large rivers

Small streams feed into high-order larger rivers of the ecoregion, which in turn contribute to slough/swamp systems. However, most if not all of the slough/swamp habitat in the ecoregion is associated with the Arkansas River and its tributaries within the Arkansas River Valley. The largest of the rivers which originates in the ecoregion is the Ouachita River. Transitioning from low-order streams, gravel and cobble give way to more fine substrates, such as sand and silt. Ecological processes in many of the large-order rivers in the Ouachitas have been affected by locks, dams, or dredging.

As a result of serious alteration of the lower Arkansas River associated with dam construction, the Arkansas River is not a target within this river system; the Arkansas has a total of 6 navigation dams and a larger dam that impounds Lake Dardanelle, all which have had dramatic effects on habitat. Many important aquatic targets, such as the Arkansas shiner, *Notropis girardi*, have been extirpated

from the reach found within the boundaries of the ecoregion. These targets should be addressed more appropriately in adjacent ecoregions where habitat is not limiting or absent.

Socioeconomics

There exists a vast body of local knowledge and research into the socio-economic history and current conditions in the Ouachita Mountains. Only a small fraction of this data is presented here because of the variability between the two states and the many localized effects and conditions of economic development patterns. Generalities and averages present a distorted picture and are not useful in planning and implementing specific projects.

POPULATION

The population of the Ouachita Ecoregion in 1990 was 470,000 with 395,000 in Arkansas and 75,000 in Oklahoma. Most of this population is concentrated in Little Rock and its western suburbs (220,000 or 47%). Little Rock is located on the eastern edge of the Ouachitas downstream from the significant riverine ecosystems. Urbanization, suburban sprawl, and recreation pressures are the main impacts of Little Rock on the ecosystems of the Ouachitas. Hot Springs and its satellite retirement communities are home to another 75,000 people (16%) bringing urbanization and recreational pressures to the Saline River and Lake Ouachita. The rural and small town population of the Ouachitas in Arkansas stands at 100,000 and has decreased in every census since the 1920's. Most of these small towns are located on the periphery of the ecoregion where the mountains meet the Gulf Coastal Plain. In the Oklahoma third of the Ouachitas, the population (75,000) has decreased or remained stable in every census since the 1920's.

The Arkansas and Oklahoma populations are very different. The population of the Ouachitas in Arkansas have higher levels of education and income than the state average and the minority population is low. However, in the Oklahoma portion of the Ouachitas, education and income levels are well below state average and a large minority population resides in the area.

LAND OWNERSHIP PATTERNS

Of the 11.48 million acres in the Ecoregion 1.61 million (15%) is managed by the U.S. Forest Service. Approximately 2.6 million acres is owned by timber or resource extraction interests. Other state and federal agencies manage 10% of the ecoregion. A majority of the balance (~40%) is in small private holdings. The distribution of land ownership is very different between the two states and consequently will be discussed separately as this pattern affects the local political scene.

The majority of federal ownership is in Arkansas with 30% of the ecoregion managed by the federal or state government. Timber corporations, such as Weyerhaeuser and Green Bay Packaging, manage another 25%, with the balance (45%) in private, generally small ownership. In Oklahoma, the largest landowner is Weyerhaeuser Corporation with 775,000 acres (26%), 550,000 acres of which lies in McCurtain county alone. The Forest Service manages 150,000 acres (5%) of the ecoregion in Oklahoma. Another 5% is managed by other state and federal agencies with the balance (55%) in the hands of smaller private landowners.

ECONOMIC PATTERNS

The timber industry is the largest economic force in the Ouachita Ecoregion followed by tourism and small livestock production. It is expected that this pattern will continue as timber corporations transfer operations from the Pacific Northwest to the South, tourism increases and high density chicken farms saturate the area. The spread of chicken farms has done more to raise the incomes of the poorer, land based, rural population than any other economic trend. Mining of sand, gravel and stone as well as drilling for gas and oil are also locally important.

LOCAL ATTITUDES AND FUTURE TRENDS

In Arkansas, the impacts from timber practices, recreation and urbanization will increase and continually effect and modify Conservancy conservation plans and objectives. Generally, people of the Arkansas Ouachitas are familiar with conservation efforts by both environmental groups and governmental agencies. The Conservancy's efforts to work with the private timber industry will be vital to the success of this project.

In Oklahoma, impacts from timber practices are also key with increases in recreational use and urbanization expected but not yet evident. However, the resident population is generally more wary of government and "outside" efforts in environmental conservation.

Where the Conservancy proposes to work in specific locations within the Ouachitas, more detailed data on socio-economic conditions, history and attitudes will need to be researched. The Conservancy will move to enlist the support of organizations with the expertise and local knowledge base in providing and developing this essential information.

Human Use and Historical Impacts to Ecoregion

Humans have been a powerful force in the ecological dynamics of the Ouachita Mountains for thousands of years. Shortleaf pine spread throughout the Ouachita Mountains 1600 to 1000 years ago (Delcourt and Delcourt, 1990). This spread was accompanied by the extensive use of fire by aboriginal Americans. For more than 4000 years aboriginal Americans used fire to increase forage for game animals. They also cleared fertile areas in the major river valleys to raise crops and introduced new species of plants and animals to the Ouachitas. Their fishing and mussel harvesting impacted riverine ecosystems. These activities together with a complex geological and evolutionary history created the anthropogenic phenomenon that was the tessellated landscape present when the first European settlers penetrated the area.

Intrusions by Europeans began approximately 450 years ago with the first Spanish explorations. Newly introduced diseases caused native populations to crash and the human influence on the landscape lessened for a time. Bison spread eastward from the plains during this interval. Anthropogenic influence increased again when the Ouachitas were resettled in the 1850's by Europeans, when wagon trains five across could be driven through a fire-maintained landscape. By then, the herds of bison were gone, followed shortly by the woodland elk, ocelot, black bear, red wolves, Florida panther, and even white-tailed deer. Overharvesting and changes in ecosystem processes and community composition and structure also resulted in the extirpation as breeding species - two fish, nine birds and twelve plants. Some of these species are now extinct, some are recovering or have been reintroduced.

The forests of the Ouachita Mountains were completely cut over by the late 1920's and the second growth forest cut again in the 40's and 50's. Only scattered fragments remain in a "pre-settlement" condition within this completely reordered landscape. Even within these fragments, 70 years of fire suppression have taken a toll. The riparian ecosystem was completely disrupted by the building of railroads to extract timber and the cutting of hardwood cross-ties. Many riparian areas were then homesteaded and have not regenerated. Construction of large impoundments in the 1950's and 1960's exacerbated the destruction of riparian forests and devastated many riverine ecosystems.

An excellent opportunity exists for conservation of the remaining biodiversity and restoration of these ecosystems. The reintroduction of ecosystem processes, such as fire, and the full range of community structures, such as old growth, that maintained and defined the original ecosystems will go a long way toward restoring the entire range of ecosystem functional qualities and values.

The stresses on ecosystem integrity identified in the following section come from a variety of human activities which degrade existing ecosystem functions and communities or prevent recovery of these communities and systems. These stresses are diverse in origin and complex in their short-term and long-term consequences. Stresses on ecological systems are cumulative and interactive in their deleterious effects. In order to assess and prioritize these stresses, a stress assessment has been completed. This analysis provided a framework by which we rank both our evaluation of the degree of ecological stress and our understanding of its effects and consequences. Further research may cause priority reorganization. As our understanding of ecosystem processes deepens, the degree of perceived risk may increase or decrease.

Stresses and Sources of Stress to Ecological Systems

Upland Forest Ecosystems

Stresses: Habitat destruction/conversion, altered composition/structure, alteration of natural fire regimes, fragmentation
Source: conversion to silviculture

Over the last 20 years, two million acres of second growth forest have been converted to pine plantation. These plantations consist mostly of genetically "improved" loblolly pine not naturally found in the forested upland ecosystem. Although conversion has slowed due to the lack of economically viable areas to convert and decisions by the USFS to abandon this management practice, it is an ongoing stress to the forest ecosystem. The ecosystem stress is derived from the impact of having large areas in what amounts to a monoculture of early serial stage exotics. Furthermore, the stress is continuous through the second, third and fourth rotations ad infinitum.

Conversion to plantation removes native trees, involves intensive site preparation, such as bedding and fertilizing, and planting of genetically improved stock. The trees are harvested on a 28-32 year rotation. Many miles of dirt and gravel roads have been constructed for easy access to these trees, fragmenting the landscape and contributing to the sedimentation in rivers. Plantations use biocides and fertilizers heavily, and are often surrounded by plowed firebreaks. The result is the complete loss of ecosystem integrity through the destruction of community composition, structure and natural

processes. This process threatens further loss of rare species, unique communities, ecosystem structure, and composition and processes – essentially the integrity of the large forested landscape.

In comparison, conversion for uses other than forestry is relatively minor except in the flat Arkansas Valley. Row cropping was never sustainable on Ouachita Mountain soils (doesn't apply to the Arkansas Valley) and was abandoned long ago. Livestock farming is a common practice. The preparation of pasture by herbiciding and chaining the forest has been a widespread on private lands in Oklahoma. This is a serious stress on the forested ecosystem at the western end of the Ouachitas. Because all trees are not eliminated and pastures generally remain in native grasses, the long-term effect of conversion to livestock or pasture is not likely to be as severe as conversion to plantations. Still, these practices destroy natural communities and degrade ecosystem functions, and can increase erosion rates.

All factors of urbanization and sprawl disrupt ecosystem processes and landscape integrity. Urbanization and sprawl occurs around the city of Hot Springs and the western suburbs of Little Rock. Its effects on the total ecosystem are localized but serious in some areas. In addition to commercial and residential development, one practice that is having a particularly negative impact on ridgetop forest communities is the placement of communication towers on tall peaks in the range. The forest communities found on these peaks are unique because the stressful environmental conditions lead to many local adaptations, and tend to be old because ridgetop tree harvest was not economical. Increased urbanization also leads to the fragmentation of the forest with utility right-of-ways, roads and strips of development.

The conversion of large forested ecosystems to other uses such as impoundments, agricultural fields and urban conglomerations destroys the habitat that birds need to sustain their numbers. Such habitat changes favor generalist species over others, mostly migratory songbirds. Neo-tropical migrants generally require interior forest area, often with a specific community structure to reproduce successfully. Industrial forests tend to keep large areas in earlier serial stages, create edges that are often abrupt, and suppress other ecological processes (such as fire and insect outbreaks which are part of the functional qualities of the forest ecosystem).

Stresses: habitat destruction/conversion, Altered composition/structure, alteration of natural fire regimes, fragmentation
Source: Incompatible forestry Practices

The forest industry is the single largest economic force in the Ouachita Mountains. With at least six million acres of maturing forest, logging pressures will remain high. Traditional silvicultural practices have affected the forest ecosystem in a number of ways over the past 90 years. The emphasis has been on the harvesting and growing of pine, which has changed community composition and structure in different ways across the forested landscape.

Although traditional forestry practices conserve forested areas, until recently, little consideration has been given to the conservation of unique communities and essential ecosystem processes. Matrix forest structure in the Ouachitas has changed from an open, savanna-woodland community with large trees in the overstory and a grass dominated understory to a dense closed canopy forest with many small trees and a depauperate understory. The forested ecosystem has become a more uniform one

created by timber harvesting and the alteration of fire regimes, without the patterns created by natural ecosystem processes and diverse natural communities.

On Forest Service land the emphasis on management for pine timber has changed. It is still common on private lands to clear mesic north-slope hardwood forests and plant pine and attempts are made in other forest communities to control hardwoods with herbicides to increase the pine component. Trees in wooded seeps, springs and along cliff lines have been harvested, thus eliminating mesic conditions and the associated dependent species. Old growth conditions are virtually non-existent, the largest fragment being the 14,000-acre McCurtain County Wilderness Area. Old growth dependent species or species that need large forested areas as habitat may be eliminated from forest communities. The lack of research and extension in sustainable forestry alternatives results in a large data gap.

The forested upland ecosystem is fire dependent and many forest communities cease to exist without this essential ecosystem process. Seventy years of fire suppression in the Ouachita Mountains has drastically altered community composition and structure. Fire reduces tree density, favors some species and communities over others, changes community structure and adds diversity to the forested landscape. Glades, prairies, woodlands, savannas and pine-oak forests are examples of fire dependent communities.

Good progress has been made over the last 8 years toward restoring altered fire regimes in pine dominated ecosystems, and a partnership of interested agencies and others is working toward the same for the Oak dominated ecosystems of the Ouachitas at the necessary landscape scale. Within these restorations, fires must be allowed to burn at different intensities during different seasons of the year and across transitional boundaries to maintain ecotones. These efforts need to be continued and expanded to ensure conservation of the ecoregional fire dependent targets.

Incompatible forestry practices can also lead to increased erosion and fragmentation from harvesting and road building. The use of biocides and introduction of exotic species during wildlife "improvement" projects also decreases biodiversity and degrade ecosystem processes. Aquatic systems are also indirectly effected by these forestry practices

Traditional silvicultural practices alter the composition and structures of forest communities. These practices have virtually eliminated old growth conditions in the Ouachita Highlands. Some species are able to take advantage of these forestry operations while others cannot; the result is that forestry operations artificially favor some species over others. Those species that are dependent on old growth conditions, unfragmented or large blocks of mature forest or other ecosystem processes decline, while generalists species or those favoring young or small patches of forest increase.

Stresses: habitat destruction or conversion, fragmentation, erosion/sedimentation, toxins/contaminants
Source: Mining Practices

This activity is very localized but has the potential to threaten unique communities in the Ouachitas. Glades, seeps and cliff lines are particularly vulnerable to the exploitation of mineral resources.

The frontal belt in Oklahoma and the Poteau Mountains of Oklahoma and Arkansas adjoin the Arkoma Basin, which has experienced extensive development of fuel resources (oil, gas, and coal). Oil exploration has moved into the frontal belt with over 100 wells drilled between 1986-1990 alone.

Many of these wells have yielded gas or oil and exploratory activity is continuing. The right of ways (pipelines, roads) associated with this type of development are serious sources of forest fragmentation. Coal resources are not currently being developed although it has been considered. If developed, the geology would dictate strip mining methods similar to those found to the north.

Stresses: habitat disturbance, erosion/sedimentation, introduction of exotic species
Source: Recreational Uses

Recreational uses are often concentrated in special areas. The complete destruction of the natural communities found in the natural hot springs of the Ouachitas occurred historically before any research was completed. Glades and other more open areas in the forest make great campgrounds both official and casual. Mountain peaks with their viewscapes, cliff lines and waterfalls with their delicate natural communities are examples of areas heavily used by hikers.

Riparian Ecosystems

Stresses: alteration of habitat destruction, change in hydrologic regime, introduction of invasive species
Source: Dam Construction, water withdrawals

The construction of impoundments has drowned hundreds of miles of riparian forest and destroyed hundreds of miles of riverine aquatic habitat. The Ouachita valley suffered the loss of fully two-thirds of its riparian forests to impoundments along its lower end. The other major river valleys have lost between 20-30% of their riparian forests and riverine aquatic habitats to impoundments. Seventeen major dams have been built and there are plans for an additional six.

Aggravating this direct habitat loss is the associated change in hydroperiods, which reverse normal ecosystem processes. The timing, duration, depth and velocity of flooding has been altered or stopped due to impoundments. Floodwaters stored behind the dams are released slowly at a time when the rivers would normally be low. Floodwaters also move large volumes of silt and sediment which should be naturally deposited on the floodplains during flood events. Nutrient rich silts and sediments are now trapped behind the dams. The seasonal expansions of riverine water onto floodplains are critical to the lifecycle of many aquatic species. The scouring action of floodwaters and deposition of silts and sediments are essential ecosystem processes. Furthermore, the permanent retention of sediment in these impoundments results in an often severe alteration of the system's natural sediment budget which can cause geomorphological instability and associated severe streambank erosion downstream of the dam. This erosion can alter and even destroy large amounts of the riparian ecosystem. Overall, the interruption of this complex ecological process has far reaching impacts on the flora and fauna, some of which may take decades to become noticeable. The results are destruction of the riparian forest, or changes in forest composition, structure and growth rates and a concurrent change in fauna as riparian ecosystems adjust to new parameters.

Ecosystem processes in riparian zones are intact only above the high level mark of the impoundments. These areas also have the narrowest strips of riparian forest. The larger floodplains with their large bottomland hardwood forests have been most impacted.

Stresses: habitat alteration/destruction, habitat fragmentation, introduction of exotic species.
Sources: Conversion

Historically, riparian areas have been used as travel corridors, as a pathway to upland timber removal, and for homesteading. Riparian areas were cleared for railroads and the hardwoods used as crossties. These areas were then settled and farmed; seldom were they allowed to regrow. Beginning in the 1930's and continuing today, many homesteads were abandoned and riparian areas allowed to reforest through natural processes.

Recent trends in forestry toward large plantations has resulted in the conversion of riparian forest to softwoods. The replacement of riparian forests (mostly hardwoods) with plantations of loblloy pine leads to diminished biological diversity. This practice is most widespread where flooding has been controlled. The result is the destruction of ecological communities, reduction of riparian forests to narrow strips along river corridors, and the loss of ecosystem processes and functions. Some of the practices associated with traditional forestry can also degrade riparian areas. Inappropriate harvesting methods, road building and disturbances which allow the spread of exotic species will degrade riparian forests through fragmentation, changes in species composition and community structure, and a loss of biological diversity.

Conversion to agriculture is not as great a concern. Past agricultural clearing is reversing itself as agriculture becomes economically marginal. In the narrower upper watershed the riparian forests have mostly reestablished themselves. Those areas that have been converted to agriculture continue to degrade riparian ecosystems by fragmenting the forest. In many places there is no riparian buffer strip at all. Free ranging livestock (also feral hogs) have had deleterious impacts on understory vegetation and forest reproduction through heavy and uncontrolled access and use of riparian zones. This disturbance has also been a pathway for the introduction of exotic species.

Urbanization threatens riparian ecosystems throughout the Ouachita Mountains. Currently these developments are limited in extent and in most cases tied to the recreational opportunities and industries associated with the large impoundments. New roads and other developments are inevitably restricted to the relatively flat areas of floodplains found in riparian ecosystems. Southeast Oklahoma is the poorest area in the state, and consequently many development efforts are underway to encourage industrial and recreational uses, including new and improved corridors, assistance to industrial parks and promotion of recreational opportunities. Arkansas has similar, if less extensive, development assistance programs. Particularly worrisome is the proposed interstate highway connection which would run north-south along the Arkansas-Oklahoma border from Fort Smith to Texarkana. At present there are no quick and easy routes through the Ouachitas. A highway such as this opens up large areas of rather remote and hard to reach areas to development.

Urbanization increases the fragmentation of riparian forests and accelerates the spread of exotic species. Urban development also makes the restoration of ecosystem processes, such as functional hydroperiods, difficult or impossible.

As a whole, riparian forest conversion and clearing can also have dramatic effects on aquatic systems. Forested riparian corridors provide important shade which plays a role in keeping water temperatures low. These forests also play a key role in curbing streambank erosion, whether at natural or accelerated rates associated with stream or watershed alterations; sedimentation is a major threat to

aquatic targets of the ecoregion. In fact, soil is the largest pollutant by volume in the ecoregion. Furthermore, riparian forests provide fish and invertebrate habitat in the form of branches and even whole trees. Leaves and other inputs also play an important role in the carbon cycle, fueling the food chain of aquatic systems.

Stresses: habitat degradation, habitat fragmentation, introduction of exotic species
Source: Recreational Uses

Riparian zones are popular recreational sites. Most of the recreational opportunities are concentrated along the major impoundments where boating, fishing and camping use is heavy. All the larger streams receive heavy use in the summer from campers, canoeists and day users in both developed and undeveloped recreation sites. Where overuse occurs erosion, habitat destruction, forest fragmentation and the spread of exotic species are problems.

Riverine Ecosystems

Stresses: habitat destruction, habitat disturbance, loss of genetic diversity, alteration of hydrologic regimes, thermal alteration, resource depletion, sedimentation, salinity alteration
Source: Dam Construction, Water Diversions and Withdrawals, operation of dams/reservoirs

The ecological integrity of the rivers and streams of the Ouachita Mountains has been severely compromised by numerous dams. Only the Glover River and the mainstems of the upper forks of the Saline River have escaped impoundment. Seventeen major impoundments and uncountable small, private dams have been built. At least six additional major dams are planned and several have various levels of approval. These would impound the Glover and Saline (North Fork) Rivers and further impound the Little and Kiamichi Rivers.

Impoundments physically destroy large areas of riverine ecosystem, and therefore alter the hydrology of the downstream portion of the entire ecosystem; it is disrupted and often destroyed. Impoundments also block the normal movement and migration of species, allow the introduction of exotics, and create thermal pollution downstream. Mussel glochidia (young) are parasitic though harmless to their often species specific host fish. Various fish species serve as hosts to the glochidia depending on the species of mussel. By hosting mussel glochidia, migratory fish perform an important function of distributing mussels throughout a river system; impoundments make such repopulation impossible. This disruption may have doomed some species of mussel to extinction even though the senescent populations are still extant. Overtime reduced reproductive productivity caused by interrupted breeding migrations leads to general population decline for both fish and mussels.

Texas water authorities, specifically Dallas in partnership with State of Oklahoma are currently exploring interbasin transfer options, including diversion from the Kiamichi River.

The destruction of a natural riffle-pool environment dislocates fish communities as well as other aquatics species, including amphibians and mussels. With impoundments in place, many big river fish can no longer migrate upstream to breed.

Downstream ecological disruption occurs because impoundments generally reverse and regulate the hydropattern of the dammed rivers. Water is impounded during high flows and released slowly throughout the year. The water temperature, oxygen levels and natural sediment transfer process are drastically altered. The scouring action produced by large storm events is an essential ecosystem process which remakes riverine topography, opening up new habitat for disturbance dependent species and communities. Further, without the natural variation in flow, seasonal flooding of riverine water onto floodplains, critical to the lifecycle of many aquatic species, is lost. For example, many fish species use seasonally flooded areas for spawning. Similarly, the permanent retention of sediment in these impoundments results in an often severe alteration of the system's natural sediment budget which can lead to severe streambank erosion downstream of the dam. This often severe erosion can result in increases in sedimentation and habitat destruction.

River reaches upstream of impoundments can also be effected. Although these reaches are often targeted as conservation priorities, isolation from downstream reaches can result in shifts in community composition, local extirpation of species present prior to dam construction, and even reduction in species richness (Lienesch et. al 2000). Headwaters, stream reaches typically isolated by reservoirs, are more dramatically affected by abiotic factors that can temporarily render certain habitats inhospitable, making access to downstream refuge areas important. Isolation cuts off colonizers from downstream areas that play a key role in re-establishing the fish populations after these catastrophic events, such as flooding and severe drought.

Stresses: sedimentation/erosion, toxins/contaminants, habitat destruction, alteration of hydraulic regime
Source: Incompatible Forestry Practices

Forestry is the primary land use in every major watershed in the Ouachita Mountains. The USFS and large forest industries manage well over half the landscape. The thousands of smaller non-industrial landowners also manage much of their land for the economic benefits derived from timber production. As with any heavily timbered landscape, poor in agricultural resources (soil) and with over 2,000,000 acres in plantations, forestry is likely to remain the major economic use of the land.

Forestry operations which do not use best management practices cause many non-point source pollution problems. Erosion and sedimentation occurs during and after tree harvesting and as a result of unsound construction, placement, and maintenance of roads. Sediment deposited on the river substrate alters the habitat used by fish and mussels. It smothers breeding sites and eggs and reduces reproductive productivity. In suspension it reduces light penetration, alters the micro flora and fauna, increases water temperatures, reduces mussel feeding time and causes a general degradation of riverine ecosystems.

Intensive forestry operations (plantations) are heavy users of biocides and fertilizers. Poor application procedures result in degradation of riverine ecosystems through toxic poisoning and increased nutrient load. Extensive manipulation of vegetative cover results in changes in the infiltration and runoff of precipitation. Usually these changes increase short term runoff and decrease the amount of water available over the longer term.

Mussels are particularly sensitive to the toxins released by biocides, and the stress to micro flora and fauna causes degradation and local extirpation. These poisons have both acute and chronic effects to aquatic communities.

Stream crossing construction often occurs at riffles areas; unfortunately, riffles are primary habitat for many mussels and darters. The destruction of riffle habitat causes localized degradation and extirpations. It also destructively alters the hydrology of the streambed, leading to scour and increases chronic sedimentation problems. Biocides, sedimentation, and other runoff enter riverine systems at road crossings. Poorly placed and designed culverts and low water bridges alter stream hydrology and habitat and block the normal movement and migration of species.

Stresses: nutrient loading, toxins/contaminants, alteration of hydrologic regime, sedimentation, habitat destruction
Source: Agricultural Practices

The agricultural practices in the Ouachita Mountains consist of grazing livestock, hay mowing and confined animal feeding operations, mostly hogs and chickens. Historically the river valleys were settled and cleared for farming and have the best soils. Although the amount of land devoted to these practices is relatively small they are most often located in the river valleys along the streams where they can have the greatest, most direct impacts. These practices are the source of many non point source pollution problems. These stresses are the similar to those produced by forestry operations, including increased sedimentation from overgrazing, land clearing with biocides, and alterations in runoff and stream hydrology. Landowners have traditionally allowed livestock free access to riverine areas. This practice can result in streambank instability and decreased riparian understory which leads to increased sedimentation.

A particular problem in the Ouachita Mountains occurs with small livestock operations because of the large amount of animal waste produced and concentrated near streams. Runoff from these operations increases nutrient loading and degrades water quality. Nutrient enrichment causes changes in community composition and ecosystem processes, or their outright destruction.

Stresses: Sedimentation, habitat destruction
Source: roads, unpaved permanent and temporary

Sedimentation from the thousands of miles of unpaved road systems that run throughout the Ouachitas is a huge source of sediment. These roads, usually not designed and built with sediment retention in mind, provide a direct conduit for sediment to reach a stream – even the best streamside buffer cannot reduce this kind of runoff. The Natural Resources Conservation Service estimated that approximately ¼ of the sediment entering an Ozark stream comes from road runoff. Ouachita streams face the same threat. This number is likely similar for all Ouachita streams meaning that one quarter of sediment entering Ouachita streams has an easily identifiable source to target for action.

Sediment deposited on the river substrate alters the habitat used by fish and mussels. It smothers breeding sites and eggs and reduces reproductive productivity. In suspension it reduces light penetration, alters the micro flora and fauna, increases water temperatures, reduces mussel feeding time and causes a general degradation of riverine ecosystems.

Stresses: toxic poisoning, nutrient enrichment/loading
Source: Point source discharge, wastewater treatment, catastrophic contaminant spills

The Ouachita Mountains Physiographic Province contains one city (Hot Springs), various towns, and over 300 small villages, settlements, crossroads, state parks, forest campgrounds and recreation areas, one military base and the western suburbs of Little Rock. Each of these entities has one or more permitted point source discharges into the ecoregion's rivers. The majority of these discharges (including Little Rock) are from the settled area along the periphery of the Ouachita Mountains where the major roads follow the fall line. However, though individual point sources are permitted, no current federal or state policy or management takes the cumulative effect of these discharges into account.

Toxins and nutrient loadings from municipal sewage, wood processing mills and chicken factories have major negative impacts on sensitive species such as mussels and microorganisms. Repeated discharges and spills depauperate riverine ecosystems. Inorganic contaminants include mercury and arsenic.

Stresses: erosion/sedimentation, habitat destruction, toxins/contaminants, alteration of hydrologic regime
Source: Mining

There is very little mining activity in the Ouachita Mountains aquatic systems, but some stone and gravel mining does occur. During road and bridge construction stone and gravel are often mined from riverbeds. These operations, while generally localized and small, can cause havoc when they take place instream. Changes in hydrodynamic flow, very high rates of sedimentation, localized habitat destruction and long term changes in the physical parameters of the river bed can disrupt riverine ecosystems over the long term. These operations have acute localized and long term chronic effects on the aquatic ecosystem.

There is exploratory drilling for gas and oil in the northern part of the ecoregion. This activity is not currently impacting the riverine ecosystems of concern. Low-quality coal reserves, apparently occur in the area, but many of the historical mining sites, such as those for coal in the Arkansas River Valley and for Barite in the Caddo watershed, are being restored

Stress: extraordinary resource competition, habitat destruction/alteration, extraordinary predation/parasitism/disease
Sources: Introduction of Exotic Species

Exotic aquatic species have been documented in the riverine ecosystems of the Ouachita Mountains. Aquatic invasives—plants and animals—are both purposefully and accidentally introduced into riverine ecosystems. The Asian clam (*Corbicula fluminea*) is now a permanent resident throughout most of the continental U.S. Of particular concern is the rapid expansion of the zebra mussel (*Dreissenia polymorpha*); invasion has been documented in the Lower Mississippi and Arkansas Rivers, but not in the Red River system. No effective means have been developed to control zebra mussel spread, and with its large impoundments and heavy recreational marine traffic, invasion may be an eventuality in the Red River system. It is possible for populations of this mussel to disrupt the

entire aquatic community structure of a river by changing the food chain base. Further, by growing on the shells of native mussels, Zebra mussels will kill natives by smothering them outright.

The stocking of exotic game fish can also pose problems. Traditionally state game and fish organizations have introduced various species of sport fish, and as a result, exotic bait fish are also widespread. Game fish tend to be apex predators, which can decimate smaller native fish species and outcompete native apex predators. The introduction of the smaller species of fish used as bait disrupts native ecosystems due to competition for breeding and spawning sites.

The impact of predation by resident animals is not well documented and is probably significant only where populations have been severely impacted by other negative stresses. Muskrats, raccoons and turtles all eat mussels, as do some fish. Monitoring of endangered populations may show cause for concern. It is believed that heavy predation, in conjunction with habitat loss and reduction of other prey species, has in some cases prevented the recovery of endangered species of mussel with reduced populations (Neves, 1992).

Other rare species of fish and reptiles are preyed on as well by these and other species. Rare species could be forced into extinction, or may be unable to recover under high rates of "natural" predation. Human predation takes the form of collecting; mussels for their shells or food, fish for food, bait to catch fish, and amphibians and reptiles for bait or collecting.

Stresses: habitat destruction, nutrient enrichment, sedimentation, introduction of invasive species
Source: Recreational Uses

Water attracts recreation users. Canoeing is a particularly popular activity in Arkansas and is increasing in Oklahoma. Since the Dallas metropolitan area is only two hours away from the Kiamichi river there is the potential for great increases in the recreational use of this area. The rivers of Arkansas already receive a great deal of recreational use. Heavy recreational use can result in localized habitat destruction, increase in nutrient levels, and increased sedimentation.

Stresses: habitat destruction, habitat fragmentation, modification of water levels
Source: commercial/industrial development, development of roads and utilities, primary and secondary home development.

Hot Springs is a rapidly growing small city, with retirement homes in the area (Hot Springs Village). Second home development is becoming popular throughout the ecoregion, and is especially visible around Mena, Broken Bow and some of the reservoirs. Little Rock is likewise growing and losing urban population to its outlying suburban and rural areas. Census data shows sprawl is in effect as large and small urban areas lose populations to outlying suburban and rural areas (U.S. Census, 1999). Habitat destruction, increased municipal discharge, water diversions and conversion of habitat to other uses are the greatest threats to aquatic systems from urbanization. .

Stresses by Site: Landscape-Scale Terrestrial Sites:

Cherokee Prairies: Fragmentation, conversion (to rangeland and urbanization around Fort Smith), altered fire regime.

Magazine Mountain: Change in structure/composition: incompatible timber practices, altered fire regime, recreation, habitat destruction.

Pine-Bluestem Restoration Area: Change in structure/composition: incompatible timber practices, altered fire regime.

Novaculite Uplift: Change in structure/composition: incompatible timber practices, altered fire regime.

Beaver Bend Hills: Change in structure/composition : incompatible timber practices , altered fire regime;.

North Shore Glades: Change in structure/composition: incompatible timber practices , altered fire regime, fragmentation (timber practices); fragmentation, habitat destruction/conversion.

Rich Mountain: Change in structure/composition; altered fire regime.

Stresses by Site: Other Terrestrial Sites:

Pushmataha: Change in structure/composition; incompatible wildlife management, altered fire regime, incompatible timber.

Meadow-Rue Seeps: Change in structure/composition; alteration hydrologic regime: grazing, conversion; incompatible agriculture (pasture).

Sugarloaf Mountain: Change in structure/composition altered fire regime, incompatible timber practices, recreation (off-road vehicle use).

Least Terns sites: Alteration of hydrologic regime; barge, traffic, no flooding predation, change in structure/composition; habitat destruction.

Goose Pond: Changes in hydrologic regime, habitat destruction conversion incompatible forestry incompatible recreation (duck management), nutrification.

Cove Creek: Change in structure/composition—altered fire regime.

Little Rock Air Force Base: Incompatible land use, altered fire regime, data gaps.

Holland Bottoms: Incompatible timber, change in structure/composition, altered hydrology.

Flatside / Forked Mountain: Change in structure/composition—altered fire regime, , incompatible timber practices, recreation.

Brady Mountain: Change in structure/composition—altered fire regime.

Crayfish Complexes: Change in structure/composition habitat destruction: predation..

Stresses by Site: Aquatic sites

The stresses to aquatic systems in the Ouachita Ecoregion are varied, but most sites face a similar suite of stresses:

Name	Stress Rar	Site Stresses	Priority
Kiamichi River	High	Stresses: :Altered hydrologic regime, water withdrawals, operation of dams/reservoirs, dam construction. no. 1 priority.	1
Glover River	High	Stresses: Roads/sedimentation (logging), incompatible forestry/sedimentation sedimentation/runoff from land use, alteration of natural hydrologic regime, water withdrawals. no. 2priority	2
Upper Saline River	High	Stresses: toxins/pollution from CFOs, urbanization, dam construction/operation, extraction, incompatible forestry/sedimentation high 3-4 priority.	3
Upper Little River	High	Stresses: Roads/sedimentation (logging), incompatible forestry/sedimentation sedimentation/runoff from land use, alteration of natural hydrologic regime, water withdrawals, dam construction or maintenance. tied as no. 2 priority	4
Caddo River	Medium	Stresses: historic mining/extraction, recreational use, current gravel mining on mainstem, and nutrification from CFOs. 3-4 priority.	4
Ouachita Headwaters	High	Stresses: Point-source pollution, CFOs, incompatible forestry/sedimentation pasture/conversion	4
Mountain Fork	Medium	Stresses: Roads/sedimentation (logging), incompatible forestry/sedimentation sedimentation/runoff from land use, alteration of natural hydrologic regime, water withdrawals, dam construction or maintenance..--threats not as extreme as in Glover and Upper Little.	5
Cossatot River	Low	Stresses: Roads/sedimentation (logging), incompatible forestry/sedimentation, sedimentation/runoff from land use, alteration of natural hydrologic regime, water withdrawals, dam construction or maintenance..	5
Little Missouri River	Medium	Stresses: Road construction/maintenance, recreation, incompatible forestry/sedimentation	5
Fourche La Fave River	Medium	Stresses: nutrification	6

Plan Implementation: Addressing Stresses/Threats Through Multi-Site Strategies

Multi-Site Strategies - Background

Multi-site strategies were developed to enable implementation of the ecoregional assessment through clear, prioritized, cohesive measurable action. Participants in the multi-site strategy were asked to review literature and guidance pertaining to multi-site strategies, including relevant *Geography of*

Hope chapters, implementation sections from other ecoregional assessments, and the results of multi-site strategy meetings from other ecoregions. Initial activities were to review the major systems in the ecoregion, then review stresses and threats to determine multi-site stresses and their sources. The stresses/sources of stress assessment relied on the Geography of Hope definitions of a stress, source of stress, and threats[1]. For the purposes of this chapter and activity these definitions have been truncated: "stress" is defined as an ecological or biological element (e.g. sediments), "sources" are defined as anthropogenic in nature (e.g. roads or development), and "threats" can be any combination of sources or stresses.

Ecoregional assessments are translated to implementation through conservation action at individual sites and through implementation of multi-site strategies. Note that many multi-site strategies also address or link several threats. Major terrestrial and aquatic systems in the ecoregion were reviewed, then multi-site threats and top sources of stresses were developed and listed. The multi-site strategies below are simply outlines; a formal plan should be developed than includes specific goals, outcomes, and timelines.

The following are system threats identified in the experts meeting. Terminology was structured from the initial Geography of Hope based stresses/sources of stress analyses.

Terrestrial system threats:

- Conversion: Industrial forestry
- Agricultural conversion (present/historic) – pasture except for row cropping in the in the Arkansas River valley
- Incompatible forestry
- Altered Fire Regime
- Conversion/destruction from commercial and residential development
- Fragmentation

Aquatics system threats:

- Hydrologic alteration: dam/reservoir construction and operation, water withdrawals, dredging, channelization, instream structure and "training", thermal pollution/alteration
- Incompatible agriculture, (including CAFOs)
- Silviculture/incompatible forestry
- Roads and right-of-way construction
- Extraction/mining, (mineral as well as water extraction)
- Non-point source pollution
- Exotic species

The implementation team decided on the following as the top threats, in order of priority based on severity and pervasiveness of threat:

1. Dams/water withdrawal
2. Altered fire regime/forestry management

[1] *Stress*: something that impairs or degrades the size, condition, or landscape context of a conservation target, resulting in reduced viability; *Source*: a human or biological factor that infringes upon a conservation target that results in stress; *Threat*: the combined concept of stresses to a target and the sources of that stress to that target.

3. Nonpoint source pollution (including roads)
4. Conversion – industrial forestry
5. Conversion – agriculture
6. Development – residential/commercial
7. Exotic species

Multisite strategies are outlined below for the top threats in order of priority. See Table 1 for a list of sites included within each multi-site strategy.

The Multi-site Strategies

1. Altered Hydrology/Water Diversions

   Although variability in season flows exists for natural systems, alterations associated with dam construction and water diversions can alter these flows beyond the natural range of variability to which the aquatic species and communities have evolved or adapted. Similarly, the threat of dam construction also results in large-scale habitat destruction and alteration. These threats are of some level of concern for all aquatic sites in the ecoregion, although they are the "killer" threat for the aquatic systems in the southwestern Ouachitas, including the Kiamichi, Glover, and Upper Little Rivers where some of the rarest or most threatened species in the ecoregion are found. As a result, there exists a strong need for a multi-site strategy that addresses these threats. Specifically, this strategy will address the following linked threats:

   - Altered hydrologic regime
   - Habitat destruction/conversion
   - Habitat fragmentation/migration barrier
   - Thermal alteration
   - Geomorphic instability

To address these threats, the following goals should be incorporated into a formal Multi-Site Strategic Plan, the first step in implementing a multi-site strategy:

STRATEGY: Ensure protection or initiate restoration of natural flow regimes of target aquatic sites. The strategy will be accomplished through demonstration projects, external affairs work, and cultivation of a suite of partners.

Goals:

- Assessment of the specific source of these threats for each site (Conservation Area Plans)
- Development of capacity within existing staff to understand legal issues
- Formulation of ecosystem flow prescriptions or desired site conditions for each site
- Enlisting of partners necessary to implement strategy across suite of sites
- Utilization of existing/ongoing work at Kiamichi River as ecoregional "demonstration" site
- Development of agreements with regulatory agencies and their local counterparts responsible for dam management or water withdrawals in order to implement ecosystem flow prescriptions

- Development of a monitoring program for those parameters that fall outside the standard aquatic measures of success (e.g. physical parameter monitoring)

The completion of a multi-site strategic plan will likely include other goals not listed above, and should involve a diverse group of staff and partners to fully address this threat. Furthermore, the site conservation plans for effected sites should incorporate parts of the strategic plan where appropriate.

2. Altered Fire Regime/Forestry Management

The forested upland ecosystem of the ecoregion is fire dependent and many forest communities cease to exist without this essential ecosystem process. Seventy years of fire suppression in the Ouachita Mountains has drastically altered community composition and structure. Fire reduces tree density, favors some species and communities over others, changes community structure and adds diversity to the forested landscape. Glades, prairies, woodlands, savannas and pine-oak forests are examples of fire dependent communities. As a result, there is a strong need for a multi-site strategy that addresses this pervasive threat.

STRATEGY: Reestablish natural fire regime to the suite of forest communities and the systems within these matrix forests at a scale necessary to conserve viable populations of terrestrial targets across all ecoregional sites. The strategy will be accomplished through demonstration projects, external affairs work, and cultivation of a suite of partners.

Goals:

- Expand number and size of restoration projects on public lands, particularly those in the Ouachita National Forest and Ft. Chaffee, toward a defined, desired future outcome
- Participate in Ouachita National Forest plan revision process to incorporate appropriate use of fire and forest thinning toward desired future outcomes for suite of fire dependent systems as part of most appropriate management alternative to conserve target species and communities
- Incorporate large-scale restoration successes into Ouachita National Forest plan revision process
- Ensure that National Forest restoration success stories are utilized to educate the public, government officials, and agency staff

The completion of a multi-site strategic plan will likely include other goals not listed above, and should involve a diverse group of staff and partners to fully address this threat. Furthermore, the site conservation plans for effected sites should incorporate parts of the strategic plan where appropriate.

3. Nonpoint Source Pollution

Some type of nonpoint source pollution (NPS) is a threat to all aquatic sites in the Ouachita Ecoregion. The multi-site threat abatement project that will address this issue will have two components – a set of goals associated with sedimentation and a set of goals associated with nutrients. First, sedimentation is a key threat to the biodiversity targets of these systems; sources of this threat include unpaved roads (permanent and temporary), incompatible forestry practices, and to a much lesser extent, incompatible agricultural practices. To address this component of the

multi-site strategy, the following strategy and goals should be included, keeping in mind that some of these goals will be addressed by a similar strategy underway for the Ozark Ecoregion and need not be duplicated. In fact, it may be appropriate and more feasible to address this threat for the entire Interior Highlands.

STRATEGY 1: Develop and promote river-friendly road maintenance practices utilizing existing research data and/or new data for use throughout the Ouachitas. This strategy will be accomplished through a demonstration project and an associated focused educational program that uses specialized training and fact sheets for county officials and their road crews.

Goals:

- Compile reference materials on sedimentation associated with roads and any research into combating (Best Management Practices) this problem
- Enlist partners necessary to develop and implement a demonstration/research project that is based on the best available knowledge, including academia, government, and NGOs
- Identify a site most suitable for road sedimentation demo project (probably in conjunction with Forest Service) based on partners, funding, opportunity, and leverage, and then implement the demonstration project with partners, ensuring that it addresses the identified threat
- Based on reference materials and initial results of demonstration project, develop a workshop for key audience of county judges and road crews that work within target watersheds
- Develop a monitoring program that can be implemented outside of demonstration site to collect additional data to document changes in stream quality
- Play a key role in the research component of project to ensure that focus remains on answering TNC's questions

Second, nutrients associated confined animal feeding operations (CAFO) are threatening many ecoregional aquatic sites. This component of the multi-site strategy is also being addressed for the Ozark ecoregion, although the type of CAFO differs somewhat for the Ouachita Mountains. The following strategy and goals should be included in the multi-site plan:

STRATEGY 2: Develop and promote best management practices associated with confined animal feeding operations. This strategy will be accomplished via demonstration farms, innovative workshops, and direct landowner and corporate outreach and associated brochures and fact sheets. This strategy will also have a government relations program designed to funnel Farm Program dollars into programs toward best management practice cost-shares in the Ouachitas that make the most significant improvement in water quality.

Goals:

- Compile reference materials on sedimentation associated with agricultural operations (cattle and hog CAFO) and any research into combating (BMPs) this problem
- Enlist additional partners necessary to implement demonstration/research project that is based on the best available knowledge, including corporations, academia, government, and NGOs
- Utilize NRCS technical advisory committees in each stae to guide funding toward priority sites based on ecological significance

- Enlist partners necessary to develop and implement CAFO waste demonstration/research project that is based on the best available knowledge, including corporations, academia, government, and NGOs
- Identify a site most suitable for CAFO demo project based on partners, funding, opportunity, and leverage, and then implement the demonstration project with partners, ensuring that it addresses the identified threat
- Conduct compatible CAFO workshops for landowners within target watersheds

The completion of a multi-site strategic plan will likely include other goals not listed above, and should involve a diverse group of staff and partners to fully address this threat. Furthermore, the site conservation plans for effected sites should incorporate parts of the strategic plan where appropriate.

Table 1. *Sites to be included within each multi-site strategy described above.*

Altered Hydrology/Water Diversions	Altered Fire Regime/Forestry Management	Nonpoint Source Pollution
Kiamichi River	Cherokee Prairies	Kiamichi River
Glover River	Magazine Mountain	Glover River
Upper Saline River	Pine-Bluestem Restoration Area	Upper Saline River
Upper Little River	Novaculite Uplift	Upper Little River
Mountain Fork	Beaver Bend Hills	Mountain Fork
Cossatot River	North Shore Glades	Caddo River
	Rich Mountain	Ouachita River Headwaters
	Pushmataha	Cossatot River
	Sugarloaf Mountain	Little Missouri River
	Cove Creek	Fourche La Fave
	Little Rock Air Force Base	
	Flatside / Forked Mountain	
	Brady Mountain	

Multi-Site Strategies Reference and Comparison Table

Multi-Site Strategy	Strategy Statement	Threats Addressed	Sites Included
Altered Hydrology/ Water diversions	STRATEGY: Ensure protection or initiate restoration of natural flow regimes of target aquatic sites. The strategy will be accomplished through demonstration projects, external affairs work, and cultivation of a suite of partners.	• Altered hydrologic regime • Habitat destruction/conversion • Habitat fragmentation/migration barrier • Thermal alteration • Geomorphic instability	• Kiamichi River • Glover River • Upper Saline River • Upper Little River • Mountain Fork • Cossatot River
Altered Fire Regime/ Forest Management	STRATEGY: Reestablish natural fire regime to the suite of forest communities and the systems within these matrix forests at a scale necessary to conserve viable populations of terrestrial targets across all ecoregional sites. The strategy will be accomplished through demonstration projects, external affairs work, and cultivation of a suite of partners.	• Fire suppression • Change in structure/ composition	• Cherokee Prairies • Magazine Mountain • Pine-Bluestem Restoration Area • Novaculite Uplift • Beaver Bend Hills • North Shore Glades • Rich Mountain • Pushmataha • Sugarloaf Mountain • Cove Creek • Little Rock Air Force Base • Flatside/Forked Mountain • Brady Mountain

NonPoint Source Pollution	STRATEGY 1: Develop and promote river-friendly road maintenance practices utilizing existing research data and/or new data for use throughout the Ouachitas. This strategy will be accomplished through a demonstration project and an associated focused educational program that uses specialized training and fact sheets for county officials and their road crews. STRATEGY 2: Develop and promote best management practices associated with confined animal feeding operations. This strategy will be accomplished via demonstration farms, innovative workshops, and direct landowner outreach and associated brochures and fact sheets. This strategy will also have a government relations program designed to funnel Farm Program dollars into programs toward best management practice cost-shares in the Ozarks that make the most significant improvement in water quality.	• Sedimentation • Nutrification • Habitat destruction	• Kiamichi River • Glover River • Upper Saline River • Upper Little River • Mountain Fork • Caddo River • Ouachita River Headwaters • Cossatot River • Little Missouri River • Fourche La Fave

2002 Plan Update Rollout Data

Target Goals

Goals were set using defaults available through TNC ecoregional guidance including *Geography of Hope and Guidelines for Representing Ecological Communities in Ecoregional Plans*. All goals and targets underwent expert review. Default goals from Geography of Hope were used for most targets, although some target goals were adjusted according species rarity, known occurrences, and availability. Specifically, no target number for a G1 species could be more than the number of known population occurrences in the ecoregion and no G2 species could have a goal over 20 by Heritage definition. In addition, because of the complexities associated with using element occurrence records to identify aquatic species populations (i.e. how many element occurrences constitute a population?), particularly those of mussels, aquatic G3-G4 species are considered "captured" if occurrences are located in at least three aquatic conservation areas, which in this assessment are 8-digit watersheds.

Requested roll-out information was completed as per Geography of Hope (Groves, et al., 2000) and was approved by update team leader in June 2003.

Where is the data generated from ecoregional planning efforts stored, in what format, who is responsible for information management?
Data is stored on the latest version of the plan CD-ROM for the ecoregion. Data was collected in Microsoft Access 2000 using CPT versions 1.3 and 1.5 as the operating platform. Please see the Methodology and data management section for further data information. The Project Manager is responsible for information management.

A list of conservation targets by species, terrestrial/aquatic community, marine habitat, or ecological system
Please see the Rollout Report (Appendix B).

For each Conservation target provide: percentage of all targets that met their conservation goals; percent of targets that met their conservation goals by species, communities, and ecological system (aquatic/terrestrial); percent of G1 and G2 species that met their conservation goals; percent federally listed threatened and endangered species that met their conservation goals.
Please see the Rollout Report (Appendix B) for all lists. Percentages follow:

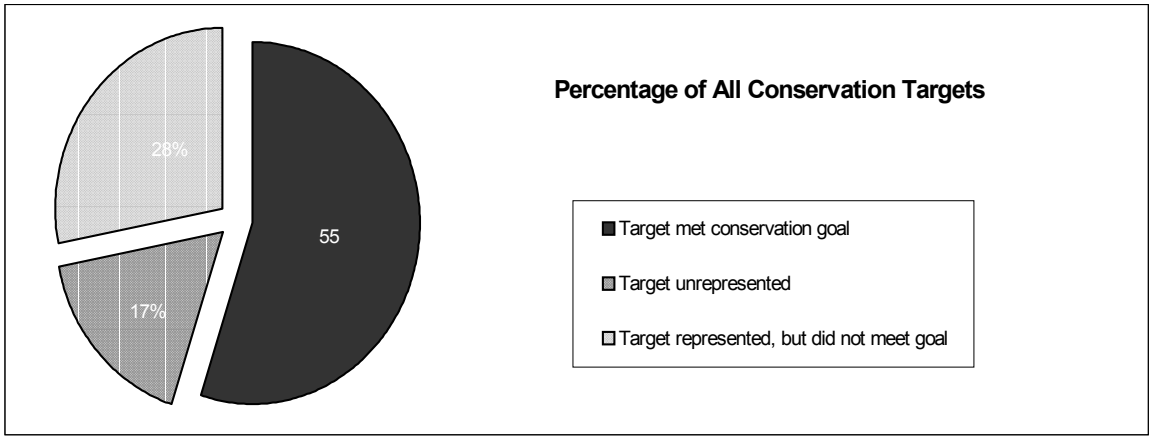
- Percent of all targets that met their conservation goals: 56% (139 of 246)
- Percent of targets that met their conservation goals by species, communities, and ecological system (aquatic/terrestrial): see below.
- Percent of G1 and G2 species that met their conservation goals: see below.
- Percent federally listed threatened and endangered species that met their conservation goals: see below.

Targets That Met Goals Matrix

Amphibians:	69% (9 of 13)	**Insects:**	63% (10 of 16)
Birds:	57% (11 of 19)	**Invertebrates:**	100% (7 of 7)
Communities:	60% (47 of 78)	**Mammals:**	50% (1 of 2)
Crustaceans:	71% (5 of 7)	**Mussels:**	100% (17 of 17)
Fish:	100% (19 of 19)	**Plants:**	31% (20 of 64)
		Reptiles:	50% (2 of 4)
All G1 Targets:	88% (22 of 25)	**All G2 Targets:**	71% (25 of 35)
OOHA PETs:	92% (26 of 28)	**All G1 – G3:**	70% (94 of 134)
Listed as Endangered:	83% (5 of 6)		
Other federal listing:	25% (3 of 12)		

Figure 1 illustrates the percentage of all conservation targets that met their goal, percentage of targets that did not meet their goal, and percentage of unrepresented (no element occurrences) targets in the portfolio.

Figure 1.



Representative populations: representative populations were used when inaccurate, outdated, inappropriate, or nonexistent point data was available for an occurrence, or if the number of individual occurrences present could be considered collectively to form a population or community. Representative populations comprise 47% of the occurrences considered viable. Of those, 78% were created from expert knowledge in the absence of contemporary ground-truthed data points (proto-EOs); 25% of the representative populations came from the OOHA data.

List up to five critical threats (sources of Stress) to targets that recur at many conservation areas across most or all of the ecoregion
Please refer to the "Threats, Sources of Threats, and Multi-Site Strategies" section.

The number of conservation areas in the ecoregion
There are 40 sites within the ecoregion. Ten of the sites are landscape-scale sites designed to conserve aquatic targets and communities; six are landscape-scale sites designed to conserve terrestrial targets and communities. There are 12 sites that are designed to be part of a network of small sites.

The number of conservation areas in the ecoregion that are considered protected
No site in the ecoregion is considered completely protected; the degree of protection determined by ownership or management plan/mission alignment with TNC has not been determined.

The number of sites that contain aquatic communities/systems and species targets
Ten sites contain aquatic communities, systems, or targets.

The number of action sites in the ecoregion
Action sites have not been determined.

The number of action sites that are landscape sites
Please see above.

An estimate of the area of all conservation areas, all action sites, all landscape-scale sites in the ecoregion.

- Acres Terrestrial Landscape-Scale Sites: 2,411,461 or 21% of ecoregion
- Acres Aquatic Landscape-Scale Sites (watershed): 3,573,338 or 31% of ecoregion
- Acres non-landscape scale terrestrial sites: 256,375 or 2% of ecoregion
- Acreage all terrestrial sites: 2,667,836 or 23% of ecoregion
- Acreage all sites: 6,068,258 or 53% of ecoregion

Management/ownership percentage of the conservation areas broken down by Federal, state, private, TNC

- Total Public Ownership: 2,113,139 acres; 79% of terrestrial conservation areas (34% if watersheds of aquatic conservation areas are included)
- Total State (AR + OK) Ownership: 112,872 acres; or 4% of terrestrial conservation areas
- Total Federal 2,000,267 Acres; or 75% of terrestrial conservation areas
- Total TNC: 8,287 acres or 0.07% of terrestrial conservation areas

Forty conservation areas were identified as part of this ecoregional assessment. In this iteration of the plan, the aquatic, landscape scale and small patch conservation areas cover a total of 6,068,258 acres, or 54% of the ecoregion. This number, however, can be misleading due to the fact that the watershed area of aquatic conservation areas was used in its calculation. Similarly, the fact that certain systems are located entirely within federal ownership may incorrectly suggest a strong federal ownership bias in conservation area selection. However, there exists nearly 2 million acres of Forest Service lands alone in the ecoregion. As a result , many conservation areas, like the geologically restricted novaculite uplift system, are found almost entirely within the Ouachita National Forest ownership. Therefore, capture of the entire site includes a predominance of federal ownership.

Terrestrial sites total 2,667,836 acres or approximately 23% of the ecoregion. Currently 2,113,139 acres or 79% of those terrestrial portfolio conservation areas are being

managed under some type of public conservation ownership. Of the conservation areas that are managed in some way for conservation, 2,000,267 acres or 17% are federally owned; 8,287 acres or 0.7% are state or locally owned; and 4,028 acres or 0.07% are owned by TNC. Table 1 provides acreage for each conservation area.

Table 1. Complete list of Portfolio Conservation Areas chosen for the Ouachita Ecoregion and the corresponding acreage for each.

Site Name	Acres	TYPE
North Shore Glades	217,739	Terrestrial
Beaver Bend Hills	272,735	Terrestrial
Holland Bottoms	9,568	Terrestrial
Cove Creek Natural Area	537	Terrestrial
Goose Pond	13,858	Terrestrial
Crayfish Complex 1	307	Terrestrial
Crayfish Complex 2	232	Terrestrial
Crayfish Complex 3	968	Terrestrial
Crayfish Complex 4	410	Terrestrial
Crayfish Complex 5	576	Terrestrial
Crayfish Complex 6	331	Terrestrial
Crayfish Complex 7	461	Terrestrial
Crayfish Complex 8	391	Terrestrial
Rich Mountain	528,196	Terrestrial
Sugarloaf Mountain	24,108	Terrestrial
Little Rock Air Force Base	7,370	Terrestrial
Bradey Mountain	10,611	Terrestrial
Meadow Rue Seep	1,234	Terrestrial
Meadow Rue Seep	1,075	Terrestrial
Pine Bluestem Restoration	317,630	Terrestrial
Flatside-Forked Mountain	81,762	Terrestrial
Crayfish Complex	799	Terrestrial
Crayfish Complex	799	Terrestrial
Novaculite Uplift	565,685	Terrestrial
Pushmataha Wildlife Management Area	32,568	Terrestrial
Least Terns Site 1	15,110	Terrestrial
Cherokee Prairies	122,922	Terrestrial
Magazine Mountain	173,153	Terrestrial
Least Terns Site 2	7,137	Terrestrial
Kiamichi River	1,165,716	Aquatic
Glover River	290,722	Aquatic
Upper Little River	235,708	Aquatic
Mountain Fork Creek	279,327	Aquatic
Cossatot River	139,485	Aquatic
Little Missouri River	79,142	Aquatic
Caddo River	193,373	Aquatic
Upper Saline River	431,671	Aquatic
Fourche La Fave River	393,510	Aquatic
Ouachita Headwaters	364,679	Aquatic

A total of 245 targets were selected; 168 species targets (46 aquatic and 122 terrestrial) and 78 community targets (8 matrix, 51 small patch, 18 large patch) were identified. A total of 148 targets or 60% met their goals.

Of the targets that met their goals, 33% were communities, 15% were plants, and 52% were animals. Of the 168 species targets, 100 or 59% met their goals. Of the 78 community targets, 47 or 60% met their goals. 39 targets or 27% of the targets that did not reach their goal (15% of all targets) did not do so due to data gaps, outdated data, or occurrences outside of portfolio conservation areas.

208 or 84% of the targets made some progress towards their goals, that is, some though not necessarily all occurrences necessary to complete a goal were recorded. Of the 1502 occurrences, 20% were heritage-recorded ranks of A, AB, B, BC or E, and 80% were representative, that is, population based, goal-derived, or expert-derived.

Of the species that met their conservation goals 23 or 15% were ranked as G1. Eight or 5% are listed endangered or threatened, and 20 or 15% are ranked as G2. Seventy percent or 94 of the 134 targets ranked G1 through G3 targets met their goals. Seventy-nine of 104 or 75% of the zoology targets, 22 of 64 or 34% of the plant targets, and 46 of 78 or 58% of the community targets met their goals. Table 2 provides a breakdown of conservation targets by global rank. Note that Combined ranks are rolled into the next highest full rank (e.g., G1G2s are counted with G2s, G2G3s are counted with G3s):

Table 2. The number of targets within each global ranking unit.

Target Type	G1	G2	G3	G4	G5	Total
Aquatic Animals	9	11	12	8	5	45
Terrestrial Animals	10	11	5	11	21	58
Plants	3	6	21	10	23	63
Terrestrial Communities	6	22	31	6	14	79
Total	28	50	69	35	63	245

Many, though not all conservation areas in the Ouachitas, contain areas that are already managed for conservation or protected by a state, federal, TNC, or other privately entity. However, rarely do these management areas encompass the entirety or even a majority of the individual conservation areas. There are approximately 2,113,139 acres or 34% of conservation areas already under some type of conservation or wildlife management (e.g., owned by state or federal government, or TNC) within the ecoregion. 14 of the 40 have this type of protection component.

Of the areas in the portfolio conservation areas that are already managed for biodiversity, 2,000,267 acres or 75% are under federal management; 112,872 acres or 4% are under

some form of state management; and 8,287 acres or 0.07% are under TNC or other private conservation management. Table 1 provides a breakdown of protected areas within the portfolio.

TERRESTRIAL COMMUNITIES

78 community targets were used for this plan; of those 9 were endemic, and 40 were limited in range. 47 of the 78 community targets, or 60% met their goals. Five of the community targets that made their goal are considered matrix size; 10 are considered large patch, and 32 are considered small patch communities. Table 3 illustrates the number of community targets that met assessment goals.

Table 3. Percent of each community target type that met assessment goals.

Spatial Pattern	Goals Met / Total Targets	Percent Targets Meeting Goals
Small Patch	32 / 52	62%
Large Patch	10 / 18	55%
Matrix	5 / 8	62%
Total	**47 / 78**	**60%**

ZOOLOGY AND BOTANY TARGETS

There were 64 plant targets; 6 of which are endemic, and 7 limited in range; 20 or 31% of the plant targets met their goals.

There were 104 zoological targets determined; 35 endemics, 32 endemic zoology targets or 91% met their goal. 16 limited range targets met their goal. Eighty-three of the 104 or 79% of the zoology targets met their goal.

Appendix 3.2 Upper West Gulf Coastal Plain Ecoregional Assessment

Note: The boundaries used in this assessment differ somewhat from those of Woods and others (2004) used elsewhere in this document. They most closely approximate the boundaries of the South Central Plains ecoregion.

Upper West Gulf Coastal Plain Ecoregional Plan

Terre Noire – S. Simon, 2001

June 2002 Final Implementation Draft

Prepared by
Dave Gosse, Russell McDowell, Rob Evans
and the UWGCP Technical and Planning Teams

The Nature Conservancy®

Table of Contents

This iteration of the Upper West Gulf Coastal Plain Ecoregional Plan is published as the final draft implementation version. This version incorporates the results of peer review of previous draft and results of the UWGCP Implementation meeting in March, 2002. All information contained in this draft should be considered Business Confidential.

Acknowledgements

Like any other ecoregional plan, the UWGCP plan production has been a group effort. Critical to the completion of this iteration was not only team member's expertise, but their energy, enthusiasm, and proactive approach to ecoregional conservation management efforts. Many team members devoted large amounts of their time and resources to completing this plan; though Russell McDowell, Lance Peacock, Rob Evans, and Doug Zollner stand out in this category—without their efforts the plan would still be conceptual.

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Apologies to whomever I am forgetting, but your help was great! Finally thanks to the Arkansas, Louisiana and Texas Field Offices for their hospitality displayed at our many meetings.

List of Appendices

UWGCP Ecoregional Management Plan

Executive Summary

In 1996 The Nature Conservancy developed an ecoregional approach to conservation, outlined in *Conservation by Design: A Framework for Mission Success*, stating that biodiversity conservation requires working at larger scales and along ecological instead of geopolitical lines. Ecoregions, large units of land and water delineated by characteristic biotic and abiotic factors, provide a better geographic basis than states for organizing our conservation priorities and actions. Strategic planning on an ecoregional scale encourages review of many species and ecological communities at once, providing a structure for capturing genetic and ecological variability within species or communities.

The major products of an ecoregional plan include: 1) identification of a portfolio of sites that, if protected, collectively conserve the biodiversity of the ecoregion, 2) an implementation strategy to protect the sites, including strategies and conservation partners, and 3) identification of data gaps to improve the quality of future conservation decision-making and ensure ecoregional plan updates capture relevant and useful data. A critical element of the conservation portfolio sites is the data captured through the plan, which not only provides a science-based foundation for ecoregional planning but also provides a starting point for site conservation planning in the implementation phase.

The Upper West Gulf Coastal Plain (UWGCP) is an area of approximately 26,250,000 acres or 40,970 square miles, covering parts of Arkansas, Louisiana, Oklahoma, and Texas. The ecoregion extends south approximately from Little Rock, Arkansas to south of Shreveport, Louisiana, southwest to Houston and northwest to outside the Dallas/Fort Worth area. Physiographically the UWGCP is bordered by the Lower West Gulf Coast Plain to the south, the Gulf Coast Prairies and Marshes to the southeast, the Crosstimbers and Southern Tallgrass Prairie to the West, the Ouachita Mountains to the north, and the Mississippi River Alluvial Plain to the East. The delineation between the Lower West Gulf Coastal Plain and the UWGCP is the northern limit of the natural range of longleaf pine.

Terrestrial systems in the UWGCP include both mesic bottomland and upland dry-mesic and hydric areas. Bottomlands are dominated by hardwood communities, primarily oak species, and more deeply flooded areas frequently have cypress and cypress-tupelo swamp vegetation. Upland areas have shortleaf and loblolly pines, mixed pine-hardwood communities, glades, and woodlands. Prairies occur on blackland sites, depending on fire history and soil depth. Barrens and woodlands occur on saline soil flats. Ancient volcanic intrusions form bauxite deposits that are home to globally rare and endemic nepheline syenite communities. Aquatic systems are low-slope, medium- to high-order streams and riverine systems. Streams are sheet-, surface- and groundwater fed. Slower, larger rivers that originate in other ecoregions flow through the UWGCP and are home to diverse mussel and fish communities. Rivers are the predominant aquatic system in the UWGCP, and contain a diverse assembly of mussels and fish. Substrates range from gravel, sand-gravel, to mud and silt. Natural lakes are few, and are remnants of river reaches; the most prominent is Caddo Lake on the Texas/Louisiana border. It is the remnant of a

pre-settlement “Great Raft,” an expansive natural logjam on the Red River that created a series of wetlands and lake areas that covered thousands of acres.

The UWGCP is home to 15 endemic species and 59 species with limited ranges. Six federally listed endangered species and two listed threatened species occur in the ecoregion. Many of the endemic species are crayfishes and mussels. There are 13 terrestrial community groups endemic to the ecoregion, and several endemic community associations.

Fire is the most pervasive natural terrestrial process in the UWGCP. Almost all terrestrial communities in the ecoregion benefit from seasonal burning; many plant species require burning to germinate. Fire also helps prevent invasive species from overrunning endemic natural areas. Wind action is another major natural process in the ecoregion. Tornadoes are frequent and high winds are regular occurrences. Seasonal and ephemeral flooding is similarly a common natural aquatic process for river systems in the UWGCP.

Though the UWGCP is 51% forested, most of that area is under commercial management. Additional uses include grazing and agriculture. Habitat fragmentation caused by urban growth and suburban sprawl occur throughout the region. Following the national trend, urban and suburban land uses are increasing though not as intensely as in other ecoregions (US Dept of Census, 2000).

In this iteration of the ecoregional plan, the portfolio conservation areas cover a total of 4,193,851 acres, or 16% of the ecoregion. Currently 1,697,294 acres or 40% of those portfolio conservation areas are being managed for biodiversity. Of the portfolio conservation areas that are managed for biodiversity, 1,447,496 acres or 85 % are federally owned; 234,095 acres or 14% are state or locally owned; and 15,704 acres or 1% are privately owned.

Terrestrial ecosystems in the UWGCP are stressed by habitat destruction or conversion, habitat fragmentation, and alteration of natural fire regimes. These stresses have improper forestry practices, development, conversion and agriculture, and fire suppression as their source. Aquatic systems are stressed by incompatible land use practices leading to sedimentation and runoff, and nonpoint source pollution. Fragmentation and loss most often occurs in the form of conversion. Conversion includes grazing and agriculture. Habitat alteration and incompatible land use include incompatible agricultural and commercial use as well as development. Invasive species include exotics such as lespedeza, cedars, and kudzu, and invasive fire-intolerant species in fire-suppressed landscapes.

The portfolio conservation areas depicted in this iteration of the UWGCP ecoregional plan are intended as a prioritization management tool for conservation action and resources. This plan also contains the supporting data for each portfolio conservation area, as well as an ecoregional management strategy applicable to the portfolio management areas. Portfolio management action areas are prioritized by biodiversity, threats, complementarity, and leverage. Results and data from this ecoregional planning process should be used to create working site conservation plans as part of the initial implementation phase of the plan.

Introduction

The mission of The Nature Conservancy is to preserve the plants, animals, and natural communities that represent the diversity of life on Earth by protecting the lands and waters they need to survive (TNC, 2001). The Nature Conservancy has worked to fulfill this mission for over 50 years through land acquisition and management, creating partnerships and involving stakeholders and communities in the conservation process. As the threats to biodiversity and their corresponding immediacy increase, TNC has been growing and changing to better fulfill its mission; one key change has been the movement from opportunistic towards strategic conservation management. Strategic conservation is represented here in the ecoregional plan. *Conservation by Design* (TNC, 1996) defined the framework on which this ecoregional plan is based by planning for biodiversity at the landscape scale. Ecoregional plans are aligned with the mission of The Nature Conservancy.

An ecoregion is generally defined as relatively large areas containing geographically distinct assemblages of natural communities, where communities share a large majority of their species, dynamics, and environmental conditions, and the communities also function together as a conservation unit at large scales (Ricketts, et al. 1999). TNC based initial ecoregion design on the efforts of the US forest Service (Bailey, 1995) and further refined to sub-ecoregions (Keys, et al., 1995). The Upper West Gulf Coastal Plain (UWGCP) ecoregion boundary is based on Bailey, though the need to modify some boundaries became apparent during the planning process.

Ecoregional plans endeavor to set the groundwork for regional, state, local, and community based conservation through strategic, long-term priorities and strategies. An ecoregional plan should

- Prioritize TNC resources and management action
- Provide a scientific basis for community based conservation action by delineating geographic areas that should be managed for conservation and biodiversity,
- Provide a general conservation strategy for those sites.
- Clearly illustrate data gaps discovered during the planning and implementation process, and provide a roadmap for reconciling those gaps.

A complete ecoregional plan contains not only the sites, but tools for the conservation planners and implementers:

- Data to support those sites and priorities,
- Strategy to implement the plan,
- A mechanism to review, update and measure the success of a plan.

The portfolio conservation areas, supporting data, and the applicable management and conservation strategies are based on the best available science, and therefore provide a roadmap for the best use of TNC and partner resources. An ecoregional plan is also useful as a data bank and data gap analysis. As such, it is a living document that requires review and updates as necessary.

Note that while the goal of an ecoregional planning effort is to delineate the minimum or priority area necessary to conserve an ecoregion's biodiversity, different portfolio sites represent different goals and not all sites represent functional landscapes. Plan users should carefully review each site description and strategy to ensure plan success (Appendix 1).

Within ecoregions, portfolio conservation areas are designed to conserve biodiversity by managing viable native community, zoology and botany targets identified during the planning process. Protection of high quality sites that conserve multiple, unprotected or nontarget occurrences are preferred conservation strategies. To best fulfill the conservation goals of the plan, implementers need to restore and maintain ecosystem patterns and processes that species and communities need to survive (Turner, 2000).

This document represents the initial ecoregional conservation planning effort for the Upper West Gulf Coastal Plain. The plan will provide a portfolio of conservation areas, including priority or action areas, the data compiled and created during this planning effort, methodology, the data gaps identified, and a strategies for plan implementation. It is hoped that conservation planners, site-based conservation staff, and TNC partners use this plan to effectively manage the biodiversity of the ecoregion. Successful use, however, will require a commitment of cooperation, resources and time, as well as the sharing of responsibility and effort.

Overview and General Description of The Upper West Gulf Coastal Plain

The Upper West Gulf Coastal Plain ecoregion is approximately 26,500,000 acres or 41,400 square miles and encompasses parts of four states, Arkansas, Oklahoma, Texas, and Louisiana. The UWGCP extends south approximately from Little Rock, Arkansas to Shreveport, Louisiana, southwest to Houston and Northwest to outside the Dallas/Fort Worth area. Physiographically it is bordered by the Lower West Gulf Coast Plain to the south, the Gulf Coast Prairies and Marshes to the southeast, the Crosstimbers and Southern Tallgrass Prairie to the West, the Ouachita Mountains to the north, and the Mississippi River Alluvial Plain to the East. The delineation between the Lower West Gulf Coastal Plain and the UWGCP is the northern limit of the longleaf pine terrestrial community.

Physiographic and Geologic Features

Following is a general description of the physiographic and geologic features of the UWGCP. More detail on the physiographic and geologic features of each portfolio conservation area will be discussed at the site conservation level of planning.

The Upper West Gulf Coastal Plain is composed largely of clays, sands, marl, gravels, bedded gravels and clays, and marine sediments associated with the Cretaceous period, approximately 50 million years ago (Shepherd, 1984). Recent geologic formations include Quaternary age Pleistocene deposits and Holocene alluvial deposits (McInnis, 1995). Further south in the gulf coastal plain, Cretaceous deposits are overlain with Tertiary Pliocene and Claiborne Eocene deposits (Bernard & LeBlanc, 1965).

This late Cretaceous marine geology in the Upper West Gulf Coastal Plain is represented by the Trinity Group, Goodland Limestone, Kiamichi, Woodbine, Tokio, Brownstown, Ozan, Annona, Saratoga Chalk, and Nacatoch sand formations. Marginally marine depositional groups from the Tertiary period include the Midway and the Jackson group. Non-marine sands, silty sands, clays, gravels, and quartzite and lignite deposits from the tertiary period are represented in the Wilson and Claiborne, groups. (Bernard & LeBlanc, 1965).

Marine, marginally marine, and nonmarine deposits are found throughout the ecoregion in Arkansas, Louisiana, Oklahoma, and Texas (McFarland, 1998). Sands underlie large parts of the UWGCP, and alkaline Lafe soils are present as well (Shepherd, 1984). There are some igneous intrusions in the ecoregion as evidenced by the bauxite and nepheline syenite formations in south central Arkansas (McFarland, 1998).

The UWGCP is bordered by the Mississippi River Alluvial Plain to the east, the Ouachita Mountains to the North, the Crosstimbers and Southern Prairies to the West, and the Lower West Gulf Coastal Plain to the south. The division between the lower and upper west gulf coastal plains is the northern extent of the Southern Longleaf Pine community.

Topography ranges generally from flat to rolling hills, with occasional ravines and erosional bluffs. Elevation ranges from 850 to less than 10 feet above sea level. A series of depositional plains make up the ecoregion; the Willis plain is the highest, to 200 feet, then the Bentley from 200 –100, the Montgomery from 125 to 70, and the Beaumont from 100 to 10 feet above sea level. Most of the UWGCP lies between 150-300 feet above sea level (Bernard & LeBlanc, 1965).

The UWGCP has microtopographic natural hillocks or "pimple mounds," approximately 3 feet high and 50 feet in diameter, and are most evident in Wrightsville soils. They are found on Tertiary and Quaternary deposits in Louisiana, Arkansas, Texas, Missouri, and Kansas, but have not been reported east of the Mississippi River. The pimple mounds support islands of upland vegetation on otherwise wetland forests or savannas. No single theory significantly explains the origin of these mounds (Bernard & LeBlanc, 1965).

All Quaternary gulf coastal plains are depositional. Each progressively older Pleistocene coastal plain passes under the deposits forming the next younger plain; each successively younger plain slopes seaward at progressively smaller rates, varying in different areas along the coast because of different initial depositional slopes and differential coastal warping (Bernard & LeBlanc, 1965).

Settlement Use History and Current Human Interaction/Demographics

It is believed that nomadic hunter-gatherers first occupied the Upper West Gulf Coastal Plain at the end of the last glacial advance, approximately 14,000 to 10,000 years ago. Approximately 2,500 years ago Native Americans began to transition from a gathering to an agricultural lifestyle (Peter, et. al., 1990). European visitors to the Upper West Gulf Coastal Plain in the early 1800s reported Native Americans were engaged in limited farming, as well as hunting and gathering. It is believed that the Caddo tribe augmented the natural fire process in the ecoregion to clear areas, enhance crops, and flush game. Though there was a European presence in the area since the 17th century, the 1820s are considered the real beginning of settlement in the ecoregion (Shepherd, 1984).

Most Native Americans were relocated from the Upper West Gulf Coastal Plain by the 1840s. Relocation coincided with increasing western settlement aided by Federal land grant programs (McInnis, 1995). Agriculture became one of the primary land uses in the UWGCP with the rise of several large plantations in the 30 years before the civil war, with cotton and corn the dominant crops (Peter, et. al., 1990). The civil war curbed large-scale agricultural development. After the civil war property was sold off in smaller tracts so that by 1900 numerous smaller farms and tenants occupied the area. Cattle grazing also became popular in the ecoregion after the civil war (McInnis, 1995).

Cotton farming grew as more lands were cleared from timber harvesting, to the point were cotton farming was attempted in nearly every terrestrial system in the ecoregion. Many of the smaller farms that were abandoned during the Great Depression in the 1920s and 1930s were purchased

by the Federal Government and became elements of Kisatchie, Davy Crockett, and Sabine National Forests (Turner, 2001).

Timber production has been the other primary land use in the ecoregion. Railroad construction through the UWGCP in the early 1800 facilitated traffic and development into the ecoregion, expanding timber and agriculture markets. Lumber mills followed rail lines into the ecoregion. The timber industry reached its peak in the UWGCP in the 1880s, and by the 1920s most of the ecoregion had been logged and cut over at least once. By 1925 almost all virgin pine had been cut over. After a decrease in large-scale timber harvesting, the timber industry moved to managed plantation harvesting. Timber harvesting for both sawmill and pulpwood continues to be a major land use in the Upper West Gulf Coastal Plain.

Mineral extraction in the UWGCP began in the late 1800s and included coal, lignite, clays, sand, gravel and metals. Many of these resources continue to be extracted from the ecoregion. Oil and gas extraction began in the 1920s following the decrease of timber production (McInnis, 1995). The Nepheline Syenite formations in the northern part of the ecoregion were mined extensively beginning in the 1930s for bauxite for the aluminum industry. In addition to creating a huge demand for aluminum, World War II was also responsible for the number of munitions plants, depots and military bases in the ecoregion (Shepherd, 1984). As munitions plants and depots were constructed in remote areas with plenty of surrounding land, they provide excellent conservation opportunities owing to their scale and use patterns.

Natural resource-based industries in the Upper West Gulf Coastal Plain have expanded this century to include recreation and tourism, though much of the local economy is still based on forestry, agriculture, and traditional resource extraction. Suburban sprawl and development of natural lands continues to increase (Shepherd, 1984; U.S. Dept. Census, 1998).

Generally land use in the UWGCP has resulted in disturbance of various types and levels throughout the ecoregion. Many areas of biodiversity have experienced some kind of past disturbance including clearing for timber, agriculture, grazing, or mineral extraction. However, some of these areas have been or are in the process of being returned to a level of pre-settlement state. Following the first round of timber extraction, many cleared areas were converted to pasture or cotton fields. Cleared areas that have failed to grow cotton may have been abandoned to return to a wooded state, and areas that were clearcut for the first time in the 1920s or 1930s are now showing older-growth forest; similarly, areas that have proven unsuccessful at hosting commercial forest are being restored to their natural state. Unfortunately suppression of the natural fire regime has resulted in stressed or ecologically incomplete landscapes (Foti and Zollner, pers. comm, 2001).

Climatology

The climate of the UWGCP is considered transitional, between subtropical humid areas of the south and gulf, and the continental climates of the great plains and midwest. Generally south or southwesterly winds contribute to hot, humid summers and mild winters. Spring and fall are usually mild. Winter temperatures average In the winter temperatures range from an average of 50º – 63º F in the afternoons and 39º – 50º F in the early mornings; there are approximately 30 – 40 days of freezing temperatures in the winter. In warmer months the temperature varies less,

with afternoon temperatures averaging between 85º – 95º F and morning temperatures averaging 68º – 75º F (NOAA, 2001a).

Precipitation occurs throughout the year, though most rainfall occurs in the spring and fall. Thunderstorms and extreme weather can occur throughout the year, though they are more prevalent in the spring and fall in the northern part of the ecoregion, and in the spring and summer in the southern part of the ecoregion. The UWGCP receives approximately 46 – 50 inches of precipitation a year with approximately 100 days receiving measurable rainfall (NOAA, 2001b).

Extreme weather includes convective thunderstorms, which may have historically been the source of lightning-ignited low-intensity fires. Tornadoes, straight-line winds, and hailstorms also occur and have historically affected natural communities as periodic disturbances. More common in the southern section of the ecoregion, hurricanes and tropical storms from the Gulf of Mexico also affect climatology and natural communities.

Systems

Terrestrial Systems

The UWGCP terrestrial community targets were chosen at the complex level (see attached Data Management Plan for a full description and methodology, Appendix 3). Summaries for each complex as it is represented in the UWGCP follow. Terrestrial system names have been generalized to conform to the Southern Resource Office's and Association for Biodiversity Information's database. Though complex names may be used across ecoregions, the composition of each complex as it occurs in the ecoregion is unique and endemic to the ecoregion. Further, community associations as they are described for this ecoregion that belong to a terrestrial community complex are endemic to the UWGCP; therefore even though some groups are noted for not containing localized endemic or rare species, the associations themselves may be rare or endemic. For a breakdown of the complexes and descriptions of each association, see Appendix 5.

Gulf Coastal Plain Xeric Sandhill Forests and Woodlands (CEGR030510)

This "sandhills" ecological system occurs in isolated large patches across the region on uplands underlain by deep, coarse sandy soils. These sites are typified by low fertility and low moisture retention which contribute to open tree canopies, usually <60% canopy closure. Sparse understory vegetation and abundant patches of bare soil are typical. Vegetation indicators are species tolerant of droughty sites, especially Bluejack Oak (*Quercus incana*) and Arkansas Oak (*Quercus arkansana*). This system may support the largest concentration of endemic vascular plant species in the WGCP (*MacRoberts, Sorrie, Evans in prep*). In addition to these endemics and near endemics are a number of species essentially restricted to such habitats in the region. Elsewhere in the southeastern United States, including most of the adjacent ecoregion (Lower West Gulf Coastal Plain, 41), these sandhills sites are closely associated with longleaf pine.

Gulf Coastal Plain Upland Pine & Pine-Hardwood Forests (CEGR030550) & (CEGR030560)

This ecological system was the historical matrix type for the ecoregion, and was present on nearly all uplands except on the most edaphically limited sites (droughty sands, calcareous clays, and shallow soil barrens/rock outcrops). These sites are underlain by loamy to fine textured soils of variable depths. These are upland sites on ridge tops and adjacent sideslopes, with moderate fertility and moisture retention. Vegetation indicators are shortleaf pine (*Pinus echinata*) and to a lesser extent Loblolly pine (*Pinus taeda*). Both may occur in combination with a host of dry to dry-mesic site hardwood species. There are no known herbaceous species restricted to the habitat, and overall this system may have supported relatively low levels of vascular plant species diversity. This system is not currently known to support any local endemic or globally rare plant species. This system has undergone major transformations since European settlement of the region.

Gulf Coastal Plain Mesic Acid Upland Hardwood Forests (CEGR031010)

This ecological system is found in limited upland areas (especially sideslopes and narrow ridgetops) which were topographically isolated from historically fire prone, pine dominated uplands. Soils can be quite variable ranging from coarse to loamy in surface texture, although all are acid in surface reactions. These areas have moderate to high fertility and moisture retention. Sites are often found along slopes above perennial streams in the region. Vegetation indicators are mesic hardwoods such as American Beech (*Fagus grandifolia*), White Oak (*Quercus alba*), and American Holly (*Ilex opaca*), although scattered, large diameter pines are also often present. Spring blooming herbaceous species are typical in the understory of most examples. This system is not known to support any localized endemic or globally rare plant species.

Gulf Coastal Plain Hardwood and Pine-Hardwood Flatwoods Forests (CEGR033040)

These "flatwoods" are usually found on non-riverine, Pleistocene high terraces. Soils are fine textured and may be saturated for lengthy periods of the year. Saturation occurs not from overbank flooding, but typically whenever precipiation events occur and especially when evapotranspiration is low (primarily late fall through early spring). This ecological system occurs in a complex of ridge and swale topography. Ridges support loblolly pine, White oak, and other mesic species such as Sweetleaf (*Symplocus tinctoria*), and Viburnum (*Viburnum dentatum*). Swales are heavily oak dominated with species tolerant of some inundation such as Willow Oak (*Quercus phellos*) Laurel Oak (*Quercus laurifolia*) with sparse coverage of wetland herbs such as *Carex glaucescens.* This system is not known to support any localized endemic or globally rare plant species.

Southeastern Coastal Plain Upland Longleaf Pinelands (320 series)

This system is exceedingly rare in the ecoregion, and is not found naturally in Louisiana, Arkansas, or Oklahoma portions of the ecoregion. While Longleaf pine (*Pinus palustris*) was the dominant vegetation type throughout most of the southeastern United States coastal plain, it reached the western limits of natural distribution in portions of eastern Texas in the Upper West Gulf. This type is found only in limited, relictual areas. The unifying feature of this system is the presence of longleaf pine. Other vegetation can be quite variable, and much like that of other

ecological systems (notably Pine and Pine – Hardwood Forests, and Xeric Sandhills). Most known sites occur on loamy uplands but the type also occurred historically on some deep, xeric sandhills in the region. This system is not known to support any localized endemic or globally rare plant species in this ecoregion.

Gulf Coastal Plain Circumneutral Upland Mesic Mixed Hardwood Forests (CEGR031020)

This system is analagous to "Mesic Acid Hardwood Forests" and is found in related topographic settings. However, this system is found on soils which exhibit somewhat higher surface soil pH reactions. Consequently, the vegetation may include Chalk Maple (*Acer leucoderme*), Southern Sugar Maple (*Acer barbatum*), Carolina basswood (*Tilia americana va. caroliniana*), Hop horn-beam (*Ostrya virginiana*) and other indicators with calciphilic tendencies. These indicators have essentially eastern distributions (as opposed to species typical of CEGR037530, which are more midwestern). A rich understory of herbaceous species may also be present, but this system is not known to support any localized endemic or globally rare plant species.

Gulf Coastal Plain Open Ponds and Emergent Marshes (CEGR048010)

This ecological system includes upland ponds which retain water for long periods of year, at sufficient depth and duration to allow presence of truly aquatic species. In well developed examples, this system tends to develop zonal vegetation patterns with emergent vegetation zones forming around the periphery of deeper waters, which in turn tend to support various floating leaved and submersed aquatic vegetation such as Floating Hearts (*Nymphoides aquatica*, *Nymphaea odorata*), Watershield (*Braseni schreberi*), Coontail, (*Ceratophyllum spp*.), Duck Weed (*Lemna spp*.), Duckmeat (*Spirodela spp*.). Emergent zone plants may include Smart Weed (*Polygonum spp*.), Maidencane (*Panicum hemitomon*), Plumegrass (*Saccharum spp*.) and a variety of other species. In most of the region, natural ponds are exceedingly rare and invariably occur as small patches on the landscape. Most "natural" examples form as a result of beaver activity or other natural impoundments of flowing waters. A wide variety of successional environments have been created which appear to be floristically similar to natural examples. This system is not known to support any localized endemic or globally rare plant species.

Gulf Coastal Plain Upland Depression Forested Ponds (CEGR034010)

This ecological system occurs in upland depressions on poorly drained, often fine textured soils. Much like swales in "flatwoods", these areas typically receive moisture from precipitation instead of overbank flooding. These areas retain water for shorter duration than do open ponds and emergent marshes and consequently develop woody vegetation layers. These areas can range in appearance from fairly open aspects with widely scattered trees to quite densely stocked with small diameter saplings and small trees. Typical woody species include Willow Oak (*Quercus phellos*), Bottomland Post Oak (*Quercus similis*), Pop Ash (*Fraxinus caroliniana*), and Mayhaws (*Crataegus spp*). This system is not known to support any localized endemic or globally rare plant species.

Gulf Coastal Plain Herbaceous Seepage Bogs (CEGR034710)

This small patch ecological system consists of herbaceous dominated seepage fed wetlands. This system may occur in settings similar to "Gulf Coast Baygalls and Bayheads", and differs primarily in lacking a substantial woody vegetation layer. It is unclear whether or not a key ecological process difference separates the two systems, although fire frequency is often presumed to be of importance. In some areas, herbaceous seepages may be rapidly encroached by vegetation in the absence of fire. In addition, most examples of this ecological system co-occur spatially with either the "shrubby" or densely wooded phase of Baygalls and Bayheads. Plant communities of this system range from bogs in which pitcher plants (*Sarracenia alata*) are potentially present (primarily Texas and Louisiana portions of the region), to those occurring outside the native range of pitcher plants. So called "muck bogs" of Texas, with a host of regionally rare species, and the local endemic Rough-stemmed Aster (*Aster puniceus var. scabricaulis*) are also found in this system.

Gulf Coastal Plain Carbonate Glades and Barrens (CEGR035010)

This system is found only on shallow carbonate soil exposures in the region. These areas are derived from chalky or glauconitic geology such as the Weches formation of eastern Texas. These areas are often sparsely vegetated, at least relative to surrounding areas. Overstory trees are often absent or represented by occasional stems of cedar (*Juniperus viginiana, Juniperus ashei*). This system provide habitat for at least 2 rare, locally endemic plant species; White Bladderpod (*Lesquerella pallida*), and Texas Glade Cress (*Leavenworthia texana*).

Gulf Coastal Plain Acidic Glades and Barrens (CEGR035010)

This system is exceedingly rare in the ecoregion, found only in association with the Catahoula geologic formation in eastern Texas. These areas support exposed sandstone or mudstone with sparse vegetation, surrounded by slightly deeper soils with prairie-like vegetation, and pockets or "mottes" of post oak (*Quercus stellata*). This system provides habitat for at least one rare, locally endemic plant; Branched Gayfeather (*Liatris cymosa*).

Gulf Coastal Plain Salt Glades and Barrens (CEGR035030)

This system occurs in association with the inland salt domes. Soils are highly saline (Natraqualfs) with predominately silty textures. Subsoils are often essentially cemented into an impervious hardpan by calcium. This condition contributes to alternate phases of extremely dry and extremely wet conditions (sometimes described as "xerohydric"). As with most glades and barrens, these areas are locally variable or zonal in appearance. An interior zone with patchy vegetation and abundant bare soil openings or "slicks" is usually present. Vegetation in this zone consists of mostly low growing forbs, many of them annuals, and many with "weedy" habits. Low, wet, shrubby zones may be present in some areas, while on the edges of sites, where the soil is deeper. This community may grade into hardwood or pine - hardwood forest, depending on the specific location. This system provides habitat for at least one rare, locally endemic plant; Geocarpon (*Geocarpon minimum*).

Gulf Coastal Plain Nepheline Syenite Glades and Barrens (CGER035040)

This small patch ecological system is only present on distinctive, massive outcrops of igneous substrate ("nepheline syenite") in Saline and Pulaski counties, Arkansas. Vegetation in these areas exhibits some degree of zonality. The outcrops themselves are relatively extreme environments for plant growth due to mild alkalinity, exfoliation of rock surfaces, and surface moisture and temperature fluctuations. They are sparsely vegetated with low-growing forbs, mosses, and lichens. Around the periphery on somewhat deeper, better developed soils vegetation cover is greater. Perennial grass cover and a diverse herbaceous layer is typical, along with a scattered, often stunted canopy of trees. This system provides habitat for at least one rare, locally endemic plant; Small-headed Pipewort (*Eriocaulon kornickianum*).

Gulf Coastal Plain Baygalls and Bayheads (CEGR036010)

This ecological system consists of densely wooded, seepage fed wetlands and adjacent (often shrubby) seepage slopes. These wetlands may occur in depressions, poorly developed upland drainages, toe-slopes, and small headwaters stream bottoms. These environments are prone to long duration standing water, and tend to occur on highly acidic, nutrient-poor soils. In most cases, these wetlands are embedded in uplands with deep sandy soils. When these communities are associated with streams, they tend to be low gradient, with narrow, often braided channels and diffuse drainage patterns. Due to excessive wetness, these habitats are normally protected from fire except those which occur during droughty periods. This system is not known to support any localized endemic or globally rare plant species.

Southeastern Coastal Plain Small Stream Forests (365 series)

This ecological system occurs in fairly small, mostly linear patches across the ecoregion, wherever small to intermediate sized perennial streams bisect the landscape. These areas have minor floodplains and valleys associated with well-developed channels. Flooding is infrequent and of shorter duration than larger rivers although available soil moisture and nutrient availability is usually high. Small areas of groundwater seepage supporting obligate wetland plants may occur, but overall, vegetation will closely resemble that of Pine and Pine-Hardwood Forests (CEGR030560). Characteristic trees include white oak (*Quercus alba*), Sweetgum (*Liquidambar styraciflua*), and loblolly pine (*Pinus taeda*). Well developed examples may exhibit a great degree of similarity to Mesic Acid Upland Hardwood Forests (CEGR031010) with species such American holly (*Ilex opaca*), American beech (*Fagus grandifolia*), and others**.**

Gulf Coastal Plain Patch Prairies (CEGR037520)

This system is characterized by naturally herb-dominated vegetation occurring over deep soils (as opposed to "glades and barrens"), with almost exclusively circumneutral surface soil pH. This system tends to occur in a matrix of acid soils, and forested vegetation although in some instances examples may co-occur spatially with other circumneutral communities locally (see CEGR037530, CEGR037540). Distinguished from related prairies to west (see CEGR051010) which occur in much larger patches across the landscape (at least historically), maintenance by somewhat more extreme disturbance regimes, and consequently support more typically midwestern species composition. The largest examples of this system are found in Southwestern Arkansas and known as blackland prairies. They include much more isolated and smaller patches

present primarily on the Fleming Formation of Texas and Louisiana. Nearly all examples are naturally isolated from one another due to large intervening areas of unsuitable habitat.

Gulf Coastal Plain Circumneutral/Calcareous Praire-Associated Upland and Slope Forests and Woodlands (CEGR037530)

This system consists of forests or woodlands on circumneutral, deep upland soils adjoining calcareous prairies characterized by a more extreme, basic pH than "Gulf Coastal Plain Circumneutral Upland Mesic Mixed Hardwood Forests." Such a characterization results in species composition more typical of Midwestern Prairie regions and less so of eastern deciduous forests. This system is also assumed to be more fire prone due to proximity to prairies. Edaphic and fire factors maintain fairly open canopies (typically < 60%). Typical woody species include; Durand Oak (*Quercus sinuata var. sinuata*), Shumard Oak, Chinkapin Oak, and Hawthorn (*Crataegus spp*.).

Gulf Coastal Plain Patch Circumneutral/Calcareous Praire-Associated Riparian Woodlands and Forests (CEGR037540)

This system consists of small stream/riparian influenced forests and woodlands on circumneutral soils. In all cases, these forests or woodlands adjoin calcareous prairies and/or calcareous forest (Compare with group small stream acid forests). These areas were likely subjected to frequent fires originating in adjacent calcareous prairies, thus in natural condition may have been more open and woodland in structure than closed forest. Vegetation indicators, such as Hackberry (*Celtis laevigata*), Shumard Oak (*Quercus shumardii*), Chinkapin Oak (*Quercus muehlenbergii*), Osage Orange (*Maclura pomifera*), and Soapberry (*Sapindus saponaria var. drummondii*) are indicative of calacareous conditions. This system is not known to support any localized endemic or globally rare plant species.

Gulf Coastal Plain Backswamp/Slough Floodplain Forests (CEGR038510)

This system type may occur in floodplain depressions of major rivers throughout the ecoregion, and the entire southeastern Coastal Plain. These areas tend to occur in oxbows and/or abandoned river channels where they receive overbank flooding. Soils are most often fine-textured and are very poorly drained (often flooded for long periods of the year). Soil color is usually gray as a result of continual anoxia. Characteristic vegetation of this system includes trees that are tolerant of inundation, such as water elm (*Planera aquatica*), baldcypress (*Taxodium distichum*), and water tupelo (*Nyssa aquatica*). Herbaceous ground cover and shrub layers tend to be sparse or patchy. This system is not known to support any localized endemic or globally rare plant species.

Gulf Coastal Plain Bottomland Hardwood Forests (CEGR038520)

Bottomland hardwood forests are found within the active floodplains of large and small rivers of the ecoregion. Regular flooding occurs in the winter and spring. Local microtopography and location within the floodplain greatly influence the amount and duration of standing water as well as the amount of scour and alluvial deposition. Soils are locally variable as well. Deciduous hardwood species, often attaining large sizes, characterize forests in this system, with oak species being most characteristic. Characteristic species include water oak (*Quercus nigra*), willow oak (*Quercus phellos*), laurel oak (*Quercus laurifolia*), swamp chestnut oak (*Quercus michauxii*),

and overcup oak (*Quercus lyrata*) are commonly encountered. This system is not known to support any localized endemic or globally rare plant species.

Cross Timbers Upland Oak Forests and Woodlands (CEGR051010)

This system is dominated by upland oak vegetation found in the Post Oak Savanna and Cross Timbers natural regions, largely outside the native range of pine (excluding the "Lost Pines" area of Bastrop, TX). This system is the presumed historical matrix vegetation type along the western boundary of the ecoregion grading into the Cross Timbers ecoregion. Characteristic trees are Post Ok (*Quercus stellata*) and Blackjack Oak (*Quercus marilandica*). This system is broadly defined across site types, and could occur on nearly any upland soils except those which support prairies or other similar vegetation. This system is not known to support any localized endemic or globally rare plant species.

Crosstimbers Tallgrass Clay Prairies (CEGR052010)

This system represents upland prairies found in the Post Oak Savanna and Cross Timbers natural regions. As opposed to "patch prairies" listed previously, these prairies occupy large portions of the landscape (at least historically), and are typified by species composition more midwestern. In this ecoregion, Cross Timbers Prairies are present only in a narrow strip in eastern Texas often called the "Post Oak Savanna" natural region. This system is not known to support any localized endemic or globally rare plant species.

Aquatic Systems

Though all aquatic systems in upper west gulf coastal plain do not drain into the Mississippi River basin, all are zoogeographically classified in the Mississippi province (Moyle and Cech, 1998), and as such, contain the richest assemblage of fish and mussel species in the Nearctic region. Further, the lower Mississippi River basin is considered a glacial age species refuge, allowing for historic reoccupation and evolution throughout the range. Aquatic systems represented in the UWGCP include lacustrine systems as natural lakes, riverine systems as high-order/big rivers, and low-order/small streams, and seeps, and palustrine systems as sloughs and swamps. The majority of aquatic systems in the UWGCP are fluvial, and natural lakes are uncommon. Man-made lakes and impoundments are not included in this summary.

Low-order/small streams and rivers

Small streams originate in the ecoregion through surface and sheetflow-fed seeps and through sheetflow, groundflow, and surface flow drainage from adjacent ecoregions. Reaches of low-order streams and rivers originating in adjacent ecoregions (e.g., Ouachita Highlands) are considered more typical upland cold low-order streams. Low-order riverine systems begin the lowland fish faunal group, and offer the most diverse fish communities in the ecoregion. Substrates can be composed of sand, gravel, or cobble; and some form from decay of bedrock uplifts at ecoregional boundaries. Pool/riffle systems are a common feature of these systems. Water is commonly clear, and cool with medium gradients. These systems will flow into higher-order/big rivers directly and contribute to slough/swamp systems as well. These systems provide critical habitat for mussel communities and beds, many of which are species targets. Fish target

species found in low-order streams include suckers, chubs, shiners (e.g., taillight and blacknose shiners), redhorses, all target darters (Robison, 1988, Smith, 1992).

High-order/large rivers

Small streams feed into high-order larger rivers in the ecoregion, which in turn contribute to slough/swamp systems. Larger rivers are part of the Red, Mississippi, Sabine, or Trinity drainage systems. Transitioning from low-order streams, Gravel and cobble give way to sand and mud stubstrates. Upstream reaches of large rivers contain significant mussel communities. Sandbars on the main channels of large rivers, (.e.g., the Red River) are habitat for the endangered Least Interior Tern. Large river fish include some chubs and shiners, alligator gar, shovelnose sturgeon, and the paddlefish. Ecological processes in most, if not all large-order rivers in the UWGCP have been affected by locks, dams, dredging, or channelization.

Sloughs and Swamps

Sloughs and swamps occur throughout the ecoregion, in connection with both higher- and lower-order riverine systems. Wetlands occur with varying levels of saturation in the UWGCP, though the typical aquatic system considered here is a permanently-flooded cypress-tupelo swamp or shrub swamp. Attributes for consideration of terrestrial management of these systems is described and through terrestrial community planning. Fish communities are similar to those found in large-river and natural lake communities.

Natural Lakes

Most natural lakes in the UWGCP originated through riverine action, either as high-order cut-offs or meanders (i.e., oxbow lakes), however some formed from riverine systems that were naturally jammed from presettlement events. Caddo Lake is the largest natural lake in the ecoregion and is the remainder of the "Great Raft," in large series of log jams, lakes, and sloughs formed on the Red River. US Army Corps of Engineers cleared the Great Raft in the mid-1800s in an effort to open the Red River to navigation (McInnis, 1995). Natural lakes in the ecoregion are generally shallow with mud, sand or silt substrates. Common fish species include most gamefish; target species found at natural lakes include the alligator snapping turtle and the alligator gar. The dominant community complex surrounding natural lakes is the gulf coastal plain Plain Backswamp/Slough Floodplain Forest.

Conservation Goals and Rollout Data

Following is the rollout data for the UWGCP ecoregional plan first iteration; attached to this plan are more detailed reports of the rollout data, including a viable target occurrences captured by conservation areas, occurrence goal fulfillment status, and target breakdown by Global rank and type.

Rollout Information

Planning teams identified 78 portfolio conservation areas necessary to preserve the biodiversity in the UWGCP. Of the 130 targets, 20% or 26 met their established goals; 54% of the targets that met their goals did so by inclusion of expert recommendation/non-heritage occurrences. Of the 26 targets that met their goals, 35% were communities, 23% were plants, and 42% were animals.

72% made progress some progress towards their goals, that is, a portion of the occurrences necessary to complete a goal were met. The remaining 36, or 28% are not represented in the portfolio. Of the unrepresented targets, 6% were terrestrial communities; 55% were zoology targets, and 39% were botany targets.

Of the species that met their conservation goals 4% are ranked as G1. 12% are listed endangered or threatened, and 8% are ranked as G2. 7% of all G1 and G2 targets met their goals. 16% of the zoology targets, 30% of the community targets, and 17% of the plant targets met their goals.

The total approximate acreage of the portfolio conservation areas is 4,193,851. These sites compose approximately 16% of the ecoregion. It should be noted that this is a dynamic plan, influenced by the addition of new or missing data; and implementation at the site level; therefore this percentage or acreage should be considered an approximate minimum necessary to conserve biodiversity in the UWGCP.

Many, though not all conservation areas in the UWGCP contain areas that are already managed for conservation or protected by a state, federal, TNC, or other privately entity. However, rarely do these management areas encompass the entirety or even a majority of the individual portfolio sites. There are approximately 1,697,295 acres or 40% already under some kind of conservation or wildlife management within the ecoregion. 48 of the 78 have some protection component, while only 4 sites can be considered 100% protected. An additional 12 sites could be considered more than 50% protected. Of the areas in the portfolio conservation sites that are already managed for biodiversity, 1,447,496 acres or 85% is under federal management; 234,095 acres or 14% is under some form of state management; 15,704 acres or 1% is under TNC or other private conservation management. Table 1 provides a breakdown of protected areas within the portfolio.

Table 1: Basic Conservation Portfolio Breakdown	
Total square miles protected in the UWGCP portfolio	2,652
Total acres protected in the UWGCP portfolio	1,697,294
Total square miles of existing conservation areas	6,553

Total acres of existing conservation areas	4,193,851
Total square miles of landscape scale (> 20,000 acres) in UWGCP Total acres of landscape scale conservation areas in UWGCP	6,144 3,932,196
Total square miles of federally managed lands in portfolio Total acres of federally managed lands in portfolio	2,262 1,447,496
Total square miles of state managed lands in portfolio Total acres of state managed lands in portfolio	366 234,095
Total square miles managed by TNC in UWGCP portfolio Total acres managed by TNC in UWGCP portfolio	25 15,704

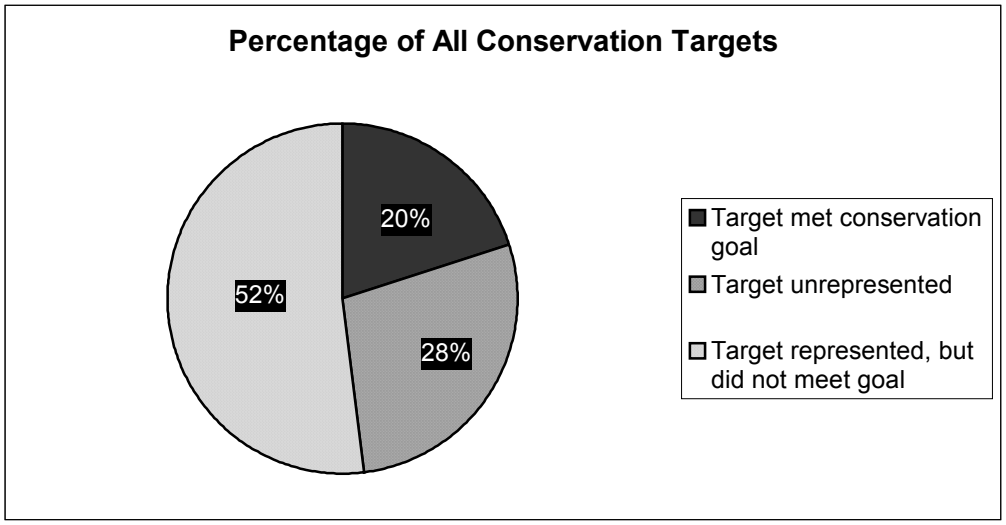
Table 2 provides a breakdown of species conservation targets by G-rank:

Target Type	G1	G2	G3	G4	G5	NA	Total
Animals	13	13	15	18	8	0	67
Plants	3	10	18	4	1	0	36
Terrestrial Communities	0	0	0	0	0	27	27
Total	16	26	33	22	9	27	130

Table 3 provides a geographic distribution of conservation targets:

Geographic Distribution	Terrestrial Communities	Animals	Plants	Total	Percentage of all targets
Endemic	13	9	6	28	22%
Limited	10	38	21	69	53%
Peripheral	1	2	0	3	2%
Widespread	3	18	9	30	23%
Disjunct	0	0	0	0	0%
Total	27	67	36	130	100%

Figure 1 illustrates the percentage of all conservation targets that met their goal, percentage of targets that did not meet their goal, and percentage of unrepresented targets in the portfolio.



Terrestrial Communities

The community team determined a total of 27 community targets; of those they found 13 endemic community targets, and 10 limited targets. Nine of the 27 community targets, or 30% met their goals. Three of the group targets are considered matrix communities, representing 2.3% of all targets for the UWGCP. 11 are considered large patch, and 13 are considered small patch communities. 33% of all terrestrial communities met their goal. 25 out of 27 terrestrial ecological systems are represented in the community targets. The community team set conservation goals based on groups due in part to significant data gaps for accurate association-level or alliance goal setting across the ecoregion; as such a transition to association-level management will be possible when the level and quality of data across the ecoregion is standardized.

Table 5 illustrates community targets met:

Spatial Pattern	Goals met / Total targets	Percent of targets meeting goals
Matrix	0 / 3	0%
Large Patch	4 / 11	36%
Small Patch	5 / 13	38%
Total	8 / 27	30%

Zoology and Botany Targets

Botany team determined that there were 36 plant targets. The botany team found 6 endemic targets, and 21 limited targets. 6 out of 36 or 17% of the plant targets met their goals.

Zoology team members determined that there were 67 animal targets. The zoology team found 9 endemic animal targets and 38 limited targets. 11 of the 67 animal targets, or 16% met their goal.

Table 4 lists the zoology and botany targets met by taxonomic group:

Taxonomic Group	Goals met / Total targets	Percent of targets meeting goals
Amphibians	1 / 3	33%
Birds	2 / 6	33%
Fishes	4 / 15	27%
Mammals	0 / 5	0%
Reptiles	2 / 2	100%
Crustaceans	0 / 13	0%
Insects	0 / 5	0%
Mollusks	2 / 18	11%
Total	11 / 67	16%

Aquatic Communities

62 sites, or 79% of the sites are considered aquatic sites or contain significant aquatic elements. 16 or 21% of the sites are primarily terrestrial sites. All aquatic sites should be considered as having a 10-acre buffer component. Since many terrestrial and aquatic sites are interdependent, many terrestrial sites and aquatic have been merged, making site conservation management efforts more efficient, coordinated, and holistic.

Stresses and Sources of Stress in the UWGCP

UWGCP technical expert teams participated in a Stresses and Sources of Stress assessment to determine and prioritize stresses on the ecological systems and portfolio conservation sites and to address their sources through implementation strategies. Stresses on systems and portfolio sites directly impact the ecoregional plan implementation and site conservation action plans. Results from this analysis were used along with priority ranking criteria to determine the ecoregion's action sites.

In order based on count, the three leading stresses for sites in the UWGCP are:
- habitat destruction or conversion;
- habitat fragmentation; and
- alteration of natural fire regimes.

Other stresses include:
- Altered composition/structure
- Altered hydrologic regime (flow, quantity, etc.)
- Excessive herbivory Habitat disturbance
- Nutrient loading
- Poor water quality (pollution, turbidity, etc.)
- Soil erosion
- Sedimentation
- Toxins/contaminants

The top three sources of stress by count are fire suppression, agriculture, and forestry/improper silvicultural practices. The top three combinations of stress and sources of stress are: fires suppression and alteration of natural fire regimes; forestry –improper silvicultural practices and altered composition/structure; and forestry—conversion and habitat destruction/conversion. Additional stressors in the UWGCP include:
- Biological (exotic species, disease, woody suppression)
- Commercial development
- Dams/reservoirs
- Dredging/diversions
- Forestry/conversion
- Improper management (e.g., managed for incompatible species)
- Industrialized livestock production
- Livestock grazing
- Recreation (includes off-road vehicle use, road/trail construction, trampling/overuse)
- Residential development
- Resource extraction – mining
- Resource extraction – oil and gas exploration and development
- Roads/construction
- Water pollution: non-point source
- Water pollution: point-source

Prioritizing Sites

Expert technical team members completed an action site evaluation matrix to arrive at the ecoregional action sites (included on data CD). The Number and Diversity of Targets field was derived from the data supporting the portfolio; Complementarity and Leverage fields were derived from data but were subject to adjustment by evaluation participants. Urgency/Degree of Threat and Feasibility/Opportunity to Abate Treat fields were similarly subject to change upon review; Biodiversity Health of Targets was the only completely subjective field to be completed by evaluation participants.

After the first round of action site review, there were 12 action sites in the UWGCP. An additional 18 sites scored highly enough to be considered secondary action sites.

Action Sites	Secondary Action Sites
Lorance Creek / Big Lake	Terre Noire
Nepheline Syenite Glades	Little Missouri and Lower Antoine Rivers
Pine Bluff Arsenal	Ross Foundation
Little River from Glover River to Millwood Lake	Nacatoch Ravines
Poison Springs	Palmetto Flats
Miller County Sandhills	Kingsland Prairie, Warren Prairie & Saline River, Ouachita River Terraces / Bastrop Ridge
Bayou Bartholomew	Sulfur River Wildlife Management Area
Caddo Lake Complex	Bayou Dorcheat
Tonkawa Sandhills/Naconiche Creek	Daingerfield State Park
Northern Sabine National Forest	Caney District, Corney Unit - Kisatchie National Forest
Davy Crockett National Forest	Caney District, Caney Unit - Kisatchie National Forest
Lower Trinity River	Bodcau
	Mill Creek Ranch
	Barksdale & Ammo Plant
	Bistineau Calcareous Forest, Bossier Point / Loggy Bayou
	Burkitt Foundation, Gus Engling Wildlife Management Area
	Camp Bette Perot
	Upper Neches River

The Action Site evaluation matrix was reviewed and adjusted at the implementation meeting. This review stemmed from an effort to move away from the yes/maybe/no categorization towards a level of prioritization to reflect the concept that all sites are action sites yet recognize some priority should be given to sites with the highest combination of diversity, health, and threats. Complementarity prioritization was performed according to Geography of Hope (TNC, 2000) as modified by participants who had performed similar prioritization evaluations for the Lower West Gulf Coastal Plain (Turner, 2001).

Sites where conservation will achieve the highest level of Complementarity

- Pine Bluff Arsenal
- Little River from Glover R. to Millwood Lake
- Nacatoch Ravines

- Kingsland Prairie, Warren Prairie & Saline River, Ouachita River Terraces / Bastrop Ridge
- Bodcau
- Caddo Lake Complex
- Barksdale and Ammo Plant
- Camp Bette Perot
- Davy Crockett National Forest

Sites where conservation will achieve the next highest level of Complementarity:
- Nepheline Syenite Glades
- Palmetto Flats
- Bayou Bartholomew
- Red River Macrosite
- Upper Sabine River Complex
- Tonkawa Sandhills/Naconiche Creek
- Mud Creek
- Northern Sabine National Forest

Prioritization of sites should not exclude conservation action at other sites identified in this planning process; especially when connectivity, functional landscapes and multi-site threats and strategies are considered. Note that most multi-site strategies will be most effective when implemented initially at sites with higher complementarity then at remaining applicable sites.

Ecoregional Plan Implementation

This section is provided to summarize the results of the UWGCP ecoregional plan implementation meeting and provide a starting point for implementation strategies throughout the ecoregion. These implementation strategies are designed to fulfill the mission of The Nature Conservancy of ensuring the survivability of biodiversity within the ecoregion by protecting the lands and waters the elements of biodiversity need to survive. Initial implementation will address multi-site strategies and multi-site threat abatement at action and other portfolio sites within the ecoregion.

Multi-Site Strategies

Multi-site strategies were developed to enable implementation of the ecoregional plan through clear, prioritized, cohesive measurable action. Participants in the multi-site strategy were asked to review literature and guidance pertaining to multi-site strategies, including relevant *Geography of Hope* chapters, implementation sections from other ecoregional plans, and the results of multi-site strategy meetings from other ecoregions. Initial activities were to review the major systems in the ecoregion, then review stresses and threats to determine multi-site stresses and their sources. The stresses/sources of stress assessment relied on the Geography of Hope definitions of a stress, source of stress, and threats[1]. For the purposes of this chapter and activity these definitions have been truncated: "stress" is defined as an ecological or biological element, i.e., sediments; "sources" are defined as anthropogenic, i.e., fragmentation or development; "threats" can be any combination of sources or stresses.

Ecoregional planning is translated to implementation through conservation action at individual sites and through implementation of multi-site strategies. Note that many multi-site strategies also address or link several threats. Multi-Site Strategies were developed through an iterative process of review and expert input/workshops. Major terrestrial and aquatic systems in the ecoregion were reviewed, then multi-site threats and top sources of stresses were developed and listed. Experts then identified multi-site strategies and developed each under a specific threat. Action items were identified for each strategy, and objectives were developed for each action item.

The following are system threats identified in the implementation experts meeting. Terminology was structured from the initial Geography of Hope based stresses/sources of stress analyses.

Terrestrial system threats:

- Conversion: Silviculture, Agriculture
- Agricultural conversion (present/historic)
- Incompatible Forestry
- Altered Fire Regime
- Conversion/destruction from commercial and residential development
- Roads and right-of-way construction

Aquatics system threats:

[1] *Stress*: something that impairs or degrades the size, condition, or landscape context of a conservation target, resulting in reduced viability; *Source*: a human or biological factor that infringes upon a conservation target that results in stress; *Threat*: the combined concept of stresses to a target and the sources of that stress to that target.

- Hydrologic alteration: dams/reservoirs, dredging, channelization, levees, Thermal pollution/alteration.
- Agriculture,
- Silviculture/incompatible forestry,
- Roads and right-of-way construction
- Extraction/mining, (mineral as well as water extraction)
- Non-point Source and Point-Source discharge
- Invasive species

The implementation team decided on the following as the top sources of stress:

Fire Suppression/Altered Fire Regime
Agriculture
Roads/Construction of Roads
Dams/Reservoirs
Residential and Commercial Development
Invasive Species

Forestry

The goal of the forestry multi-site strategy is to manage all applicable viable portfolio sites under a compatible program towards a targeted structure/composition within a functional landscape relative to TNC's portfolio conservation areas. The Forestry multi-site strategy addresses the following stresses:

- Altered composition/structure
- Habitat destruction/conversion
- Habitat fragmentation
- Nutrient loading
- Sedimentation

Compatible Forestry Strategy

The most efficient method of addressing these stresses is a compatible forestry strategy implemented across the ecoregion in conjunction with other compatible forest strategies in adjacent ecoregions. The concept behind the compatible forest initiative is that by becoming an active partner in forestry management, TNC can provide meaningful input to all partners, and build defensible data for targeted audiences demonstrating the economic and conservation feasibility of compatible forestry. TNC has identified three groups of forestry professionals to for initiative coordination: industrial foresters, public lands foresters, and private non-industrial forest landowners (PNIFLOs). It was determined that each group represents sectors of ownership for applicable portfolio conservation areas (PCAs), and successful implementation of the multi-site strategy requires a customized approach to each group. As the initiative matures, the program manager should consider compatible forestry demonstration areas for each of the three groups. Clearly defined demonstration area projects and monitoring will provide practical data targeted to group members, thus enabling buy-in to the concept, and therefore build capacity for outreach within each group.

The short-term objectives of the compatible forestry strategy initiative are

- Identify appropriate landholders within eligible PCAs
- ID appropriate national level programs at state-level implementation (e.g., forest legacy) to foster working cooperation.
- Develop relations with extension services

Further, as the initiative will be working on multiple levels with multiple entities, TNC resources should address the following program needs:

- Design and monitor demonstration areas to produce data useful to partners
- Support or introduce tax incentives and other opportunistic regulatory incentives to make the initiative more attractive
- Actively incorporate the initiative into public lands management and planning, especially through forestry plan revisions (USFS)
- Develop or partner with existing economic compatibility study to demonstrate effectiveness and connectivity in an effort to build a national and even
- Assist landowners, particularly PNIFLOs, in classifying their lands through SFI

The compatible forestry initiative should create working demonstration areas in each landowner group to build capacity towards the long-term goal of the initiative, which is to implement compatible forestry with all applicable landowners within portfolio conservation areas. In order to accomplish this goal, the initiative requires action on several levels to many audiences. An immediate need is to design and begin gathering useful data so that partner buy-in and cooperation is established; partners must be presented with data that shows in their terms that compatible forestry is economically as well as environmentally feasible. This assessment should include an appropriate risk analysis. External relations activities should address tax incentives, and identify and actively support other regulatory measures designed to make compatible forestry more attractive to partners.

Critical to the compatible forestry initiative and the demonstration activities in particular is quality information and data dissemination. As targeted towards PNIFLOs, information dissemination should include:

- Success stories
- Workshops
- Consultant/professional organization education
- Mitigation funds tie-in

Further, the initiative should make use of existing systems to disseminate data and promote the initiative. Initiative managers should also investigate the applicability of mitigation funds coordination.

Certification through professional organizations such as American Forest and Paper Association's Sustainable Forestry Initiative (SFI) and Forest Stewardship Council's (FSC) certification towards ISO 9000 standards, and any American Forestry Association standards should be addressed. Professional organizations should be provided the opportunity to use TNC's Compatible Forestry Initiative as a vehicle for their SFI and ISO 9000 certification programs. An opportunity also exists for TNC to review partners and certification standards, and pursue adjustment of those standards if necessary. The initiative will be most efficient if it is able

to reach the entirety of its intended audience; an effort should be made to identify and involve nonparticipating entities as well as non-certified landowners.

The scope of Compatible Forestry Initiative objectives may be best explored through each group's specific need. An overarching need is to identify lead staff within TNC and initiate compatible forestry action; if a full-time manager is to be used, then a job description and terms of reference should be created from this text; further, interim measures should be identified and initiated.

PNIFLOs

- ID owners/partners in PCAs. Some already identified are Winrock, Ross Foundation.
- Develop landowner incentives: private lands strategy
  --tax credits for practices, PNI certification process
  --state forestry and consultant training
- Involvement in state forestry councils/committees
- Develop relations with extension service
- Demonstration sites, field reps
- Identify "niche" partners, markets
- Involvement in government programs

Industrial Forestry Interests

- Develop regional support structure
- Identify certification and professional organization contacts.
- Determine / develop regional and national support and organizational implications
- Explore FWI levels of expertise model and public forest model for long-term organization structure
- Develop and perfect forestry management model in this ecoregion that can be exported to other ecoregions

Public Lands

- Review agency operations guidelines
- Build "unified front" towards agency credibility
- Initiate public lands liaison activities; include state forestry commissions and farm bureaus as well as federal partners
- Align and coordinate with regional FWS offices and management plan
- Assist public lands in filling their data gaps, especially inventory
- Align Compatible Forestry Initiative with USFS forest management plans; incorporate Compatible Forestry Initiative into USFS forest management plans
- Coordinate and initiate government-relations interaction for forest management plan alignment and generation of necessary MOUs
- Review and develop strategy and policy that addresses inholdings
- Gain input to / align with State/federal acquisitions policy and strategies—relates directly to inholdings

Agriculture

The goal of the agriculture multi-site strategy is threefold: successfully prevent excessive sediments and contaminants from entering targeted aquatic communities; successfully prevent incompatible agricultural practices or conversion, and to restore or reforest agricultural lands where applicable. It was generally agreed that agricultural activities have the greatest impacts on bottomland hardwood forest and aquatic systems; though it was also noted that agriculture-related stresses related to upland systems warranted review. The agriculture multi-site strategy addresses the following threats:

- Habitat destruction/conversion
- Habitat fragmentation
- Nutrient loading
- Sedimentation
- Altered Hydrologic Regime
- Non-point source pollution (i.e., FIFRA-related runoff)

The agriculture multi-site strategy addresses stresses emanating from three general types of agriculture. Each general type may require specific or custom approaches:

- Combined Animal Feeding Operation (CAFOs)
- Row Crops
- Pasture

Strategic action can be considered in terms of restoration and prevention activities. Prevention activities concern runoff prevention. Both restoration and prevention activities invite cross-cutting partnerships with neotropical and game migrants, invasive species, fragmentation abatement, and compatible forestry incentives.

Multi-site strategies involving prevention action include:

- Identifying runoff areas in targeted watersheds
- Developing a sediment budget for targeted watersheds
- Develop TNC's roll as a source of credible information to relevant state and federal government sources; e.g., federal EPA, state DEQs, Soil and water agencies, and farm bureaus.
- Use roll as credible information source to initiate conversion disincentives at local, state, and federal regulatory and government levels.
- Link external relations and outreach activities with Compatible Forestry Initiative incentives

Multi-site strategies for agricultural restoration areas

- Identifying and partnering with existing programs, including but not limited to WRP, CRP, FWS, LWCF, Gulf Wings, DU, RC&D, NRCS
- Identifying restoration areas and best management practices (BMPs) for partnership involvement
- Promoting or supporting funds acquisition for FWS to restore agricultural lands
- Pursuing carbon sequestration on restoration/reforestation areas with conservation-centered carbon sequestration guidelines:

Action Items:

- Direct state and federal incentive programs towards PCA success; assess and ID strategic reforestation through existing programs.
- Pursue and direct disincentives to address conversion
- Actively participate in carbon sequestration implementation as well as rules and regulations.
- --coordinate runoff prevention items program w/ NRCS, state agencies

Fire

The Goal of the fire multi-site strategy is to restore the range of appropriate fire regimes where fire is a natural process at portfolio areas. The major stress addressed is alteration or removal of a natural fire regime, or inadequate or incorrect application of a prescribed fire practice. The greatest barrier to threat abatement is a misunderstanding on many levels of alteration of natural fire regime, as evident through the following sources:

- Lack of historic background or data of natural fire regimes
- Risk and liability issues/fear of loss of life, property, and wildland aesthetics
- Continuation of suppression-oriented management and policy

Restoration of a natural fire regime will occur in the public and private arenas. The multi-site fire restoration strategy should initiate fire restoration demonstration sites in both arenas; to do so, TNC must continue to build capacity for fire restoration, promote fire policy towards ecological restoration, educate policy makes as well as landowners and land managers. Additional external relations should promote contract burns for private landowners and investigate costshare efforts for burning. The multi-site strategy for this ecoregion will mirror the strategy and action of the national TNC fire restoration strategy, including adoption of modified measures of success:

- ID appropriate federal, state and local fire managers and ensure their education on the role of fire in maintaining biodiversity at those sites
- Restore fire to 25% of applicable portfolio conservation areas considered moderately to severely altered
- Participate in fire restoration demonstration projects at appropriate sites according to national plan.
- Promote fire restoration literature as an education tool for land managers and land owners.
- Incorporate standardized fire restoration and adaptive management protocols to appropriate portfolio conservation areas.

Roads and R-O-Ws/Road Construction

The goal of the roads/right of way (ROW) multi-site strategy is to prevent stresses caused by road/ROW construction by reducing road/ROW construction in targeted areas, and ensure roads/ROWs that are built and maintained in targeted areas are done so with the least impact possible. Stresses from road/ROW construction include:

- Habitat destruction
- Habitat fragmentation
- Sedimentation
- Altered Hydrologic Regime

- Non-point source pollution

Note that ROWs include all rights of way for transportation, utilities, and mineral extraction activities. The roads/ROW multi-site strategy is focuses on preventing additional road/ROW building in portfolio sites or applicable adjacent areas, and ensuring that roads/ROWs that are constructed with those areas minimally impact conservation targets. Much of the road/ROW strategy uses education and external affairs activities.
Prevention and minimal impact assurance will use

- Promotion and discussion of the ecoregional plan to identified partners, including
  - federal and state highway authorities,
  - state and local planning authorities,
  - heritage programs,
  - utilities entities
  - mineral extraction companies.
- Coordination with the compatible forestry initiative towards instituting best management practices (BMPs) when roadbuilding for forestry activities
- Use of access restrictions, where appropriate
- Establishment of TNC as reliable, science-based environmental data source to above audiences

There is opportunity for crossover of management responsibility here to the compatible forestry multi-site strategy and the fire multi-site strategy. Fire implementers will incorporate the roads/ROW strategy when working with stakeholders to educate and develop procedures for burning around utility and extraction ROWs. Compatible forestry initiative implementers will incorporate compatible road building and maintenance BMPS when working with public, private, and forest partners. There is further opportunity for crossover with the freshwater aquatics multi-site strategy in working with road/ROW stream crossings to ensure their accessibility in ephemeral, high-order, or headwater streams.

An immediate need for implementation of this multi-site strategy was realized in the planning for the I-69 corridor, which will run through the ecoregion. Strategy implementers will attempt to ensure I-69 impacts UWGCP portfolio sites minimally if at all, through preventative planning. Implementers will share the ecoregional plan's areas of significant biodiversity with all levels of appropriate planning entities and agencies.

Road Construction/ROW Action Items:

- Develop federal partnerships—esp. SENRLG
- Develop TNC's information lobbying capacity at the division and state level to all relevant partners. Develop MOUs for early preventative planning.
- Share PCAs with state heritage and DOTs,

Dams/Reservoirs

The goal of the Dams/Reservoirs multi-site strategy is to ensure no new dams, reservoirs, or impoundments are constructed in the ecoregion, and to promote a conservation regime at existing altered systems. The threats addressed through this multi-site strategy are:

- Altered Hydrologic Regime
- Habitat destruction/conversion
- Habitat fragmentation
- Thermal pollution

Prevention and compatible use of existing structure are again the two directions of action for this multi-site strategy. As a preventative measure, again a major element of this strategy is the establishment of TNC as a data source, and the use or preventative planning through promotion/sharing of the areas of significant biodiversity to all appropriate entities, including

- Levee boards,
- River and water authorities
- Drainage districts
- Regional planning groups

Plan implementers should first prioritize areas where new construction will be most damaging—i.e., where a new dam or reservoir would constitute a "killer threat." MOUs could be created for eligible priority areas to be purchased and transferred to federal entities to discourage new construction, currently a provision in federal regulations. A crossover to agricultural BLM action items exists here, in that BLH areas to be acquired and transferred to federal entities should be prioritized in an effort to discourage new reservoir sites. External relations should build cooperation with FWS towards this action item.

As an external relations activity, promotion of the economic benefits of alternative water use regimes should be initiated.

Additional crossover activity exists with the Roads/ROW Construction Multi-Site Strategy, in the promotion of TNC Areas of Significant Biodiversity and availability of TNC as an impartial reliable science-based information source. Preventative planning can be occur through involvement with the Southeast Natural Resource Leaders Group (SENRLG).

Working with existing structures should involve the identification of impoundments affecting priority areas of significant biodiversity, determining natural range and variation of instream flow, and finally working with impoundment authorities towards a flow restoration program.

Action items under the dams and reservoirs multi-site strategy include:

- Work with water/reservoir authority to restore natural range and variation of instream flows
- ID and manage for conservation areas slated for impoundment; prioritize PCAs for this planning.
- Investigate and determine water policy for each state; develop information lobbying capacity here as well.

Residential/Commercial Development

The goal of the residential/commercial development multi-site strategy is to promote sustainable development throughout the ecoregion. The threats addressed by this strategy are:

- Habitat destruction/conversion

- Habitat fragmentation
- Sedimentation
- Non-point source pollution
- Point-source pollution (sewage)

The success of this multi-site strategy lies primarily in preventative measures. As such, a number of partnership opportunities are available towards implementation.

- Tax incentives
- Forest Legacy Programs
- Zoning board influence
- Wildlife exemptions
- External relations and highest/best use category avoidance
- Local land trust development

Crossover exists in this strategy again with the external relations work done under the sustainable forestry strategy towards state-level development of forest legacy programs. Crossover also exists in preventative planning for Roads/ROWs that provide development access to priority areas. External relations are primarily focused on local, county and regional outreach: reclassification of property tax/assessment and zoning use of highest/best use formats; revising state, county or local tax incentives away from sprawl and towards urban redevelopment; property tax wildlife exemptions; and work with state agencies towards focused wildlife exemption incentives. Opportunities with local land trusts, in fostering or partnering, exist; assistance may also be available from state DEQ outreach offices, such as the Arkansas Watershed Advisory Group. In certain areas, it may be beneficial to promote TNC-friendly individuals towards zoning board seats.

Action items include

- Develop state forest legacy programs towards PCAs
- Address tax incentives/disincentives and additional opportunities for informational lobbying
- Identify existing local land trusts and watershed groups as well as areas where local land trusts or watershed groups would be beneficial.
- Identify areas where TNC members or partners can provide tangible benefits by sitting on zoning boards to tax boards.

Invasive Species

The goal of the invasive species multi-site strategy is prevent damage or conversion to native species and communities by minimizing invasive species' spread and exposure. Invasive species strategy addresses the following threats:

- Altered composition/structure
- Excessive Herbivory
- Altered Hydrologic Regime
- Altered Fire Regime

Multi-site management of invasive species will again take the form of both a preventative and active stewardship strategy. The species and their corresponding damage or potential damage from invasive species needs to be identified at areas of significant biodiversity; buffer areas may be required as well. The invasive species workgroup will identify these species and prioritize the conservation areas for action. At sites invasive species control measures will be instituted if the have not already. There exists an opportunity for strategic crossover again between the invasives and the fire restoration multi-site strategy. Preventative actions may also include external relations towards providing information to state agriculture, wildlife, and trade authorities on preventing certain invasive species from entering a state, and focused education of industry and wildlife professionals towards the use, release, or control of invasive species.

Action Items:

- Identify "bad exotics" – i.e., those altering community structure
- Identify portfolio conservation areas at risk from identified invasive species
- Determine distribution of invasives concerned
- Establish partners towards removal/prevention of invasives at PCAs
- Work with other multi-site strategies that address invasives

Data Gaps

Identification and conclusion of data gaps were determined to be a multi-site strategy by the implementation group as the lack of data in certain areas was seen as an impediment for action items under other strategies. The goal of the data gaps multi-site strategy is to identify and fill data gaps preventing the full or accurate execution of other multi-site strategies. The following data gaps were raised during the implementation meeting:

- Aquatic community type and flow requirements for small and large rivers
- Determine role of ground water and aquifer action in surface water related action items: specifically as it relates to agriculture and forestry to include withdrawal as well as point source/non-point source contribution factors. Determine effects of groundwater depletion on terrestrial and aquatic communities
- Identify invasives to be managed, determine extent and potential damage, distribution.
- Identify industrial forestry landholders in portfolio conservation areas
- Identify agricultural uplands composition, location, historic context; determine multi-site strategic implications, if any.
- Determine composition, saturation, application, structure, longevity of FIFRA–related runoff (i.e., any chemical regulated by FIFRA) and its effects on targeted species and communities. Determine Best Management Practices as necessary.
- Identify and fill data gaps that TNC's partners may have on sensitive areas as well as potential mitigation areas (i.e., provide federal, state and local transportation authorities science based data on TNC-identified areas of significant biodiversity towards prevention of fragmentation as well as reception of mitigation efforts).
- Inventory targets not meeting goals from ecoregional plan– primarily crayfish, mussels, and xeric sandhill plants. CBC staff and multi-site strategy leads should review plan and determine applicable targets.

- Determine extent of migratory bird data gaps and partner with relevant agencies/entities to address. Continue partnership with Lower Mississippi River Valley Joint Venture Group (LMRVJVG) Habitat evaluation/Landscape Analysis
- Fill data gaps ecoregion-wide that were identified in the planning process, including targets and viability. Seek additional funding or partnerships as necessary. Though important, this data gap should not prevent multi-site strategies from moving towards implementation.
- Identify additional partners towards multi-site strategy implementation including academic and local county, state, regional, and federal partners.
- As measures of success at portfolio sites will incorporate biodiversity health, threat abatement, and program capacity, determine data gaps for each three areas per site that are not filled by a multi-site strategy and work towards their conclusion.

Multi-Site Strategies Reference and Comparison Table

Multi-Site Strategy **Compatible Forestry Initiative**	Goal: Manage all applicable viable portfolio sites through compatible forestry towards a targeted structure/composition within a functional landscape Establish TNC credibility as a forestry stakeholder / player through data, meaningful forest product, and conservation results	Short-Term Objective: Begin initiative; identify partners, choose demonstration sites and begin management actions; design monitoring protocol for results meaningful to partners.	Long-Term Objective: Use demonstration sites in PNFLO, industrial, public lands to show compatible forestry is economically and ecologically feasible.
	Threats addressed: • Altered composition/structure • Habitat destruction/conversion • Habitat fragmentation • Nutrient loading • Sedimentation	Year 1 Action Items: • ID and categorize landholders in PCAs • ID appropriate national level programs at state-level implementation and state-level program eligibility (i.e., forest legacy); initiate activities towards making compatible forestry economically attractive to private and industrial partners • Develop relations with extension services • ID criteria and monitoring protocol for meaningful data gathering and economic assessment input; initialize monitoring at demo site • Begin development of compatible forestry initiative at 1 PCA; write business plan • Initialize focused/useful economic assessment	Year 3 Action Items • Attain functional compatible forestry initiative site representing each landowner group; public, industrial, PNIFLOs • Implement tax/government incentives so that compatible forestry is more attractive to landowners • Provide results of national-level cooperation in initiative • Develop relationships with regional partners • Have compiled initial 2 years of monitoring data towards economic assessment
	Overall Action Items: • Certification • Compatible forestry • Public lands management (fire, roads, forestry practices, liaison (MOUs), • Demonstration sites		

Multi-Site Strategy: **Compatible Agriculture**	Goal Prevent soils and contaminants from entering water system. Prevent incompatible conversion. Pursue restoration/reforestation of agricultural lands.	Short-Term Objective • Develop specific agriculture action strategies (see below) and link initiative with compatible forest and aquatic strategies. • Establish compatible agriculture as desirable agricultural management option to identified partners; grow support for TNC as an agriculture partner/friend.	Long-Term Objective • Establish TNC as credible carbon sequestration entity for BLH restoration/ reforestation • Lead carbon sequestration efforts for conservation • Establish TNC as agricultural runoff / conversion solution source	Overall Action Items • Direct state and federal incentive programs towards PCA success; • Assess and ID strategic reforestation through existing programs. • Pursue and direct disincentives to address conversion and fragmentation • Actively participate in carbon sequestration implementation as well as regulations and standards-making.
	Threats Addressed • Habitat destruction/conversion • Habitat fragmentation • Nutrient loading • Sedimentation • Altered Hydrologic Regime • Non-point source pollution (FIFRA-related runoff)	Year 1 Action Items • Develop runoff prevention strategy; ID runoff prevention areas • Develop bottomland hardwood (BLH) restoration and reforestation (R&R) strategy; identify agencies and partners • Develop link to compatible forestry • Develop feasible carbon sequestration action plan and biodiversity parameters/ considerations • Ensure exported biodiversity specifications used in carbon sequestration policy • ID external affairs functions: strategic watershed review • Determine sediment budget and link information with appropriate partners, agencies • Export runoff prevention and BLH R&R strategies to appropriate partners, stakeholders • ID of preventative and R&R watersheds with sediment and nutrient budget and restoration characterization goals • ID of partners and business plan for approach	Year 3 Action Items • Show positive ecological influence in carbon sequestration guidelines • Establish working agreements or MOUs with local, state and federal agencies involved with BLH R&R efforts • Develop BLH R&R pilot sites in Identified areas with carbon sequestration elements. • Successful reduction in sedimentation and nutrification by amount determined in year 1 at target sites. • Have developed conversion strategy with active partnerships	

Multi-Site Strategy **Fire Restoration Program**	Goal Restore range of appropriate fire regimes where fire is a natural process to all applicable areas	Short-Term Objective • Build capacity for fire restoration • Reduce number of moderately to severely altered sites • Begin education and policy actions • Initiate cooperative programs	Long-Term Objective • Eliminate site status of moderately to severely altered • Show progress in education and policy arenas through MOUs, education attendance; show cooperative burn partners	Overall Action Items • Promote fire policy towards ecological restoration • Educate policy makers, landowners, land managers • Promote contract burns • Promote costshare efforts
	Threats Addressed • Alteration or removal of natural fire regime (habitat alteration) • Inadequate or incorrect application of a prescribed fire practice	Year 1 Action Items • Restore fire regime to 25% applicable portfolio sites considered moderately to severely altered • Enroll at least 3 participants from each private, public landowner representation in cooperative burning or education programs s	Year 3 Action Items • Restore fire to 50% of applicable portfolio sites considered moderately to severely altered; • by 5th year, to 100% of same. • Show MOUs or contracts	

Multi-Site Strategy **Roads/R-O-W Construction**	Goal Reduce road/ROW-based stresses through reduction in targeted areas, ensure road/ROWs that are built are maintained compatibly	Short-Term Objective Develop TNC's role as science-based info provider to targeted sources; ensure PCAs not damaged by Road/ROW construction	Long-Term Objective Divert any new road/ROW from PCAs; ensure existing roads/ROWs in PCAs are maintained compatibly	Overall Action Items • Develop TNC's role in I-69 planning and mitigation • Develop relationship with state DOTs • Comment on any proposed roads/ROWs affecting PCAs • Work with compatible forestry initiative to ensure logging roads and public roads in state/national forests are constructed maintained compatibly • Work with fire initiative to determine BMPs for prescribed burning around utility / extraction ROWs
	Threats Addressed • Habitat destruction • Habitat fragmentation • Sedimentation • Altered hydrologic regime • Nonpoint source pollution	Year 1 Action Items • Develop presence as science-based resource/partner to state DOTs and federal partners • Ensure TNC listed as concerned party for all ROW/road EISs near PCAs • Participate in federal joint preventive planning/mitigation effort • Establish MOUs w/ state DOTs towards receipt of mitigation consideration for other new roads/ROWs • Review procedure and enforcement of ecologically compatible BMPs concerning runoff by state; determine additional action as necessary • ID all stream crossing that inhibit fish movement	Year 3 Action Items • Management agreements with owners of all ROWs in PCAs • Establish TNC science to state DOTs, MOUs for recognition of PCAs • Crossover action with compatible forestry • In appropriate PCAs, ensure accessibility for large wide-ranging targets in preparation of reintroduction • Identify existing stream crossings that inhibit fish migration and retrofit • Work with DOT, federal partners to ensure new stream crossings are compatible	

Multi-Site Strategy **Dams / Reservoirs**	Goal Promote conservation regime in altered systems affecting PCAs Ensure no new impoundments	Short-Term Objective Bring ecological management regime to existing impoundments	Long-Term Objective Bring all existing PCA-related impoundments under ecological management Prevent any new impoundments to	Overall Action Items ID PCAs where new impoundments would be "killer threats" ID PCAs where current impoundments cause thermal pollution and flow issues Develop and execute MOUs for PCA-related impoundments;
	Threats Addressed • Altered hydrologic regime • Habitat destruction • Habitat fragmentation • Thermal pollution	Year 1 Action Items • Identify impoundments that could affect PCAs • Identify areas where impoundments are being considered that could affect PCAs • Develop ecological management MOUs for half of existing impoundments • Continue Development of TNC's role as science source and mediator in impoundment issues •	Year 3 Action Items • All ecological management MOUs developed • Use monitoring from ecologically-managed impoundments to promote further activity as necessary • Continue TNC's role as science-based info source/mediator; promote alternative water management regimes	

Multi-Site Strategy: **Residential/ Commercial development**	Goal Promote sustainable development throughout the ecoregion. Prevent development from threatening PCAs	Short-Term Objective Establish sustainable development as a priority for TNC; establish TNC as credible partner in topic	Long-Term Objective Show measurable influence in planning, education fields concerning sustainable development	Overall Action Items • Develop state forest legacy programs towards PCAs • Address tax incentives/disincentives an additional opportunities for local lobbying • Identify existing local land trusts and watershed groups; also areas where such entities would be beneficial. • Identify zoning board presence opportunities
	Threats Addressed • Habitat destruction/conversion • Habitat fragmentation • Sedimentation • Non-point source pollution • Point-source pollution (sewage)	Year 1 Action Items • Identify potential partners at all scales • Identify tax and zoning opportunities • Show influence to state forest legacy programs in AR, TX, OK, LA through compatible/sustainable measures • Identify tax incentive/disincentive opportunities and contacts in states; develop state/local/regional incentive/disincentive strategy • Identify existing local land trusts and watershed groups near/in all PCAs; begin/strengthen relationships • Assist in establishing new land trusts/watershed alliances where needed • Begin marketing watershed advisory group model to TX, OK, LA	Year 3 Action Items • Establish partnerships with land trusts and watershed alliances at related to half of all PCAs • Reduce tax unsustainable incentives; enhance sustainable development incentives; show progress towards eliminating "highest/best use" concept • Export watershed advisory group to other state governments; establish 1 additional state watershed advisory group or equivalent • Assist in placing partners or representatives on local zoning boards; establish influence on zoning boards in areas where PCAs are most at risk of incompatible development. • Involve national external affairs to raise awareness of issue and begin partnership/education at higher level.	

Multi-Site Strategy **Invasive Species**	Goal Prevent damage or conversion to native species and communities by minimizing invasives' spread and eliminating invasives at PCAs	Short-Term Objective Identify and begin elimination of invasives at all PCAs	Long-Term Objective Develop partnerships/programs to ensure exposure to invasives is minimized at all PCAs.	Overall Action Items • Identify "bad exotics" • Identify PCAs at risk • Determine distribution, extent of damage from exotics • Establish partners towards removal/prevention of invasives at PCAs • Work with other multi-site strategies that address issue
	Threats Addressed • Altered composition/structure • Excessive herbivory • Altered hydrologic regime • Altered fire regime	Year 1 Action Items Identify type and extent of invasives and damage at PCAs Initialize activity at all PCAs not already active in invasives control Establish ecological methods as preferred control where necessary Identify and propagate local partnerships in invasives control (e.g., LA's hogs)	Year 3 Action Items Positively influence state governments in invasive species control measures (e.g., TX parks and wildlife) Secure funding from state agencies towards control	
Multi-site Strategy **Data Gaps**	Goal Identify and conclude data gaps	Short-Term Objective Address data gaps identified in this iteration of ecoregional plan for UWGCP	Long-Term Objective Show significant progress, if not conclusion, to all data gaps listed in this iteration of plan	Overall Action Items See list in section in ecoregional plan

	Threats Addressed Conservation inaction at PCAs where data gaps occur	Year 1 Action Items • Fully describe aquatic communities • Identify invasives to be managed • Identify industrial forestry landowners, PNIFLOs in PCAs • Characterize uplands agriculture • Characterize/complete data gaps on sensitive areas for partners; include potential mitigation areas • Inventory targets not meeting goals from ecoregional plan; primarily crayfish, mussels, xeric sandhill plants • Characterize target crayfish habitat and life ecology • Determine level/extent migratory bird gaps and partner with relevant agencies • Fill data gaps relating to target • Identify partners on all levels as called for in above multi-site strategies	Year 3 Action Items • Determine role of groundwater and aquifer action in surface water related action items, specifically related to agriculture and forestry • Determine effects of GW depletion on terrestrial and aquatic communities • Determine composition, saturation, application, structure, longevity of FIFRA related runoff and BMPs	

Ecoregional Boundary and Management Decisions

The management regime of certain areas of the UWGCP will be changed due to various terrestrial and aquatic community requirements, which are described below. Graphic representations of these agreements appear in Appendix 2.

Bayou Bartholomew. Previously the Bayou Bartholomew watershed was divided by the ecoregional boundary between the UWGCP and the Mississippi River Alluvial Plain (MSRAP). Until this boundary is officially changed, UWGCP will be considering the entire Bayou Bartholomew watershed as defined by EPA Hydrologic Unit Catalog number 8040205 under its management strategy. UWGCP conservation planning in this watershed will be coordinated with management efforts in MSRAP.

Longleaf Pine. An 420-square-mile piece of longleaf pine community in Bienville Parish, Louisiana, was previously included in the UWGCP. This area contains viable longleaf pine, xeric woodland, baygalls and bayhead communities, and Louisiana Pine Snake, Yellow Brachycercus mayfly, Red-Cockaded Woodpecker, Soxman's milk-vetch, and Mohlenbrock's Umbrella-sedge occurrences. As the defining physiographic feature between upper and lower gulf coastal plains, it was determined that this longleaf pine community should be managed under the Lower West Gulf Coastal Plain's conservation strategies.

Red River West. The Red River and its drainage within HUCs 11140101, 11140103, 11140102, and 11140105 will not be managed under this ecoregional plan. This area of the Red River is more closely aligned with the higher stream reaches upriver and the communities are more aligned with the neighboring ecoregion. Aquatic occurrences in this reach are more representative of upstream communities and are not typical of the Red River in the UWGCP.

In an effort to promote management consistency across ecoregional lines, and recognizing that some communities and portfolio conservation areas are shared by ecoregions, UWGCP planners have made an effort to delineate those areas and work with surrounding ecoregions to jointly form and implement conservation strategies. Those areas include:

WGCP	UWGCP
Central Sabine National Forest	Davy Crockett National Forest (RCW cluster)
Weches Glades	Sabine National Forest (RCW cluster)
Angelina River Bottoms, West	Jackson/Bienville Wildlife Management Area
Long King Creek	

Conservation Goals: Methodology Issues

Use of EOs. Expert teams used lists of state tracked, State ranked, federally listed, and globally ranked species to create target lists, the results of which were used to query state heritage data for element occurrences (EOs). The ecoregional planning conceptual process required the results of these EO requests to be analyzed for viability, and expert teams would then use viable EOs as the foundation from which to build conservation portfolio sites. Please see Appendix 3, Data Management Plan/Methodology for a detailed explanation of the process. Please see Appendix 10 for a list of expert teams.

Significant EO-related data gaps related to state heritage program data were recognized during the viability process. Common data gaps encountered included data missing on individual elements or occurrences, tracking inconsistencies between participating states, or the obsolescence of EOs (i.e., last observation over 20 years). Please see Appendix 4, Data Gaps and implications section for a full discussion.

Overall all planning teams attempted to set quantitative conservation goals. Target goals that defaulted to "all viable" were then given a minimum amount of 5 for nonendemic and 10 for endemic elements. In the rollout data, any conservation targets retaining an "all viable" goal were changed to the actual number of viable goals found.

When creating the portfolio conservation areas for the UWGCP, EOs were used as a threshold for consideration and as a measurement of the site. The primary selection factor for portfolio conservation areas was the ability to capture an ecological function, not simply a cluster of viable EOs. However, monitoring of the EOs at these ecologically functional sites will provide a measure of success for plan and site conservation implementation.

Due to the age and accuracy of heritage EO data, approximately 800 proto-EOs were generated based on technical team experience at a certain portfolio conservation area or citing from relevant literature. Initial proto-EOs were created for obsolete EOs where technical experts could vouch for their viability. Additional proto-EOs were built throughout the site selection process as the question "what other elements occur at this site?" was posed. Proto-EOs were generated during the initial site selection meeting and refined during both portfolio conservation area reviews following that session.

Species distribution during target selection, and goal setting was derived from initial state heritage EO reports or ABI Natureserve data. Some distribution data was weighted according to an occurrence's global rank, as distribution data may not accurately reflect the abundance of a species; for example, though Red Cockaded Woodpeckers are considered widespread in distribution, they are either very rare and local throughout its range, or found locally (G3). Further, the Woodpecker is federally listed as endangered, yet its distribution is ranked as widespread.

Many of the portfolio sites, if properly managed, will provide habitat for species currently extirpated at those sites and possibly in the region. Such management occurs at the site

conservation plan level, but effort should be made in future iterations of this plan to identify, discuss, and manage for those extirpated elements. Further, some sites or parts of sites were created as "placeholder" sites if: insufficient data for habitats or species existed; an element occurrence was non-viable or unverified, yet experts knew of adjacent viable habitat for that element not yet recorded; or if habitat or type locality indicated restoration possibilities for elements. The identity and extent of permanence of these sites will become evident during each site conservation planning event.

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USGS Generalized Geology of the Conterminous US: (http://geology.cr.usgs.gov/pub/National-Atlas/geologic/usgeomet8.html)

List of Appendices

Appendix 4.1 Aquatic health and ecobasin condition: Methodology

Data Sources:
Stream reaches layer- NHD (National Hydrography Dataset) from NRCS (National Resource Conservation Science)

Roads layer- TIGER (Topologically Integrated Geographic Encoding and Referencing system)

Dams Data- EPA Basin CD

Riparian Zones- A polygon layer derived by buffering 100 meters on each side of the stream reach

Land use/Land cover Raster- NLCD (National Land Cover Data) from USGS

Measurement Concepts and Units:-
Dam Density- Number of dams per ecobasin (sq. miles)
Methodology- Dams (point layer) were intersected with the Ecobasins layer (polygon) and summed the number of dams for respective ecobasins based upon their spatial locations. Units were expressed as the number of dams per square mile of Ecobasin.

Road Density- Length of roads (miles) per ecobasin (sq. miles)
Methodology- Roads (line layer) were intersected with the Ecobasins layer (polygon) and measured the lengths of road segments for respective ecobasins based upon their spatial locations. Units were expressed as the miles of roads per square mile of Ecobasin.

Riparian Road Density- Length of roads (miles) in riparian zone per ecobasin (sq. miles)
Methodology- Same methodology as measuring the road density except the measurement was taken inside the riparian zones in each ecobasin. Units were expressed as the total number of miles of roads within the total square miles of riparian area for each Ecobasin.

Crossing Density - Number of stream-roads intersections (points) per ecobasin (sq. miles)
Methodology- Stream layer (line features) was intersected to the road layer (line features); at every intersection of a stream and a road line feature, programmatically generated a point. Such intersection points were counted for each ecobasin as number of stream-road intersections. Units were expressed as the total number of crossings per square mile of Ecobasin.

Ecobasin Forested- Percent forest present inside each ecobasin
Methodology- Classified NLCD dataset was used; based upon the ecobasins spatial location land cover was mapped in percentage. 'Tabulate Areas' function was used in ESRI ArcView software. As a result the function returned % contribution of each class from the NLCD dataset for each ecobasin.

Percent forest in Riparian zone- Percent forest present inside the riparian zone in each ecobasin
Methodology- Same methodology as measuring Forested- % forest present inside each ecobasin except the forest cover was mapped inside the riparian zones (100 meters).

Appendix 5.1 Public opinion survey

2005 Arkansas
Non-Game Wildlife Conservation
Survey

by

Survey Research Center
Institute of Government
University of Arkansas at Little Rock
2801 South University Avenue
Little Rock Arkansas 72204
501.569.8561

Release Date: February 2005

2005 Arkansas
Non-Game Wildlife Conservation
Survey

Introduction

At the request of the Arkansas Game & Fish Commission and their partners, the UALR Institute of Government Survey Research Center (SRC) conducted a telephone survey between January 31 and February 19, 2005. The purpose of the survey was to obtain data and information relating to Arkansans' opinions on wildlife issues. The information provided in this report will be used in planning how to manage Arkansas wildlife. AGFC Conservation Committee and SRC developed all questions used in the survey jointly.

Using a combination of screening questions, samples were developed for groups: State General Adults - adults over 18 years of age residing in the state of Arkansas; and Rural Landowners - adults over 18 years of age who own 5 acres or more of land in Arkansas and reside in Arkansas outside of the six Metropolitan Statistical Areas (i.e. not in Washington or Benton; Crawford or Sebastian; Faulkner, Saline, Pulaski, or Lonoke; Jefferson; Crittenden; or Miller counties.) A total of 413 (State General Adults) and 402 (Rural Landowners) interviews were conducted, which provide a potential for sampling error of ±5 percent at the conventional 95 percent confidence interval. For example, if a survey showed that 49 percent of a sample indicated that they were "Very Interested" in the wild animals that live in Arkansas, we can be 95 percent confident that the comparative figure for the entire population would be between 44 percent and 53 percent.

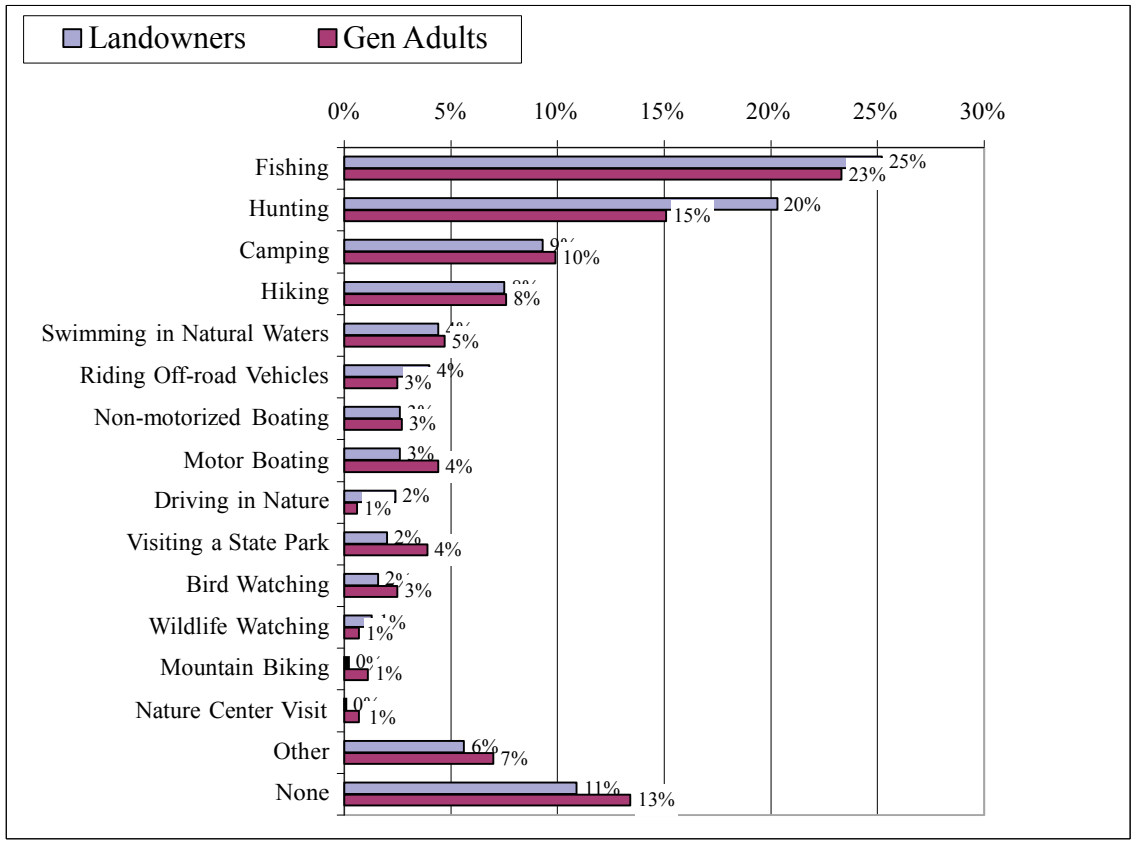
The State General Adults and Rural Landowners samples were weighted independently for gender and age group. The 2000 Census on Population and Housing provided the sample estimates that formed the basis for weighting. The age groups were 18 to 24 years of age, 25 to 39, 40 to 54, 55 to 64, and 65 and over. Descriptive data analysis included frequency distributions and cross-tabulations of data broken down by group.

Chi-square was performed on valid responses to determine whether significant differences (0.05 level) existed between the two samples.

List of Questions

Outdoor Recreation

What outdoor recreational activities or hobbies did you participate in during the last 12 months in Arkansas?



Highlights

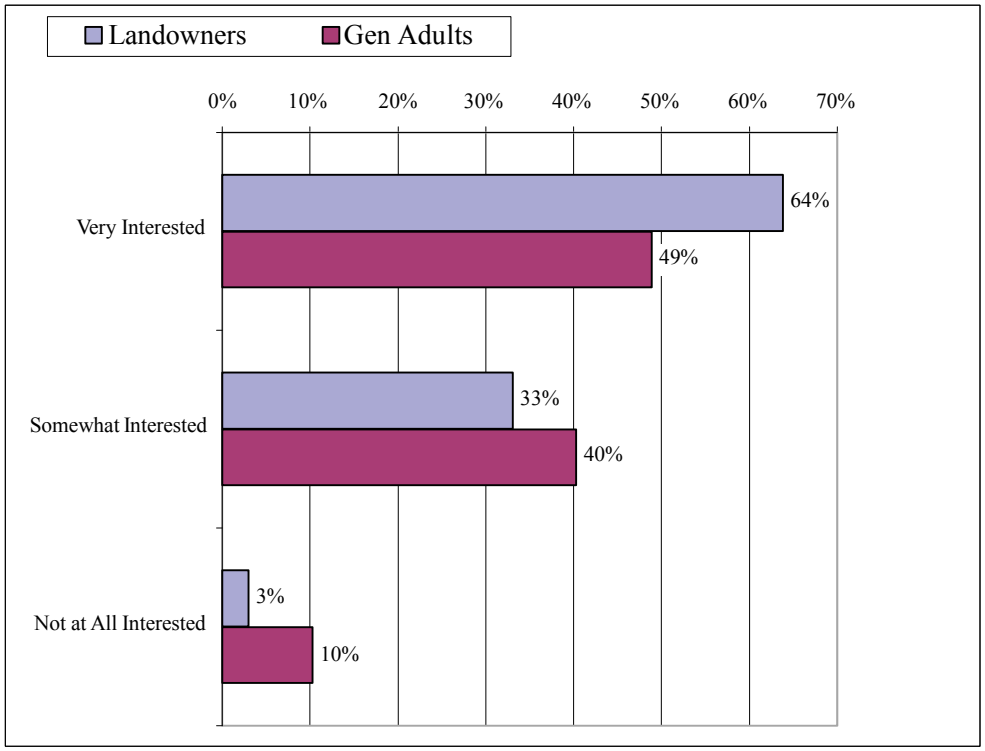
- Fishing and hunting were the most frequently named outdoor recreational activities for both rural (25%) and statewide (23%) respondents.

	Rural Landowners	State Gen Adults
Fishing	25%	23%
Hunting	20%	15%
Camping	9%	10%
Hiking	8%	8%
Swimming in Natural Waters	4%	5%
Riding Off-road Vehicles	4%	3%
Non-motorized Boating	3%	3%
Motor Boating	3%	4%
Driving in Nature	2%	1%
Visiting a State Park	2%	4%
Bird Watching	2%	3%
Wildlife Watching	1%	1%
Mountain Biking	0%	1%
Nature Center Visit	0%	1%
Other	6%	7%
None	11%	13%
Total	100%	100%

Significant difference between groups.

Interest in Wild Animals

How interested are you in the wild animals that live in Arkansas?



Highlights

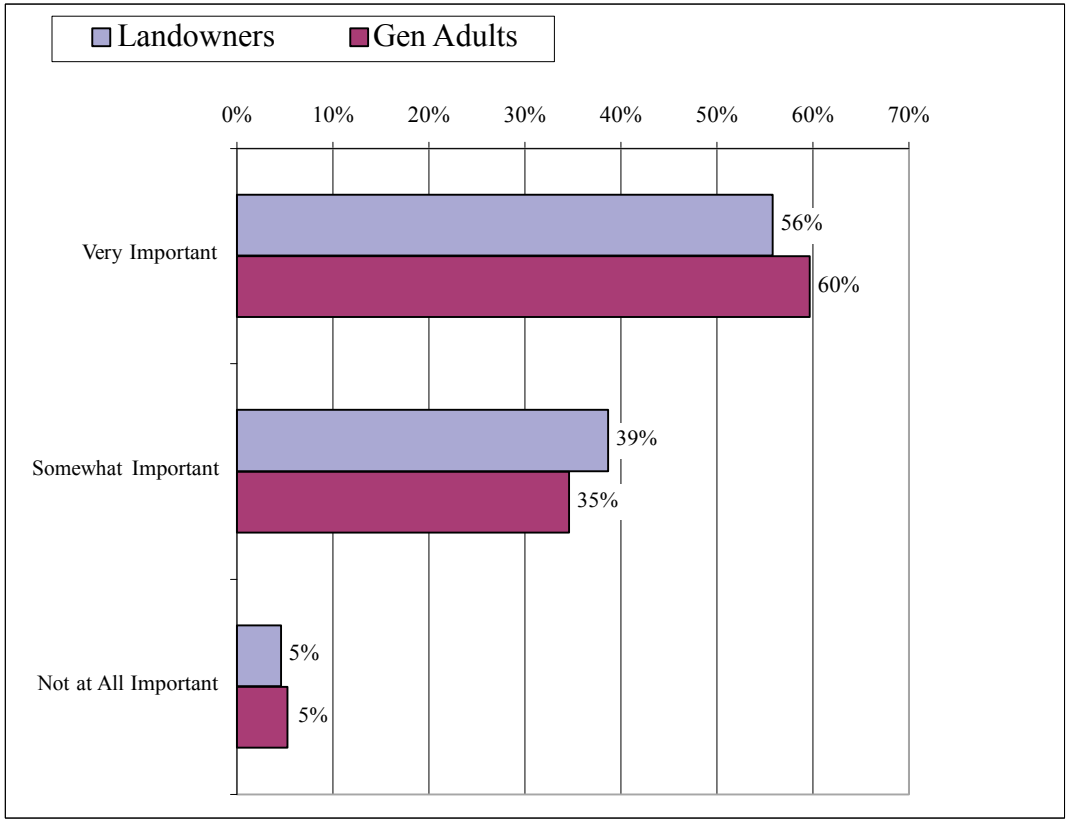
- The majority of respondents were very interested in wild animals that live in Arkansas.
- Rural Arkansans (64%) were significantly more interested in the state's wild animlas than statewide respondents (49%) were.

	Rural Landowners	State Gen Adults
Very Interested	64%	49%
Somewhat Interested	33%	40%
Not at All Interested	3%	10%
Don't Know	0%	1%
Total	100%	100%

Significant difference between groups.

Non-game Wildlife Maintenance

How important is it to you that Arkansans maintain healthy populations of non-game wildlife?



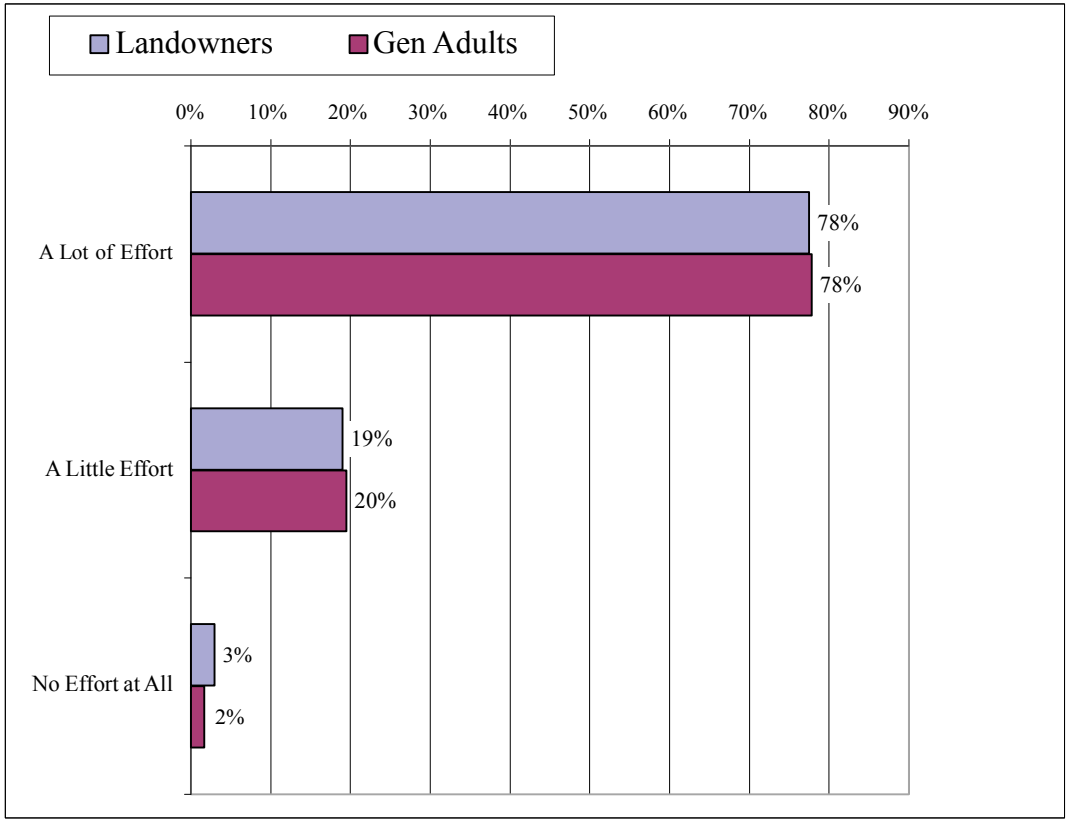
Highlights

- Most respondents of both groups, 56% of Rural and 60% of State, find it very important that Arkansans maintain healthy populations of non-game wildlife.

	Rural Landowners	State Gen Adults
Very Important	56%	60%
Somewhat Important	39%	35%
Not at All Important	5%	5%
Don't Know	1%	0%
Total	100%	100%

Effort to Maintain Birds

Please tell me if you believe a lot of effort, a little effort, or no effort should be made to maintain their healthy populations? How about birds such as songbirds and owls …



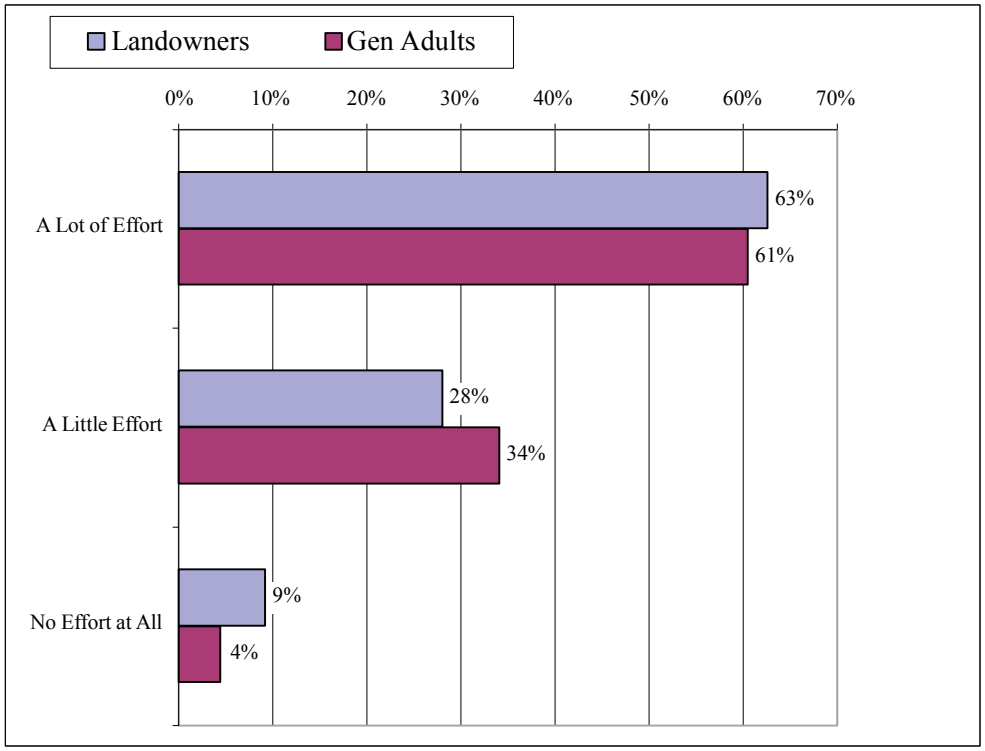
Highlights

- A clear majority of both groups (78% each) believe that a lot of effort should be made to maintain healthy bird populations.

	Rural Landowners	State Gen Adults
A Lot of Effort	78%	78%
A Little Effort	19%	20%
No Effort at All	3%	2%
Don't Know	1%	1%
Total	100%	100%

Effort to Maintain Insects

Please tell me if you believe a lot of effort, a little effort, or no effort should be made to maintain their healthy populations? How about insects such as butterflies and dragonflies …



Highlights

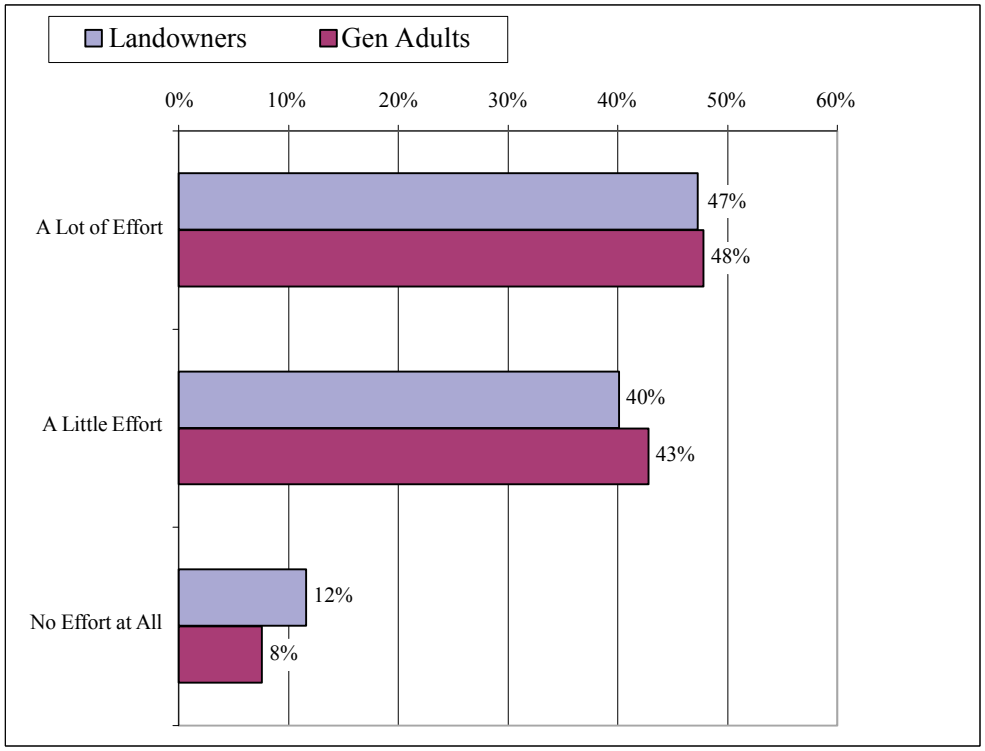
- Over half of both Rural (63%) and State (61%) respondents believe that a lot of effort should be made to maintain healthy insect populations.
- The two groups differed, however, in that the State group's overall opinion about effort, whether a little or a lot, was stronger at 95% than the Rural groups' opinion at 91%.

	Rural Landowners	State Gen Adults
A Lot of Effort	63%	61%
A Little Effort	28%	34%
No Effort at All	9%	4%
Don't Know	0%	1%
Total	100%	100%

Significant difference between groups.

Effort to Maintain Amphibians

Please tell me if you believe a lot of effort, a little effort, or no effort should be made to maintain their healthy populations? How about amphibians such as frogs and salamanders …



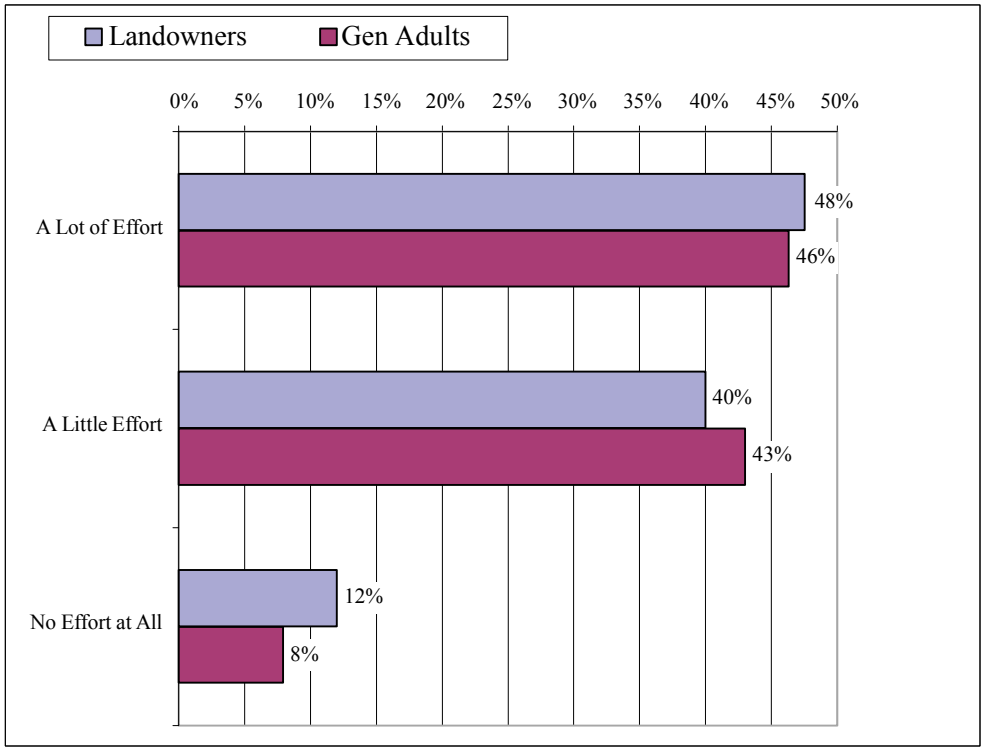
Highlights

- Nearly half of both groups, 47% of Rural respondents and 48% of State, belive that a lot of effort should be made to maintain healthy amphibian populations.
- Additional, sizable portions of each group, 40% of Rural and 43% of State, thought that a little effort should be devoted to this purpose.

	Rural Landowners	State Gen Adults
A Lot of Effort	47%	48%
A Little Effort	40%	43%
No Effort at All	12%	8%
Don't Know	1%	2%
Total	100%	100%

Effort to Maintain Aquatic Animals

Please tell me if you believe a lot of effort, a little effort, or no effort should be made to maintain their healthy populations? How about aquatic animals such as crawfish and mussels …



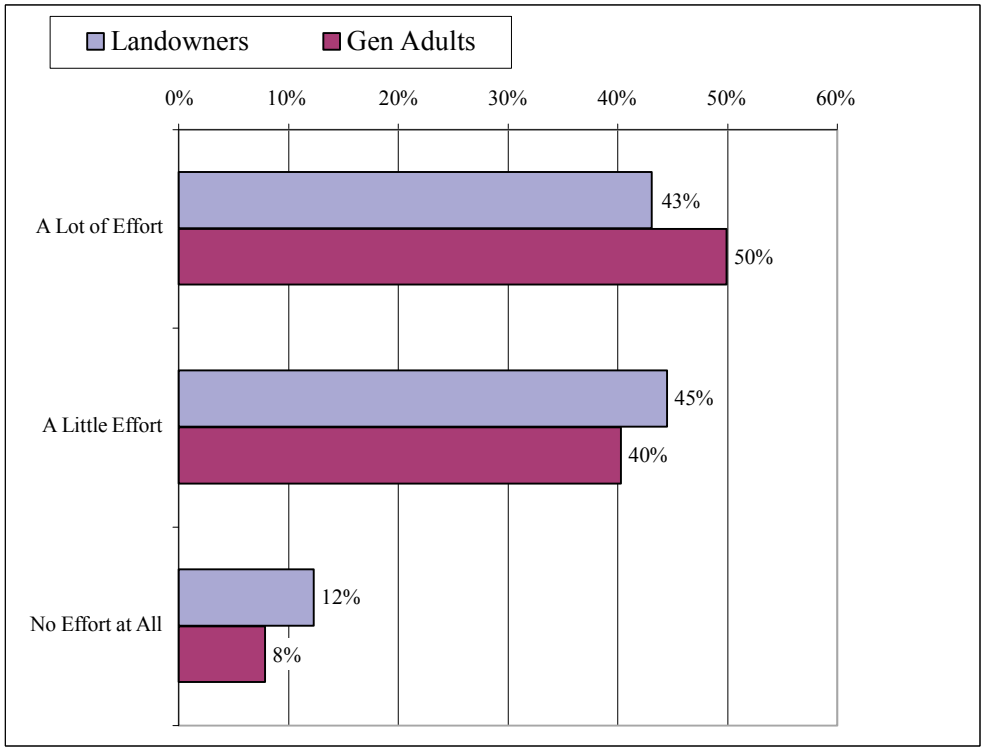
Highlights

- Almost half of each group, 48% of Rural and 46% of State, believed that a lot of effort should be made to maintain healthy aquatic animal populations.
- An additional 40% of Rural and 43% of State believed that a little effort should be made.

	Rural Landowners	State Gen Adults
A Lot of Effort	48%	46%
A Little Effort	40%	43%
No Effort at All	12%	8%
Don't Know/Refused	1%	3%
Total	100%	100%

Effort to Maintain Reptiles

Please tell me if you believe a lot of effort, a little effort, or no effort should be made to maintain their healthy populations? How about reptiles such as turtles and lizards …



Highlights

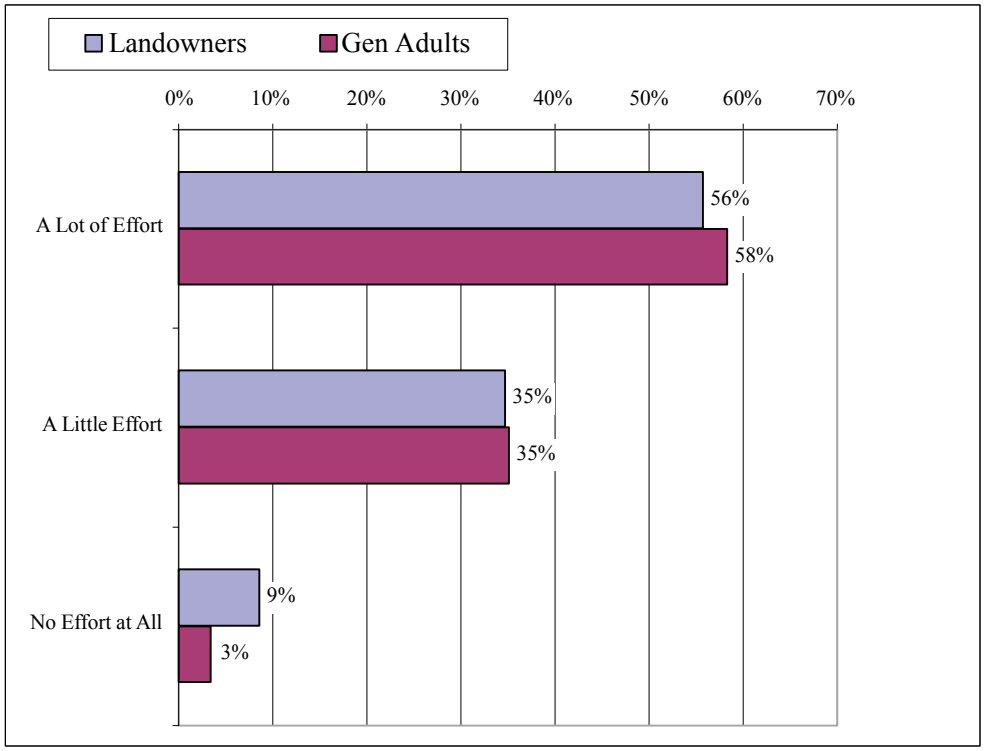
- Statewide respondents (50%) were most likely to believe that a lot of effort should be made to maintain healthy populations of reptiles and second most likely (40%) that a little effort should be made.
- Rural respondents, on the other hand, were nearly evenly divided in believing that a lot (43%) or a little (45%) effort should be made toward amphibians.

	Rural Landowners	State Gen Adults
A Lot of Effort	43%	50%
A Little Effort	45%	40%
No Effort at All	12%	8%
Don't Know/Refused	0%	2%
Total	100%	100%

Significant difference between groups.

Effort to Maintain Fish

Please tell me if you believe a lot of effort, a little effort, or no effort should be made to maintain their healthy populations? How about fish such as minnows and darters …



Highlights

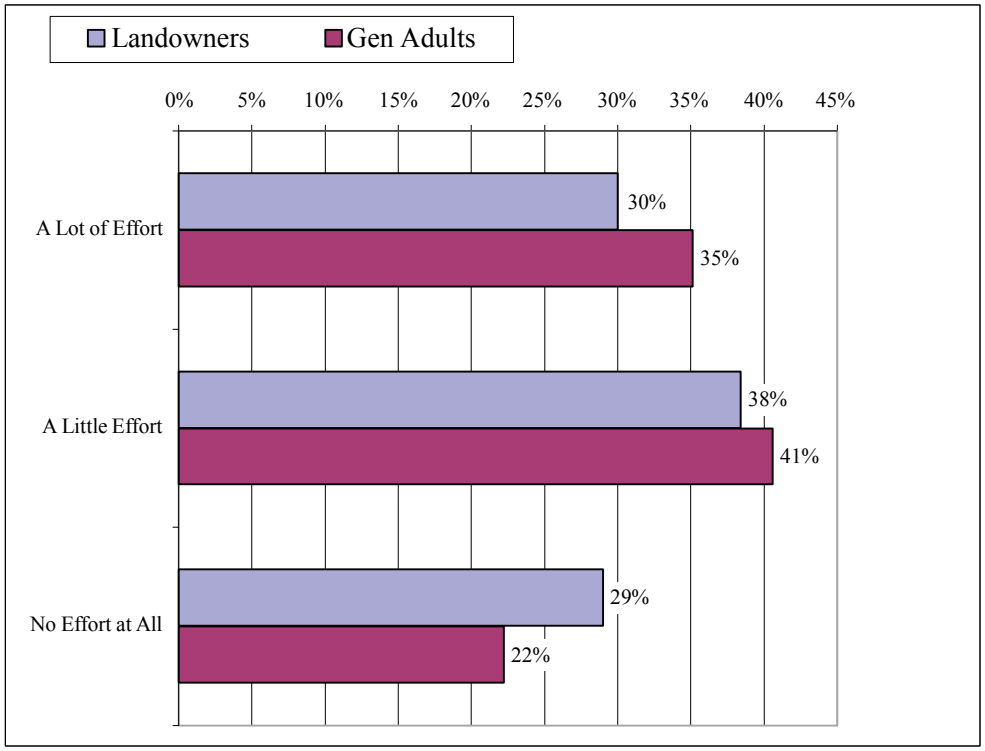
- A little more than half of each group, 56% of Rural and 58% of State, thought that a lot of effort should be made to maintain healthy fish populations.
- An additional 35% thought a little effort should be made.
- The two groups differed significantly in their opinions that no effort should be made: 9% of Rural respondents and 3% of State respondents.

	Rural Landowners	State Gen Adults
A Lot of Effort	56%	58%
A Little Effort	35%	35%
No Effort at All	9%	3%
Don't Know	1%	3%
Total	100%	100%

Significant difference between groups.

Effort to Maintain Mammals

Please tell me if you believe a lot of effort, a little effort, or no effort should be made to maintain their healthy populations? How about mammals such as harvest mice and bats …



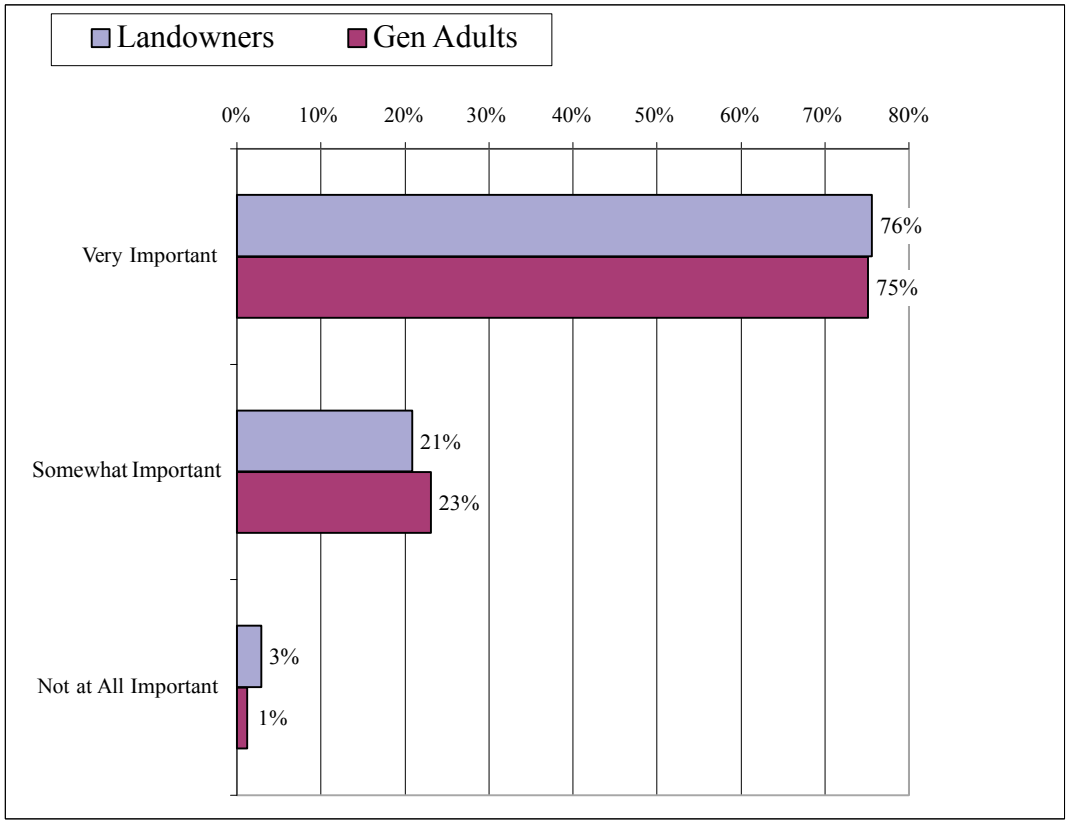
Highlights

- Respondents in both groups were most likely to believe that only a little effort should be mae to maintain healthy mammal populations: 38% of Rural and 41% of State respondents.

	Rural Landowners	State Gen Adults
A Lot of Effort	30%	35%
A Little Effort	38%	41%
No Effort at All	29%	22%
Don't Know	3%	2%
Total	100%	100%

Non-game Wildlife Habitat Maintenance

Arkansas has many special places where non-game wildlife live. These places include prairies, caves, forests, and clear-flowing streams. How important is it to you that Arkansans maintain these places?



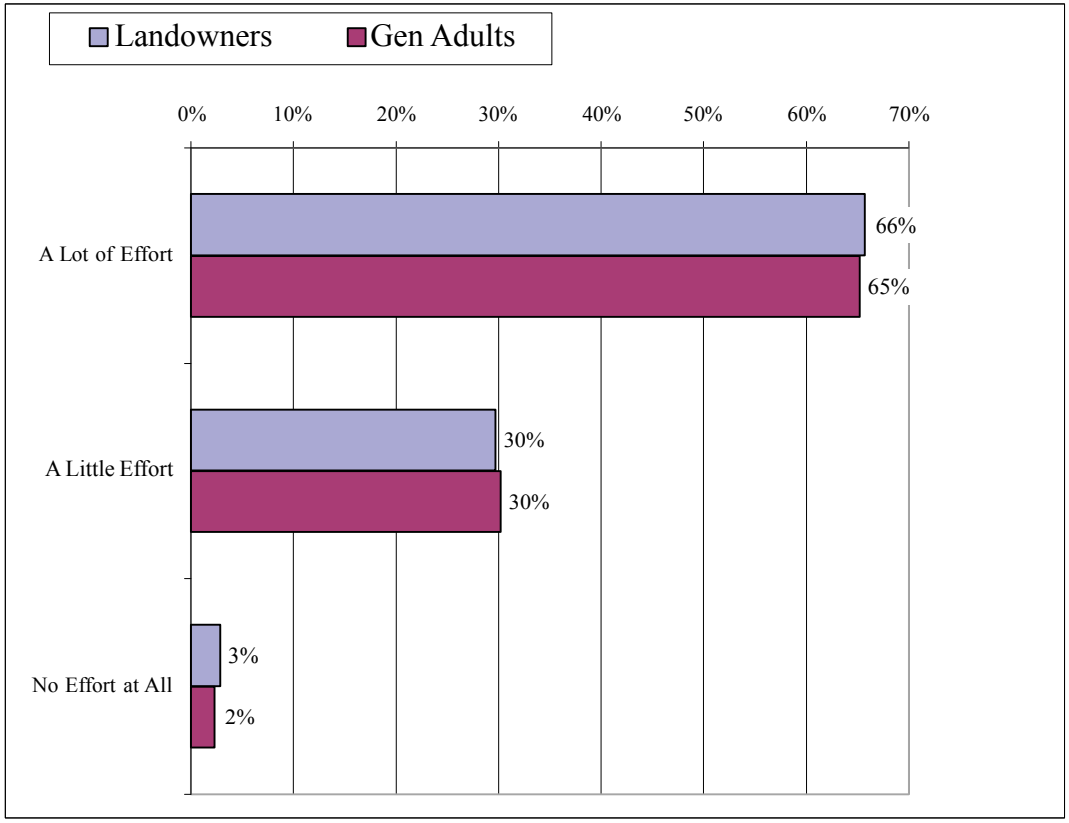
Highlights

- About three quarters of both groups think it is very important to maintain wlidlife habitats.

	Rural Landowners	State Gen Adults
Very Important	76%	75%
Somewhat Important	21%	23%
Not at All Important	3%	1%
Don't Know/Refused	1%	1%
Total	100%	100%

Effort to Maintain Prairies and Glades

Here are a few examples of the many types of places where non-game wildlife live. For each example, please tell me if you believe a lot of effort, a little effort, or no effort should be made to maintain their quality. How about prairies and glades …



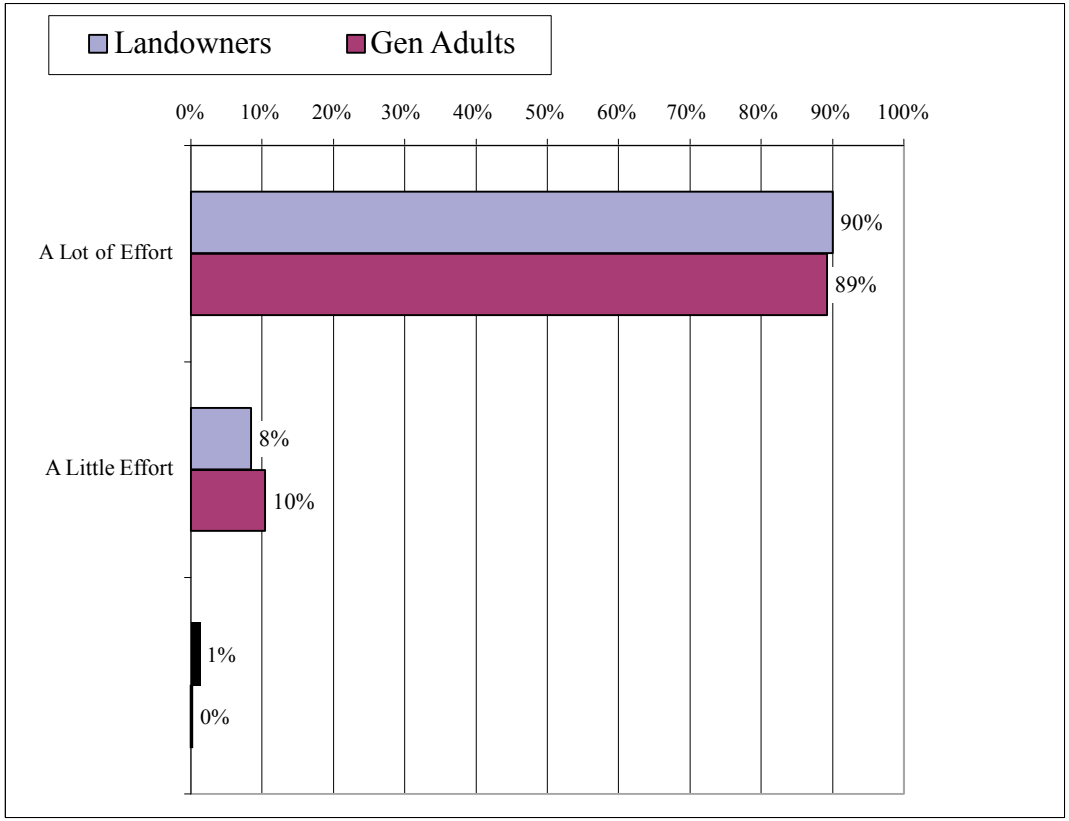
Highlights

- Most respondents in both the Rural (66%) and the State (65%) groups believe that a lot of effort should be made to maintain the quality of prairies and glades

	Rural Landowners	State Gen Adults
A Lot of Effort	66%	65%
A Little Effort	30%	30%
No Effort at All	3%	2%
Don't Know/Refused	2%	2%
Total	100%	100%

Effort to Maintain Rivers, Streams and Lakes

Please tell me if you believe a lot of effort, a little effort, or no effort should be made to maintain their quality? How about rivers, streams and lakes …



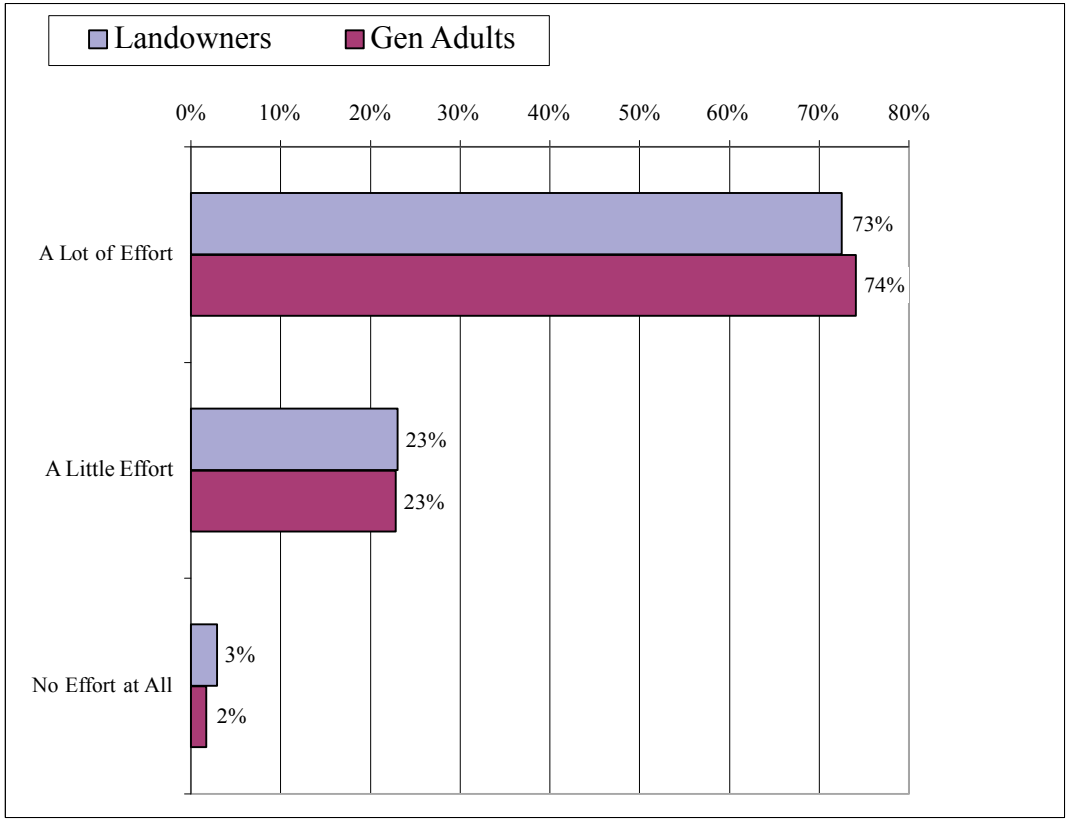
Highlights

State (89%) respondents believe that a lot of effort should be made to maintain the quality of this

	Rural Landowners	State Gen Adults
A Little Effort	8%	10%
No Effort at All	1%	0%
Don't Know	1%	0%
Total	100%	100%

Effort to Maintain Bottomland Forests and Flatwoods

Please tell me if you believe a lot of effort, a little effort, or no effort should be made to maintain their quality? How about bottomland forests and flatwoods …



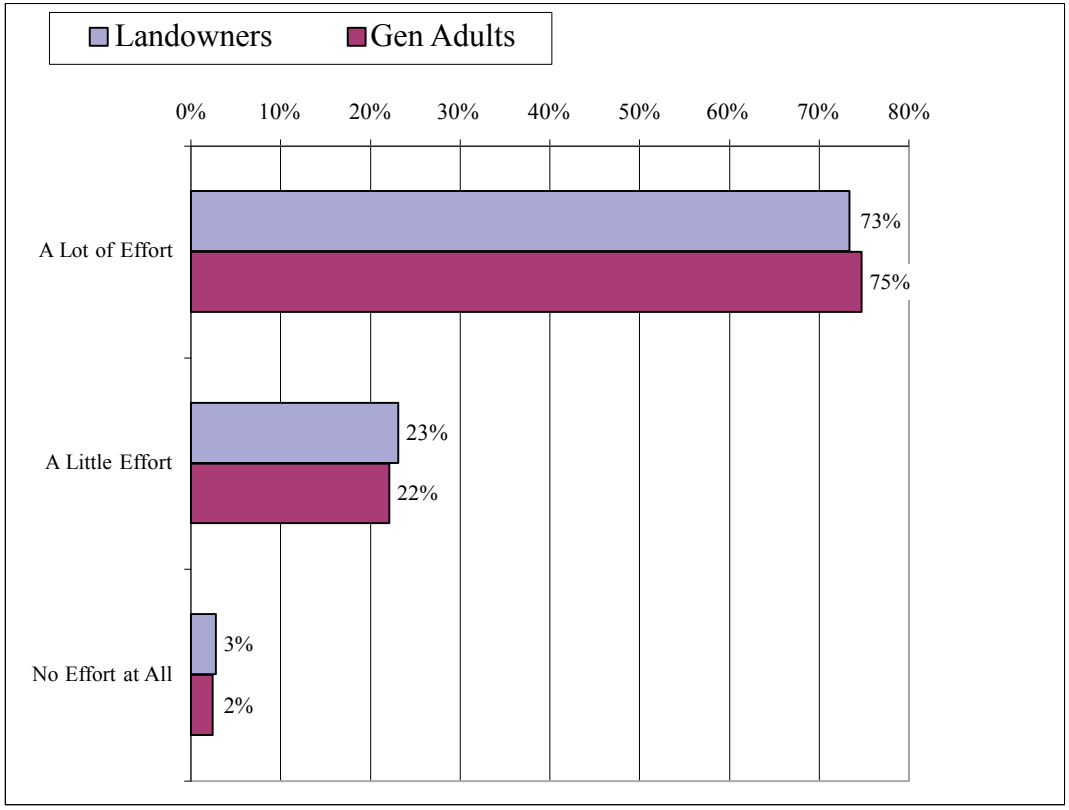
Highlights

- Almost three-fourths of both groups, 73% of Rural and 74% of State, thought that a lot of effort should be devoted to maintain bottomland forests and flatwoods.

	Rural Landowners	State Gen Adults
A Lot of Effort	73%	74%
A Little Effort	23%	23%
No Effort at All	3%	2%
Don't Know	2%	1%
Total	100%	100%

Effort to Maintain Caves and Springs

Please tell me if you believe a lot of effort, a little effort, or no effort should be made to maintain their quality? How about caves and springs …



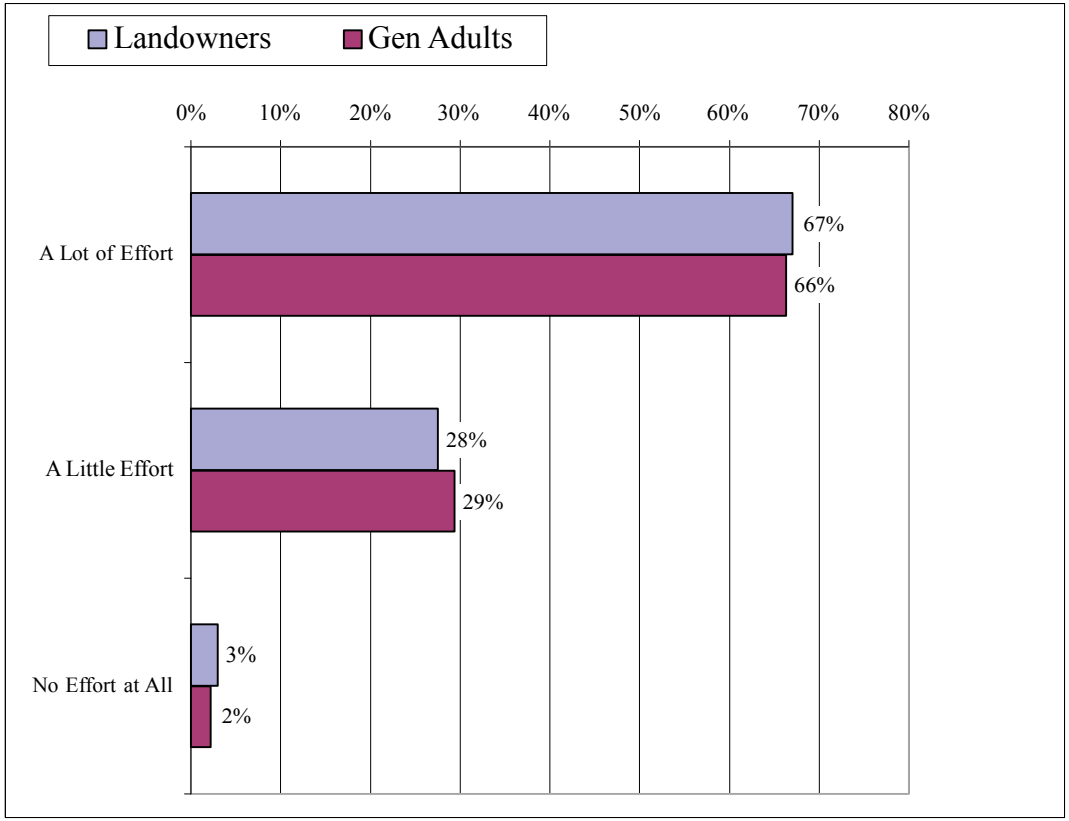
Highlights

- About three-fourths of both Rural (73%) and State (75%) respondents thought that a lot of effort should be devoted to maintain caves and streams.

	Rural Landowners	State Gen Adults
A Lot of Effort	73%	75%
A Little Effort	23%	22%
No Effort at All	3%	2%
Don't Know/Refused	1%	1%
Total	100%	100%

Effort to Maintain Urban Developed Land

Please tell me if you believe a lot of effort, a little effort, or no effort should be made to maintain their quality? How about urban developed land, parks, and green spaces …



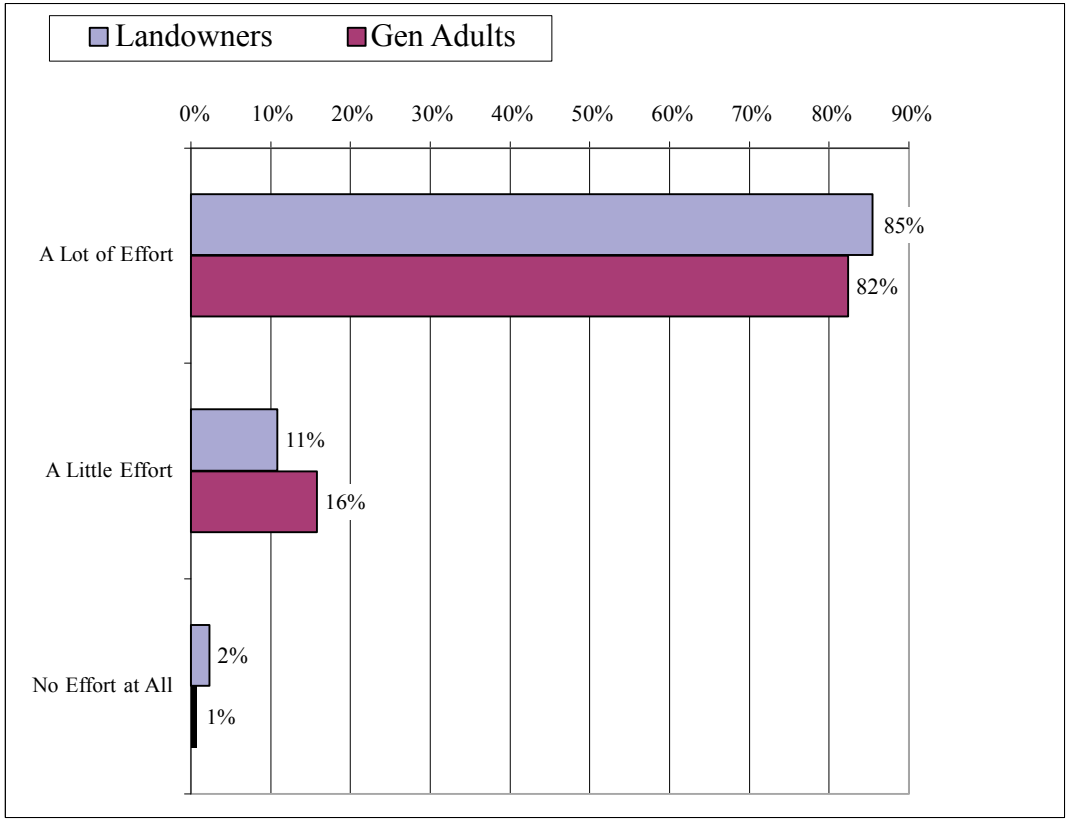
Highlights

- About two-thirds of the Rural (67%) and State (66%) groups think that a lot of effort should be made to maintain the quality of urban developed land.

	Rural Landowners	State Gen Adults
A Lot of Effort	67%	66%
A Little Effort	28%	29%
No Effort at All	3%	2%
Don't Know/Refused	3%	2%
Total	100%	100%

Effort to Maintain Upland Forests

Please tell me if you believe a lot of effort, a little effort, or no effort should be made to maintain their quality? How about upland forests such as the Ozark Mountains …



Highlights

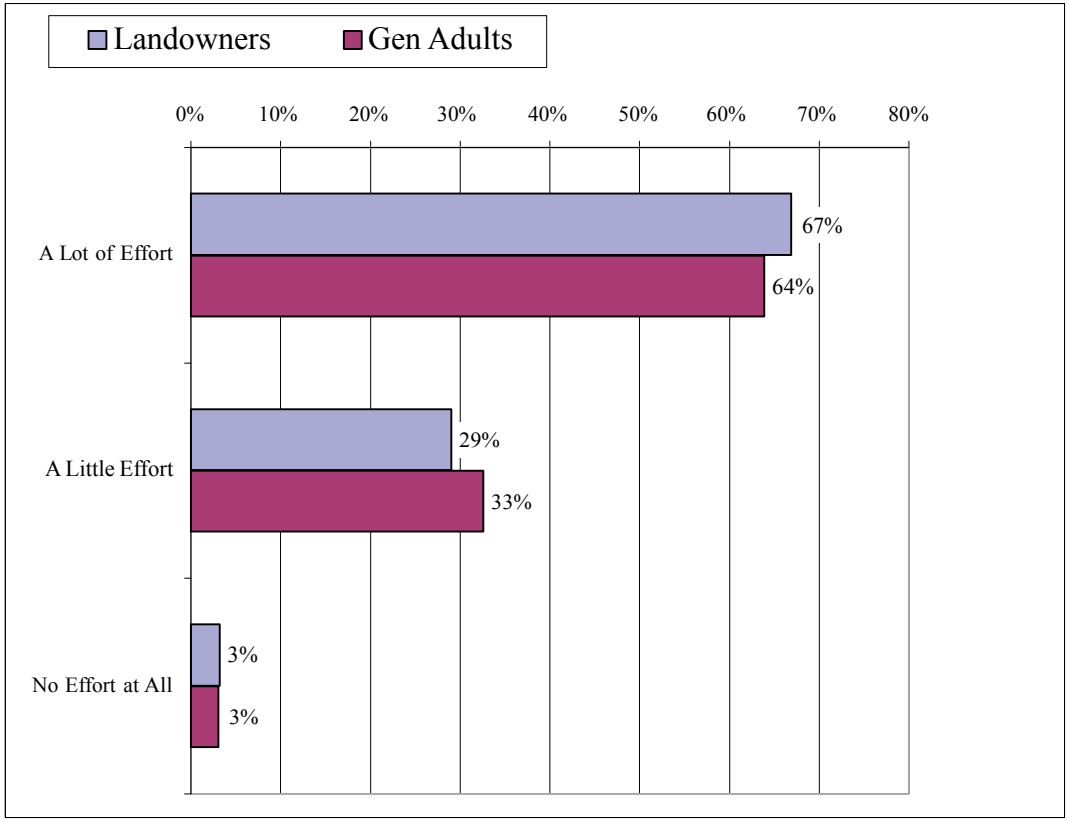
- A clear majority of both groups, 85% of Rural and 82% of State, think that a lot of effort should be made to maintain the quality of upland forests.

	Rural Landowners	State Gen Adults
A Lot of Effort	85%	82%
A Little Effort	11%	16%
No Effort at All	2%	1%
Don't Know/Refused	2%	1%
Total	100%	100%

Significant difference between groups.

Effort to Pastures, Fencerows, and Other Agri Lands

Please tell me if you believe a lot of effort, a little effort, or no effort should be made to maintain their quality? How about pastures, fencerows, and other agricultural lands …



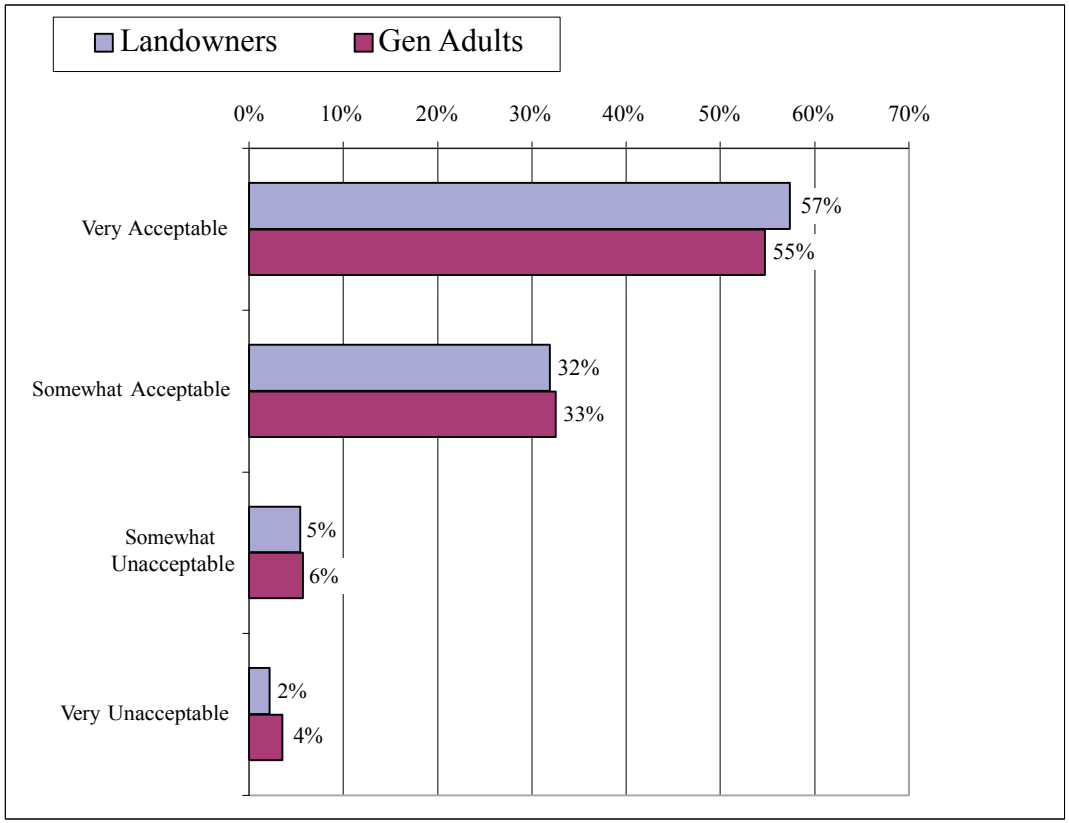
Highlights

- About two-thirds of Rural (67%) and State (64%) respondents think that a lot of effort should be made to maintain pastures, fencerows, and other agricultural lands.

	Rural Landowners	State Gen Adults
A Lot of Effort	67%	64%
A Little Effort	29%	33%
No Effort at All	3%	3%
Don't Know	1%	0%
Total	100%	100%

Controlled Fires

There are a number of ways to improve places where wildlife live. How acceptable or unacceptable are these pracices to you? Conducting controlled fires in order to make the land more suitable for non-game wildlife …



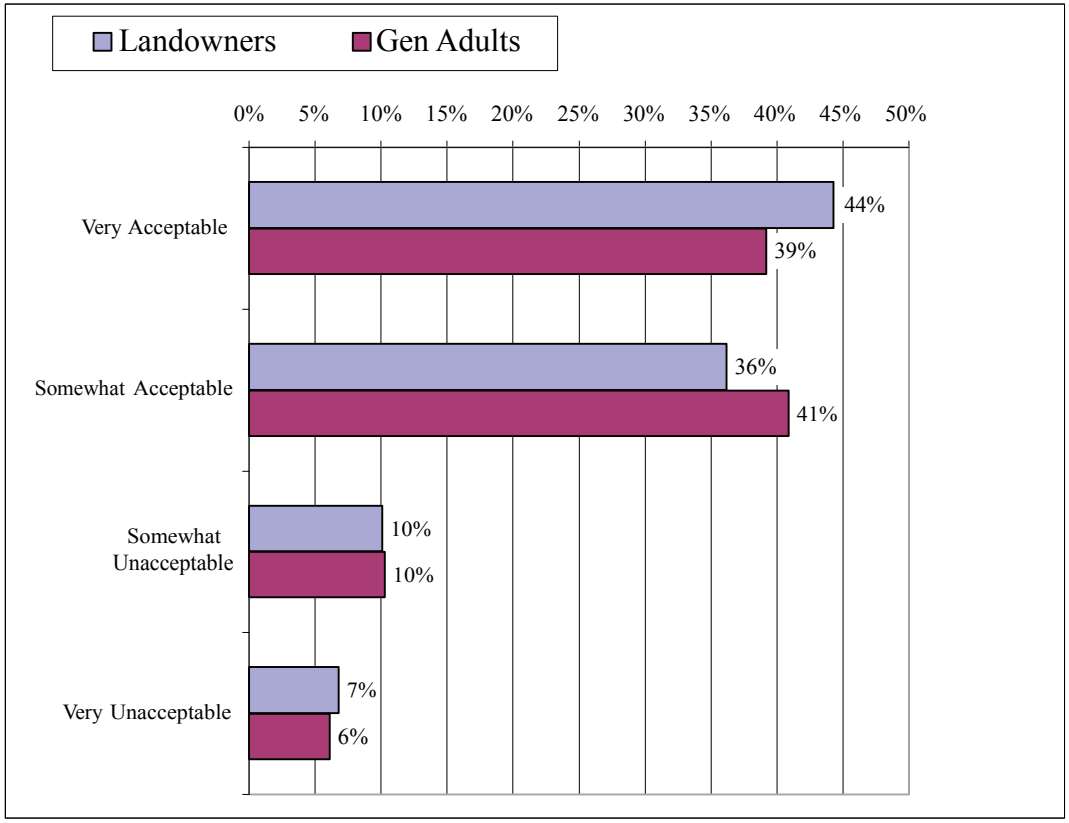
Highlights

- Altogether, 89% of Rural and 88% of State find controlled fires to be an acceptable practice for improving places where wildlife live.
- Just over half of both groups, 57% of Rural and 55% of State, find this practice to be very acceptable.

	Rural Landowners	State Gen Adults
Very Acceptable	57%	55%
Somewhat Acceptable	32%	33%
Somewhat Unacceptable	5%	6%
Very Unacceptable	2%	4%
Don't Know/Refused	3%	4%
Total	100%	100%

Thinning Tracts of Timber

Thinning tracts of timbeer to make it more suitable for non-game wildlife. Would that be acceptable or un acceptable?



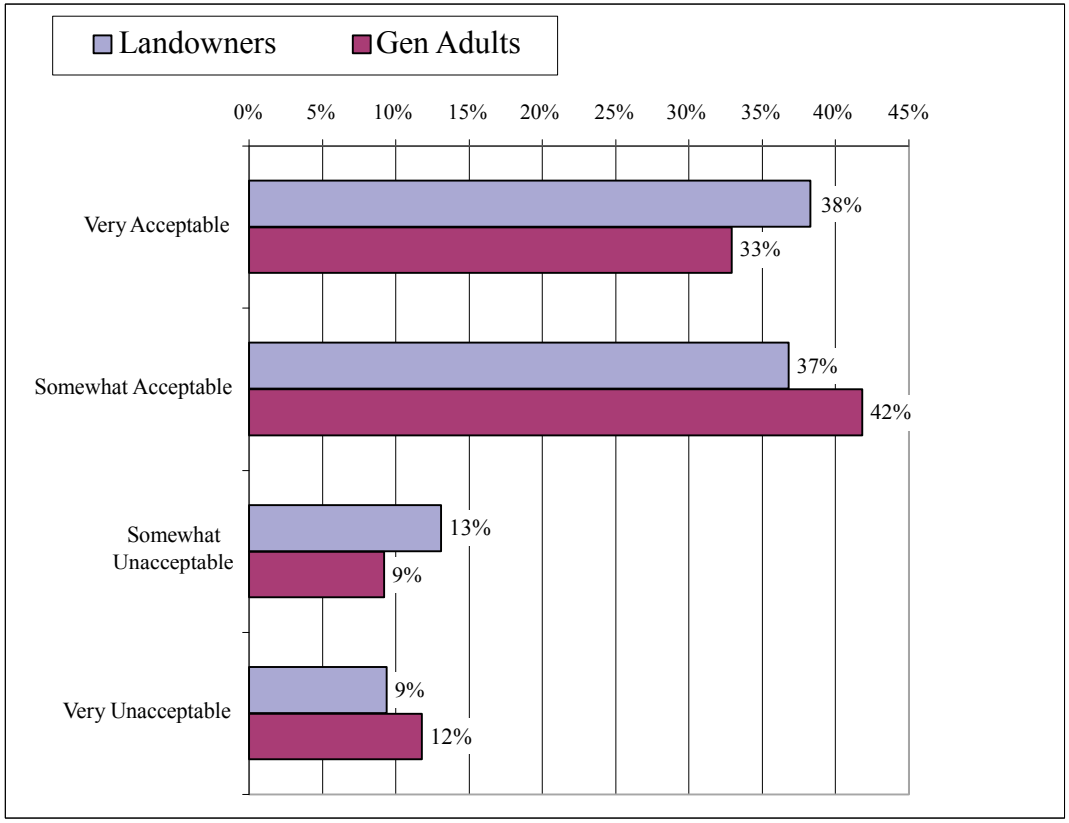
Highlights

- Eighty percent of each group, Rural and State, think that thinning tracts of timber is an acceptable way to make wildlife habitat more suitable.
- Not quite half -- 44% of Rural and only 39% of State -- find thinning tracts of timber very acceptable.

	Rural Landowners	State Gen Adults
Very Acceptable	44%	39%
Somewhat Acceptable	36%	41%
Somewhat Unacceptable	10%	10%
Very Unacceptable	7%	6%
Don't Know	3%	3%
Refused	0%	1%
Total	100%	100%

Paying Private Landowners

Paying private landowners to do these and other types of activities that benefit non-game wildlife and where they live. Is this acceptable or unacceptable?



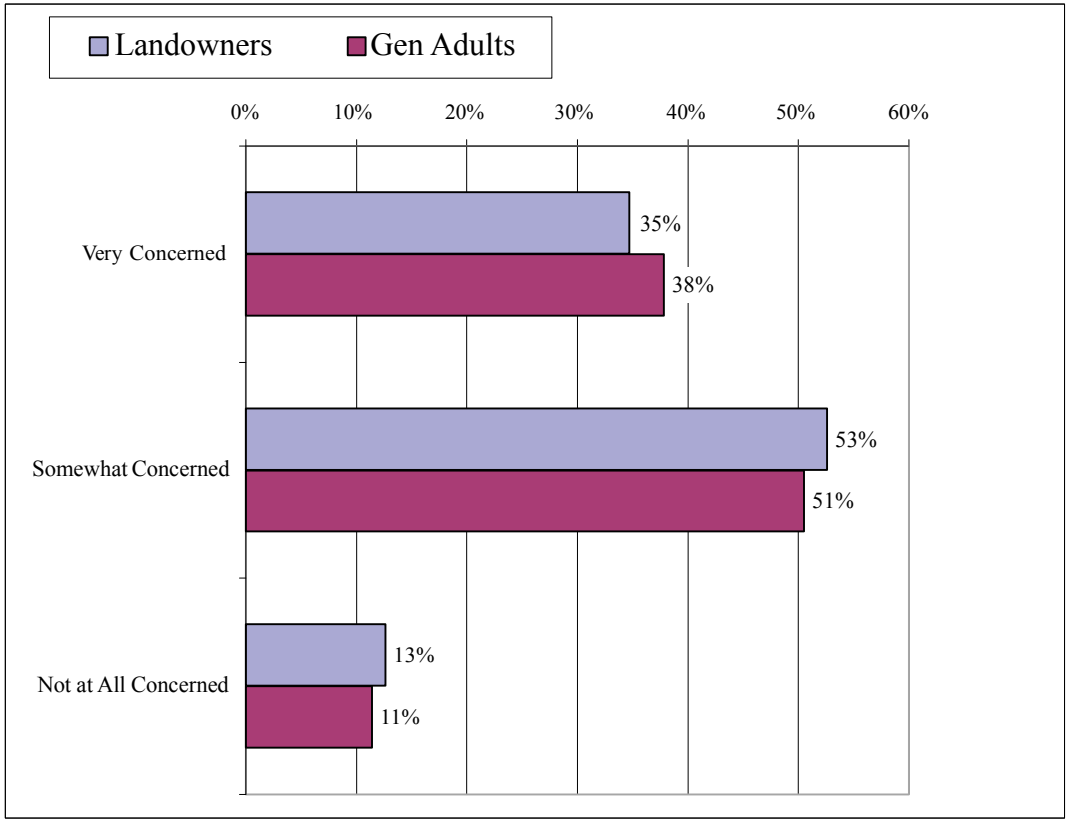
Highlights

- Three-quarters of both groups find it acceptable to pay private landowners to engage in practices to make non-game wildlife habitats more suitable.
- A litte more than a third of Rural respondents (38%) and about a third of State respondents (33%) think it is very acceptable to pay private landowners to improve wildlife habitats.

	Rural Landowners	State Gen Adults
Very Acceptable	38%	33%
Somewhat Acceptable	37%	42%
Somewhat Unacceptable	13%	9%
Very Unacceptable	9%	12%
Don't Know/Refused	3%	4%
Total	100%	100%

Impact of Human Activities

How concerned are you about the impact of human activities on non-game wildlife? Very concerend, somewhat concerned, or not at all concerned?



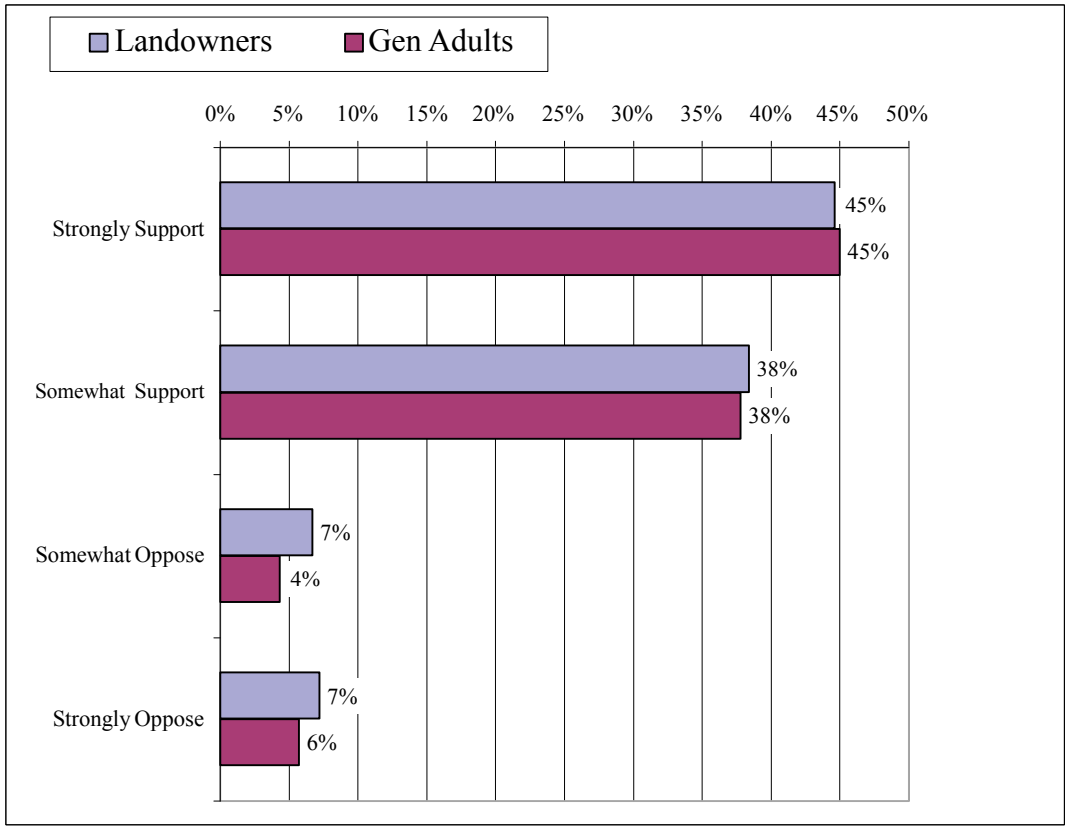
Highlights

- Respondents in both groups tended to be only somewhat concerned about the impact of human activities on non-game wildlife: 53% of Rural and 51% of State respondents.
- More than a third of each group, 35% of Rural and 38% of State, report being very concerned.

	Rural Landowners	State Gen Adults
Very Concerned	35%	38%
Somewhat Concerned	53%	51%
Not at All Concerned	13%	11%
Total	100%	100%

Funding Support

A question that often arises is "Howwill these conservation efforts and activities be funded? Funding will be provided by a new federal grant to Arkansas. Each grant dollar requires a matching state dollar. Do you support or oppose funding these wildlife conservation efforts and activities through this new federal grant?



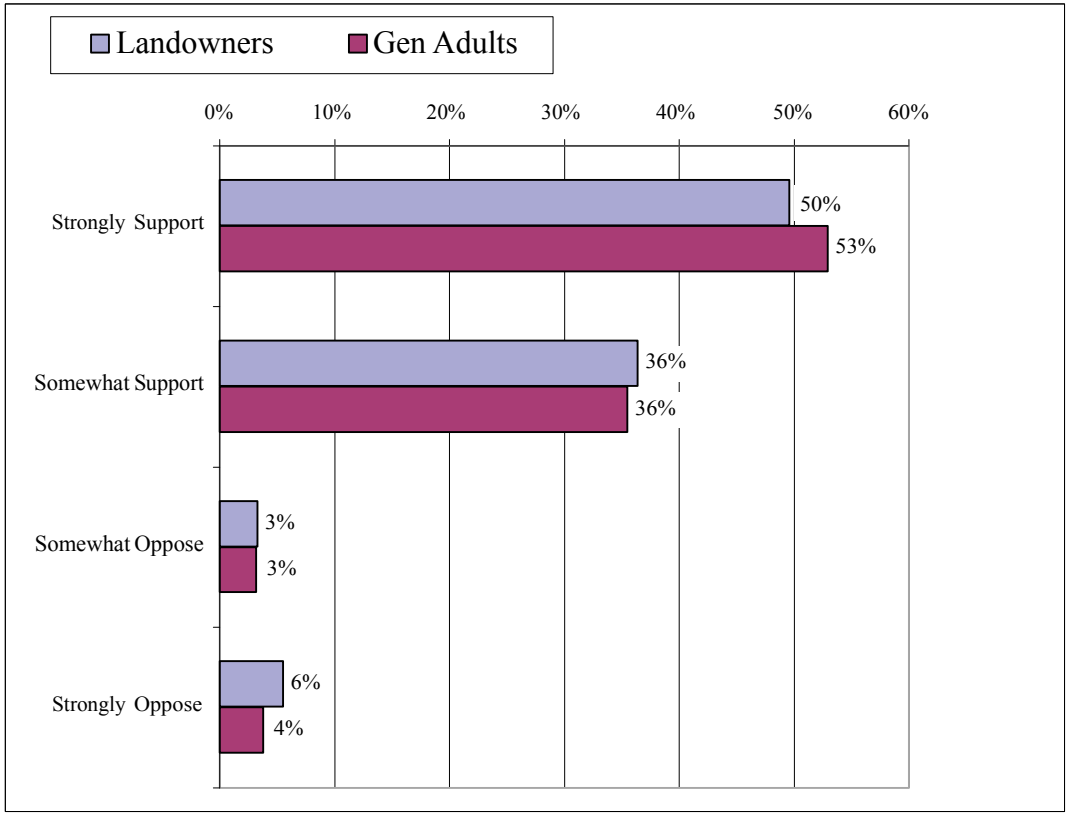
Highlights

- A majority of both groups of respondents, 83% of Rural and 83% of State also, support this federal grant's funding of wildlife conservation efforts and activities
- Forty-five percent of each group stronglhy support this method of funding for conservation efforts.

	Rural Landowners	State Gen Adults
Strongly Support	45%	45%
Somewhat Support	38%	38%
Somewhat Oppose	7%	4%
Strongly Oppose	7%	6%
Don't Know	2%	7%
Refused	1%	0%
Total	100%	100%

Support for AGF Action Plan

Do you support or oppose the efforts of the Arkansas Game and Fish Commission and its partners to develop an action plan to manage non-game wildlife with public input?



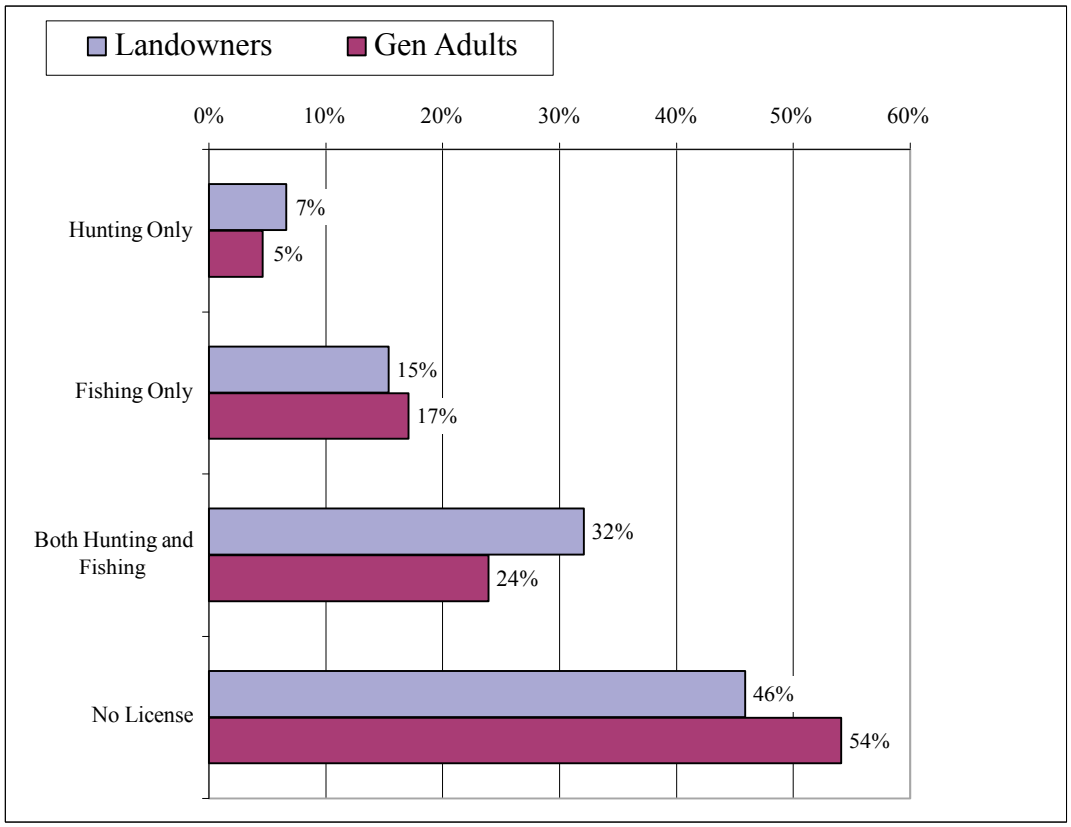
Highlights

- A clear majority of both groups, 86% of Rural and 89% of State, support efforts of the Arkansas Game and Fish Commission and its partners to develop an action plan to manage non-game wildlife with public input.
- About half, 50% of Rural respondents and 53% of State, strongly support these efforts.

	Rural Landowners	State Gen Adults
Strongly Support	50%	53%
Somewhat Support	36%	36%
Somewhat Oppose	3%	3%
Strongly Oppose	6%	4%
Don't Know	4%	4%
Refused	1%	1%
Total	100%	100%

Hunting or Fishing License

During the last 12 months, did you purchase an Arkansas hunting or fishing license?



Highlights

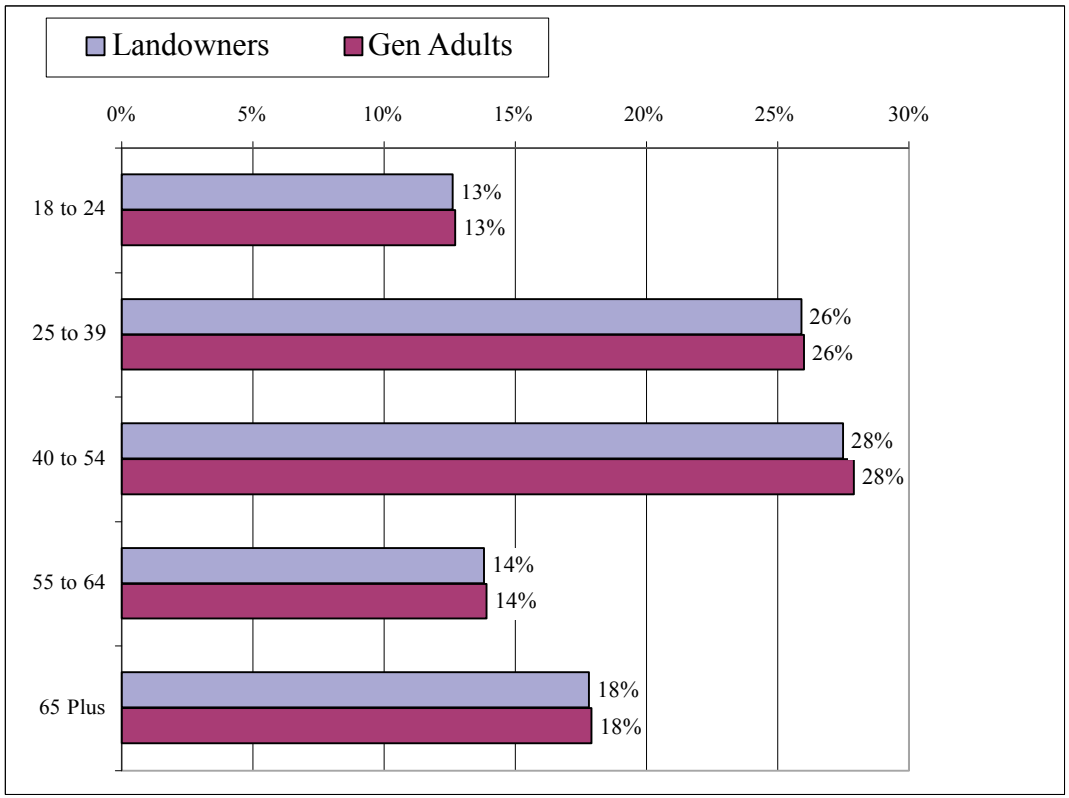
- During the last 12 months, 32% of Rural respondents and 24% of their statewide counterparts purchased both hunting and fishing licenses.
- Fishing licenses were more frequently sought than hunting, 15% to 7% for Rural respondents and 17% to 5% for State.
- The two groups differed significantly in that more Rural respondents had purchased one or both licenses in the last year.

	Rural Landowners	State Gen Adults
Hunting Only	7%	5%
Fishing Only	15%	17%
Both Hunting and Fishing	32%	24%
No License	46%	54%
Total	100%	100%

Significant difference between groups.

Age Group

What is your age?



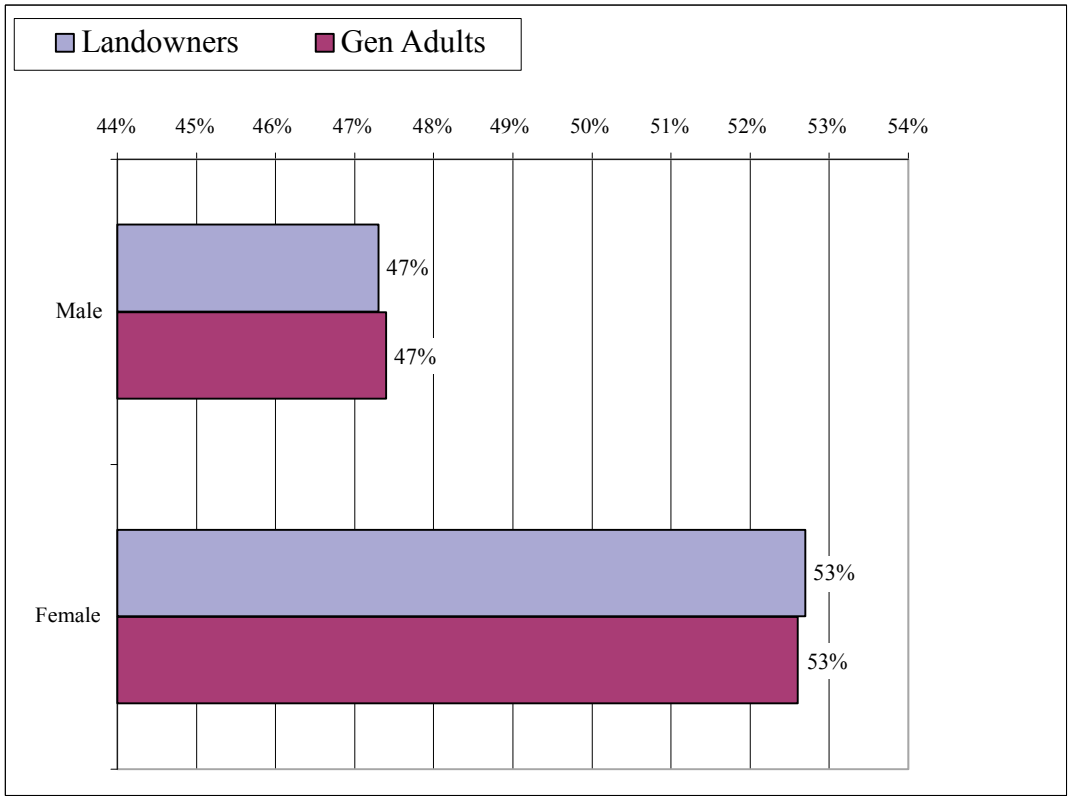
Highlights

- The sample data were weighted for age so as to be in proportion with the state adult population

	Rural Landowners	State Gen Adults
18 to 24	13%	13%
25 to 39	26%	26%
40 to 54	28%	28%
55 to 64	14%	14%
65 Plus	18%	18%
Don't Know/Refused	3%	2%
Total	100%	100%

Gender

And I need to verify that you are a …



Highlights

- The sample data were weighted for gender so as to be in proportion with the state adult population

	Rural Landowners	State Gen Adults
Male	47%	47%
Female	53%	53%
Total	100%	100%

Appendix 6.3 Stakeholder/Public Meeting Presentation

Presented on these occasions:

- Public meetings at Hope, Fayetteville, Jonesboro, Lake Village, and Little Rock
- Commission following stakeholder meetings (with science work, peer review and public involvement substantially complete)

Regional Stakeholder Meetings

Why Are We Here?

DESIGNING A FUTURE
for Arkansas Wildlife

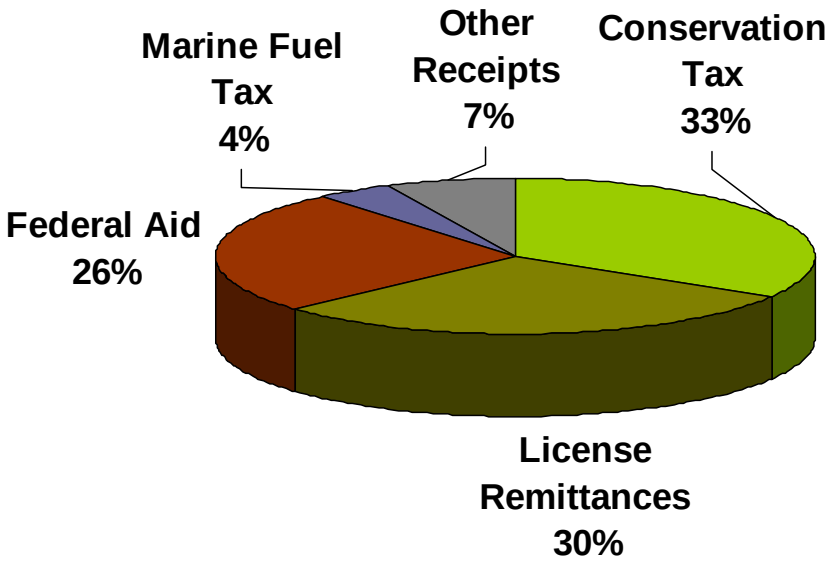

WELCOME
Designing a Future for Arkansas Wildlife

DESIGNING A FUTURE
for Arkansas Wildlife

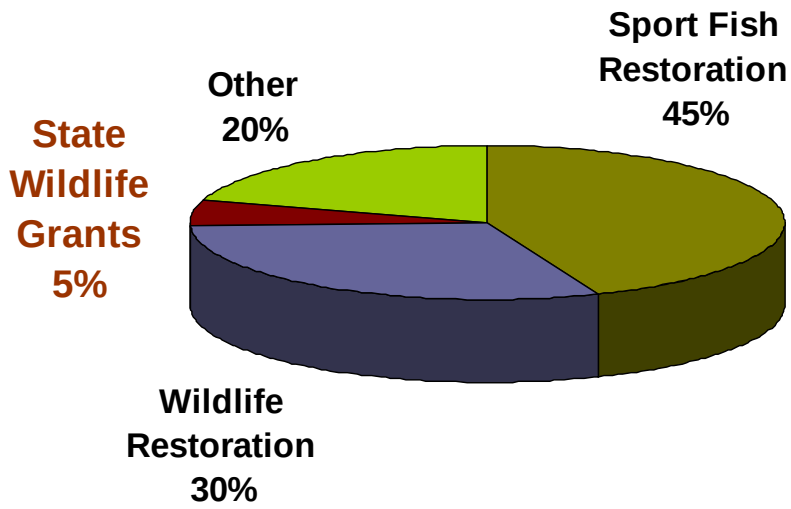
State Wildlife Grants Program

- Congress created the program in 2001
- Federal matching dollars for states to support cost-effective voluntary conservation strategies to prevent wildlife from becoming endangered.
  - 75 federal/25 state match for planning
  - 50 federal/50 state match for implementation
- Federal funds allocated to states based on a formula
- Arkansas has received between $500K & $900K annually since 2001
- Federal funds have potential to grow substantially over time

State Wildlife Grants
Small But Significant



Sources of AGFC 2005 Total Revenue



Federal Portion of AGFC 2005 Revenue

Examples of State Wildlife Grants

Funded Projects

- *Statewide Research* (e.g., bear study, bat monitoring, desert shrew status survey, passerine bird study, quail/pine bluestem research, swamp rabbit ecology, paddlefish survey, Ozark hellbender habitat assessment, alligator population survey, breeding bird atlas survey, Arkansas mammals, new cave invertebrates, Lonoke Crayfish, Rafenesque's Big Eared Bat, cataloging crayfish, Ouachita Creekshell, Swallow Tailed Kite, Swainson's Warblers, Cerulean Warbler, grassland birds)
- *Comprehensive Wildlife Conservation Strategy development* (e.g., database development, website, species/habitat research, opinion survey, public workshops
- *Other* (e.g., NHC Bird management, Herp Database, Hulsey Hatchery & Craig Hatchery - Watchable Wildlife, Conservation Camps, Nature Mapping - GPS/GIS, Fishes of Arkansas revision, Nature Center Exhibits, publications)

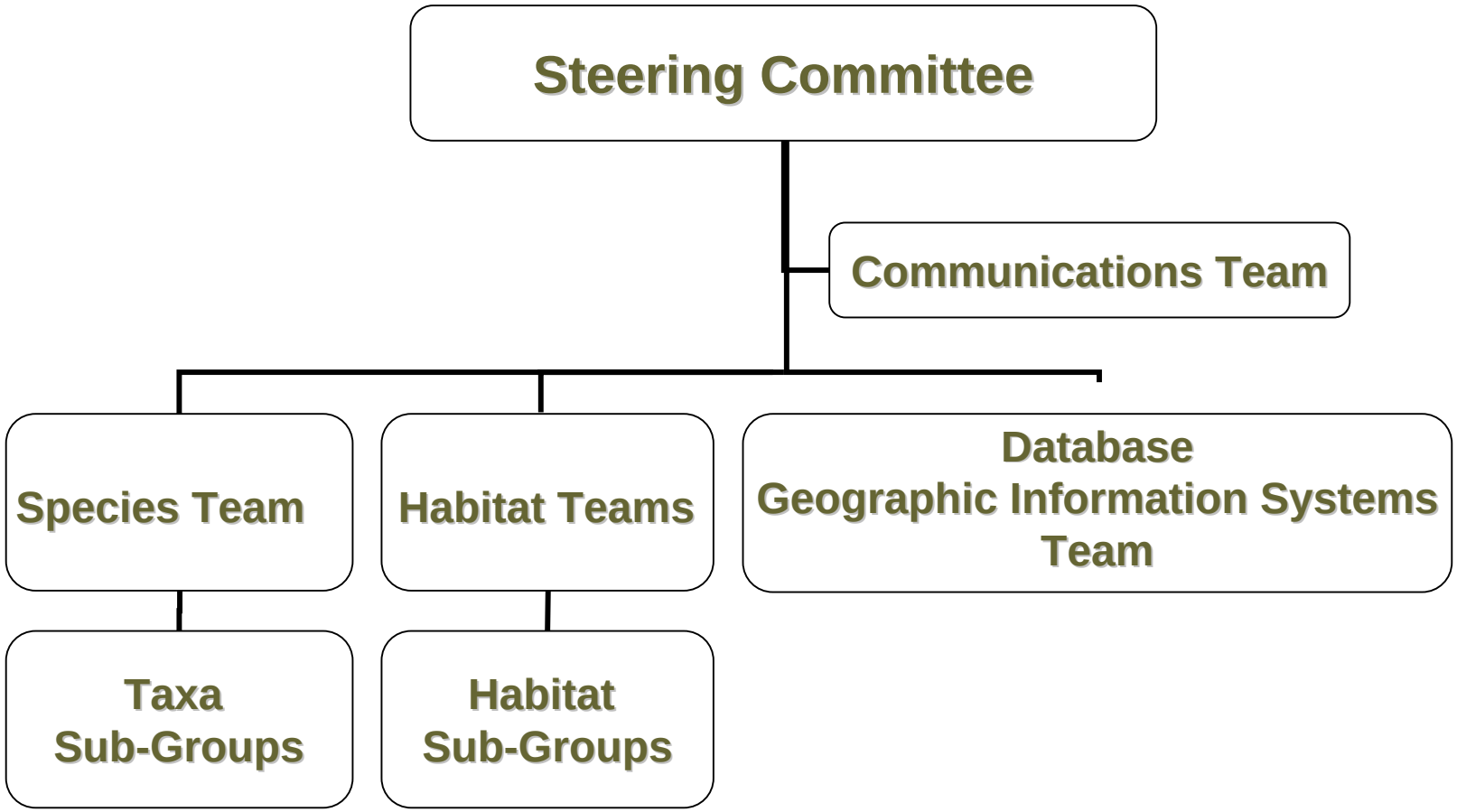
Continued Funding Requires

- States must develop a *Comprehensive Wildlife Conservation Strategy* by October 1, 2005
- Strategy must be approved
- Beginning in FY06, funds must be spent on *species of greatest conservation need* consistent with priorities set in strategy

Eight Required Elements For Comprehensive Wildlife Strategy

- Distribution and abundance of *species*
- Locations and relative condition of key *habitats*
- *Problems* affecting species and habitats and priority research
- *Conservation actions* needed
- Plans for *monitoring* species and habitats
- Review and revision *process*
- *Coordination* with federal, state and local land and water agencies
- Broad public *participation*

Who Is Developing The Draft Strategy?



Steering Committee

- Arkansas Game & Fish Commission
  - Steve Filipek (Fisheries)
  - Lucy Moreland (Education)
  - Doyle Shook (Wildlife)
  - Kris Rutherford (Grants Coordinator)
  - John Sunderland (Planning Coordinator)
- Bill Holimon, Arkansas Natural Heritage Commission
- Ken Smith, Audubon Arkansas
- Allan Mueller, U.S. Fish & Wildlife Service
- Lane Patterson, The Nature Conservancy
- Jim Baker, NRCS
- Betty Crump, U.S. Forest Service & Arkansas Academy of Science

Examples of Partners

- Arkansas Game & Fish Commission
- U.S. Forest Service
- Arkansas Natural Heritage Commission
- U.S. Fish & Wildlife Service
- Aububon Arkansas
- The Nature Conservancy
- Arkansas Academy of Sciences
- University of Arkansas, Division of Agriculture
- Arkansas Department of Parks & Tourism
- U.S. Geological Survey
- USDA, Natural Resources Conservation Service
- Multi-Agency Wetlands Planning Team
- Arkansas Department of Environmental Quality
- UALR
- Arkansas State University
- Arkansas Tech
- Arkansas Highway & Transportation Department
- ***Your organization, agency or institution?***

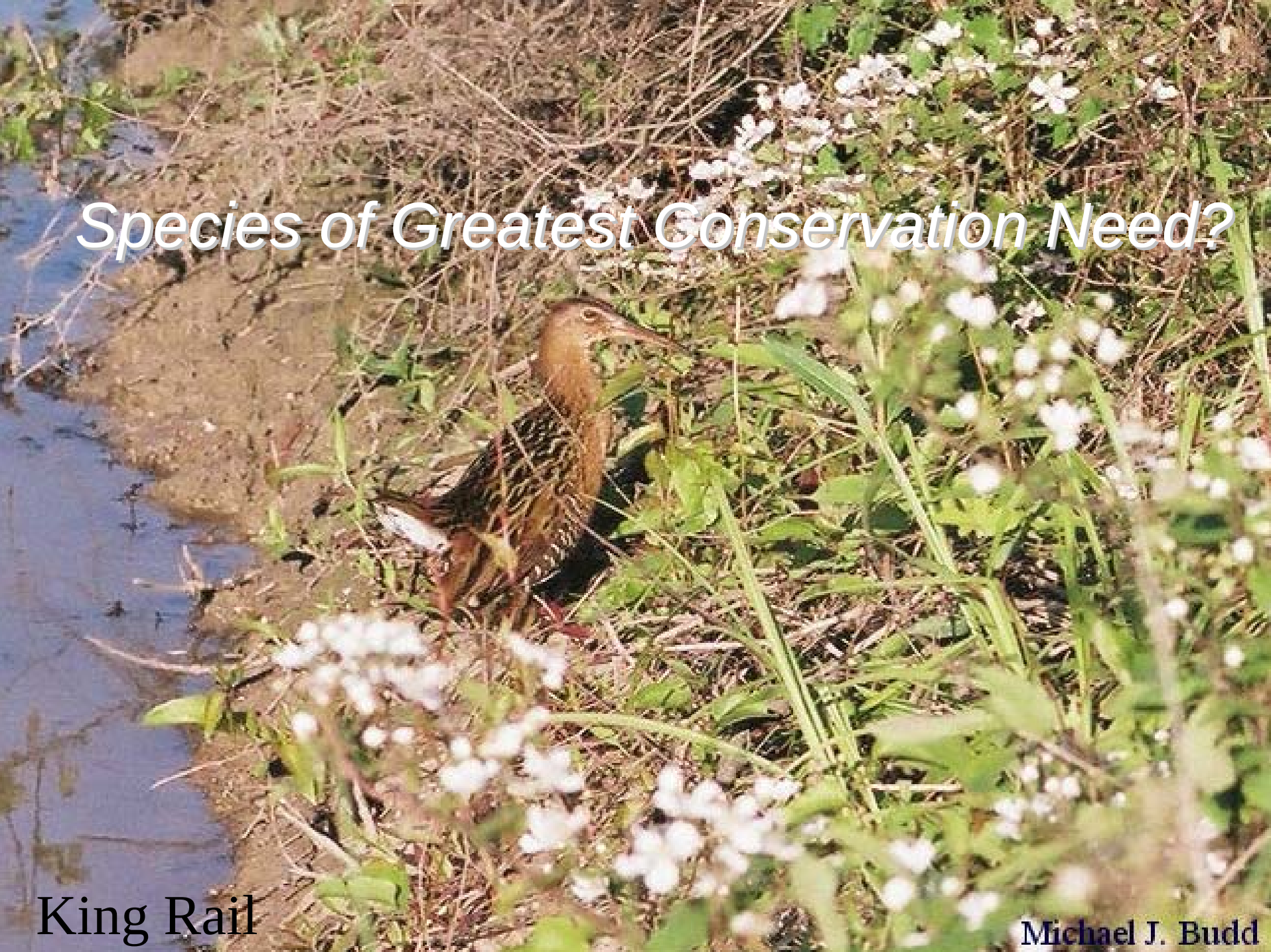
Strategy Vision

"A living, accessible *planning tool* that is both strategic and operational, for leveraging funds, information and effort for species and habitat conservation on public and private lands … more vision than plan."

Strategy Goals

- Keep common species common
- Keep additional species off the threatened and endangered lists
- Save the pieces (habitats)
- Increase funding for nongame wildlife
- Build partnerships with private and public entities
- Promote voluntary conservation actions


Species of Greatest Conservation Need?


Species of Greatest Conservation Need?
King Rail
Michael J. Budd

Strategy Identifies Species of Greatest Conservation Need

- List determined by each state
- Fauna, not flora
- May include aquatic species and invertebrates
- May include federal and state listed wildlife species
- List carries no legal or regulatory authority except to guide expenditures of State Wildlife Grant funding
- List will change as status or information changes

Species Team

- Work in taxa sub-groups to select *species of greatest conservation need*
- Work with Habitat Team and other partners to assess species viability and habitat conditions in each ecoregion
- Populate the CWCS database
- Coordinate peer review of data

Basis for identifying species of greatest conservation concern

- Global and state rankings
- Population trends
- Integrated bird conservation plans (e.g., Partners In Flight list)
- Other expert opinion (e.g., agency, academic, nonprofit, etc)

Arkansas Species of Greatest Conservation Concern

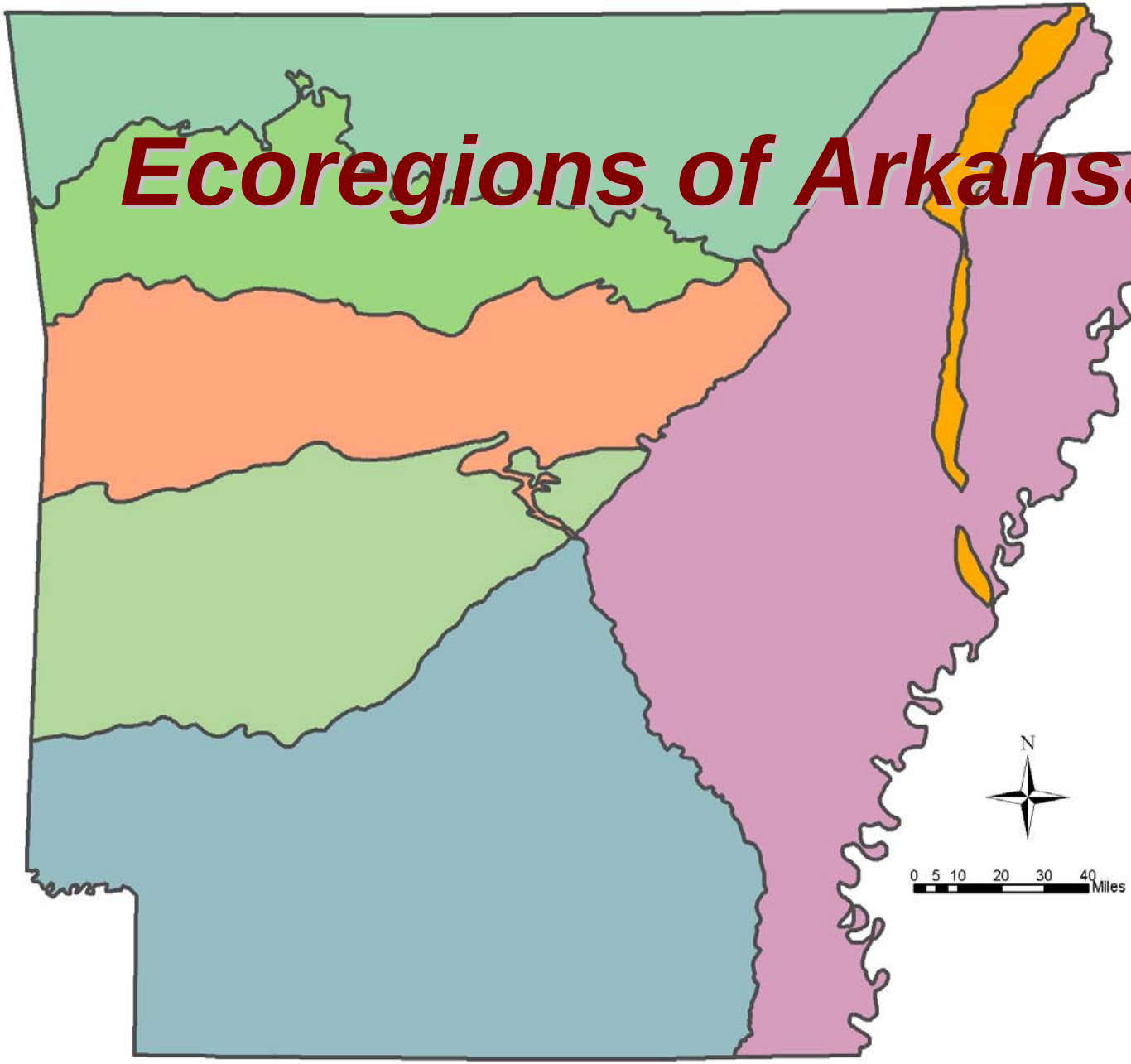
- 25 amphibians
- 78 birds
- 25 crayfish
- 50 fish
- 64 insects
- 43 invertebrates (other)
- 18 mammals
- 56 mussels
- 14 reptiles

A total of 373 species

Habitat Team

- Determines ecoregion delineation
- Selects land (habitat) classification for terrestrial species
- Determines habitat classification for aquatic species
- Works with Species Team and taxa sub-groups to link species to their habitats

Ecoregions of Arkansas



DESIGNING A FUTURE
for Arkansas Wildlife

Terrestrial Habitats

- Arkansas Valley Prairie and Woodland
- Caves, Mines & Karst Habitat
- Central Interior Acidic Cliff and Talus
- Central Interior Calcareous Cliff and Talus
- Central Interior Highlands and
- Appalachian Sinkhole and Depression Pond
- Central Interior Highlands Calcareous Glade and Barrens
- Central Interior Highlands Dry Acidic Glade and Barrens
- Crop Land
- Cultivated Forest
- Lower Mississippi Alluvial Plain Grand Prairie
- Lower Mississippi Flatwoods Woodland and Forest
- Lower Mississippi River Bottomland Depression
- Lower Mississippi River Dune Woodland and Forest
- Lower Mississippi River High Bottomland Forest
- Lower Mississippi River Low Bottomland Forest
- Lower Mississippi River Riparian Forest
- Mississippi River Alluvial Plain Loess Slope Forest
- Mud Flats

Terrestrial Habitats (cont)

- Ouachita Montane Oak Forest
- Ouachita Mountain Forested Seep
- Ouachita Novaculite Glade and Woodland
- Ozark-Ouachita Dry Oak Woodland
- Ozark-Ouachita Dry Mesic Oak Forest
- Ozark-Ouachita Mesic Hardwood Forest
- Ozark-Ouachita Pine/Bluestem Woodland
- Ozark-Ouachita Pine-Oak Forest
- Ozark-Ouachita Pine-Oak Woodland
- Ozark-Ouachita Riparian
- Pasture Land
- Ponds, Lakes, and Water Holes
- South-Central Interior Large Floodplain
- Southeastern Great Plains Tallgrass Prairie
- Urban/Suburban
- West Gulf Coastal Plain Calcareous Prairie
- West Gulf Coastal Plain Dry Pine-Hardwood Flatwoods
- West Gulf Coastal Plain Large River Floodplain Forest
- West Gulf Coastal Plain Mesic Hardwood Forest
- West Gulf Coastal Plain Nepheline Syenite Glade
- West Gulf Coastal Plain Pine-Hardwood Forest
- West Gulf Coastal Plain Red River Floodplain Forest
- West Gulf Coastal Plain Saline Glade
- West Gulf Coastal Plain Sandhill Oak and Shortleaf Pine Forest and Woodland
- West Gulf Coastal Plain Seepage Swamp and Baygall
- West Gulf Coastal Plain Small Stream/River Forest
- West Gulf Coastal Plain Wet Hardwood Flatwoods

Aquatic Habitats

Eco-Basins

- Ouachita Mountains - Ouachita River
- South Central Plains - Ouachita River
- Mississippi River Embayment (Bayou Bartholomew) - Ouachita River
- Ouachita Mountains - Red River
- South Central Plains - Red River
- Boston Mountains - Arkansas River
- Ouachita Mountains - Arkansas River
- Arkansas River Valley - Arkansas River
- Mississippi River Embayment - Arkansas River
- Ozark Highlands - Arkansas River
- Ozark Highlands - White River
- Boston Mountains - White River
- Mississippi River Embayment - White River
- Mississippi River Embayment - St. Francis River
- Mississippi River Embayment (Lake Chicot) - Mississippi River
- Mississippi River Loess Plains - White River
- Mississippi River Loess Plains - St. Francis River

Within Eco-Basins

- Littoral
- Pelagic
- Pool
- Side Channel
- Shoal
- Slough
- Oxbow – connected
- Other
- Riffle
- Run
- Glide
- Cave stream
- Spring run
- Seep
- Groundwater
- Swamp/Wetland
- Oxbow - disconnected

Database/GIS Team

- Develop data protocols
- Oversee design of data infrastructure
- Monitor development of *Comprehensive Wildlife Conservation Database*
- Develop Geographic Information Systems (GIS) analysis and mapping capability

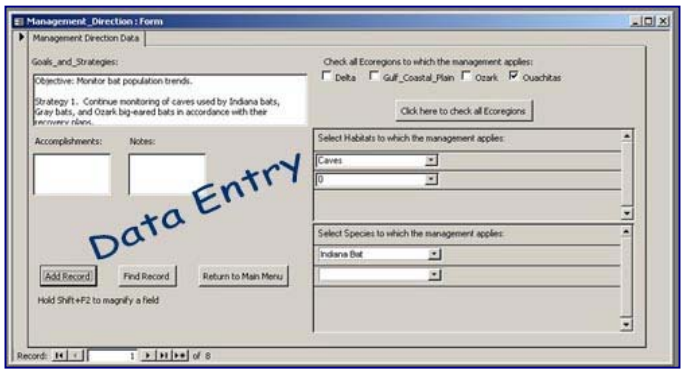
Input

Species information

Habitat information

Current species and habitat management plans

Comprehensive Wildlife Conservation Database



Output

Standardized Reports

Species distribution & abundance

Habitats & community types

Problems affecting species & habitats

Voluntary conservation actions

Proposed plans for monitoring species & their habitats

DESIGNING A FUTURE
for Arkansas Wildlife

Taxidea taxus

American Badger

Class: Mammalia
Order: Carnivora
Family: Mustelidae

Viability Score: **0.8 out of 10**

Secure — Imperiled

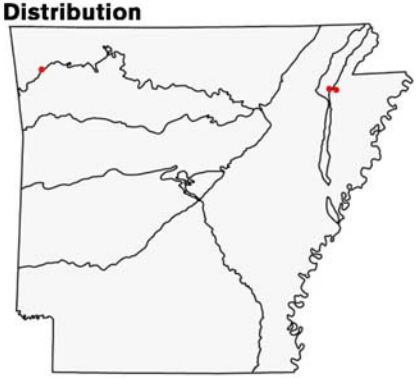
.0 2.5 5.0 7.5 10.0

Population Trend: Unknown

G Rank: G5 – Secure

S Rank: SA – Of accidental occurrence in Arkansas

Distribution



Occurrence records

Ecoregions in which the species occurs:

- Ozark Highlands ☑
- Mississippi Valley Loess Plains ☑
- Boston Mountains ☐
- Mississippi Alluvial Plain ☐
- Arkansas Valley ☐
- South Central Plains ☐
- Ouachita Mountains ☐

Team

AGFC Mr. Blake Sasse, UALR Dr. Bob Sikes, UAM Dr. Don White, UALR Dr. Gary Heidt, J. D. Wilhide, ASU Dr. Renn Tumlison, ATU Dr. Tom Nupp, ASU Dr. Thomas Risch, USFS Mr. David Saugey, ASU Mr. Stephen Brandenbur

Habitats

Habitats	Weight
Pasture Land	Optimal
Crop Land	Suitable
Ozark-Ouachita Riparian	Suitable

Problems Faced

Unknown

Threat:
Source:

Conservation Actions

Conservation Actions	Importance	Category
More data is needed to determine conservation actions.	Medium	Data Gap

Data Gaps/Research Needs

Conduct status survey.

Monitoring Strategies

More information is needed before a monitoring strategy can be developed.

Comments

A heavy-bodied, short-legged mammal with long fore claws, long fur (longest on the sides), and a short bushy tail; upperparts are yellowish gray to reddish brown, with a white middorsal stripe extending from the snout to the neck or shoulders in the north and usually to the rump in the south; black patches are present on the face and cheeks; underparts are buffy, except for the whitish chin, throat, and mid-ventral area; feet are dark brown to black; head and body length 42-72 cm, tail length 10-15.5 cm, mass 4-12 kg. Rarely encountered in northern Arkansas. Recent records may indicate that a population has been established in Arkansas.

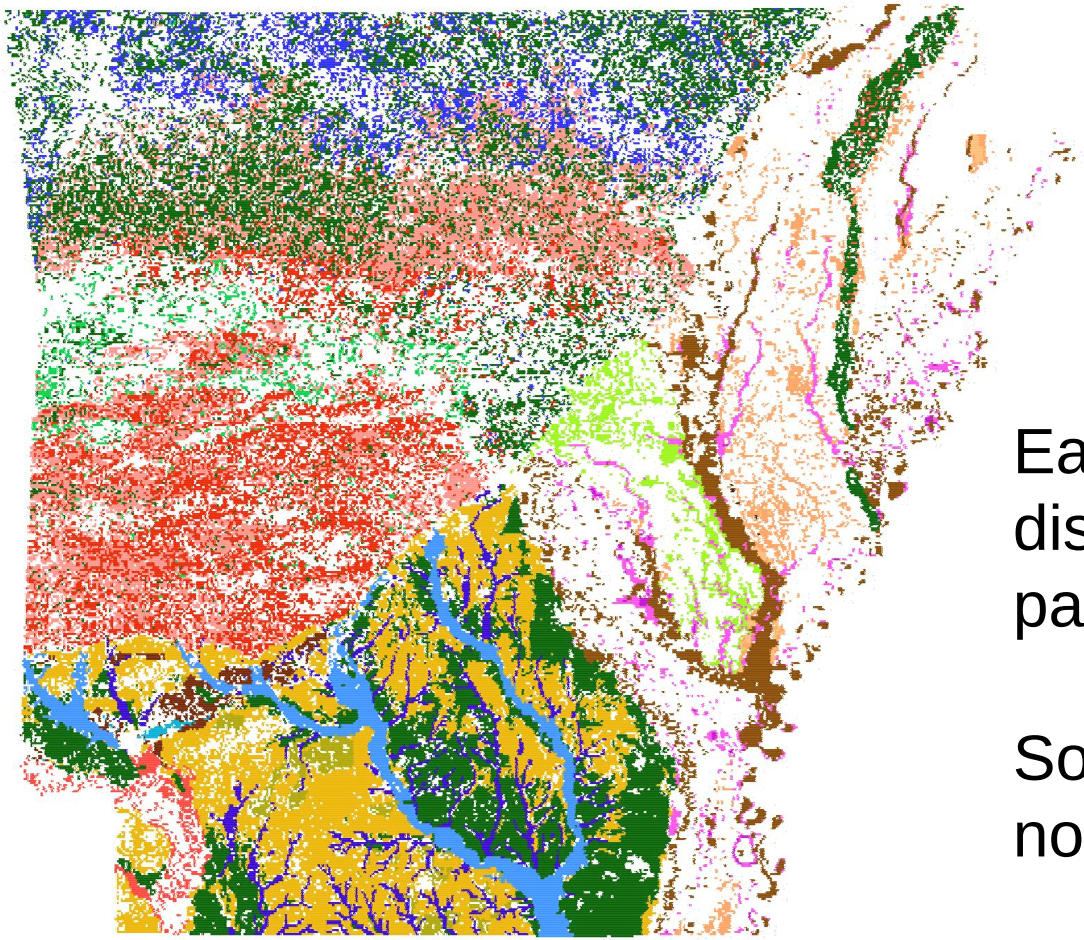
(Natureserve 2004, Sheffield and others 2004, Sealander and Heidt 1990)

Habitat Name Arkansas Valley Prairie and Woodland

Definition:

This system of prairies and associated woodlands is found in the Arkansas Valley ecoregion of Arkansas and adjacent Oklahoma. This region is distinctly bounded by the Boston Mountains to the north and the Ouachita Mountains to the south. The valley is characterized by broad, level to gently rolling uplands derived from shales and is much less rugged and more heavily impacted by Arkansas River erosional processes than the adjacent mountain regions. In addition, the valley receives annual precipitation total of 2-6 inches less than the surrounding regions due to a rainshadow produced by a combination of prevailing western winds and mountain orographic effects. The shale-derived soils associated with the prairies are thin and droughty. The combined effect of droughty soils, reduced precipitation, and prevailing level topography create conditions highly conducive to the ignition and spread of fires. Stands are typically dominated by Andropogon gerardii, Sorghastrum nutans, Panicum virgatum and Schizachyrium scoparium. Some extant examples of this system remain, but most are small and isolated. •DISTRIBUTION•Range: Arkansas River Valley region of Arkansas and adjacent Oklahoma.

Example of A GIS Habitat Map



Each color shows the distribution of a particular habitat

Some habitats have not yet been mapped


The Goal To Use GIS To
Prioritize Conservation Actions

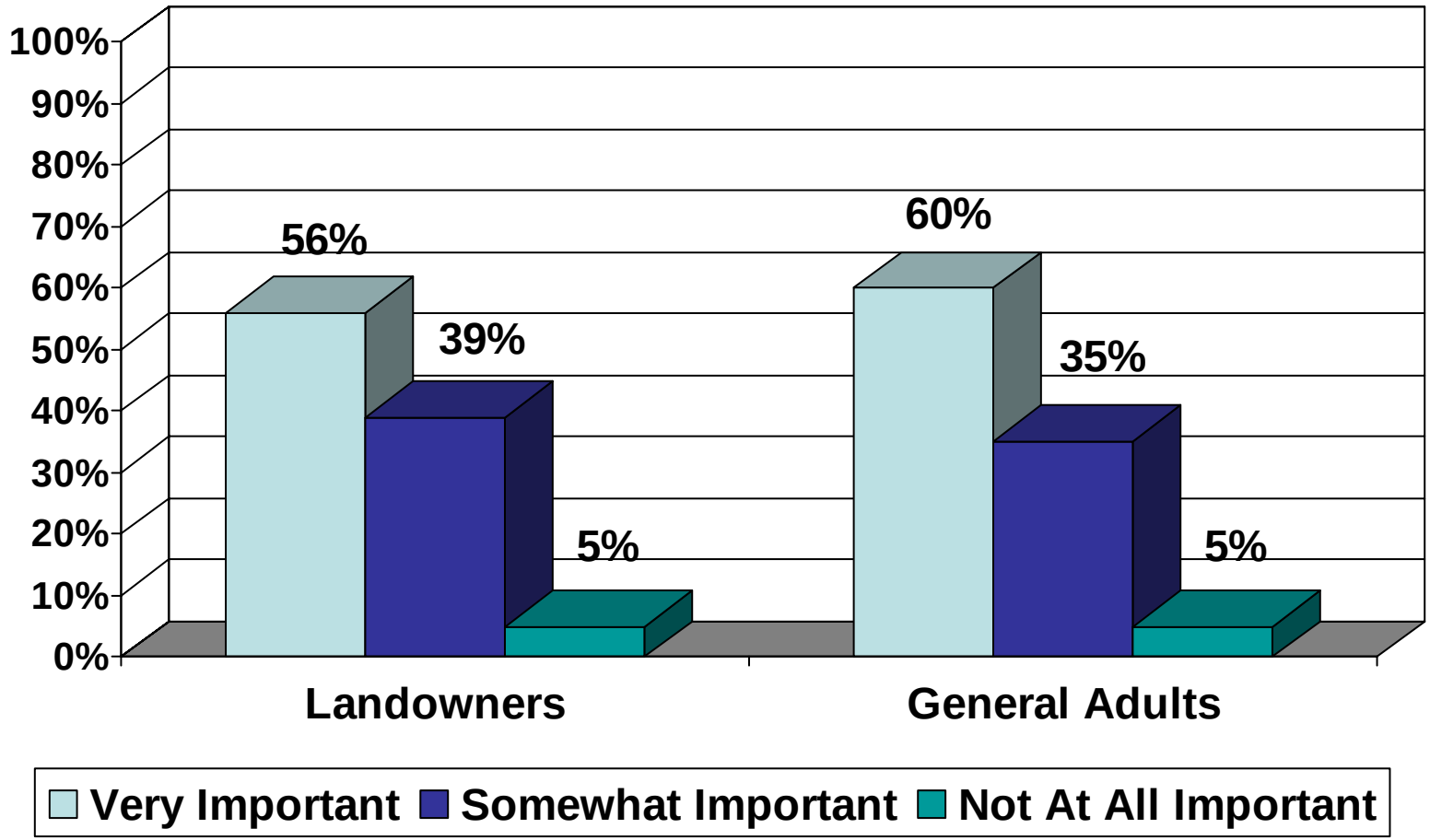
Communications Team

- Assist in-reach and partner information
- Manage public information and involvement
- Seek public input in partnership with Cooperative Extension Service
  - Regional stakeholder workshops
  - Interactive website at www.WildlifeArkansas.com
- Contract with UALR/Institute of Government for pubic opinion survey
- Publish strategy in various formats

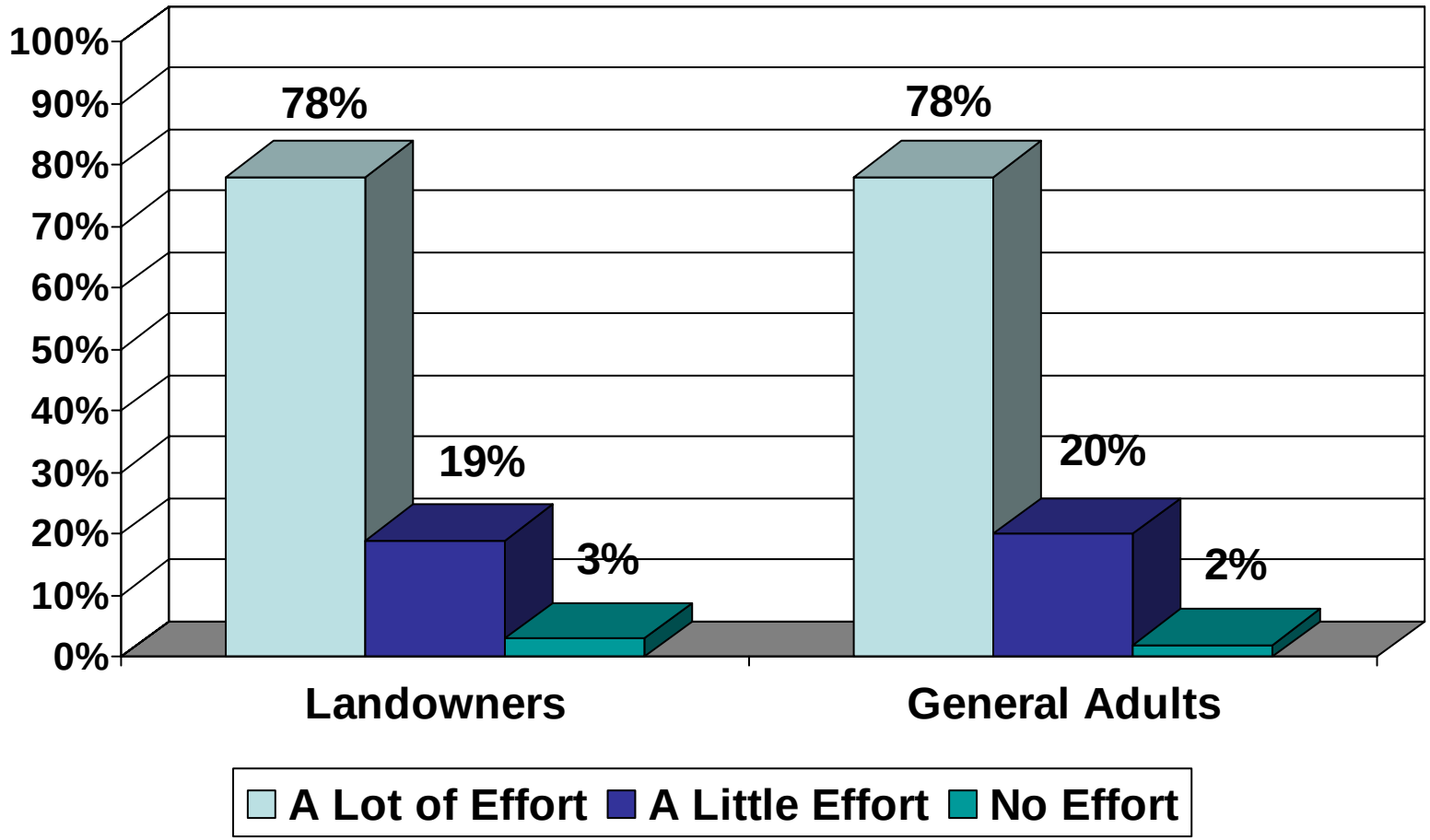
2005 Arkansas Nongame Wildlife Conservation Survey

- 800 adult Arkansans surveyed
- Survey conducted by University of Arkansas at Little Rock, Institute of Government survey research group
- Statistically valid for the general population of adults and landowners with more than 5 acres for the state as a whole
- Telephone interviews conducted in April 2005
- For the complete results of this survey, go to http://www.wildlifearkansas.com/materials/cwcsfinalreport.pdf

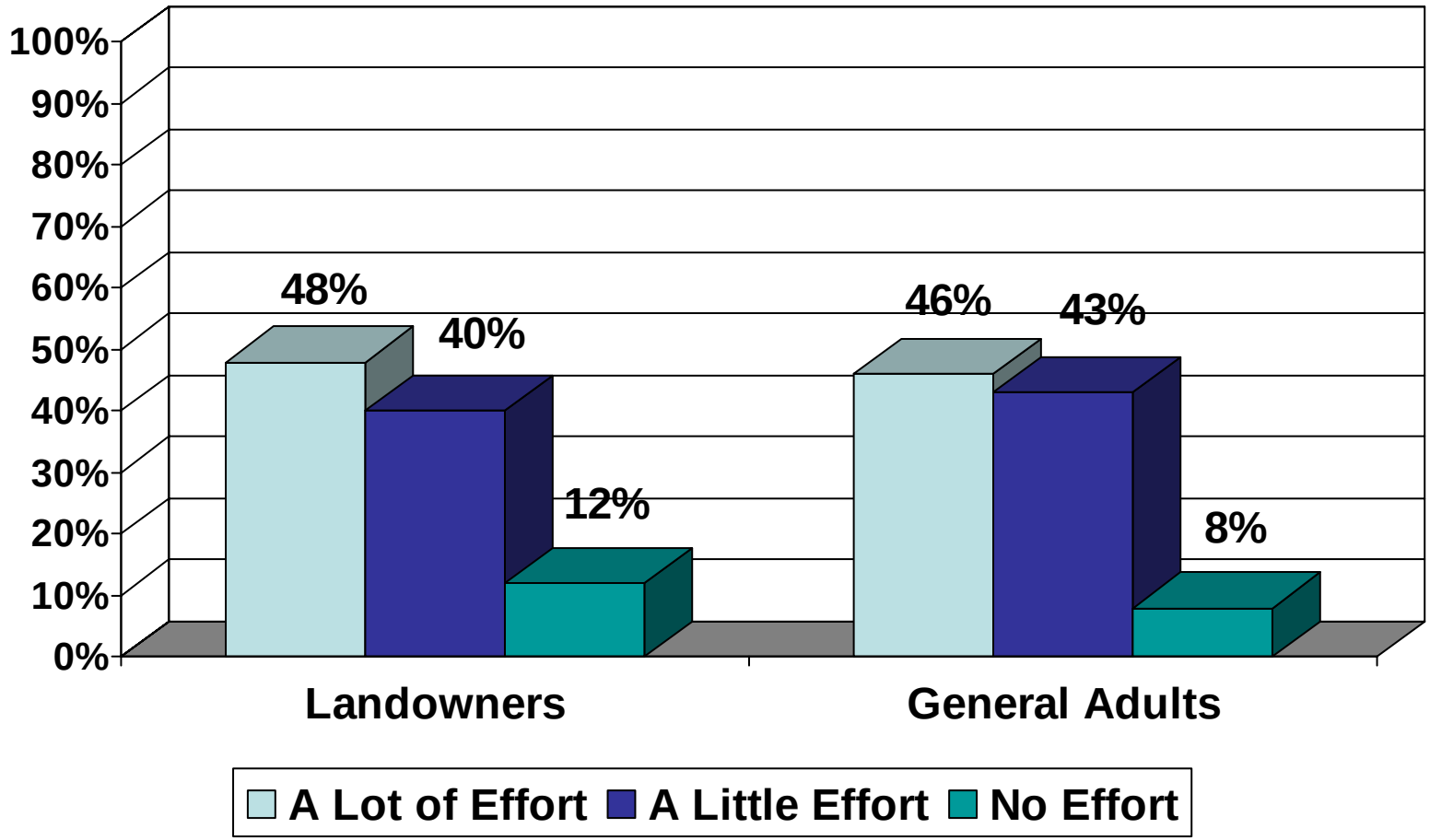
How important is it to you that Arkansas maintain healthy populations of nongame wildlife?



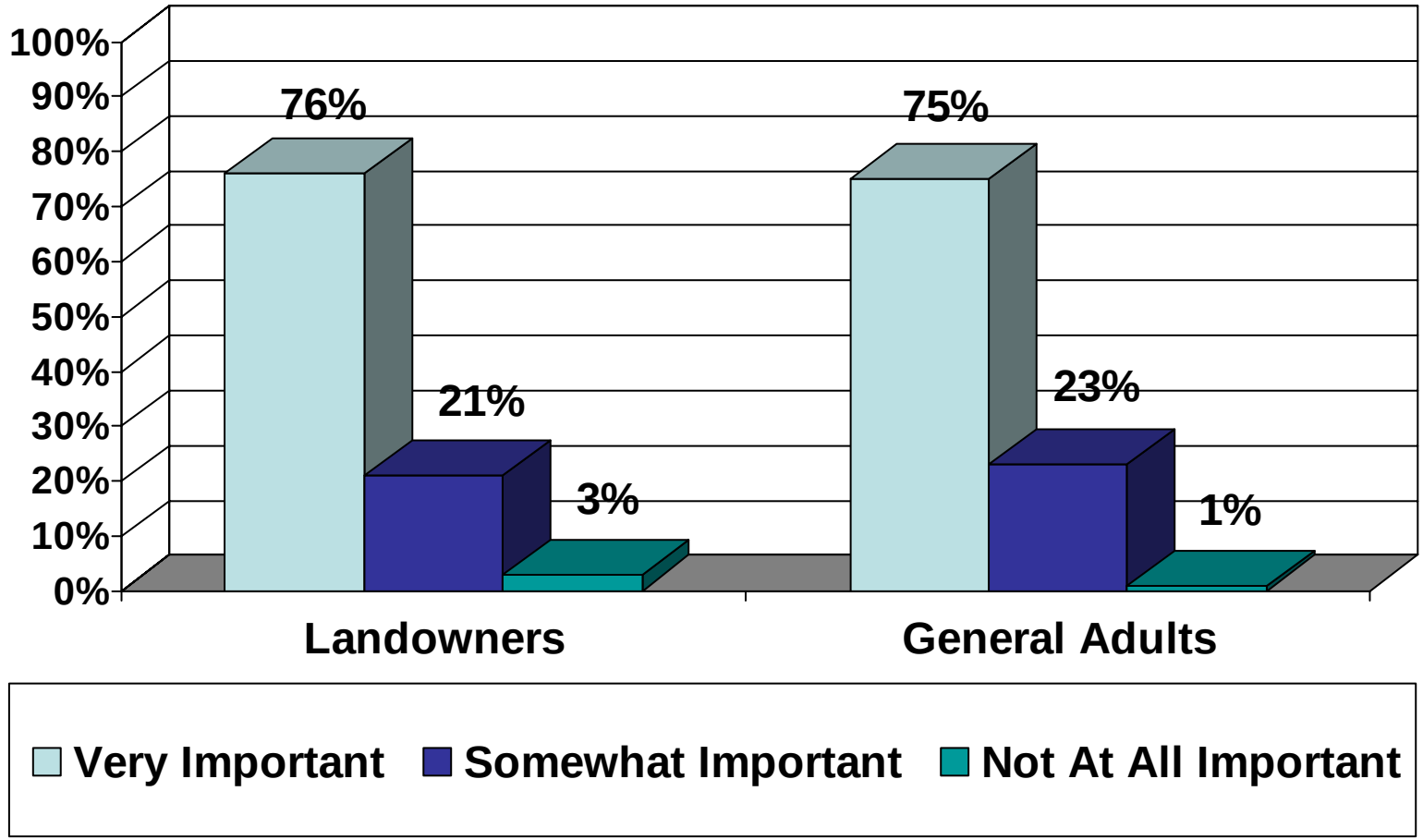
Please tell me if you believe a lot of effort, a little effort or no effort should be made to maintain healthy populations. How about birds such as songbirds and owls?



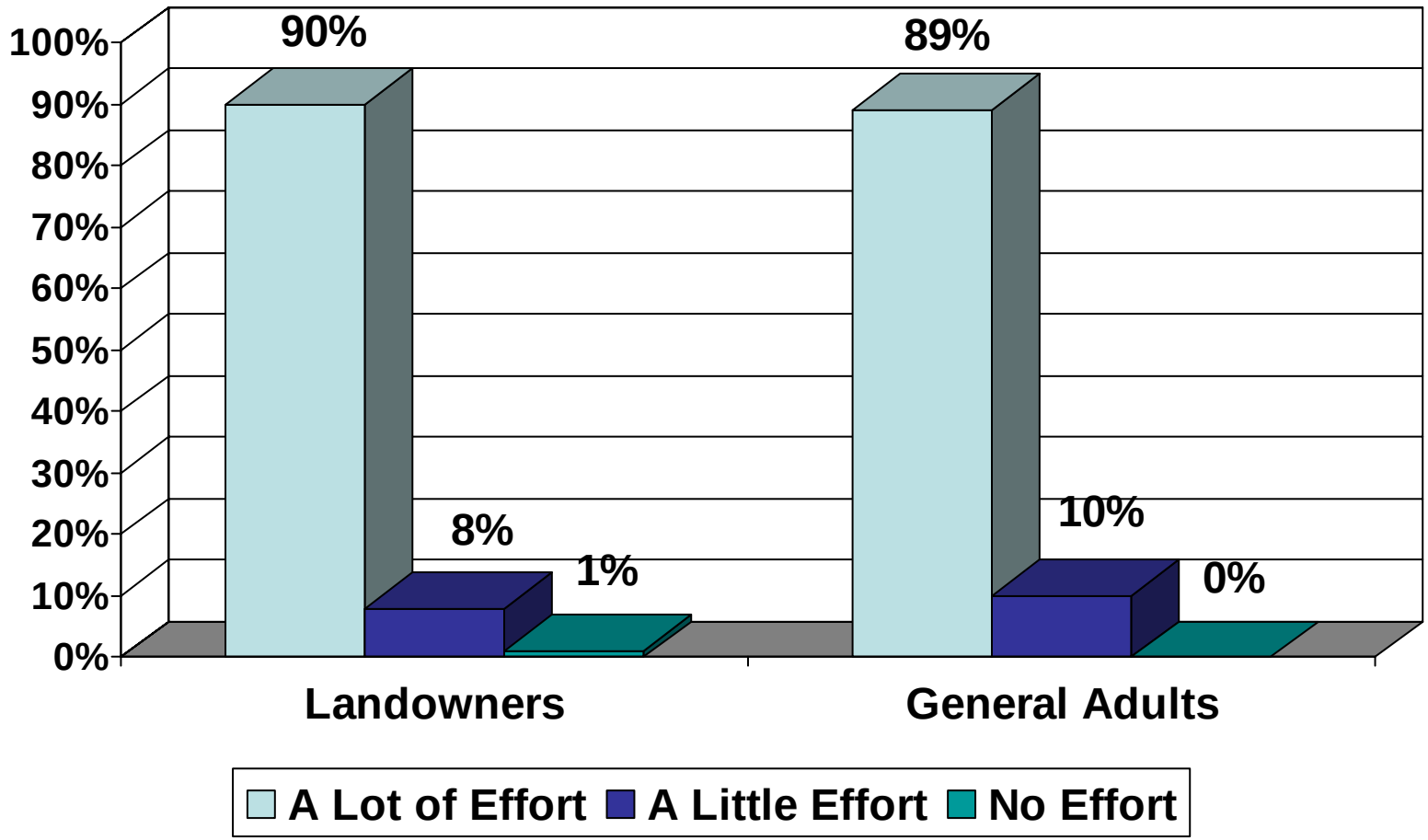
Please tell me if you believe a lot of effort, a little effort or no effort should be made to maintain healthy populations. How about aquatic species such as crayfish and mussels?



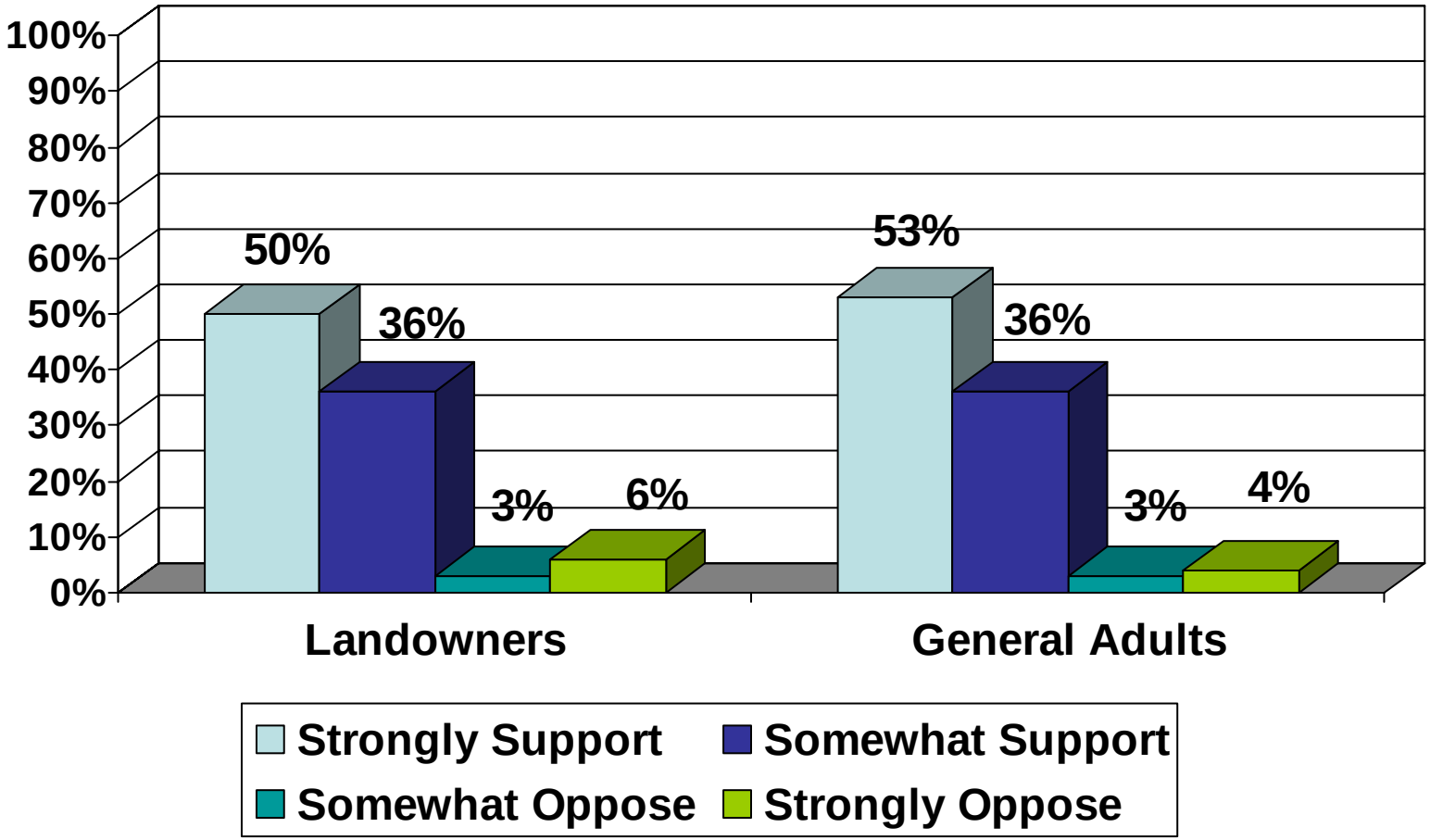
Arkansas has many special places where nongame wildlife live. These places include prairies, caves, forests and free-flowing streams. How important is it to you that Arkansas maintain these places?



Please tell me if you believe a lot of effort, a little effort or no effort should be made to maintain habitats. How about rivers, streams and lakes?



Do you support or oppose the efforts of the Arkansas Game & Fish Commission and its partners to develop an action plan to manage nongame wildlife species with public input?



After The Strategy Is Submitted

- An interagency Implementation Committee will be established to provide leadership/oversight
- Use as tool for setting budget and program priorities for State Wildlife Grant funds
- Annual technical review conference
- Promote voluntary conservation actions and creative partnerships to implement strategy

Your Role

- Participate in small group discussions tonight
- Review draft strategy online at www.WildlifeArkansas.com
- Provide input online
- Sign up for strategy updates (as the plan will be posted in sections between now and August)
- Determine what you or your organization can voluntarily do to help implement the strategy
- Complete an online evaluation of this meeting


Asking the RIGHT Questions:
A Key to Group Management
• Feedback & Clarification
(Summarize & Paraphrase)
• Debr g
• Cl ded (Yes/No)

Small Group Discussion

- Brainstorming, not consensus
- Seeking input, understanding
- Input from small groups will be combined with input from website, technical review and other sources
- Facilitators will keep time, keep group on task, help ensure that all get the opportunity to participate
- Recorders will seek to obtain as a complete a record as possible

Discussion Questions

- What do you think about the list of species of greatest conservation need? Why?
- What conservation practices will be most attractive to private landowners? Why are they attractive?
- What prevents landowners from implementing conservation practices that benefit wildlife? Why?


FUTURE

Thank You!

- We know your time is valuable
- We hope that your time has been well spent tonight
- We strongly urge you to continue your involvement

DESIGNING A FUTURE
for Arkansas Wildlife

The Nature Conservancy
SAVING THE LAST GREAT PLACES ON EARTH

The Nature Conservancy
Arkansas Field Office
601 North University Avenue
Little Rock, AR 72205

tel [501] 663.6699
fax [501] 663.8332
nature.org

September 16, 2005

Mr. Scott Henderson, Director
Arkansas Game and Fish Commission
2 Natural Resources Drive
Little Rock, AR 72205

Dear Mr. Henderson:

The Nature Conservancy has dedicated itself to the long-term survival of all viable native species and community types through conservation activities that restore and conserve ecological processes needed to ensure their long-term persistence. To accomplish this vision, TNC staff is charged with identifying the species, communities, and ecological systems that will serve as targets for conservation action in ecoregions of the United States. The CWCS SWG program has provided support to TNC in accomplishing our goal of site conservation planning and in determining conservation data gaps.

Further, CWCS administered through Arkansas Game and Fish Commission has provided a coordinated approach that has pooled the resources of a larger group of conservation partners to fund research and improvements for "species of greatest conservation need."

Thank you to the AGFC for your key efforts in working towards meetings the goals and objectives of the CWCS.

Sincerely,

Kay McQueen
Director of Conservation Programs

United States Department of Agriculture **Forest Service** **Ouachita National Forest** **P.O. Box 1270 Hot Springs, AR 71901**

File Code: 1500
Date: September 15, 2005

Dear Scott Henderson, Arkansas Game and Fish Commission Director

You and your Staff are to be commended for your leadership in developing the Comprehensive Wildlife Conservation Strategy (CWCS). The Arkansas CWCS is a unique tool that represents all wildlife species, not just demand species, and I believe it represents an ideological shift to comprehensive management for ecosystem health.

Native ecological communities across the Southern Region are increasingly threatened by fragmented land ownership and development, disrupted natural disturbance regimes, and non-native invasive species. In response to these threats, conservation agencies and organizations have been devoting considerable resources to developing a consistent framework for conservation plans. These plans include the Ecoregional Conservation Plans of The Nature Conservancy, Physiographic Area Conservation Plans by Partners in Flight, Revised National Forest Land and Resource Management Plans, and Comprehensive Wildlife Conservation Strategies (CWCS) of State agencies.

The Arkansas Game and Fish Commission (AGFC) has demonstrated a high level of commitment to this effort by providing leadership in the CWCS initiative. As a result of partnership efforts, conservation targets, key factors, and measurable ecological indicators, have been developed for habitat relative to over 370 aquatic and terrestrial wildlife species. The AGFC Staff and key partners including the Arkansas Natural Heritage Commission, the Arkansas Chapter of the Nature Conservancy, the Audubon Society, Conservation Southeast, Inc., Natural Resource Conservation Service, USDA Cooperative Extension Service, USDI Fish and Wildlife Service, the Ouachita and Ozark-St. Francis National Forests, as well as many local academic scientific experts throughout the State, have cooperatively developed and populated this database.

The process and database developed through this partnership have spread beyond this original application and are currently being utilized in plan development and revisions in other national forests, as well as by other agencies. The Forest Services appreciates and commends the Arkansas Game and Fish Commission's dedication and commitment to the Comprehensive Wildlife Conservation Strategy. Together, all who have contributed have helped craft a balanced strategic plan appropriate to the times and the challenges in managing lands for the benefit of all.

Sincerely,

/s/ Alan G. Newman
ALAN G. NEWMAN
Forest Supervisor

The Department of
Arkansas Heritage

Mike Huckabee, Governor
Cathie Matthews, Director

Arkansas Arts Council

Arkansas Historic Preservation Program

Delta Cultural Center

Historic Arkansas Museum

Mosaic Templars Cultural Center

Old State House Museum

Arkansas Natural Heritage Commission

1500 Tower Building
323 Center Street
Little Rock, AR 72201
(501) 324-9619
fax: (501) 324-9618
tdd: (501) 324-9811
e-mail: info@arkansasheritage.org
website:
http://naturalheritage.com

An Equal Opportunity Employer

September 19, 2005

Scott Henderson
Arkansas Game and Fish Commission
2 Natural Resources Drive
Little Rock, AR 72205

Dear Mr. Henderson,

The Arkansas Natural Heritage Commission would like to thank you for the opportunity to assist in the development of the Arkansas Comprehensive Wildlife Conservation Strategy. We appreciate the Arkansas Game and Fish Commission for providing the leadership for this extensive, cooperative vision for conserving the wildlife species in greatest need of conservation in Arkansas.

The Arkansas Natural Heritage Commission is committed to providing additional assistance as needed. We look forward to working with you and other partners in the execution of this important strategy.

Sincerely,

Thomas Foti

Tom Foti
Research Chief

Audubon ARKANSAS

Heritage West
201 East Markham Street
Suite 450
Little Rock, AR 72201
Tel: 501-244-2229
Fax: 501-244-2231
www.audubon.org

September 21, 2005

Scott Henderson
Director
Arkansas Game and Fish Commission
#2 Natural Resources Drive
Little Rock, AR 72205

Dear Scott:

I am writing in support of the Comprehensive State Conservation Wildlife Strategy (CSCWS) program as implemented in Arkansas. The Arkansas CSCWS is making possible today a wildlife program that was only a dream two decades ago. With the exception of excellent hunting and fishing programs designed to manage game species, no intentional effort was made to study, to protect, and to manage non-game species, unless those species were listed as endangered or threatened by the U.S. Fish and Wildlife Service. The state conservation tax brought greater equity to wildlife management, but the State Wildlife Grants (SWG) available through the CSCWS has finally brought full equity for all animal species in the state.

Not only is the health of smallmouth populations closely watched, but now stream darters and mussels are accorded status and valued as indicators of aquatic habitat health. Not only are ducks and geese monitored, but raptors and warblers are counted each year with great interest and precision. Indeed, its feels like a new day has arrived in the Natural State.

In closing, I wish to call attention to the exceptional people you have gathered to guide the CSCWS program. John Sunderland, Doyle Shook, Jane Anderson, and David Goad are outstanding and a credit to the Arkansas Game and Fish Commission. I have total confidence in their management and administrative abilities.

I sincerely hope this program survives the budget axe in Washington, D.C. The future health of our nation depends on healthy ecosystems and a balance between the built and natural communities. The CSCWS helps to assure that balance. Thank you for this opportunity to write in support of the CSCWS.

Sincerely yours,

Ken Smith

Kenneth L. Smith
State Director

cc: John Sunderland
Jane Anderson

UofA
UNIVERSITY OF ARKANSAS
DIVISION OF AGRICULTURE
Cooperative Extension Service

September 26, 2005

Scott Henderson, Director
Arkansas Game and Fish Commission
2 Natural Resources Drive
Little Rock, AR 72205

Dear Mr. Henderson:

The University of Arkansas Division of Agriculture Cooperative Extension Service was pleased to partner with Arkansas Game and Fish Commission to fulfill the requirements for public involvement as part of the Arkansas Comprehensive Wildlife Conservation Strategy (CWCS).

Our county Extension agents and specialists were engaged in facilitating the five regional meetings with farmers and private landowners held throughout the state. The input reported from the meetings, the website, and the statewide survey not only contributed to the CWCS plan, but also benefited our natural resource program. In our 2005 strategic plan, one objective was to aid citizens, farmers, and natural resource managers with understanding the complex of natural resource interests and management alternatives. The CWCS provided a perfect venue for addressing that need.

We look forward to continued opportunities to work with your agency in developing an informed constituency regarding our wildlife resources in Arkansas.

Sincerely,

Ivory W. Lyles

Dr. Ivory Lyles
Associate Vice President of Agriculture
Cooperative Extension Service
University of Arkansas

Cc: Milo Shult, Tom Riley, Becky McPeake

Arkansas is our campus

P.O. Box 391
2301 S. University Avenue
Little Rock, Arkansas 72203
501-671-2000

Visit our web site at: http://www.uaex.edu

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Plant Conference Call, June 4, 2003, Ozark NF, Attendees: Mike Brod, Theo Witsell, Scott Simon, discussion on list of species for the Ozark-St. Francis NF.

Plant Meeting, August 25, 2003 in Hot Springs, AR Attendees: Susan Hooks, Mike Brod, and Jeff Holmes, entered final data into the database.

Plant Meeting, August 25, 2003 in Hot Springs, AR Attendees: Susan Hooks, Mike Brod, and Jeff Holmes, entered final data into the database.

Plant Meeting, July 15, 2003 in Hot Springs, AR Attendees: Susan Hooks, Mike Brod, worked on entering species info into database.

Plant Meeting, July 18, 2003 in Hot Springs, AR Attendees: Susan Hooks, Mike Brod, worked on species document as references for the database.

Plant Meeting, July 23, 2003 in Hot Springs, AR Attendees: Susan Hooks, Theo Witsell, reviewed each species and its associated targets.

Plant Meeting, July 8, 2003 in Hot Springs, AR Attendees: Susan Hooks, Scott Simon, Betty Crump, Jeff Holmes, assigned species to targets and revised some key factors.

Plant Meeting, June 17, 2003 in Hector, AR Attendees: Susan Hooks and Mike Brod, reviewed the database and began developing a process for organizing data.

Plant Meeting, June 23, 2003 in Hot Springs, AR Attendees: Susan Hooks, Mike Brod, Jeff Holmes, Betty Crump, Steve Osborne began work on targets, key factors and indicators.

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