



Section 2. Species of Greatest Conservation Need

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Species of Greatest Conservation Need (SGCN)

Identification and Prioritization

The Comprehensive Wildlife Conservation Strategy (CWCS) Species Team (Table 2.1) created a list of species of greatest conservation need for Arkansas. Existing data from agencies and partners was cross-referenced with expert opinion.

Some species were chosen for inclusion on the list because they are rare, some because their populations are in decline or, in some cases, because not enough is known to determine their taxonomic, life history or conservation status.

Problems faced by Arkansas' wildlife are many and varied. They include the advance of exotic plant and animal species as well as the fragmenting and destruction of habitats. The aim of the list is to represent broadly the taxa of Arkansas so that the overall health of ecosystems at a landscape level can be addressed and effectively managed.

Inclusion on the list of Species of Greatest Conservation Need (SGCN) does not confer any special or regulatory status as federal listing as an endangered or threatened species does.

The identification of SGCN is part of a process to identify species and groups of species that will be the focus of programs and projects supported by federal funding under the State Wildlife Grant program. Federally-listed species that occur in Arkansas are included on the list of SGCN and addressed by this strategy. However, such species are eligible for funding by sources other than State Wildlife Grants.

Inclusion on the list of SGCN is flexible. As the CWCS is implemented, the list will be revised annually to reflect new information about the status of species. Such revisions will allow for the continuing prioritization to address the most pressing needs of species and groups of species on this list.

How the SGCN list was created

The CWCS Species Team assembled a list of potential species from the existing lists of rare, declining or imperiled fauna kept by the Arkansas Game and Fish Commission and the Arkansas Natural Heritage Commission. The AGFC list includes Partners In Flight priority bird species. These were combined to produce a draft list of species of greatest conservation need.

The CWCS Species team decided to consider all native amphibians, birds, fish, mammals and reptiles for inclusion on the list. Vegetation is specifically excluded from funding. Of the invertebrates, all native crayfish and mussels were considered for the list. Only representative insects and other invertebrates were considered because the team was concerned that the numbers of these species, many with poorly known conservation status, could overwhelm the list.

All species of wildlife, for example most managed game species (for which we have management plans), were not included. This may be desirable in future iterations of the CWCS.

Standards used by NatureServe (see sidebar below) are used to rank the conservation status of species. NatureServe uses the following factors in assessing conservation status: total number and condition of populations; population size; range

Table 2.1. **CWCS Species Team**

Bill Holimon, Team Leader, Arkansas Natural Heritage Commission (ANHC)
Steve Filipek, Fisheries Biologist, Arkansas Game and Fish Commission (AGFC)
Kelly Irwin, Herpetologist, AGFC
Lane Patterson, GIS, The Nature Conservancy (TNC)
Bill Posey, Malacologist, AGFC
Catherine Rideout, Ornithologist, AGFC
Blake Sasse, Mammalogist, AGFC
Dan Scheiman, Ph. D., Ornithologist, Audubon Arkansas
Brian Wagner, Nongame Aquatic Biologist, AGFC
Michael Warriner, Entomologist, ANHC
Doug Zollner, Ecologist, TNC

What is NatureServe?

Arkansas' species priority scores and list of SGCN were derived from information compiled by NatureServe.

NatureServe is a non-profit conservation organization that provides the scientific information and tools needed to help guide effective conservation action. NatureServe and its network of natural heritage programs are the leading source for information about rare and endangered species and threatened ecosystems.

NatureServe represents an international network of biological inventories—known as natural heritage programs or conservation data centers—operating in all 50 U.S. states, Canada, Latin America and the Caribbean. NatureServe collects and manages detailed local information on plants, animals, and ecosystems, and also develops information products, data management tools, and conservation services to help meet local, national, and global conservation needs. The objective scientific informa-

tion about species and ecosystems developed by NatureServe is used by all sectors of society—conservation groups, government agencies, corporations, academia, and the public—to make informed decisions about managing our natural resources. Key activities include:

- Establishing scientific standards for biological inventory and biodiversity data management.
- Developing comprehensive and current databases on at-risk species and ecological communities.
- Designing advanced biodiversity data management systems in partnership with information technology leaders.
- Making biodiversity information available to the public through their websites, publications, and custom services to clients and partners.
- Providing information products and conservation services to guide natural resource decision-making.

extent and area of occupancy, short- and long-term trends, scope, severity and immediacy of threats, number of protected occurrences, intrinsic vulnerability and environmental specificity.

Criteria for inclusion on the SGCN list

Generally, those species ranked G1, G2 and G3 are included on the draft list:

G1: Critically imperiled on a global scale — at highest risk of extinction due to extreme rarity or steep population declines.

G2: Imperiled — at high risk of extinction due to restricted range, few populations or steep population declines.

G3: Vulnerable — at moderate risk of extinction due to a restricted range, few populations, recent and widespread declines.

Similarly, species with S1, S2 and S3 ranks are included on the draft list.

S1: Critically imperiled in Arkansas — at highest risk of extinction due to extreme rarity or steep population declines.

S2: Imperiled in Arkansas — at high risk of extinction due to restricted range, few populations or steep population declines.

S3: Vulnerable in Arkansas — at moderate risk of extinction due to a restricted range, few populations, recent and widespread declines.

Taxa Association Team contribution and review

The draft planning list was divided into into several faunal associations: birds, mammals, fish, reptiles, amphibians, insects, crayfish, mussels, invertebrates - other and karst species. These lists were provided to teams of academic experts. Taxa Association Teams (Table 2.2) consisted of experts drawn from a coalition of public agencies, private nonprofit organizations and academic institutions. In committees, they contributed to populating the Arkansas CWCS database.

Consulting additional information, Taxa Association Teams further refined the species list. As of October 1, 2005, the Arkansas list of SGCN has 369 species (Appendix 2.1, pages 1684-1691).

Species removed from consideration were those that are extinct or those that are common elsewhere and rare in Arkansas because the state is on the periphery of their range.

Some species were added after the draft planning list was formed. Undescribed species and species with apparently more secure statuses (G4-G5 and S4-S5) were included on the list if their populations are thought to be in decline or if little is known about their conservation status. One species, the Ivory-billed Woodpecker, was added to the list because it was rediscovered in Arkansas after having been presumed extinct for sixty years.

Table 2.2. **Taxa Association Teams**

Bird Taxa Association Team

ANHC	Mr. Bill Holimon
USFS	Mr. Steve Duzan
USFWS	Mr. Allan Mueller
AGFC	Ms. Catherine Rideout
AGFC	Ms. Karen Rowe
Audubon Arkansas	Dr. Dan Scheiman

Mammal Taxa Association Team

AGFC	Mr. Blake Sasse
UALR	Dr. Bob Sikes
UAM	Dr. Don White
UALR	Dr. Gary Heidt
ASU	Mr. J. D. Wilhide
Henderson State U.	Dr. Renn Tumblison
ATU	Dr. Tom Nupp
ASU	Dr. Thomas Risch
USFS	Mr. David Saugey
ASU	Mr. Stephen Brandenbura

Mussel Taxa Association Team

AGFC	Mr. Bill Posey
USFWS-ES	Mr. Chris Davidson
ASU	Dr. Alan Christian
TNC	Mr. Doug Zollner
AHTD/ASU	Dr. John Harris

Crayfish Taxa Association Team

AGFC	Mr. Brian Wagner
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Amphibian and Reptile Taxa Association Team

ASU	Dr. Stan Trauth
AGFC	Mr. Kelly Irwin

Table 2.2. **Taxa Association Teams**, continued.

Fish Taxa Association Team

AGFC	Mr. Steve Filipek
SAU	Dr. Henry Robison
UA/Ft. Smith	Dr. Tom Buchanan
AGFC	Mr. Jeff Quinn
AGFC	Mr. Brian Wagner
AGFC	Mr. Bill Posey
USFS	Ms. Betty Crump
ADEQ	Mr. Jim Wise
USFS	Mr. Alan Clingenpeel

Invertebrate and Insect Taxa Association Team

ANHC	Mr. Michael Warriner
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Karst Species SubTeam

TNC	Mr. Tim Snell
TNC	Mr. Michael Slay
TNC	Mr. Ethan Inlander
AGFC	Mr. Brian Wagner

Developing the Species Priority Score protocol

To best prioritize the efforts directed by the CWCS, Arkansas developed a protocol to evaluate all species on the SGCN list and manage the information in a database. A “Species Priority Score” for SGCN makes it possible to prioritize projects to address the most pressing needs of species and groups of species included in the database.

Calculating the Species Priority Score

G Ranks (Table 2.3) are used to determine the range of vulnerability or security of a species worldwide. Several factors are considered in assessing conservation status: total number and condition of populations; population size; range extent and area of occupancy; short- and long-term trends; scope, severity and immediacy of threats; number of protected occurrences; and intrinsic vulnerability and environmental specificity. (Source: Natureserve 2005). For the CWCS, the global conservation condition of a species is weighted more heavily than is state condition.

In calculating the Species Priority Score, Arkansas assigned a numeric value to the G Rank from 1 to 16 which represents an exponential progression. This emphasizes scores of species that are imperiled across their entire range, and de-emphasize species that are relatively more common but are rare or imperiled only in Arkansas. A higher number represents a more imperiled status. Generally:

G1=16

G2=8

G3=4

G4=2

G5=1

Combination G Ranks, for example, G3G5, that fell between the values assigned were given an average value. Subspecies were treated in the same manner as species. Where a determination needed to be made for a score value, the more conservative one was selected.

Similarly, the S Ranks (Table 2.4) were assigned a numeric value:

S1=5

S2=4

S3=3

S4=2

S5=1

Combination S Ranks, for example, S2S3, that fell between the values assigned were given an average value. Subspecies were treated in the same manner as species. Again, where a determination needed to be made for a score value, the more conservative one was selected.

Table 2.3. Key to G Rank Scores

G Rank	Description	Score Value
G?	Uncertain global ranking	1
G1	Critically imperiled species	16
G1?	Critically imperiled (inexact numeric rank)	16
G1G2	Critically imperiled (uncertain rank)	12
G1G3	Critically imperiled (uncertain rank)	10
G1Q	Critically imperiled (questionable taxonomy)	16
G1T1	Critically imperiled subspecies	16
G2	Imperiled species	8
G2?	Imperiled (inexact numeric rank)	8
G2G3	Imperiled (uncertain rank)	6
G2G4	Imperiled (uncertain rank)	5
G2Q	Imperiled (questionable taxonomy)	8
G3	Vulnerable species	4
G3G4	Vulnerable (uncertain rank)	3
G3G4Q	Vulnerable (uncertain rank, questionable taxonomy)	3
G3G4T1Q	Vulnerable (uncertain rank, critically imperiled subspecies, questionable taxonomy)	16
G3G5	Vulnerable (uncertain rank)	2.5
G3Q	Vulnerable (questionable taxonomy)	4
G3T1T2	Vulnerable (critically imperiled or imperiled subspecies)	12
G4	Apparently secure species	2
G4G5	Apparently secure (uncertain rank)	1.5
G4T1	Apparently secure (critically imperiled subspecies)	16
G4T2Q	Apparently secure (imperiled subspecies, questionable taxonomy)	8
G4T3	Apparently secure (vulnerable subspecies)	4
G4T3Q	Apparently secure (vulnerable subspecies, questionable taxonomy)	4
G4T3T4	Apparently secure (vulnerable or apparently secure subspecies)	3
G4T4	Apparently secure (apparently secure subspecies)	2
G5	Secure	1
G5T?	Secure (inexact number rank for subspecies)	1
G5T1T3	Secure (critically imperiled or imperiled subspecies)	10
G5T2	Secure (imperiled subspecies)	8
G5T4	Secure (apparently secure subspecies)	2
G5T5	Secure (secure subspecies)	1
GH	Possibly extinct	16
GHQ	Historic record of questionable taxonomy	16
GX	Presumed extinct	16

Table 2.4. Key to S Rank Scores

S Rank	Description	Score Value
S?	Unranked-not yet assessed	1
S1	Critically imperiled in Arkansas	5
S1?	Critically imperiled in Arkansas (inexact numeric rank)	5
S1B	Critically imperiled breeding species in Arkansas	5
S1B,S2N	Critically imperiled breeding, imperiled nonbreeding species in Arkansas	5
S1B,S3N	Critically imperiled breeding, vulnerable nonbreeding species in Arkansas	5
S1B,S4N	Critically imperiled breeding, apparently secure nonbreeding species in Arkansas	5
S1B,SZN	Critically imperiled breeding, uncommon or irregular nonbreeding species in Arkansas	5
S1N	Critically imperiled nonbreeding species in Arkansas	5
S1S2	Critically imperiled in Arkansas (uncertain rank)	4.5
S1S3	Critically imperiled in Arkansas (uncertain rank)	4
S2	Imperiled in Arkansas	4
S2?	Imperiled in Arkansas (inexact numeric rank)	4
S2B	Imperiled breeding species in Arkansas	4
S2B,S2N	Imperiled breeding and nonbreeding species in Arkansas	4
S2B,S3N	Imperiled breeding, vulnerable nonbreeding species in Arkansas	4
S2B,S4N	Imperiled breeding, apparently secure nonbreeding species in Arkansas	4
S2S3	Imperiled species in Arkansas (uncertain rank)	3.5
S3	Vulnerable in Arkansas	3
S3?	Vulnerable in Arkansas (inexact numeric rank)	3
S3B	Vulnerable breeding species in Arkansas	3
S3B,S3N	Vulnerable breeding and nonbreeding species in Arkansas	3
S3B,S5N	Vulnerable breeding, secure nonbreeding species in Arkansas	3
S3B,SZN	Vulnerable breeding, uncommon or irregular nonbreeding species in Arkansas	3
S3N	Vulnerable nonbreeding species in Arkansas	3
S3S4	Vulnerable species in Arkansas (uncertain rank)	2.5
S3S4B,SZN	Vulnerable breeding (uncertain rank), uncommon or irregular nonbreeding species in Arkansas	2.5
S3S4N	Vulnerable nonbreeding species in Arkansas (uncertain rank)	2.5
S4	Apparently secure in Arkansas	2
S4B	Apparently secure breeding species in Arkansas	2
S4B,S4N	Apparently secure breeding, apparently secure nonbreeding species in Arkansas	2
S4B,S4S5N	Apparently secure breeding, apparently secure nonbreeding species in Arkansas (uncertain rank)	2
S4B,S5N	Apparently secure breeding, secure nonbreeding species in Arkansas	2
S4N	Apparently secure nonbreeding species in Arkansas	2
S5	Secure in Arkansas	1
S5N	Secure nonbreeding species in Arkansas	1
SA	Of accidental occurrence in Arkansas	1
SE3	Reintroduced species, considered vulnerable in Arkansas	3
SH	Of historic occurrence in Arkansas, possibly extirpated	5
SPB,S2N	Potential breeding species, imperiled nonbreeding species in Arkansas	2
SU	Presumed extirpated in Arkansas	5
SX	Presumed extinct	5

Factoring in Population Trend

After the G score is added to the S score, the resulting raw score is multiplied by 0.75 if the species is increasing or multiplied by 1.25 if the species is declining so that the score will reflect trend data. The raw scores of stable populations or instances where trend data were not available were not manipulated. Population trend was determined by Taxa Association Teams using information derived from literature reviews, expert opinion or recent survey data.

The resulting number is divided by 0.2625 to scale it to a hundred point scale. The final score, the Species Priority Score, is presented on the first page of species reports and in Tables 2.6-2.14. The entire list of SGCN, ranked by Species Priority Score, is provided in Appendix 2.1, pages 1684-1691.

Table 2.5. **Evaluation of Species Priority Scores by taxa association.** At right are averages of Species Priority Scores within each taxa association. A higher score implies the taxa association has a higher degree of conservation need.

Priority Score	Taxa
56	Crayfish
47	Invertebrate - other
41	Mussel
34	Fish
33	Insect
32	Amphibian
25	Mammal
19	Bird
19	Reptile

Revising the SGCN list

The process for adding a species to the list is as follows: Any person or group may petition to have a species listed. This request is first taken to the species' Taxa Association Team for approval or denial.

If approved, the species is added to the SGCN database and information is captured about its conservation status. If the species is rejected by the Taxa Association Team (Table 2.2), the person or group may appeal to the Species team (Table 2.1).

However, the conservation status of a species, and whether it is increasing or in decreasing, will determine the Species Priority Score and the potential to have associated research and conservation actions funded.

SGCN Ranking by Species Priority Score

Table 2.6. **Calculated Species Priority Scores for amphibian species of greatest conservation need.** A higher score implies a greater need for conservation concern and actions.

Priority Score	Common Name	Scientific Name
95	Ozark Hellbender	<i>Cryptobranchus alleganiensis bishopi</i>
50	Kiamichi Slimy Salamander	<i>Plethodon kiamichi</i>
50	Sequoyah Slimy Salamander	<i>Plethodon sequoyah</i>
46	Fourche Mountain Salamander	<i>Plethodon fourchensis</i>
43	Illinois Chorus Frog	<i>Pseudacris illinoensis</i>
42	Caddo Mountain Salamander	<i>Plethodon caddoensis</i>
38	Rich Mountain Salamander	<i>Plethodon ouachitae</i>
27	Oklahoma Salamander	<i>Eurycea tynerenis</i>
27	Louisiana Slimy Salamander	<i>Plethodon kisatchie</i>
27	Southern Crawfish Frog	<i>Rana areolata areolata</i>
23	Spotted Dusky Salamander	<i>Desmognathus conanti</i>
23	Northern Crawfish Frog	<i>Rana areolata circulosa</i>
23	Plains Spadefoot	<i>Spea bombifrons</i>
19	Ringed Salamander	<i>Ambystoma annulatum</i>
19	Grotto Salamander	<i>Eurycea spelaea</i>
19	Great Plains Narrowmouth Toad	<i>Gastrophryne olivacea</i>
19	Strecker's Chorus Frog	<i>Pseudacris streckeri</i>
19	Eastern Spadefoot	<i>Scaphiopus holbrookii</i>
19	Hurter's Spadefoot	<i>Scaphiopus hurterii</i>
15	Mole Salamander	<i>Ambystoma talpoideum</i>
15	Eastern Tiger Salamander	<i>Ambystoma tigrinum tigrinum</i>
15	Dwarf Salamander	<i>Eurycea quadridigitata</i>
15	Four-toed Salamander	<i>Hemidactylum scutatum</i>
15	Bird-voiced Treefrog	<i>Hyla avivoca</i>
15	Wood Frog	<i>Rana sylvatica</i>

Amphibians

Table 2.7. **Calculated Priority Scores for bird species of greatest conservation need.** A higher score implies a greater need for conservation concern and actions.

Priority Score	Common Name	Scientific Name
100	Ivory-billed Woodpecker	<i>Campephilus principalis</i>
38	Red-cockaded Woodpecker	<i>Picoides borealis</i>
34	Interior Least Tern	<i>Sterna antillarum athalassos</i>
33	Bachman's Sparrow	<i>Aimophila aestivalis</i>
33	Henslow's Sparrow	<i>Ammodramus henslowii</i>
33	Migrant Loggerhead Shrike	<i>Lanius ludovicianus migrans</i>
33	King Rail	<i>Rallus elegans</i>
33	Greater Prairie Chicken	<i>Tympanuchus cupido</i>
29	Northern Harrier	<i>Circus cyaneus</i>
29	Willow Flycatcher	<i>Empidonax traillii</i>
24	Piping Plover	<i>Charadrius melodus</i>
24	American Woodcock	<i>Scolopax minor</i>
24	Bewick's Wren	<i>Thryomanes bewickii</i>
23	Rufous-crowned Sparrow	<i>Aimophila ruficeps</i>
23	Sedge Wren	<i>Cistothorus platensis</i>
23	Swallow-tailed Kite	<i>Elanoides forficatus forficatus</i>
23	Common Moorhen	<i>Gallinula chloropus</i>
23	Purple Gallinule	<i>Porphyrio martinica</i>
21	Cerulean Warbler	<i>Dendroica cerulea</i>
20	Trumpeter Swan	<i>Cygnus buccinator</i>
19	Grasshopper Sparrow	<i>Ammodramus savannarum</i>
19	American Black Duck	<i>Anas rubripes</i>
19	Short-eared Owl	<i>Asio flammeus</i>
19	Sanderling	<i>Calidris alba</i>
19	Yellow Warbler	<i>Dendroica petechia</i>
19	Little Blue Heron	<i>Egretta caerulea</i>
19	Least Bittern	<i>Ixobrychus exilis</i>
19	Swainson's Warbler	<i>Limnothlypis swainsonii</i>
19	Black-crowned Night-Heron	<i>Nycticorax nycticorax</i>
19	Eastern Towhee	<i>Pipilo erythrophthalmus</i>
19	Barn Owl	<i>Tyto alba</i>
19	Blue-winged Warbler	<i>Vermivora pinus</i>
19	Bell's Vireo	<i>Vireo bellii</i>
17	Le Conte's Sparrow	<i>Ammodramus leconteii</i>
17	Anhinga	<i>Anhinga anhinga</i>
17	Bald Eagle	<i>Haliaeetus leucocephalus</i>
17	Osprey	<i>Pandion haliaetus</i>
17	Lark Sparrow	<i>Chondestes grammacus</i>
15	Ruffed Grouse	<i>Bonasa umbellus</i>

Table 2.7. Birds, continued.

Priority Score	Common Name	Scientific Name
15	American Bittern	<i>Botaurus lentiginosus</i>
15	Smith's Longspur	<i>Calcarius pictus</i>
15	Yellow-crowned Night-Heron	<i>Nyctanassa violacea</i>
14	Least Sandpiper	<i>Calidris minutilla</i>
14	Chuck-will's-widow	<i>Caprimulgus carolinensis</i>
14	Whip-poor-will	<i>Caprimulgus vociferus</i>
14	Chimney Swift	<i>Chaetura pelagica</i>
14	Yellow-billed Cuckoo	<i>Coccyzus americanus</i>
14	Prairie Warbler	<i>Dendroica discolor</i>
14	Snowy Egret	<i>Egretta thula</i>
14	Rusty Blackbird	<i>Euphagus carolinus</i>
14	Wood Thrush	<i>Hylocichla mustelina</i>
14	Red-headed Woodpecker	<i>Melanerpes erythrocephalus</i>
14	Kentucky Warbler	<i>Oporornis formosus</i>
14	American White Pelican	<i>Pelecanus erythrorhynchos</i>
14	Pied-billed Grebe	<i>Podilymbus podiceps</i>
14	Prothonotary Warbler	<i>Protonotaria citrea</i>
14	Brown-headed Nuthatch	<i>Sitta pusilla</i>
14	Buff-breasted Sandpiper	<i>Tryngites subruficollis</i>
11	Worm-eating Warbler	<i>Helmitheros vermivorus</i>
11	Mississippi Kite	<i>Ictinia mississippiensis</i>
11	Hudsonian Godwit	<i>Limosa haemastica</i>
11	Painted Bunting	<i>Passerina ciris</i>
11	Hooded Warbler	<i>Wilsonia citrina</i>
10	Northern Pintail	<i>Anas acuta</i>
10	Dunlin	<i>Calidris alpina</i>
10	Semipalmated Sandpiper	<i>Calidris pusilla</i>
10	Northern Bobwhite	<i>Colinus virginianus</i>
10	Black-bellied Plover	<i>Pluvialis squatarola</i>
9	Wood Stork	<i>Mycteria americana</i>
8	Upland Sandpiper	<i>Bartramia longicauda</i>
8	Stilt Sandpiper	<i>Calidris himantopus</i>
8	Western Sandpiper	<i>Calidris mauri</i>
8	Short-billed Dowitcher	<i>Limnodromus griseus</i>
8	Wilson's Phalarope	<i>Phalaropus tricolor</i>
8	American Avocet	<i>Recurvirostra americana</i>
8	Lesser Yellowlegs	<i>Tringa flavipes</i>
8	Greater Yellowlegs	<i>Tringa melanoleuca</i>
8	Solitary Sandpiper	<i>Tringa solitaria</i>

Table 2.8. **Calculated Priority Scores for crayfish species of greatest conservation need.** A higher score implies a greater need for conservation concern and actions.

Priority Score	Common Name	Scientific Name
100	crayfish	<i>Procambarus ferrugineus</i>
80	crayfish	<i>Bouchardina robisoni</i>
80	crayfish	<i>Cambarus aculabrum</i>
80	crayfish	<i>Cambarus causeyi</i>
80	Hell Creek Crayfish	<i>Cambarus zophonastes</i>
80	crayfish	<i>Fallicambarus gilpini</i>
80	crayfish	<i>Fallicambarus harpi</i>
80	crayfish	<i>Fallicambarus petilicarpus</i>
80	crayfish	<i>Procambarus reimeri</i>
65	crayfish	<i>Fallicambarus strawni</i>
50	crayfish	<i>Faxonella blairi</i>
50	Coldwater Crayfish	<i>Orconectes eupunctus</i>
50	William's Crayfish	<i>Orconectes williamsi</i>
46	crayfish	<i>Fallicambarus jeanae</i>
46	Mammoth Spring Crayfish	<i>Orconectes marchandi</i>
36	crayfish	<i>Procambarus regalis</i>
34	crayfish	<i>Orconectes meeki brevis</i>
34	Ringed Crayfish	<i>Orconectes neglectus chaenodactylus</i>
30	crayfish	<i>Orconectes nana</i>
30	crayfish	<i>Procambarus tenuis</i>
27	Bristly Cave Crayfish	<i>Cambarus setosus</i>
27	crayfish	<i>Orconectes menae</i>
23	Neosho Midget Crayfish	<i>Orconectes macrus</i>
23	crayfish	<i>Procambarus parasimulans</i>

Table 2.9. **Calculated Priority Scores for fish species of greatest conservation need.** A higher score implies a greater need for conservation concern and actions.

Priority Score	Common Name	Scientific Name
100	Yellowcheek Darter	<i>Etheostoma moorei</i>
80	Caddo Madtom	<i>Noturus taylori</i>
80	Leopard Darter	<i>Percina pantherina</i>
80	Pallid Sturgeon	<i>Scaphirhynchus albus</i>
50	Arkansas River Shiner	<i>Notropis girardi</i>
46	Paleback Darter	<i>Etheostoma pallidorsum</i>
46	Ouachita Madtom	<i>Noturus lachneri</i>
43	Arkansas Darter	<i>Etheostoma cragini</i>
40	Alabama Shad	<i>Alosa alabamae</i>
38	Western Sand Darter	<i>Ammocrypta clara</i>
38	Crystal Darter	<i>Crystallaria asprella</i>
38	Kiamichi Shiner	<i>Notropis ortenburgeri</i>
38	Ozark Shiner	<i>Notropis ozarcanus</i>
38	Peppered Shiner	<i>Notropis perpallidus</i>
34	Ozark Cavefish	<i>Amblyopsis rosae</i>
34	Ouachita Darter	<i>Percina sp nov</i>
33	Alligator Gar	<i>Atractosteus spatula</i>
33	Strawberry River Darter	<i>Etheostoma fragi</i>
33	Bluehead Shiner	<i>Pteronotropis hubbsi</i>
30	Lake Sturgeon	<i>Acipenser fulvescens</i>
30	Longnose Darter	<i>Percina nasuta</i>
29	Least Darter	<i>Etheostoma microperca</i>
29	Silver Redhorse	<i>Moxostoma anisurum</i>
29	Paddlefish	<i>Polyodon spathula</i>
27	Blue Sucker	<i>Cycleptus elongatus</i>

Table 2.9. Fish, continued.

Priority Score	Common Name	Scientific Name
27	Red River Shiner	<i>Notropis bairdi</i>
27	Brown Madtom	<i>Noturus phaeus</i>
27	Stargazing Darter	<i>Percina uranidea</i>
27	Southern Cavefish	<i>Typhlichthys subterraneus</i>
23	Bluntnose Shiner	<i>Cyprinella camura</i>
23	Spotfin Shiner	<i>Cyprinella spiloptera</i>
23	American Brook Lamprey	<i>Lampetra appendix</i>
23	Redspot Chub	<i>Nocomis asper</i>
23	Sabine Shiner	<i>Notropis sabiniae</i>
23	Suckermouth Minnow	<i>Phenacobius mirabilis</i>
23	Flathead Chub	<i>Platygobio gracilis</i>
21	Ozark Chub	<i>Erimystax harrisi</i>
21	Goldstripe Darter	<i>Etheostoma parvipinne</i>
19	Lake Chubsucker	<i>Erimyzon sucetta</i>
19	Swamp Darter	<i>Etheostoma fusiforme</i>
19	Goldeye	<i>Hiodon alosoides</i>
19	Least Brook Lamprey	<i>Lampetra aepyptera</i>
19	Ouachita Shiner	<i>Lythrurus snelsoni</i>
19	Sturgeon Chub	<i>Macrhybopsis gelida</i>
19	Sicklefin Chub	<i>Macrhybopsis meeki</i>
19	Shorthead Redhorse	<i>Moxostoma macrolepidotum</i>
19	Blackspot Shiner	<i>Notropis atrocaudalis</i>
19	Slenderhead Darter	<i>Percina phoxocephala</i>
15	Taillight Shiner	<i>Notropis maculatus</i>
11	Current Darter	<i>Etheostoma uniporum</i>

Table 2.10. **Calculated Priority Scores for insect species of greatest conservation need.** A higher score implies a greater need for conservation concern and actions.

Priority Score	Common Name	Scientific Name
80	Bowed Snowfly	<i>Allocapnia oribata</i>
80	winter stonefly	<i>Allocapnia warreni</i>
80	Magazine Mountain mold beetle	<i>Arianops sandersoni</i>
80	Sulphur Springs Hydroporus Diving Beetle	<i>Hydroporus sulphurius</i>
80	Magazine stripetail	<i>Isoperla szczytkoi</i>
80	Nearctic paduniellan caddisfly	<i>Paduniella nearctica</i>
80	ground beetle	<i>Rhadine ozarkensis</i>
80	beetle	<i>Rimulicola divalis</i>
65	Texas Frosted Elfin	<i>Callophrys irus hadros</i>
65	mayfly	<i>Paraleptophlebia calcarica</i>
50	winter stonefly	<i>Allocapnia jeanae</i>
50	winter stonefly	<i>Allocapnia ozarkana</i>
50	Caddo Sallfly	<i>Alloperla caddo</i>
50	stonefly	<i>Leuctra paleo</i>
42	American Burying Beetle	<i>Nicrophorus americanus</i>
38	Linda's Roadside Skipper	<i>Amblyscirtes linda</i>
38	noctuid moth	<i>Schinia indiana</i>
34	Swamp Metalmark	<i>Calephelis muticum</i>
32	Duke's Skipper	<i>Euphyes dukesi</i>
32	Prairie Mole Cricket	<i>Gryllotalpa major</i>
32	Ozark Snaketail Dragonfly	<i>Ophiogomphus westfalli</i>
30	mayfly	<i>Dannella provonshai</i>
30	Byssus Skipper	<i>Problema byssus</i>
30	King's Hairstreak	<i>Satyrium kingi</i>
29	Meske's Skipper	<i>Hesperia meskei</i>
27	Lace-winged Roadside Skipper	<i>Amblyscirtes aesculapius</i>
27	Carolina Roadside Skipper	<i>Amblyscirtes carolina</i>
27	Ozark Clubtail Dragonfly	<i>Gomphus ozarkensis</i>
27	Georgia Satyr	<i>Neonympha areolata areolata</i>
25	Giant Stag Beetle	<i>Lucanus elephus</i>
25	Diana	<i>Speyeria diana</i>
23	lace bug	<i>Acalypta susanae</i>
23	Copeland's Mold Beetle	<i>Arianops copelandi</i>

Table 2.10. Insects, continued.

Priority Score	Common Name	Scientific Name
23	Woodland Tiger Beetle	<i>Cicindela unipunctata</i>
23	microcaddisfly	<i>Ochrotrichia robisoni</i>
23	microcaddisfly	<i>Paucicalcaria ozarkensis</i>
23	Ouachita Shore Bug	<i>Pentacora ouachita</i>
23	Yehl Skipper	<i>Poanes yehl</i>
23	Ouachita Pseudactium	<i>Pseudactium magazinensis</i>
23	Ozark Pseudactium	<i>Pseudactium ursum</i>
23	ground beetle	<i>Scaphinotus inflectus</i>
23	ground beetle	<i>Scaphinotus parisiana</i>
23	anthophorid bee	<i>Tetraloniella albata</i>
21	tiger beetle	<i>Cicindela lepida</i>
21	Scrubland Tiger Beetle	<i>Cicindela obsoleta</i>
21	red milkweed beetle	<i>Tetraopes quinquemaculatus</i>
21	Texas milkweed beetle	<i>Tetraopes texanus</i>
19	lace bug	<i>Acalypta lillianus</i>
19	noctuid moth	<i>Catocala lincolnana</i>
19	Six-banded Longhorn Beetle	<i>Dryobius sexnotatus</i>
19	predaceous diving beetle	<i>Heterosternuta phoebeae</i>
19	Ouachita Diving Beetle	<i>Hydroporus ouachitus</i>
19	Small-eyed Mold Beetle	<i>Ouachitychus parvovulus</i>
17	Ant-like Tiger Beetle	<i>Cicindela cursitans</i>
17	Big Sand tiger beetle	<i>Cicindela formosa pigmentosignata</i>
17	Beach-dune Tiger Beetle	<i>Cicindela hirticollis</i>
17	Sandy Stream Tiger Beetle	<i>Cicindela macra</i>
15	Cow Path Tiger Beetle	<i>Cicindela purpurea</i>
15	robberfly	<i>Microstylum morosum</i>
13	Twelve-spotted Tiger Beetle	<i>Cicindela duodecimguttata</i>
11	winter stonefly	<i>Allocapnia malverna</i>
8	Arkansas agapetus caddisfly	<i>Agapetus medicus</i>
8	contorted ochrotrichian microcaddisfly	<i>Ochrotrichia contorta</i>

Table 2.11. **Calculated Priority Scores for invertebrate species of greatest conservation need.** A higher score implies a greater need for conservation concern and actions.

Priority Score	Common Name	Scientific Name
80	Magazine Mountain Shagreen	<i>Inflectarius magazinensis</i>
80	isopod	<i>Lirceus bidentatus</i>
80	Striate Supercoil	<i>Paravitrea aulacogyra</i>
80	Ozark Pyrg	<i>Pyrgulopsis ozarkensis</i>
80	Ouachita Pebblesnail	<i>Somatogyrus amnicoloides</i>
80	Thicklipped Pebblesnail	<i>Somatogyrus crassilabris</i>
80	Channelled Pebblesnail	<i>Somatogyrus wheeleri</i>
65	Foushee Cavesnail	<i>Amnicola cora</i>
65	cave obligate pseudoscorpion	<i>Apochthonius diabolus</i>
65	cave obligate pseudoscorpion	<i>Apochthonius titanicus</i>
65	cave obligate harvestman	<i>Crosbyella distincta</i>
65	cave obligate harvestman	<i>Crosbyella roeweri</i>
65	Calico Rock Oval	<i>Patera clenchi</i>
65	cave obligate springtail	<i>Schaefferia alabamensis</i>
65	Mountain Cave Amphipod	<i>Stygobromus montanus</i>
65	cave obligate millipede	<i>Trigenotyia parca</i>
65	Arkansas Wedge	<i>Xolotrema occidentale</i>
57	bat cave isopod	<i>Caecidotea macropropoda</i>
50	springtail	<i>Pseudosinella dubia</i>
50	Elevated Spring Amphipod	<i>Stygobromus elatus</i>
50	Ouachita Needlefly	<i>Zealeuctra wachita</i>
46	Rich Mountain Slitmouth	<i>Stenotrema pilsbryi</i>
42	Hubricht's Long-tailed Amphipod	<i>Allocrangonyx hubrichti</i>
42	amphipod	<i>Bactrurus pseudomucronatus</i>
42	isopod	<i>Caecidotea dimorpha</i>
42	isopod	<i>Caecidotea oculata</i>
42	cave obligate isopod	<i>Caecidotea simulator</i>
42	cave obligate planarian	<i>Dendrocoelopsis americana</i>
42	Shelled Cave Springtail	<i>Pseudosinella testa</i>
34	White Liptooth	<i>Millerelix peregrina</i>
34	Ouachita Slitmouth	<i>Stenotrema unciferum</i>
30	isopod	<i>Caecidotea ancyla</i>
30	isopod	<i>Caecidotea steevesi</i>
30	isopod	<i>Caecidotea stiladactyla</i>
27	land snail	<i>Gastrocopta rogersensis</i>
27	isopod	<i>Lirceus bicuspidatus</i>
27	Ozark Cave Amphipod	<i>Stygobromus ozarkensis</i>
25	springtail	<i>Arrhopalites clarus</i>
23	millipede	<i>Abacion wilhelminae</i>
23	isopod	<i>Caecidotea fonticulus</i>
23	pseudoscorpion	<i>Microcreagris ozarkensis</i>
23	pseudoscorpion	<i>Pseudozaona occidentalis</i>
17	earthworm	<i>Diplocardia meansi</i>
8	isopod	<i>Caecidotea salamensis</i>

Table 2.12. Calculated Priority Scores of mammal species of greatest conservation need. A higher score implies a greater need for conservation concern and actions.

Priority Score	Common Name	Scientific Name
80	Ozark Big-eared Bat	<i>Corynorhinus townsendii ingens</i>
46	Indiana Bat	<i>Myotis sodalis</i>
42	Ozark Pocket Gopher	<i>Geomys bursarius ozarkensis</i>
34	Eastern Small-Footed Bat	<i>Myotis leibii</i>
33	Rafinesque's Big-Eared Bat	<i>Corynorhinus rafinesquii</i>
33	Southeastern Bat	<i>Myotis austroriparius</i>
23	Seminole Bat	<i>Lasiurus seminolus</i>
23	Gray Bat	<i>Myotis grisescens</i>
23	Desert Shrew	<i>Notiosorex crawfordi</i>
23	Eastern Harvest Mouse	<i>Reithrodontomys humulis</i>
23	Plains Harvest Mouse	<i>Reithrodontomys montanus</i>
19	Long-tailed Weasel	<i>Mustela frenata</i>
19	Southeastern Shrew	<i>Sorex longirostris</i>
17	Southern Bog Lemming	<i>Synaptomys cooperi</i>
15	Black-tailed Jackrabbit	<i>Lepus californicus</i>
13	Western Harvest Mouse	<i>Reithrodontomys megalotis</i>
11	Eastern Spotted Skunk	<i>Spilogale putorius</i>
6	American Badger	<i>Taxidea taxus</i>
6	American Black Bear	<i>Ursus americanus americanus</i>

Table 2.13. **Calculated Priority Scores for mussel species of greatest conservation need.** A higher score implies a greater need for conservation concern and actions.

Priority Score	Common Name	Scientific Name
100	Curtis Pearlymussel	<i>Epioblasma florentina curtisi</i>
100	Turgid Blossom	<i>Epioblasma turgidula</i>
100	Scaleshell	<i>Leptodea leptodon</i>
80	Ouachita Rock Pocketbook	<i>Arkansia wheeleri</i>
80	Speckled Pocketbook	<i>Lampsilis streckeri</i>
80	Louisiana Pearlshell	<i>Margaritifera hembeli</i>
80	Fat Pocketbook	<i>Potamilus capax</i>
80	Winged Mapleleaf	<i>Quadrula fragosa</i>
76	Arkansas Fatmucket	<i>Lampsilis powellii</i>
62	Neosho Mucket	<i>Lampsilis rafinesqueana</i>
61	Southern Hickorynut	<i>Obovaria jacksoniana</i>
57	Western Fanshell	<i>Cyprogenia aberti</i>
57	Purple Lilliput	<i>Toxolasma lividus</i>
57	Ouachita Creekshell	<i>Villosa arkansasensis</i>
52	Spectaclecase	<i>Cumberlandia monodonta</i>
46	Pink Mucket	<i>Lampsilis abrupta</i>
46	Pyramid Pigtoe	<i>Pleurobema rubrum</i>
43	Snuffbox	<i>Epioblasma triquetra</i>
38	Rabbitsfoot	<i>Quadrula cylindrica</i>
34	Ohio Pigtoe	<i>Pleurobema cordatum</i>
34	Salamander Mussel	<i>Simpsonaias ambigua</i>
31	Slippershell Mussel	<i>Alasmidonta viridis</i>
30	Ellipse	<i>Venustaconcha ellipsiformis</i>
27	Ozark Pigtoe	<i>Fusconaia ozarkensis</i>
27	Arkansas Brokenray	<i>Lampsilis reeveiana</i>
27	Round Hickorynut	<i>Obovaria subrotunda</i>
24	Louisiana Fatmucket	<i>Lampsilis hydiana</i>

Mussels

Table 2.13. Mussels, continued.

Priority Score	Common Name	Scientific Name
23	Southern Pocketbook	<i>Lampsilis ornata</i>
23	Pink Heelsplitter	<i>Potamilus alatus</i>
23	Ouachita Kidneyshell	<i>Ptychobranthus occidentalis</i>
23	Pondhorn	<i>Unio merus tetralasmus</i>
23	Bleedingtooth Mussel	<i>Venustaconcha pleasii</i>
19	Elktoe	<i>Alasmidonta marginata</i>
19	Rock Pocketbook	<i>Arcidens confragosus</i>
19	Butterfly	<i>Ellipsaria lineolata</i>
19	Black Sandshell	<i>Ligumia recta</i>
19	Hickorynut	<i>Obovaria olivaria</i>
19	Southern Mapleleaf	<i>Quadrula apiculata</i>
19	Texas Lilliput	<i>Toxolasma texasensis</i>
19	Tapered Pondhorn	<i>Unio merus declivis</i>
17	Rainbow	<i>Villosa iris</i>
15	Flat Floater	<i>Anodonta suborbiculata</i>
15	Purple Wartyback	<i>Cyclonaias tuberculata</i>
15	Fatmucket	<i>Lampsilis siliquoidea</i>
15	Flutedshell	<i>Lasmigona costata</i>
15	Creeper	<i>Strophitus undulatus</i>
15	Fawnsfoot	<i>Truncilla donaciformis</i>
15	Little Spectaclecase	<i>Villosa lienosa</i>
10	Round Pearlshell	<i>Glebula rotundata</i>
8	Undescribed <i>Lampsilis</i> species A	<i>Lampsilis sp_A</i>
8	Undescribed <i>Lampsilis</i> species B	<i>Lampsilis sp_B</i>
8	Gulf mapleleaf	<i>Quadrula nobilis</i>

Table 2.14. **Calculated Species Priority Scores for reptile species of greatest conservation need.** A higher score implies a greater need for conservation concern and actions.

Priority Score	Common Name	Scientific Name
24	Queen Snake	<i>Regina septemvittata</i>
23	Great Plains Skink	<i>Eumeces obsoletus</i>
23	Ground Snake	<i>Sonora semiannulata</i>
21	Texas Horned Lizard	<i>Phrynosoma cornutum</i>
19	Midwest Worm Snake	<i>Carphophis amoenus helenae</i>
19	Western Diamondback Rattlesnake	<i>Crotalus atrox</i>
19	Collared Lizard	<i>Crotaphytus collaris</i>
19	Southern Prairie Skink	<i>Eumeces obtusirostris</i>
19	Texas Coral Snake	<i>Micrurus tenere tenere</i>
19	Graham's Crayfish Snake	<i>Regina grahamii</i>
19	Ornate Box Turtle	<i>Terrapene ornata ornata</i>
15	Western Chicken Turtle	<i>Deirochelys reticularia miaria</i>
15	Western Slender Glass Lizard	<i>Ophisaurus attenuatus attenuatus</i>
15	Gulf Crayfish Snake	<i>Regina rigida sinicola</i>

Distribution of Terrestrial Species*

The first spatial scale - element occurrence

The first spatial scale for terrestrial habitats is depicted by maps of element occurrence (defined in sidebar below) generated by The Nature Conservancy (TNC) from data kept by the Arkansas Natural Heritage Commission (ANHC). ANHC provided site-specific records of occurrence for species in Arkansas. Using a nationally standardized methodology, this database is populated by a variety of sources. Information is gathered from museums, scientific publications, research studies and field surveys. Information is also obtained from other governmental agencies such as the Arkansas Game and Fish Commission (AGFC), U.S. Forest Service (USFS) and U.S. Army Corps of Engineers. Element Occurrence maps are not generated for species that ANHC does not track or for most migratory species.

If data are available, the map is presented on the first page of a Species Report in the “Distribution” section. Species Reports are located on pages 45-1082.

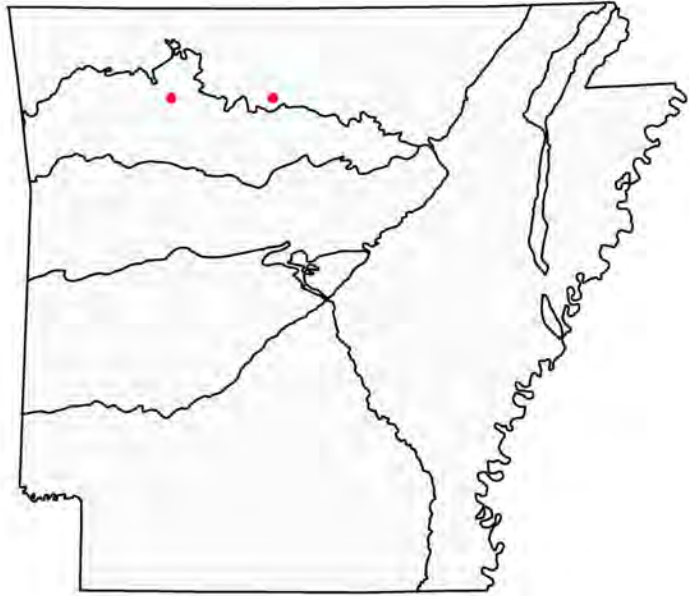
The lines within the state outline depict seven ecoregions (Figure 2.1) (Woods and others 2004). Ecoregions are addressed in Section 3, pages 1083-1187.

What is an Element Occurrence?

An **Element Occurrence (EO)** is an area of land and/or water in which a species or natural community is, or was, present. An EO should have practical conservation value for the Element as evidenced by potential continued (or historical) presence and/or regular recurrence at a given location. **For Species Elements**, the EO often corresponds with the local population, but when appropriate may be a portion of a population (*e.g.*, long distance dispersers) or a group of nearby populations (*e.g.*, metapopulation). Source: Arkansas Natural Heritage Commission (www.ArkansasHeritage.org)

*This section (and the ones following it) provides explanations of the origin and appearance of material presented in the Species Reports, pages 45-1082.

Figure 2.1. Example of **element occurrence map**. Red dots on a map refer to a known occurrence of a species using records kept by the Arkansas Natural Heritage Commission. The lines within the state outline are seven Level III ecoregions (Woods and others 2004).



The second spatial scale - ecoregions

For the second spatial scale, Taxa Association Teams noted the presence or absence of each species in one or more ecoregions. Taxa Association Teams, using the best available data and professional judgement, chose to use the ecoregion delineations proposed by Woods and others (2004) (Figure 2.1). Some discrepancies may occur between the distribution information provided by element occurrence maps and the information provided here because Taxa Association Teams consulted different sets of distribution data.

Terrestrial species were assigned to one or more of these ecoregions: Ozark Highlands, Boston Mountains, Arkansas Valley, Ouachita Mountains, Mississippi Valley Loess Plains, Mississippi Alluvial Plain and South Central Plains. These correspond to level III ecoregions. They were selected for use because they are recognized by state and federal governmental agencies, academic institutions and private organizations in Arkansas and are consistent with habitat classification systems in adjacent states.

Ecoregions have general similarity to ecosystems in the type, quality, and quantity of environmental resources. These characteristics include geology, physiography, climate, soils, land use, wildlife, fish, hydrology and vegetation.

Roman numerals indicate 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 (Commission for Environmental Cooperation Working Group, 1997). At Level III, the continental United States contains 104 ecoregions and the conterminous United States has 84 ecoregions (U.S. Environmental Protection Agency [USEPA], 2003). Level IV ecoregions are further subdivisions of level III ecoregions. Explanations of the methods used to define the USEPA's ecoregions are given in Omernik (1995), Omernik and others (2000), and Gallant and others (1989). Source: www.epa.gov/wed/pages/ecoregions.htm

Ecoregions where the species occurs:

Figure 2.2. Example of **ecoregion checkoff** for species. The ecoregion checkoff is presented for each SGCN on the first page of each Species Report (pages 45-1082). This may differ somewhat from the map of element occurrences because the source of the information used came from Taxa Association Teams.

Ozark Highlands	<input type="checkbox"/>
Boston Mountains	<input type="checkbox"/>
Arkansas Valley	<input type="checkbox"/>
Ouachita Mountains	<input type="checkbox"/>
Mississippi Valley Loess Plains	<input type="checkbox"/>
Mississippi Alluvial Plain	<input type="checkbox"/>
South Central Plains	<input checked="" type="checkbox"/>



Figure 2.3. **Locations and delineations of ecoregions used by the CWCS.** The lines within the state are seven Level III ecoregions (Woods and others 2004). Discussion of ecoregions is in Section 3.

The third spatial scale - terrestrial habitat tables

The third spatial scale addresses the distribution of SGCN by associating each terrestrial species with one of more of 45 habitat types that occur in the state. Thirty-eight habitat types (Table 2.15) are described by NatureServe National Vegetation Classification System: Ecological Communities and Systems (2005). An additional seven habitat classifications were included for habitat types used by SGCN in Arkansas that had not been previously described.

Arkansas chose to use this classification system because it is a standardized, systematic list of habitats from a third party and because it is being used by other states and agencies, specifically the U.S. Forest Service, whose planning database the AGFC built as part of a data-sharing effort. Habitat types are described on pages 1188-1575

After determining which habitats the species may occur in, the Taxa Association Team weighted the value of the habitat to the species in question. The values are obligate, optimal, suitable or marginal.

In the case where habitat use and importance was unknown but predicted, “data gap” was assigned.

Figure 2.4. Example of **terrestrial habitats** as presented in Species Reports.

Habitats	Weight
West Gulf Coastal Plain Pine-Hardwood Forest	Marginal
South-Central Interior Large Floodplain	Optimal
West Gulf Coastal Plain Small Stream/River Forest	Suitable
West Gulf Coastal Plain Wet Hardwood Flatwoods	Suitable
Lower Mississippi River Bottomland Depression	Optimal
Lower Mississippi River Dune Woodland and Forest	Marginal
West Gulf Coastal Plain Seepage Swamp and Baygall	Optimal
Lower Mississippi River Riparian Forest	Optimal
Lower Mississippi River Low Bottomland Forest	Optimal
Lower Mississippi River High Bottomland Forest	Optimal
West Gulf Coastal Plain Large River Floodplain Forest	Optimal
West Gulf Coastal Plain Red River Floodplain Forest	Optimal

Table 2.15. **CWCS Habitats** described by NatureServe

Arkansas Valley Prairie and Woodland
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
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
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
South-Central Interior Large Floodplain
Southeastern Great Plains Tallgrass Prairie
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

Additional habitats added for CWCS

Caves, mines and karst
Crop Land
Cultivated Forest
Mudflats
Pastureland
Ponds, Lakes and Waterholes
Urban/Suburban

The third spatial scale - terrestrial habitat maps

In addition to the terrestrial habitat tables, the third spatial scale is also depicted by “potential habitat maps” that were generated by TNC based on descriptors provided by the habitat teams. The information provides some descriptions of potential locations of key habitats and community types essential to conservation of SGCN. These maps use GAP Vegetation Map in combination with ancillary layers (polygons from Level III Omernik Ecoregions, STATSGO soils, 1:500,000 Arkansas Geology, Saucier Geomorphology).

“Potential habitat maps” show each habitat associated with the species in question, color-coded by importance (or weight) (Figure 2.5). Because many habitat definitions spanned multiple ecoregions while the known species occurrence did not, the habitats are only mapped within ecoregions in which the species is known to occur.

Of the 45 habitat types that SGCN were assigned to, 20 were mapped. Some unmapped habitats had insufficient data, while others were lumped with similar habitats because the differences are not distinguished by GAP. In addition, the Ozark Highlands, Boston Mountains, Arkansas Valley and Ouachita Mountains were combined as the Interior Highlands ecoregion. For additional information about this process, refer to Appendix 2.2, pages 1692-1697. Arkansas continues to refine the use of GAP data to predict and define habitats and is considering a Phase II mapping effort to more accurately predict potential habitat occurrence.

If data are available (Table 2.16), the map is presented on the second page of Species Reports in the “Habitats” section.

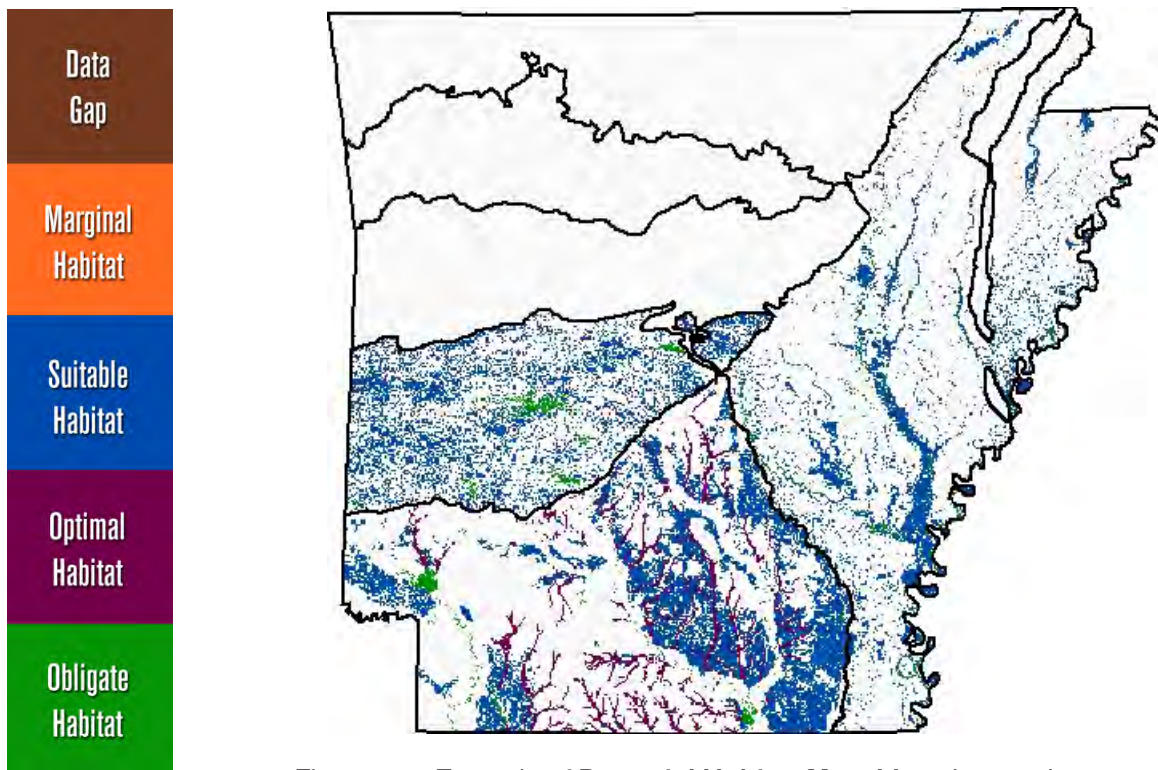


Figure 2.5. Example of **Potential Habitat Map**. Map shows where habitats, weighted by importance to each species, may occur.

Table 2.16. Habitat types mapped in “Potential Habitat Maps”

Central Interior Highlands Calcareous Glade and Barrens
Central 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
Mississippi River Alluvial Plain Loess Slope Forest
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
South-Central Interior Large Floodplain
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 Pine-Hardwood Forest
West Gulf Coastal Plain Red River Floodplain Forest
West Gulf Coastal Plain Sandhill Oak and Shortleaf Pine Forest and Woodland
West Gulf Coastal Plain Small Stream/River Forest

Table 2.17. Habitat types not mapped in “Potential Habitat Maps”

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
Crop Land
Cultivated Forest
Ouachita Montane Oak Forest
Ouachita Mountain Forested Seep
Ouachita Novaculite Glade and Woodland
Pasture Land
Ponds, Lakes, and Water Holes
Southeastern Great Plains Tallgrass Prairie
Urban/Suburban
West Gulf Coastal Plain Mesic Hardwood Forest
West Gulf Coastal Plain Nepheline Syenite Glade
West Gulf Coastal Plain Saline Glade
West Gulf Coastal Plain Seepage Swamp and Baygall
West Gulf Coastal Plain Wet Hardwood Flatwoods

Distribution of Aquatic Species

The first spatial scale - element occurrence

The first spatial scale is depicted by maps of element occurrence (defined on page 24) generated by The Nature Conservancy (TNC) from data kept by the Arkansas Natural Heritage Commission (ANHC). ANHC provided site-specific records of occurrence for species in Arkansas. Using a nationally-standardized methodology this database is populated by a variety of sources. Information is gathered from museums, scientific publications, research studies and field surveys. Information is also obtained from other governmental agencies such as the Arkansas Game and Fish Commission (AGFC), U.S. Forest Service (USFS), Arkansas Department of Environmental Quality (ADEQ) and U.S. Army Corps of Engineers. Element occurrence maps are not generated for species that the ANHC does not track nor for most migratory species.

If data are available, the map is presented on the first page of Species Reports in the Distribution section. Species Reports are located on pages 45-1082.

The lines within the state outline are seven Level III ecoregions (Woods and others 2004).

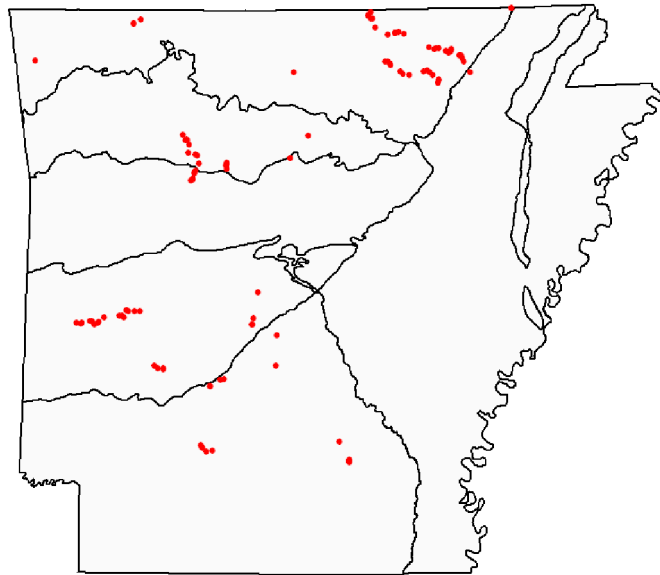


Figure 2.6. Example of **element occurrence map (aquatic)**. Red dots on a map refer to a known occurrence of a species in aquatic habitats. The lines within the state outline depict ecoregions, a version of the seven terrestrial ecoregions that are further subdivided by six major rivers to form 18 ecoregions (Filipek and others 2004).

The second spatial scale - ecoregions

For the second spatial scale, Taxa Association Teams noted the presence or absence of each species in one or more ecoregions. Taxa Association Teams, using the best available data and professional judgement, chose to use the ecoregion delineations proposed by Woods and others (2004) (Figure 2.7). Some discrepancies may occur between the distribution information provided by element occurrence maps and the information provided here because Taxa Association Teams consulted different sets of distribution data.

Aquatic species were assigned to one or more of these ecoregions: Ozark Highlands, Boston Mountains, Arkansas Valley, Ouachita Mountains, Mississippi Valley Loess Plains, Mississippi Alluvial Plain and South Central Plains. These correspond to level III ecoregions and were selected for use because they are recognized by state and federal governmental agencies, academic institutions and private organizations in Arkansas and are consistent with habitat classification systems in adjacent states.

Ecoregions have general similarity to ecosystems in the type, quality, and quantity of environmental resources. These characteristics include geology, physiography, climate, soils, land use, wildlife, fish, hydrology and vegetation.

Roman numerals indicate 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 (Commission for Environmental Cooperation Working Group, 1997). At Level III, the continental United States contains 104 ecoregions and the conterminous United States has 84 ecoregions (U.S. Environmental Protection Agency [USEPA], 2003). Level IV ecoregions are further subdivisions of level III ecoregions. Explanations of the methods used to define the USEPA's ecoregions are given in Omernik (1995), Omernik and others (2000), and Gallant and others (1989). Source: www.epa.gov/wed/pages/ecoregions.htm

Figure 2.7. Example of **Ecoregion occurrence checkoff** for all SGCN. The ecoregion checkoff is presented for each SGCN on the first page of each Species Report.

Ecoregions where the species occurs:

Ozark Highlands	<input type="checkbox"/>
Boston Mountains	<input type="checkbox"/>
Arkansas Valley	<input type="checkbox"/>
Ouachita Mountains	<input type="checkbox"/>
Mississippi Valley Loess Plains	<input type="checkbox"/>
Mississippi Alluvial Plain	<input type="checkbox"/>
South Central Plains	<input checked="" type="checkbox"/>

The third spatial scale - ecobasins

For the third spatial scale, Taxa Association Teams noted the presence or absence of each aquatic and aquatic/terrestrial species in one or more ecobasins. As used here, 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. Ecobasins are described and evaluated in Section 5, pages 1576-1612.

This information is presented in tabular form (Figure 2.8) and depicted by ecobasin maps (Figure 2.9), both on the second page of the Species Reports.

Ecobasins

South Central Plains - Ouachita River

South Central Plains - Red River

Ozark Highlands - White River

Mississippi River Embayment - White River

Mississippi River Embayment - St. Francis River

Figure 2.8. Example of **ecobasin table**. Taxa Association Teams determined whether a SGCN occurred in an ecobasin. This information was presented as a table and also mapped (Figure 2.9).

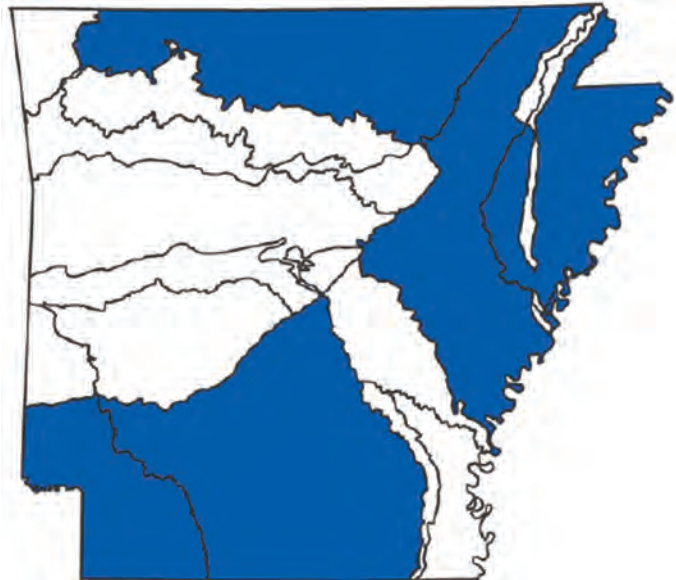


Figure 2.9. Example of **ecobasin map**. Blue depicts the presence of an aquatic species within an ecobasin.

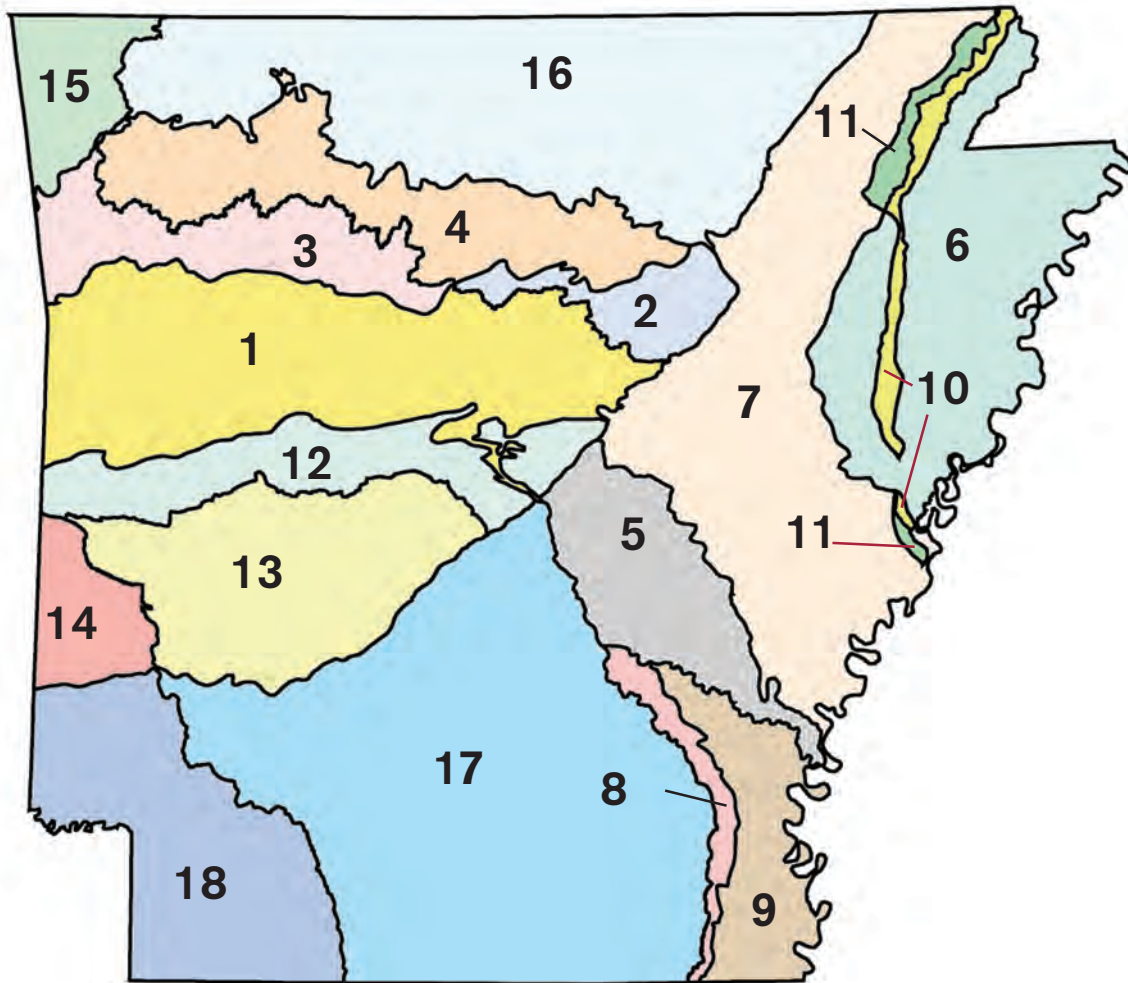


Figure 2.10. Ecobasin delineation for CWCS

Key EcoBasins

-
- 1 Arkansas Valley - Arkansas River
 - 2 Arkansas Valley - White River
 - 3 Boston Mountains - Arkansas River
 - 4 Boston Mountains - White River
 - 5 Mississippi River Alluvial Plain - Arkansas River
 - 6 Mississippi River Alluvial Plain - St. Francis River
 - 7 Mississippi River Alluvial Plain - White River
 - 8 Mississippi River Alluvial Plain (Bayou Bartholomew) - Ouachita River
 - 9 Mississippi River 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

The fourth spatial scale - aquatic habitats

For the fourth spatial scale, Taxa Association Teams determined the aquatic habitat preferences of each species based on published evidence and scientific judgement and assigned one or more aquatic habitat types (Figure 2.11) to each SGCN.

Seventeen habitat types were used to describe species' habitat preferences. These descriptors were further refined by size (small, medium, large and headwater).

After determining which habitats the species may prefer, the Taxa Association Team judged the importance (or weight) of the habitat to the species in question. The importance values were obligate, optimal, suitable or marginal. The teams also had the option to assign "data gap" to habitats where the preference or usage by the species was unknown but predicted.

Because of the ephemeral nature of aquatic habitats, they are not mapped. A list of habitats used by each aquatic SGCN is presented in a table on the second page of Species Reports.

Figure 2.11. Example of **aquatic habitats** showing size and importance as presented in Species Reports.

Habitats	Weight
Natural Pool: - Medium - Large	Suitable
Natural Run: - Medium - Large	Optimal
Natural Shoal: - Medium - Large	Optimal

Aquatic habitat subtypes

In addition to noting whether the aquatic habitat is natural or man-made, Taxa Association Teams defined the habitat with these characteristics.

Littoral Lentic – Shallow, near-shore area of a lake (<20' or 6m) where light can penetrate to the bottom and where rooted aquatic plants may colonize.

Pelagic Lentic – Deeper, open water areas of lakes and reservoirs away from the shoreline.

Pool Lotic – A deeper and generally wider portion of a stream with low velocity, low gradient, and variable substrates including finer silts and sands.

Side channel Lotic – A secondary channel off the main stem of a river that carries a portion of the flow of the primary channel. Can function as a high-water channel to relieve the pressure of flood flows.

Shoal Lotic – A shallow area of a river, can function like a flooded riffle in a large river, and usually composed of sand, gravel or a silt/sand/gravel conglomerate.

Slough Lotic – Side channels which are remnants of abandoned river channels, narrower than oxbows, yet connected to the river either during most river stages or only during high flow events.

Oxbow - connected Lotic – A lake occupying a former channel (meander) of the river isolated by movement of the stream channel. These lakes are connected to the main river by either broad or narrow chutes, allowing ingress and egress of water (and fish, invertebrates) from the river to the lake and back.

Other Lotic – Miscellaneous aquatic lotic habitat not listed or combination of aquatic lotic habitats.

Riffle Lotic - Shallow, swift sections of streams with turbulent flow where gradient can change significantly. Riffles are the hydraulic controls for upstream pools or glides. These habitats usually have coarser substrates such as gravel and cobble but can have boulder substrates if the gradient is high enough and the underlying geology appropriate.

Run Lotic – Swiftly flowing reaches with little surface turbulence and no major flow obstructions. Often considered as “flooded riffles”. Runs usually have gravel, cobble and boulder substratum.

Glide Lotic – Shallow stream reaches with low to moderate velocities, little or no turbulence, and uniform substrates of sand, gravel and sometimes cobble.

Cave Stream Subsurface – A subterranean stream that starts in a cave and flows underground for at least part of its length.

Spring Run Subsurface – Short, spring-fed streams with substrates of silt, sand and gravel that often contain thick growths of watercress.

Seep Subsurface – Small, groundwater discharge areas that slowly release water to the surface and/or to a stream. Flows are slow enough that noticeable flows may not be observed.

Groundwater Subsurface – Subsurface water standing in or passing through the soil and the underground strata. Groundwater is recharged via infiltration and enters streams through seepage and springs.

Swamp/Wetlands – Shrub or tree-dominated wetlands characterized by periodic flooding and nearly permanent subsurface flow through subsurface through sediments and organic material.

Oxbow - disconnected Lentic – An older channel scar lake, isolated from the river during some shift in the channel alignment. Only connected to the main stem river during relatively high river stages and flows.

Expert Assessment of SGCN

Problems facing SGCN

Taxa Association Teams recorded problems which adversely affect species or habitats of each species. Taxa Association Teams were provided standardized lists of threats (Table 2.17) and ascribed sources (Table 2.18) to each threat. Problems faced by each species of greatest conservation need is provided on the second page of a Species Report. Analysis and scope of problems faced by species within an ecoregion is discussed in Section 3. Ecoregions, pages 1083-1087.

Table 2.16 Problems and Threats

Hydrological alteration
 Nutrient loading
 Habitat destruction
 Sedimentation
 Biological alteration
 Chemical alteration
 Alteration of natural fire regimes
 Altered composition/structure
 Excessive herbivory
 Extraordinary competition for resources
 Extraordinary predation/parasitism/disease
 Groundwater depletion
 Habitat destruction or conversion
 Habitat disturbance
 Habitat fragmentation
 Resource depletion
 Riparian habitat destruction
 Toxins/contaminants

Table 2.17 Source (of Problems and Threats)

Commercial/industrial development
 Conversion of Riparian Forest
 Crop production practices
 Excessive groundwater withdrawal
 Excessive non-commercial harvest or collection
 Fire suppression
 Landfill construction or operation
 Management of/for certain species
 Parasites/pathogens
 Channel alteration
 Channel maintenance
 Commercial harvest
 Confined animal operations
 Dam
 Exotic species
 Forestry activities
 Grazing
 Municipal/Industrial point source
 Predation
 Recreation
 Resource extraction
 Road construction
 Urban development
 Water diversion

Figure 2.12. Example of **problems faced** by SGCN as presented in Species Reports.

Problems Faced

KNOWN PROBLEM: Even-aged forest management, lack of understory and midstory

Threat: Altered composition/structure
 Source: Forestry activities

KNOWN PROBLEM: Loss of bottomland hardwood habitat for timber

Threat: Habitat destruction
 Source: Commercial harvest

KNOWN PROBLEM: Loss of bottomland hardwood habitat due to conversion to agriculture

Threat: Habitat destruction
 Source: Conversion of Riparian Forest

Research Needs

For many species, not enough is known about their status, distribution, taxonomic relationships, life history and ecological relationships to develop an approach to conservation. In some cases, basic research or status surveys are required before appropriate conservation actions or monitoring strategies can be prescribed.

Figure 2.13. Example of **Data Gaps or Research Needs** suggested by Taxa Association Teams as presented in Species Reports.

Data Gaps/Research Needs

Determine host fish.

Compare taxonomic relationship of southern hickorynuts in Ouachita River watershed to those in other watersheds.

Conduct status survey.

Conservation Actions

These are voluntary conservation actions that are called for to maintain the viability of a species. For each SGCN, Taxa Association Teams provide Conservation Actions needed to maintain viable populations or restore the species or its habitat. Where possible, they ranked the importance of the Conservation Action to the species in question.

These are suggestions for voluntary actions and have no legal standing.

Conservation Actions were placed into categories for further analysis (Table 2.19). The categories are listed here and analyses are provided in Section 3, The Ecoregions of Arkansas (pages 1083-1187).

Table 2.19. Conservation Action categories

Category	Description
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 Actions
Public Relations/Education	Public outreach and education involving species of concern or key habitats
Other	Other conservation actions not covered by these categories

Figure 2.14. Example of **Conservations Actions**, Importance of Conservation Action and assignment to a Conservation Action category by Taxa Association Teams as presented in Species Reports.

Conservation Actions	Importance	Category
Manage for uneven aged forests using small group selection harvest.	High	Habitat Restoration/Improvement
Manage for dense understory and ground cover.	High	Habitat Restoration/Improvement

Monitoring Strategies

Effectively addressing problems faced by species requires monitoring the response of the species over time. Some trend analysis will result (or continue to result) from species and habitat monitoring. Monitoring strategies provided on the Species Reports have been suggested by the Taxa Association Teams, using best available data and professional judgement, to address species-specific monitoring needs.

Monitoring will provide information to adapt conservation actions to respond appropriately to new information or changing conditions. These will be incorporated annually at CWCS information sharing symposia.

Figure 2.15. Example of **monitoring strategies** proposed by Taxa Association Team and presented in Species Reports.

Monitoring Strategies

The Partners in Flight North American Landbird Conservation Plan indicates that long-term population trend monitoring for this species is generally considered adequate but some issues, such as bias, may not have been accounted for. Continue to conduct Breeding Bird Surveys at all routes established in Arkansas.

Comments and citations

At the end of each species reports, comments are included about the status of the species in Arkansas, life history notes and species description. Citations of publications used are referred to here.

Species Reports

Amphibians	45
Bird	113
Crayfish	339
Fish	411
Insects	561
Invertebrates - other	713
Mammals	815
Mussels	870
Reptiles	1047