Section 2. Species of Greatest Conservation Need

Species of Greatest Conservation Need (SGCN)

Identification and Prioritization

The Arkansas Wildlife Action Plan Species Team 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.

How the SGCN list was created

The AWAP 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 team decided to consider all native amphibians, birds, fish, mammals and reptiles for inclusion on the list. 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.

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 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.

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 information 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 data- bases 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.

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 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 consisted of experts drawn from a coalition of public agencies, private nonprofit organizations and academic institutions. In committees, they contributed to populating the Arkansas WAP database.

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.

Consulting additional information, Taxa Association Teams further refined the species list. The first version of the Plan listed 369 species of greatest conservation need. For the 2015 revision, taxa teams reviewed and updated state ranks for many taxa groups. The result was the addition of 66 species due to increased priority and deletion of 57 species due to increased information and lowering of priority score. The number of SGCN increased to 377.

Developing the Species Priority Score Protocol

To best prioritize the efforts directed by the AWAP, 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 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 (NatureServe 2005). For the AWAP, 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-emphasizes 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 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.

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. The entire list of SGCN, ranked by Species Priority Score, is provided in Appendix 2.1. Lists of SGCN ranked by taxa are provided in Appendix 2.2. Table 2.1 below shows the average of species priority scores for each taxa group.

Table 2.1. 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
46	Invertebrate - other
44	Crayfish
40	Mussel
32	Insect
31	Mammal
30	Fish
28	Amphibian
23	Bird
20	Reptile

Distribution of Terrestrial Species*

The first spatial scale - occurrence

The first spatial scale for terrestrial habitats is depicted by maps of species occurrences. Occurrence data are derived from several sources. The most widely used source is element occurrence database (defined in sidebar below) generated by from data kept by the Arkansas Natural Heritage Commission (ANHC). ANHC provided site-specific records of occurrence for species that they track 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. Where element occurrence records are not available, other data sources may be supplemented. For bird SGCN, eBird location data for the time period January 1966 to February 2015 were downloaded and mapped. For many butterfly species, county-level location data were provided by researchers. A point at county center was mapped to indicate species occurrence.

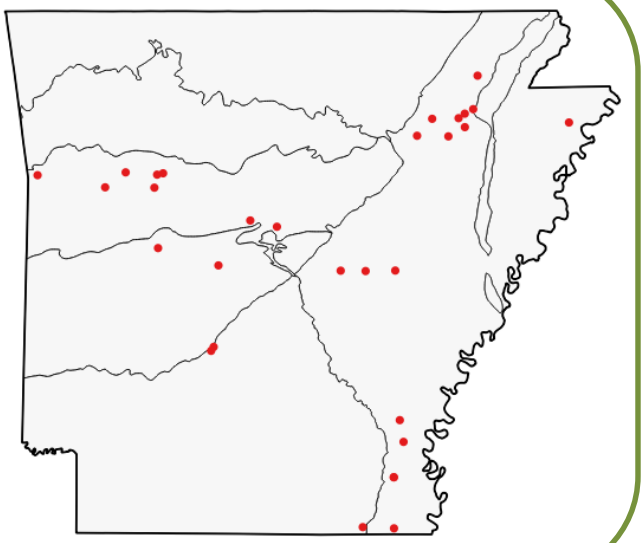
If data are available, the species occurence map is presented on the first page of a Species Report in the "Distribution" section. Known occurrences are represented by red dots (Figure 2.1). The lines within the state outline depict seven ecoregions (Figure 2.3; Woods and others 2004). Ecoregions are addressed in Section 3.

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 36-1131.

Figure 2.1. Example of element occurrence map. Red dots on a map refer to a known occurrence of a species. 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 2.3). Some discrepancies may occur between the distribution information provided by 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 120 ecoregions and the conterminous United States has 85 ecoregions (U.S. Environmental Protection Agency [USEPA], 2011). 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) and Gallant and others (1989).

Figure 2.2. 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:

- [x] Ozark Highlands
- [ ] Boston Mountains
- [x] Arkansas Valley
- [x] Ouachita Mountains
- [x] South Central Plains
- [ ] Mississippi Alluvial Plain
- [ ] Mississippi Valley Loess Plains

Figure 2.3. Locations and delineations of ecoregions used by the AWAP. 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 37 habitat types that occur in the state. Thirty habitat types (Table 2.2) are described by NatureServe National Vegetation Classification System: Ecological Communities and Systems (2005). An additional eight 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. 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
Lower Mississippi River Bottomland Depression	Optimal
Lower Mississippi River Dune Woodland and Forest	Marginal
Lower Mississippi River High Bottomland Forest	Optimal
Lower Mississippi River Low Bottomland Forest	Optimal
Lower Mississippi River Riparian Forest	Optimal
Ozark-Ouachita Large Floodplain	Optimal

Table 2.2. AWAP Habitats described by NatureServe.

Crowley's Ridge Loess Slope Forest
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, Pond, Woodland and Forest
Lower Mississippi River High Bottomland Forest
Lower Mississippi River Low Bottomland Forest
Lower Mississippi River Riparian Forest
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
Ozark-Ouachita Prairie and Woodland
West Gulf Coastal Plain Calcareous Prairie and Woodland
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
West Gulf Coastal Plain Wet Hardwood Flatwoods

Additional Habitats added for AWAP

Caves, Mines, Sinkholes, and other Karst Features
Crop Land
Cultivated Forest
Herbaceous Wetland
Mud Flats
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 37 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 3.1. Arkansas continues to refine the use of GAP data to predict and define habitats.

If data are available, the map is presented on the second page of Species Reports in the "Habitats" section.

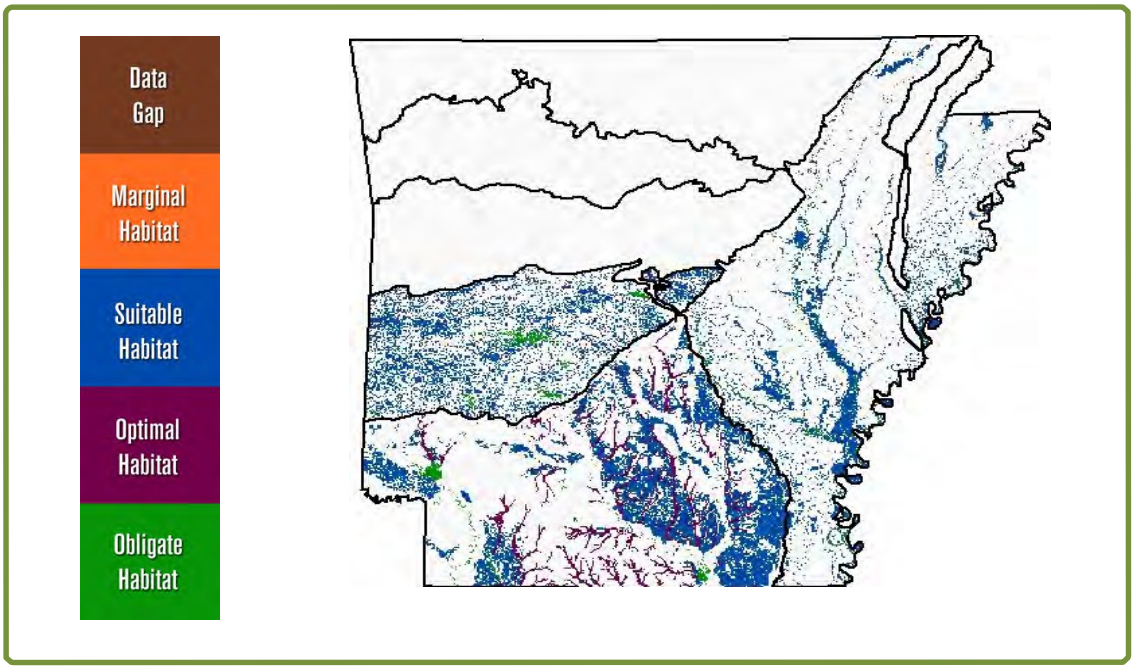


Figure 2.5. Example of Potential Habitat Map. Map shows where habitats, weighted by importance to each species, may occur.

Table 2.3. Habitat types mapped in "Potential Habitat Maps"

Caves, Mines, Sinkholes & other Karst Habitat
Crop Land
Crowley's Ridge Loess Slope Forest
Cultivated Forest
Lower Mississippi Flatwoods Woodland Forest
Lower Mississippi River Bottomland Depression
Lower Mississippi River Dune, Pond, Woodland, and Forest
Lower Mississippi River High Bottomland Forest
Lower Mississippi River Low Bottomland Forest
Lower Mississippi River Riparian Forest
Interior Highlands Calcareous Glade and Barrens
Interior Highlands Dry Acidic Glade and Barrens
Ozark-Ouachita Dry Oak and Pine Woodland
Ozark-Ouachita Dry-Mesic Oak Forest
Ozark-Ouachita Mesic Hardwood Forest
Ozark-Ouachita Pine/Bluestem Woodland
Ozark-Ouachita Pine-Oak Forest / Woodland
Ozark-Ouachita Riparian
Ozark-Ouachita Large Floodplain
Pasture Land
Ponds, Lakes, and Water Holes
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 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 2.4. Habitat types not mapped in "Potential Habitat Maps"

Herbaceous Wetlands
Mud Flats
Ouachita Montane Oak Forest
Ozark-Ouachita Cliff and Talus
Ozark-Ouachita Forested Seep
Ozark-Ouachita Prairie and Woodland
West Gulf Coastal Plain Mesic Hardwood Forest
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 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 or for most migratory species.

If data are available, the map is presented on the first page of Species Reports in the Distribution section. Data for aquatic species are represented 2 ways. For amphibians and reptiles, point locations are provided, overlain on the ecoregions map (Figure 2.6). For fish, mussels, and crayfish, the distribution map portrays a spatial relation between the sample location of the species and the associated HUC12 watershed boundary. These maps were created by conducting a spatial join of the geographic latitude and longitude of an individual species in relation to the HUC12 watershed boundary and are overlain on the ecobasins layer and a streams layer (Figure 2.7).

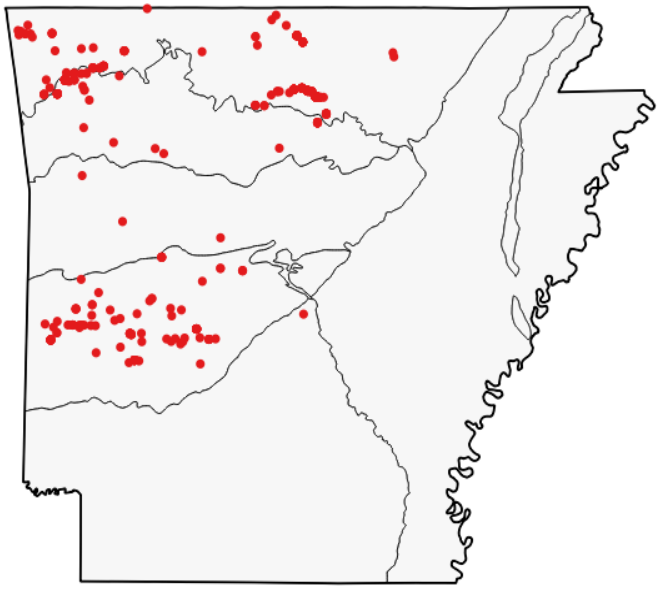


Figure 2.6. Example of element occurrence map for aquatic amphibians and reptiles. Red dots indicate known locations. Lines within the state outline depict ecoregions.

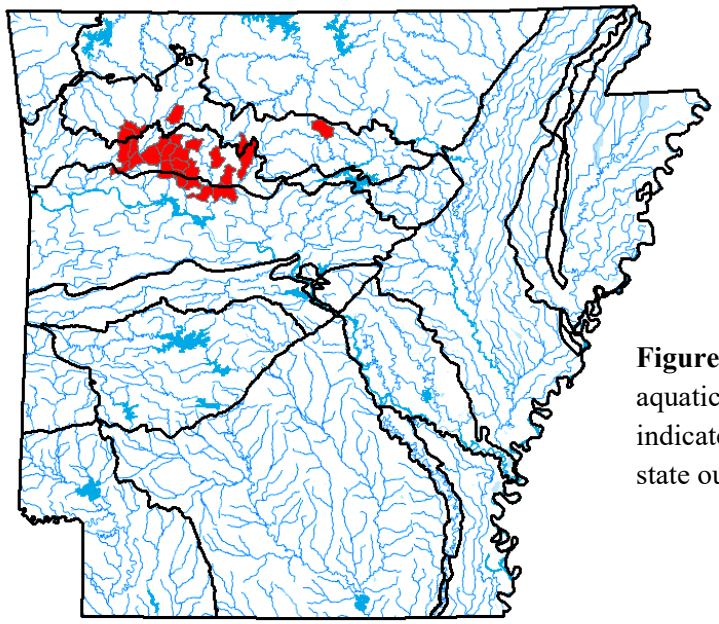


Figure 2.7. Example of element occurrence map for aquatic fish, mussels, and crayfish. Shaded polygons indicate HUCs with known locations. Lines within the state outline depict ecobasins.

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 2.3). 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.

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. 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. 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 (Figure 2.10). Ecobasins are described and evaluated in Section 5.

Ecobasins

South Central Plains - Ouachita River
South Central Plains - Red River
Ozark Highlands - White River
Mississippi River - White River
Mississippi River - 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).

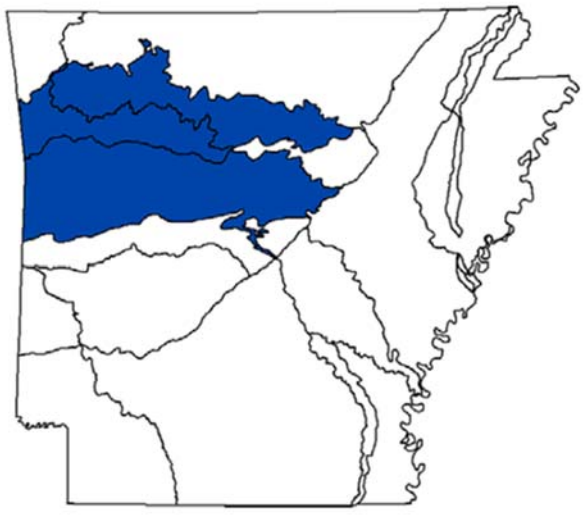


Figure 2.9. Example of ecobasin map. Blue depicts the presence of an aquatic species within an ecobasin.

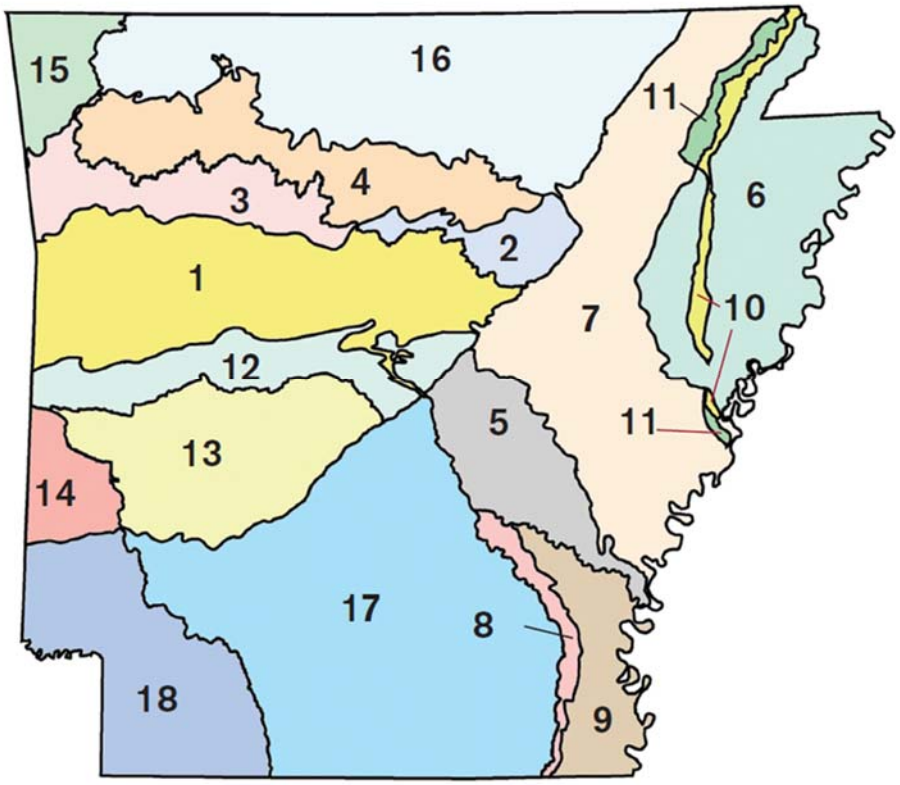


Figure 2.10. Ecobasin delineation for AWAP.

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 judgment and assigned one or more aquatic habitat types to each SGCN (Figure 2.11).

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 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 2.5) and ascribed sources (Table 2.6) to each threat. Problems faced by each species of greatest conservation need are 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.

Table 2.5 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
Collisions with man-made structures

Table 2.6 Source (of Problems and Threats)

Commercial/industrial development
Conversion of riparian forest
Agricultural 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/Browsing
Municipal/Industrial point source
Predation Recreation
Resource extraction
Road construction
Urban development
Water diversion

Problems Faced

KNOWN PROBLEM: Loss of wooded wetlands on breeding grounds.	Threat: Habitat destruction Source: Conversion of Riparian Forest
KNOWN PROBLEM: Loss of wooded wetlands on breeding grounds.	Threat: Habitat destruction Source: Forestry activities
POTENTIAL PROBLEM: Vulernability to toxins and contaminants.	Threat: Toxins/contaminants Source: Non-point source pollution

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

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.

Data Gaps/Research Needs

Determine habitat use in the winter.
Determine the effect of contaminants on health and survival.
Determine the effect of winter habitat selection on survival and carry-over effects to breeding season.
Information is needed on diet on the wintering grounds in Arkansas.

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

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 2.7).

The categories are listed here and analyses are provided in Section 3. The Ecoregions of Arkansas.

Table 2.7. 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

Conservation Actions	Importance	Category
Manage water fluctuations for invertebrates in winter.	Low	Habitat Restoration/Improvement
Restore and protect wooded wetlands on breeding grounds.	Low	Habitat Protection

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.

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 judgment, 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 AWAP information sharing symposia.

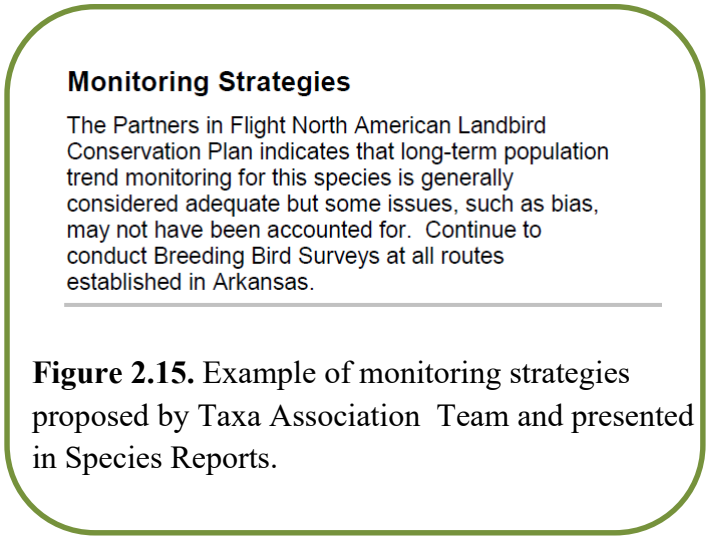


Figure 2.15. Example of monitoring strategies proposed by Taxa Association Team and presented in Species Reports.

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. A list of individuals who compiled and reviewed the species information is provided in the Taxa Team Association and Peer Reviewers section at the end of each account.