

## Ouachita Mountains, Arkansas River Valley and Western Gulf Coastal Plain Region

This is a large and diverse region that encompasses three subregions: the Ouachita Mountains, Arkansas Valley and the Western Gulf Coastal Plain. The region includes all or portions of the following counties: Sequoyah, Haskell, LeFlore, Latimer, Pittsburg, Atoka, Pushmataha, Choctaw, and McCurtain. Under Bailey's ecological classification system, this region is equivalent

to the combination of Bailey's Ouachita Mountains, Western Mid-coastal Plains and Arkansas Valley sections. Under Omernick's ecological classification system, it is equivalent to the Arkansas Valley, Ouachita Mountains and South Central Plains ecoregions.

The best professional judgment of the advisory group and technical experts was used to identify each Conservation Landscape's status and trend. And, even though some issues and actions apply to multiple Regions, each Region chapter is designed to stand-alone.

Conservation Landscapes listed in general priority order:

Very High priority Conservation Landscapes:

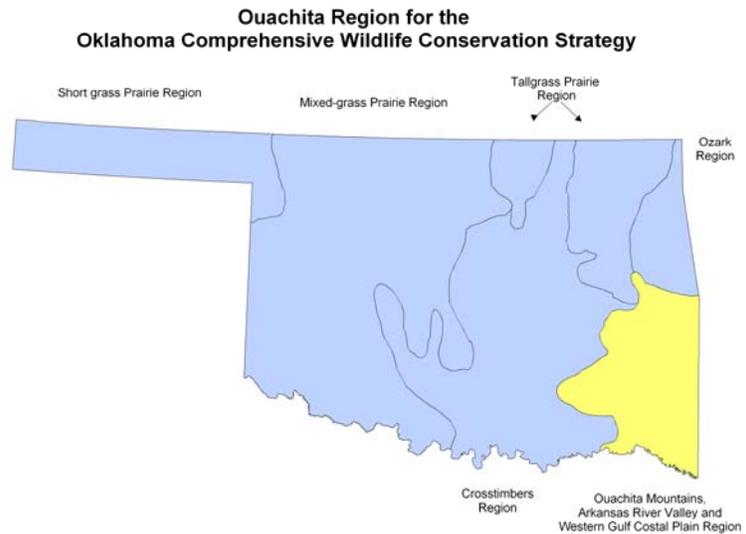
- Small River
- White Oak/Hickory Mesic Forest
- Oak/Hickory Bottomland Hardwood Forest
- Gravel (hard)-bottom Streams and Associated Riparian Forests
- Shortleaf Pine/Oak Woodland or Savannah

High priority Conservation Landscapes:

- Shortleaf Pine/Oak Woodland and Forest
- Large River
- Mesic Loblolly Pine/Oak Forest
- Springs and Seeps

Moderate priority Conservation Landscapes:

- Herbaceous Wetland
- Tallgrass Prairie
- Sandy (soft)-bottom Streams and Associated Riparian Forests
- Post Oak/Blackjack Oak Woodland



## Conservation Landscape: Small River

The relative condition of Small River habitat is currently poor with a declining trend. Five small rivers are found in this Region. Each river originates in the Ouachita Mountains then flows north to the Arkansas River (Poteau River) or south to eventually enter the Red River (Kiamichi, Little, Glover, and Mountain Fork). The upper reaches of these rivers are relatively shallow, clear, and fast moving with a channel substrate of cobble or bedrock. The lower reaches of these rivers are relatively turbid and slow moving and meander over a sandy or silty substrate in broad forested floodplains. Flow rates are typically greater during the winter and spring and lower during the summer and fall, however the seasonal variation is less than that which is seen on the two large rivers. The small rivers contain gravel bars and sloughs but not the dynamic mosaic of sandbars, mudflats, and sloughs that are found on the larger river systems. Most sloughs along the smaller rivers are dominated by woody vegetation including River Birch (*Betula nigra*), Sycamore (*Platanus occidentalis*), Water Oak (*Quercus nigra*), and Red Maple (*Acer rubra*).

The species of greatest conservation need found in this habitat are listed in the following table. The population abundance and trend of each species are described in relative terms. The best professional judgment of the advisory group and technical experts was used to identify each species status and trend. Species are sorted alphabetically within groups of amphibians (Amph), birds, fish, invertebrates (Inve), mammals (Mamm), and reptiles (Rept) for easy reference.

Species status definitions:

Low – species is rare, has a small population size, and/or occurs in only a small portion of the Region.

Medium – species is uncommon and occurs over a large portion of the Region or species is common but occurs in only a small part of the Region.

Abundant – species is common and widespread within the Region in appropriate habitat.

Unknown – the status of this species is not known.

Species of Greatest Conservation Need		Status				Trend			
Group	Common Name	Low	Medium	Abundant	Unknown	Declining	Stable	Increasing	Unknown
Amph	Many-ribbed Salamander				X				X
Bird	Bald Eagle	X						X	
Bird	Canvasback	X							X
Bird	Lesser Scaup		X			X			
Bird	Little Blue Heron		X						X
Bird	Louisiana Waterthrush		X						X
Bird	Northern Pintail		X			X			
Bird	Prothonotary Warbler		X						X
Bird	Snowy Egret								
Bird	Solitary Sandpiper	X							X
Bird	Wood Stork		X				X		
Fish	Alabama Shad	X							X
Fish	Alligator Gar	X				X			
Fish	Black Buffalo	X							X
Fish	Blackside Darter		X				X		
Fish	Blackspot Shiner	X							X
Fish	Bluehead Shiner	X							X

Species of Greatest Conservation Need		Status				Trend			
Group	Common Name	Low	Medium	Abundant	Unknown	Declining	Stable	Increasing	Unknown
Fish	Blue Sucker	X							X
Fish	Brown Bullhead	X							X
Fish	Chain Pickerel	X							X
Fish	Crystal Darter	X							X
Fish	Cypress Minnow	X							X
Fish	Harlequin Darter	X				X			
Fish	Ironcolor Shiner	X							X
Fish	Kiamichi Shiner	X				X			
Fish	Leopard Darter	X				X			
Fish	Longnose Darter	X							X
Fish	Mountain Madtom	X							X
Fish	Orangebelly Darter			X			X		
Fish	Ouachita Mountain Shiner		X				X		
Fish	Paddlefish		X				X		
Fish	Pallid Shiner (Chub)	X							X
Fish	Peppered (Colorless) Shiner	X				X			
Fish	Plains Minnow			X		X			
Fish	Rocky Shiner		X						X
Fish	Shovelnose Sturgeon	X							X
Fish	Southern Brook Lamprey		X						X
Fish	Taillight Shiner	X							X
Fish	Western Sand Darter	X							X
Inve	Black Sandshell	X				X			
Inve	Bleufer			X			X		
Inve	Butterfly mussel		X			X			
Inve	Faxonella blairi				X				X
Inve	Little Spectaclecase			X			X		
Inve	Louisiana Fatmucket	X				X			
Inve	Monkeyface Mussel			X			X		
Inve	Mooneye	X				X			
Inve	Ohio River Pigtoe	X				X			
Inve	Ouachita Creekshell	X				X			
Inve	Ouachita Kidneyshell		X			X			
Inve	Ouachita Rock Pocketbook	X				X			
Inve	Plain Pocketbook		X			X			
Inve	Purple Lilliput	X				X			
Inve	Rabbitsfoot	X				X			
Inve	Scaleshell	X				X			
Inve	Southern Hickorynut	X				X			
Inve	Texas Lilliput	X							X
Inve	Threeridge Mussel			X			X		
Inve	Wartyback Mussel		X				X		
Inve	Washboard			X			X		

Species of Greatest Conservation Need		Status				Trend			
Group	Common Name	Low	Medium	Abundant	Unknown	Declining	Stable	Increasing	Unknown
Inve	Winged Mapleleaf	X				X			
Mamm	Eastern Small-footed Myotis				X				X
Mamm	Indiana Myotis	X				X			
Mamm	Northern Long-eared Myotis				X				X
Mamm	Rafinesque's Big-eared Bat				X				X
Mamm	River Otter		X					X	
Mamm	Seminole Bat				X				X
Mamm	Southeastern Myotis				X				X
Rept	Alligator Snapping Turtle				X				X
Rept	American Alligator				X				X
Rept	Eastern River Cooter				X				X
Rept	Midland Smooth Softshell				X				X
Rept	Mississippi Map Turtle				X				X
Rept	Ouachita Map Turtle				X				X
Rept	Razor-backed Musk Turtle				X				X
Rept	Spiny Softshell Turtle				X				X

The following conservation issues and actions are listed in general priority order.

*Conservation Issue: Incomplete data concerning species of greatest conservation need (refer to the matrix above) and habitat, an impediment for effective conservation planning and implementation:*

1. Data are incomplete regarding the distribution and ecology of many species of greatest conservation need that occupy the small river habitat type. Several of these species are highly mobile and occur in water too deep to easily sample or survey. In order to establish effective conservation actions, more complete data are needed to determine the population status and trend for many species and more thorough evaluations are needed to determine the factors that limit population sizes or are responsible for apparent declines.
2. Few data exist regarding the historic (i.e., presettlement) condition of small river habitat in Oklahoma. This information is important because it can serve as a desired condition when establishing goals for conservation efforts.
3. There is a general scarcity of monitor data for the biological composition of small rivers (e.g., fish, mussel, and macroinvertebrate communities).

*Conservation Actions:*

- Conduct surveys of existing literature, reports, and museum records to evaluate historic distributions, abundances, and habitat affinities of species of greatest conservation need, and examine possible causes of population declines where these are suspected.
- Conduct field surveys to establish baseline conditions for the current distributions, abundances, and habitat affinities of species of greatest conservation need. Taxonomic groups in greatest need of surveys include freshwater mussels, crayfish, and fish.
- Verify the accuracy of existing data and assess changes in populations over time.

- Develop and maintain a database to store and analyze distributional and ecological data for species of greatest conservation need, and make these data available to natural resource planners (e.g., wildlife agencies and environmental agencies).
- Conduct ecological studies on Tier I and Tier II species of greatest conservation need to:
  - identify factors that limit population sizes,
  - evaluate factors that may be responsible for population declines, and
  - develop recommendations to enhance populations (i.e., through enhancement of habitat conditions).
- Use historic literature and maps in conjunction with present day field studies to evaluate the historic and present conditions (e.g., channel morphology, flow patterns, and water quality) of small rivers.
- Develop a monitoring program to track habitat condition/quality and the status of species of greatest conservation need over time.
- Use the results of these surveys and studies to update the Comprehensive Wildlife Conservation Strategy via adaptive resource management.

*Conservation Issue: Water quality changes as a result of nutrients, sediment, and other pollutants:*

4. Several sources contribute nutrients to the rivers including animal feeding operations (e.g., dairies, poultry houses, and their waste application fields), septic systems from houses near streams and rivers, and fertilized crop fields.
5. Insufficient riparian vegetation or vegetated buffers around headwater streams can contribute to sediment, nutrients, and pollutants entering aquatic systems and ending up in the rivers.
6. Municipal and industrial discharges can contribute to pollutant loads, especially nutrients, in rivers.
7. Some pesticides act as endocrine system disrupters and these may enter aquatic systems through storm water runoff from agricultural fields and confined animal feeding operations disrupting the reproduction and development of freshwater mussels, amphibians, and fish.
8. Some landowners do not control the access that their livestock have to the river, resulting in cattle grazing and watering in river channels and riparian areas where they contribute nutrients, damage riparian vegetation, and potentially destabilize river banks thereby releasing sediment.
9. Septic systems and animal waste application fields that occur in porous soils in stream and river floodplains can contribute nutrients to rivers through groundwater connections.
10. Wetlands within river and stream floodplains have been filled or drained for agricultural and residential purposes, removing important filters of storm water runoff increasing sediment and nutrients in rivers and streams and decreasing the available important breeding areas for amphibians and feeding areas for waterfowl and shorebirds.

*Conservation Actions:*

- Increase promotion and use of Best Management Practices and conservation cost-share programs to control nutrients and sediment in storm water runoff.
- Evaluate the need for better cost-share arrangements, more acceptable landowner incentives, and revise Best Management Practices to increase the use of incentives to benefiting species of greatest conservation need.
- Provide cost-share funding for the construction of fences and alternative sources of water for livestock in order to keep cattle out of rivers and riparian areas.
- Develop and distribute educational materials to schools and landowners about Best Management Practices to control nutrients and sediment, the interconnection of rivers, wetlands and groundwater, and the importance of riparian vegetation and wetlands as filters for nutrients and sediment.

- Increase the use of existing cost-share programs to restore riparian habitat and wetlands that serve as filters of storm water and as wildlife habitat.
- Improve the acceptability of these programs to private landowners or develop new programs targeted at small rivers.
- Purchase conservation easements from private landowners or acquire property in title from willing sellers in the floodplains of river and streams and in the headwaters of streams.
- Restore, enhance, or create wetlands and riparian vegetation on these acres to stabilize stream banks and filter sediment, nutrients, and other pollutants to limit development within sensitive floodplains and improve habitat conditions for wildlife species of greatest conservation need.
- Develop monitoring programs for wildlife populations, habitat quality, and water quality to assess the effects of habitat restoration and conservation easement programs.
- Discourage residential development within river floodplains.
- Discourage the construction of poultry houses and other concentrated animal operations near streams and rivers. This also includes the placement of land application areas for animal wastes.
- Develop local stream teams or watershed groups comprised of citizens and/or governmental organizations to address local concerns, monitor water quality, monitor wildlife populations and provide public outreach and education.
- Support national or state scenic rivers designations (e.g., the Glover River).

*Conservation Issue: Geomorphic alteration and instability of river channels:*

11. River channels normally meander through their floodplains and maintain stable, vegetated banks, but some human activities alter the channel structure of rivers and contribute to bank instability. These actions include:
  - efforts to channelize the river and confine the channel to a narrower pace,
  - in-stream gravel or sand mining,
  - creating channel constrictions such as those that sometimes occur at bridges and low water dams, and
  - dredging of river channels to make them deeper and narrower to convey water more quickly.
12. These actions can result in the river cutting a deeper channel and creating a disconnection between the river and its riparian vegetation. Channel cutting erodes gravel and sediment from the river bank and deposits it into the river, and creates bare cut banks that are prone to erosion and contribute more sediment into the river.
13. Channelization efforts are often undertaken to enhance the movement of storm water (e.g., reduce flooding) and to allow development (e.g., agricultural or residential) within the floodplain, often initiated without thought to potential impacts downstream.
14. In relatively level areas, riparian vegetation has been removed to convert this habitat to pasture or riverside residential and recreational developments, contributing to river bank instability and facilitates bank erosion.
15. Increased deposition of fine sediment from eroding banks settles into gravel beds and riffles that impair their quality as spawning habitat for fish and habitat for freshwater mussels.

*Conservation Actions:*

- Develop cost-share programs or grant programs to provide funding for landowners and conservation districts to restore the morphology of river channels.
- Support research into and possible use of alternative bank stabilization and channel restoration techniques that incorporate fluvial geomorphology principles.
- Increase the use of existing cost-share programs to restore riparian habitat and wetlands that stabilize banks, serve as filters of storm water and as wildlife habitat.

- Improve the acceptability of these programs to private landowners or develop new programs targeted at small rivers.
- Purchase conservation easements from private landowners or acquire property in title from willing sellers within the floodplains of rivers and streams and in the headwaters of streams.
- Restore, enhance, or create wetlands and riparian vegetation on these acres to stabilize stream banks and filter sediment to will limit development within sensitive floodplains and improve habitat conditions for wildlife species of greatest conservation need.
- Develop monitoring programs for wildlife populations, habitat quality, and water quality to assess the effects of habitat restoration and conservation easement programs.
- Discourage residential and infrastructure development within river floodplains.
- Develop regulations that restrict or prohibit channel modifications, in-stream gravel and sand mining, and channel dredging.

*Conservation Issue: Commercial harvest of freshwater mussels:*

16. Freshwater mussels have been harvested commercially for over a century but little is known about the population structure and biology of many mussel species. Commercial harvest is restricted to common species, yet the harvest of common mussels can dislodge, injure, or kill non-targeted rare mussels that occur along with common species.
17. Freshwater mussel populations are difficult to monitor and monitoring programs are costly. As a result, monitoring is often limited to harvest levels with little monitoring to assess in-stream populations.
18. Some methods of mussel harvest can impair water quality and affect mussel habitat. Additionally, the reduction of mussel populations can decrease water quality because freshwater mussels are filter feeders that remove suspended algae, plankton, and detritus from the river.

*Conservation Actions:*

- Develop a monitoring program for mussel species that occur in rivers that are open to harvest and evaluate the impact of harvest on mussel populations.
- Conduct ecological studies of both rare and harvested mussel species to determine possible conservation actions that may be taken to maintain stable or improve depleted populations.

*Conservation Issue: Altered patterns of flow and decreasing water quantity:*

19. Reservoirs, flood control impoundments, and recreational ponds hold storm water runoff and can reduce the volume of surface flows that reach rivers and streams.
20. The loss of wetlands and the constriction of floodplains reduce the ability of the land to hold and slowly release water, often resulting in “flashier” stream and river flows in which flow is accelerated during storm events, but then rapidly drops afterward.
21. Surface flows are diverted from the river by impoundments on tributaries, and then withdrawn from the system for irrigation and residential use.
22. Reservoir construction on river mainstems and major tributaries alters the historic flooding frequencies and flow patterns. (Reservoirs can reduce the magnitude of small floods, especially the annual spring and early summer floods that naturally occur on Oklahoma rivers. Reservoirs also may reduce flow rates during normal summer low-flow periods by holding back water.)
23. Proposals to impound streams and sell the water outside of the Region will increase the amount of water diverted and withdrawn from rivers, leaving less water for fish and other wildlife populations.

*Conservation Actions:*

- Conduct studies of the habitat and flow needs for species of greatest conservation need.
- Establish minimum in-stream flow standards/requirements that will meet the needs of these species and conserve populations with the watershed.
- Conduct studies assessing and comparing current and historic flow patterns on small rivers.
- Where changes in flow patterns are documented, evaluate methods to restore historic patterns such as modifying reservoir management to release water to mimic historic flows.
- Support and promote water conservation programs and public education efforts directed at water conservation.
- Develop monitoring programs for wildlife populations and habitat quality to assess the effects of flow management, habitat restoration, and conservation easement programs.
- Discourage residential and infrastructure development within river floodplains that would contribute to efforts to channelize rivers, construct flood control impoundments, or remove wetlands.
- Develop local stream teams or watershed groups comprised of citizens and/or governmental organizations to address local concerns, monitor water quality, monitor wildlife populations, and provide public outreach and education.
- Support national or state scenic rivers designations.

*Conservation Issue: Heavy recreational use of small rivers:*

24. The impact of canoeing on fish, freshwater mussel, and other wildlife species has not been evaluated. Heavy recreational use may compact gravel bars and disturb mussel beds, may result in channel modifications due to the removal of woody debris in the river or the local loss of riparian vegetation.
25. Increasing levels of recreational use may result in conflicts among user groups (e.g., canoeists, fishermen, and campers).

*Conservation Action:*

- Develop studies to evaluate the impact of recreation activities on wildlife.
- Where impacts are found, develop recommendations to reduce impacts using a combination of education and regulations.

*Conservation Issue: Impediments to the movement of fish within rivers:*

26. Dams, culverts, and some bridge designs can act as impediments to the upstream movements of fish and other aquatic wildlife

*Conservation Action:*

- Remove or redesign structures that isolate populations of species of greatest conservation need or prevent these species from recolonizing reaches of rivers (e.g., replace culverts and bridges that block the movement of fish with new structures that allow fish to pass through).

*Conservation Issue: Invasive and exotic plants and animals:*

27. Several exotic aquatic plants have the potential to become established in small rivers within the Region, especially in the West Gulf Coastal Plain.
28. Exotic plant species such as Japanese Honeysuckle and Chinese Privet have become established in riparian areas where they displace native plants and may alter habitat conditions for wildlife species of greatest conservation need.
29. Some agencies, organizations, and businesses promote exotic plants for erosion control, livestock forage, beautification programs, and wildlife habitat that are actually invasive.

*Conservation Actions:*

- Evaluate the severity and magnitude of the ecological damage done by exotic plant and animal species (e.g., displacement of native vegetation/plant communities, predation on native animal populations, or hybridization with native species) to identify those exotic species causing the greatest impact to this habitat and species of greatest conservation need.
- Provide the results of studies of exotic species impacts to landowners and conservation agencies/organizations.
- Improve coordination between wildlife biologists, conservation agencies, and agricultural organizations so that these groups can share information about the negative effects of using exotic plant materials.
- Develop control or management plans for the exotic species that cause the greatest ecological damage (e.g., herbicide treatment and mechanical removal) and develop monitoring programs to measure and evaluate the effectiveness of these control measures.
- Develop cost-share, or incentives programs for private landowners to encourage them to control invasive and exotic species.

*Potential indicators for monitoring the effectiveness of the conservation actions:*

- Acres acquired (including easements) or proportion of acres protected/acquired within a given watershed.
- Number of denied applications for exotic species introductions.
- Number of landowners participating in conservation practices.
- Miles of degraded and restored streams.
- New local conservation groups and their effectiveness.
- Public opinion toward conservation actions.
- Relative condition (populations/trends) of species of greatest conservation need and key indicator species.
- Relative condition and quantity of habitat.
- Stream flow and habitat quality (e.g., measure return of stream flow with range of natural variation).
- Water quality parameters.

## Conservation Landscape: White Oak/Hickory Mesic Forest

The relative condition of White Oak/Hickory Mesic Forest habitat is currently poor with a declining trend. White Oak/Hickory Mesic Forest, or more properly Western Mesophytic Forest, is currently restricted to the Ouachita Mountains in southern LeFlore, northern McCurtain, and possibly northeastern Pushmataha counties where they occur locally on sites with favorable moisture and soil conditions including the north-facing slopes of the larger mountain ridges and in narrow sheltered ravines. As a result of their restricted distribution, mesic forests typically occur as patches or bands of habitat embedded within a larger landscape of mixed pine-hardwood forests and woodlands. Mesic forests have a high diversity of tree species and often have well developed canopies, midstories and understories. Dominant canopy trees include White Oak (*Quercus alba*), Northern Red Oak (*Quercus rubra*), and Mockernut Hickory (*Carya tomentosa*). Other widespread canopy species include Black Gum (*Nyssa sylvatica*), Carolina Basswood (*Tilia caroliniana*), Bitternut Hickory (*Carya cordiformis*), Sugar Maple (*Acer saccharum*), Black Cherry (*Prunus serotina*), Black Oak (*Quercus velutina*), and Black Walnut (*Juglans nigra*). The diverse midstories and understories are comprised of Flowering Dogwood (*Cornus florida*), Downy Serviceberry (*Amelanchier arborea*), Eastern Hophornbeam (*Ostrya virginiana*), Carolina Silverbell (*Halesia carolina*), American Beautyberry (*Callicarpa americana*), Littlehip Hawthorn (*Crataegus spathulata*), American Holly (*Ilex opaca*), Rusty Blackhaw (*Viburnum rufidulum*), Strawberry Bush (*Euonymus americanus*), Pawpaw (*Asimina triloba*), and Ozark Chinquapin (*Castanea ozarkensis*). In isolated areas (e.g., Beech Creek, Walnut Mountain, upper Mill Creek, upper Big Creek, and the Glover and Mt. Fork River corridors), American beech (*Fagus grandifolia*) is a dominant overstory species. Mesic forests on north-facing mountain slopes in LeFlore County also support the only known populations of Cucumber Magnolia (*Magnolia acuminata*) and Umbrella Magnolia (*Magnolia tripetala*) in Oklahoma.

Western mesophytic forest is considered a late-successional forest type and is maintained by infrequent small-scale disturbances (e.g., wind events and glaze storms). Large-scale stand replacement events such as high intensity burning and timbering tend to favor the regeneration of early-successional species, resulting in a loss of late-successional habitat. The extent of western mesophytic forest in the Ouachita Mountains of Oklahoma is unknown due primarily to the paucity of research on the subject and lack quality historical documentation. It is likely that the extent of western mesophytic forest varied prior to European settlement, depending on the intensity of anthropogenic disturbance. Unregulated timbering in the late 19th and early 20th centuries resulted in the loss of most of the old-growth mesophytic forest in southeastern Oklahoma. Public acquisition of a large block of cut-over land in the Ouachita Mountains (now part of the Ouachita National Forest) in the mid 1930's and subsequent fire suppression and grazing control policies slowed the loss of mesophytic habitats allowing some degraded areas to recover. An accurate survey of the extent of mesophytic forest in southeastern Oklahoma at present is not available.

Recognized vegetation associations within this habitat include:

- American Beech – White Oak – American Holly Forest
- Northern Red Oak – Shumard Oak Forest
- Southern Red Oak – Mockernut Hickory Forest
- Sugar Maple – Chinquapin Oak Forest
- Sugar Maple – Northern Red Oak – Bitternut Hickory Forest
- Sugar Maple – White Oak – Mockernut Hickory Forest
- White Oak – Mockernut Hickory – American Basswood Forest

The species of greatest conservation need found in this habitat are listed in the following table. The population abundance and trend of each species are described in relative terms. The best professional judgment of the advisory group and technical experts was used to identify each species status and trend. Species are sorted alphabetically within groups of amphibians (Amph), birds, fish, invertebrates (Inve), mammals (Mamm), and reptiles (Rept) for easy reference.

Species status definitions:

Low – species is rare, has a small population size, and/or occurs in only a small portion of the Region.

Medium – species is uncommon and occurs over a large portion of the Region or species is common but occurs in only a small part of the Region.

Abundant – species is common and widespread within the Region in appropriate habitat.

Unknown – the status of this species is not known.

Species of Greatest Conservation Need		Status				Trend			
Group	Common Name	Low	Medium	Abundant	Unknown	Declining	Stable	Increasing	Unknown
Amph	Four-toed Salamander				X				X
Amph	Kiamichi Slimy Salamander				X				X
Amph	Many-ribbed Salamander				X				X
Amph	Ouachita Dusky Salamander				X				X
Amph	Rich Mountain Salamander				X				X
Amph	Ringed Salamander				X				X
Amph	Sequoyah Slimy Salamander				X				X
Amph	Southern Red-backed Salamander				X				X
Bird	American Woodcock	X							X
Bird	Cerulean Warbler	X				X			
Bird	Hooded Warbler	X							X
Bird	Kentucky Warbler		X						X
Bird	Swainson's Warbler	X							X
Bird	Whip-poor-will		X						X
Bird	Wood Thrush	X							X
Bird	Worm-eating Warbler	X							X
Inve	American Burying Beetle		X						X
Inve	Rich Mountain Slitmouth Snail				X				X
Mamm	Eastern Small-footed Myotis				X				X
Mamm	Eastern Spotted Skunk				X				X
Mamm	Indiana Myotis	X				X			
Mamm	Northern Long-eared Myotis				X				X
Mamm	Rafinesque's Big-eared Bat				X				X
Mamm	Southeastern Myotis				X				X
Rept	Northern Scarletsnake				X				X
Mamm	Golden Mouse				X				X

The following conservation issues and actions are listed in general priority order.

*Conservation Issue: Incomplete data concerning species of greatest conservation need (refer to the matrix above) and habitat, an impediment for effective conservation planning and implementation:*

1. Mesic forests have not been extensively studied in Oklahoma. Ecological and distributional data are incomplete for many species of greatest conservation need that depend upon this community. In order to establish effective conservation actions, more complete data are needed to determine the population status and trends for

many species. More thorough evaluations are needed to determine the factors that limit population sizes or are responsible for suspected declines.

2. The mesic forest community typically occurs in locations with specific slope/aspect and soils; therefore, it should be relatively easy to model and map. The current and historic distributions and conditions of this community, however, have not been assessed.

*Conservation Actions:*

- Conduct surveys of existing literature, reports, and museum records to evaluate historic distributions, abundances, and habitat affinities of species of greatest conservation need and examine the possible causes of suspected population declines.
- Conduct field surveys to establish baseline conditions for the current distributions, abundances, and habitat affinities of species of greatest conservation need.
- Verify the accuracy of existing data and assess changes over time.
- Develop databases to store and analyze distributional and ecological data for species of greatest conservation need.
- Conduct ecological studies on Tier I and Tier II species of greatest conservation need (e.g., salamanders, songbirds, and bats) to:
  - identify factors that limit population sizes,
  - evaluate factors that may be responsible for population declines, and
  - develop recommendations to enhance populations (i.e., through enhancement of habitat conditions).
- Develop a method to accurately identify and map the distribution and the condition of this community to establish a current baseline.
- Assess historic literature and conduct field studies to evaluate the probable historic distribution and condition of this habitat type in conjunction with a landscape-level evaluation of the probable locations and distributions of all forest, woodland, and savannah types.
- Use the results of these surveys and studies to update the Comprehensive Wildlife Conservation Strategy via adaptive resource management.

*Conservation Issue: Fragmentation and conversion of habitat:*

3. Fragmentation and loss of habitat caused by the conversion of mesic oak-hickory forest to other land uses such as pine plantations and introduced pastures that are planted to Tall Fescue.
4. Fragmentation and loss of habitat due to increasing number of residential developments, particularly secondary homes, cabins, and ranchettes, coinciding with the trend for increasing fragmentation of land ownership with more individuals owning smaller tracts of land.
5. Fragmentation and loss of habitat due to expanding infrastructure including roads, utility lines, and pipelines.

*Conservation Actions:*

- Develop a landowner incentive program to encourage the retention of mesic forest stands and not convert these to other vegetation such as Fescue pasture or Loblolly Pine.
- Develop programs to maintain biologically meaningful tracts of mesic oak-hickory forests such as: conservation easements, conservation leases, or willing-seller land acquisitions preceded by a landscape-level assessment of habitat conditions to identify focus areas of greatest conservation value in order to get the greatest “bang for the buck” or conservation efficiency.
- Explore tax reform and other ways to help families pass down large tracts of land from one generation to the next.

- Evaluate methods to restore mesic deciduous forest on introduced pastures or pine plantations and develop cost-share programs or grants to assist and encourage willing landowners who wish to restore/replant these areas.
- Support cooperative efforts between government agencies and research institutions to develop or update Best Management Practices and management recommendations to minimize the ecological footprint left by road, pipeline, and utility line construction, and the impacts of right-of-way maintenance practices.
- Develop and distribute informational materials with Best Management Practices and recommendations to landowners, agencies, and utility companies.
- Develop educational materials for schools and landowners that highlight the value (i.e., ecological and economic) of hardwood trees and the mesic forest community.
- Develop wildlife corridors to connect tracts of mesic hardwood forest or to connect mesic forest with other important communities such as riparian forest.

*Conservation Issue: Invasive and exotic plants and animals that are detrimental to species of greatest conservation need:*

6. Several exotic plant species including *Sericea lespedeza*, Autumn Olive, Chinese Privet and Japanese Honeysuckle have become established in mesic hardwood forests and may be displacing native understory plants and altering native plant communities and habitat conditions for wildlife species of conservation need.
7. Feral hogs may cause substantial damage to seeps, springs, and vernal pools which are important breeding areas for amphibians.
8. Exotic tree pathogens, such as those affecting native chestnuts and Flowering Dogwood, can alter forest structure and diversity.

*Conservation Actions:*

- Evaluate the severity and magnitude of the ecological damage done by exotic plant and animal species (e.g., displacement of native vegetation, predation on native animal populations, or hybridization with native species) to identify those exotic species causing the greatest impact to species of greatest conservation need.
- Develop control or management plans (e.g., controlled burning programs, herbicide treatment, and mechanical removal) for the exotic species that cause the greatest ecological damage, and develop monitoring programs to measure and evaluate the effectiveness of these control measures.
- Develop cost-share or incentives programs for private landowners to encourage them to control invasive and exotic species.
- Develop educational materials about the ecological damage done by invasive and exotic vegetation and introduced plant diseases.
- Minimize damage to trees (e.g., during right-of-way maintenance and to seed trees during timber harvest) to lessen the chance of infection by pathogens and the spread of disease.

*Conservation Issue: Altered forest community structure as a result of historic and current land management:*

9. Many mesic forest stands are comprised of dense even-aged second growth forest as a result of widespread timber harvest in the early 1900s. These forest stands lack the diverse structure of canopy, midstory and understory vegetation that existed historically in uneven-aged forests; the dense canopies or midstories in these even-aged forests may limit the abundance and diversity of understory vegetation.
10. Dense canopy or midstory conditions can limit light penetration to the forest floor, which can limit the recruitment of oak species/oak regeneration in favor of more shade tolerant species.
11. Excessive use of prescribed fire in mesic habitats is resulting in the xerification of these areas causing further loss and fragmentation of this limited habitat type altering

the vegetation community and possibly fostering the spread of exotic disturbance-dependent species.

12. Vernal pools may be lost or degraded as a result of sedimentation, the alteration of drainage patterns by road construction, or feral hog activity. Mesic forests support the greatest diversity of amphibians in the Region and many of these depend upon vernal pools and seasonal wetlands for reproduction.

*Conservation Actions:*

- Evaluate the effectiveness of midstory thinning or timber stand improvement as a tool to diversify forest structure and increase understory vegetation.
- Restrict prescribed burning in mesic habitats.
- Identify and develop protection and management plans for vernal pools, seeps, and seasonal wetlands that are important to salamander species of greatest conservation need. These plans can include activities such as fencing, dredging/removal of accumulated sediments, development of conservation easements, or construction of new vernal pools.
- Develop monitoring programs to evaluate the success of vernal pool management plans and their effects on local populations of amphibians.

*Conservation Issue: Habitat loss or damage caused by heavy recreational use that negatively affects species of greatest conservation need:*

13. The use of off-road and all-terrain vehicles can compact soil, create soil erosion problems, damage understory vegetation and crushing nests and wildlife (e.g., salamanders) that live in the dense leaf litter found in mesic forests.
14. Excessive equestrian use of the habitat can create erosion problems or facilitate the spread of exotic weedy herbaceous plants

*Conservation Actions:*

- Develop regulations to control off-road vehicle use on public lands.
- Close or gate unneeded roads (e.g., old logging roads) to limit access by all-terrain and off-road vehicles.
- Develop informational materials about the potential impacts of off-road vehicle and equestrian use and develop recommendations to minimize these impacts.

*Potential indicators for monitoring the effectiveness of the conservation actions:*

- Acres of restored or enhanced habitat.
- Habitat quality such as changes in forest tract size, forest structure, and total acreage.
- Number of landowners/acres involved in conservation programs.
- Number or percentage of acres acquired or placed into conservation programs (incentive programs).
- Relative condition (populations/trends) of species of greatest conservation need and key indicator species.
- Relative condition and quantity of habitat.
- Stand health, composition structure.

## Conservation Landscape: Oak/Hickory Bottomland Hardwood Forest

The relative condition of Oak/Hickory Bottomland Hardwood Forest habitat is currently poor with a declining trend. Bottomland Hardwood Forests are widespread in the Region but occur locally within the floodplains of rivers and large streams. A large percentage of this habitat, possibly over 50 percent, has been either converted to agricultural uses (e.g., crop fields or introduced pasture) or permanently inundated by the construction of reservoirs (Brabander et al. 1985)<sup>3</sup>. Approximately 175,000 acres of this habitat type are likely to occur in the Region, with the largest tracts of bottomland forest documented to occur in the floodplains of the Little River, Kiamichi River, upper Poteau River, and Gaines Creek (Brabander 1985). Bottomland hardwood forests are diverse plant communities and their species composition varies with soil conditions and flooding frequency and duration. Most bottomland hardwood forests are dominated by oak species such as Water Oak (*Quercus nigra*), Willow Oak (*Quercus phellos*), and Shumard Oak (*Quercus shumardii*). Other common deciduous trees include Black Gum (*Nyssa sylvatica*), Sweetgum (*Liquidambar styraciflua*), Red Maple (*Acer rubra*), and Sugarberry (*Celtis laevigata*). Common understory vegetation includes American Hornbeam (*Carpinus caroliniana*), Parsley Hawthorn (*Crataegus marshallii*), Deciduous Holly (*Ilex decidua*), and Spicebush (*Lindera benzoin*). Dwarf Palmetto (*Sabal minor*) grows in the understory of bottomland forests of a few sites in southeastern McCurtain County.

This habitat type includes semi-permanently flooded forests of Bald Cypress (*Taxodium distichum*) and seasonally flooded forests of Overcup Oak (*Quercus lyrata*) and Water Hickory (*Carya aquatica*) which occur in the floodplains of the Little River and some Red River tributaries in the West Gulf Coastal Plain section. In the floodplain of the Arkansas River and its tributaries are bottomland forests are dominated by Pin Oak (*Quercus palustris*), Pecan (*Carya illinoensis*), Sugarberry (*Celtis laevigata*), and Shumard Oak (*Quercus shumardii*).

Recognized plant associations within this habitat type include:

- Bald Cypress Semi-permanently Flooded Forest
- Black Gum – Red Maple Temporarily Flooded Forest
- Black Gum – Sweetgum Temporarily Flooded Forest
- Overcup Oak – Water Hickory Seasonally Flooded Forest
- Pecan – Sugarberry Temporarily Flooded Forest
- Pin Oak – Pecan/Deciduous Holly Seasonally Flooded Forest (Arkansas River Valley)
- Red Maple – Sweetgum Seasonally Flooded Forest
- Sweetgum – Water Oak/American Hornbeam Seasonally Flooded Forest
- Sweetgum – Willow Oak/American Hornbeam Seasonally Flooded Forest
- Water Oak – Red Elm – Sweetgum/American Hornbeam Temporarily Flooded Forest
- Water Oak – Willow Oak/American Hornbeam Temporarily Flooded Forest
- Willow Oak – Black Gum/American Hornbeam Temporarily Flooded Forest

The species of greatest conservation need found in this habitat are listed in the following table. The population abundance and trend of each species are described in relative terms. The best professional judgment of the advisory group and technical experts was used to identify each species status and trend. Species are sorted alphabetically within groups of amphibians (Amph), birds, fish, invertebrates (Inve), mammals (Mamm), and reptiles (Rept) for easy reference.

Species status definitions:

Low – species is rare, has a small population size, and/or occurs in only a small portion of the Region.

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<sup>3</sup> Brabander, J.J., R.E. Masters and R.M..Short 1985 Bottomland Hardwoods of Eastern Oklahoma: A Study of their Status, Trends and Values. 142 pp.

Medium – species is uncommon and occurs over a large portion of the Region or species is common but occurs in only a small part of the Region.

Abundant – species is common and widespread within the Region in appropriate habitat.

Unknown – the status of this species is not known.

Species of Greatest Conservation Need		Status				Trend			
Group	Common Name	Low	Medium	Abundant	Unknown	Declining	Stable	Increasing	Unknown
Amph	Crawfish Frog				X				X
Amph	Four-toed Salamander				X				X
Amph	Kiamichi Slimy Salamander				X				X
Amph	Many-ribbed Salamander				X				X
Amph	Mole Salamander				X				X
Amph	Ouachita Dusky Salamander				X				X
Amph	Ringed Salamander				X				X
Amph	Sequoyah Slimy Salamander				X				X
Amph	Southern Red-backed Salamander				X				X
Amph	Three-toed Amphiuma				X				X
Amph	Western Bird-voiced Treefrog				X				X
Amph	Western Lesser Siren				X				X
Bird	American Woodcock	X							X
Bird	Cerulean Warbler	X				X			
Bird	Hooded Warbler	X							X
Bird	Kentucky Warbler		X						X
Bird	Lesser Scaup		X			X			
Bird	Little Blue Heron		X						X
Bird	Louisiana Waterthrush		X						X
Bird	Northern Pintail		X			X			
Bird	Prothonotary Warbler		X						X
Bird	Red-headed Woodpecker		X			X			
Bird	Rusty Blackbird	X							X
Bird	Solitary Sandpiper	X							X
Bird	Swainson's Warbler	X							X
Bird	Swallow-tailed Kite	X							X
Bird	Wood Stork		X				X		
Bird	Wood Thrush	X							X
Bird	Worm-eating Warbler	X							X
Mamm	Golden Mouse				X				X
Mamm	Indiana Myotis	X				X			
Mamm	Marsh Rice Rat				X				X
Mamm	Northern Long-eared Myotis				X				X
Mamm	Rafinesque's Big-eared Bat				X				X
Mamm	River Otter		X					X	
Mamm	Seminole Bat				X				X
Mamm	Southeastern Myotis				X				X
Mamm	Swamp Rabbit				X				X
Rept	American Alligator				X				X

Species of Greatest Conservation Need		Status				Trend			
Group	Common Name	Low	Medium	Abundant	Unknown	Declining	Stable	Increasing	Unknown
Rept	Eastern River Cooter				X				X
Rept	Louisiana Milksnake				X				X
Rept	Midland Smooth Softshell				X				X
Rept	Mississippi Map Turtle				X				X
Rept	Northern Scarletsnake				X				X
Rept	Ouachita Map Turtle				X				X
Rept	Razor-backed Musk Turtle				X				X
Rept	Spiny Softshell Turtle				X				X
Rept	Western Chicken Turtle				X				X
Rept	Western Mudsnake				X				X

The following conservation issues and actions are listed in general priority order.

*Conservation Issue: Incomplete data concerning species of greatest conservation need (refer to the matrix above) and habitat, an impediment for effective conservation planning and implementation:*

1. Data are incomplete for species of greatest conservation need (particularly those whose populations are low or unknown and for those whose status and trends of are declining or unknown) thus making it difficult to identify management issues and establish effective corrective strategies.
2. Baseline knowledge about flora/fauna and both the historic and current distribution and condition of this habitat type is incomplete.
3. Bottomland hardwood forest communities typically occur in predictable locations with specific soils and proximity to streams and rivers; therefore, they should be relatively easy to model and map. However, the current and historic distributions and conditions of this community have not been completely assessed.

*Conservation Actions:*

- Conduct surveys of existing literature, reports, and museum records to evaluate historic distributions, abundances, and habitat affinities of species of greatest conservation need and examine the possible causes of suspected population declines.
- Conduct field surveys to establish baseline conditions for the current distributions, abundances, and habitat affinities of species of greatest conservation need.
- Verify the accuracy of existing data and assess changes over time.
- Develop and maintain databases to store and analyze distributional and ecological data for species of greatest conservation need.
- Conduct ecological studies on Tier I and Tier II species of greatest conservation need (e.g., songbirds, amphibians, and bats) to:
  - identify factors that limit population sizes,
  - evaluate factors that may be responsible for population declines, and
  - develop recommendations to enhance populations (i.e., through enhancement of habitat conditions).
- Develop a method to accurately identify and map the distribution and condition of this community to establish a current baseline.
- Assess historic literature and conduct field studies to evaluate the probable historic distribution and condition of bottomland forests.
- Use the results of these surveys and studies to update the Comprehensive Wildlife Conservation Strategy via adaptive resource management.

*Conservation Issue: Habitat loss and modification as a result of altered patterns of seasonal flooding due to stream and river channel modifications:*

4. Reservoir construction and stream channelization projects have reduced the frequency and magnitude of flooding which is necessary to maintain bottomland hardwood forests. In some areas, channel modifications have resulted in deep incised stream channels and created a disconnection between the streams and their bottomland forests.
5. Vernal pools and seasonally flooded wetlands within bottomland forests have been lost or degraded as a result of sedimentation and/or reduction in periodic flooding, resulting in losses of important breeding areas for a diversity of amphibians and feeding areas for waterfowl.

*Conservation Actions:*

- Where modifications have occurred, restore hydrology to tracts of bottomland hardwood forest by managing for the historic hydroperiod reconnecting streams with their floodplain forests. Restoration efforts may include restoring the structure of stream or river channels, restoring stream meanders, or creating low dikes to retain seasonal storm water.
- Identify and develop protection and management plans for vernal pools, seeps, and seasonal wetlands that are important to salamander species of greatest conservation need. These plans can include activities such as fencing, dredging/removal of accumulated sediments, development of conservation easements, or construction of new vernal pools.
- Develop monitoring programs to evaluate the success of vernal pool management plans and their effects on local populations of amphibians.

*Conservation Issue: Fragmentation and conversion of habitat:*

6. Fragmentation and loss of bottomland hardwood communities has resulted from the conversion of these forests to other land uses such as crop fields, pine plantations, and Fescue pastures.
7. Habitat fragmentation coincides with the trend for increasing fragmentation of land ownership where more individuals own smaller tracts of land.
8. Fragmentation of forest tracts as a result of increasing numbers of roads, utility lines, and pipelines; species that rely on relatively large unbroken tracts of forest are most susceptible to this trend.
9. In some areas, chemical herbicides are being used to eradicate bottomland hardwood vegetation to convert the land to other uses such as pasture.

*Conservation Actions:*

- Develop a landowner incentive program to encourage the retention of bottomland hardwood forest stands and not convert these to other vegetation such as Fescue pasture.
- Develop programs to maintain biologically meaningful tracts of bottomland oak-hickory forests such as conservation easements, conservation leases, or willing-seller land acquisitions, preceded by a landscape-level assessment of habitat conditions to identify focus areas of greatest conservation value in order to get the greatest “bang for the buck” or conservation efficiency.
- Explore tax reform and other ways to help families pass down large tracts of land from one generation to the next.
- Evaluate methods to restore bottomland hardwood forests on pastures or crop fields and develop cost-share programs or grants to assist and encourage willing landowners who wish to restore/replant these areas.
- Support cooperative efforts between government agencies and research institutions to develop or update Best Management Practices and management recommendations

to minimize the ecological footprint left by road, pipeline, and utility line construction, and the impacts of right-of-way maintenance practices.

- Develop and distribute informational materials with Best Management Practices and recommendations to landowners, agencies and utility companies.
- Develop educational materials for schools and landowners that highlight the value (i.e., ecological and economic) of hardwood trees and the bottomland forest community.
- Develop wildlife corridors to connect disjunct tracts of bottomland hardwood forest or to connect these forest tracts with other important forest communities.

*Conservation Issue: Altered forest community structure as a result of historic and current land management:*

10. Many bottomland forest stands are comprised of dense even-aged second growth forest as a result of widespread timber harvest in the early 1900s. These forest stands lack the diverse structure of canopy, midstory and understory vegetation that existed historically in uneven-aged forests. The shading caused by dense canopies in these even-aged forests may limit the abundance and diversity of understory vegetation and sustained shading may limit the recruitment of oak species in favor of more shade tolerant species over time.

*Conservation Action:*

- Evaluate the effectiveness of midstory thinning or timber stand improvement as a tool to diversify forest structure and increase understory vegetation.

*Conservation Issue: Invasive and exotic plants and animals that are detrimental to species of greatest conservation need:*

11. Several exotic plant species including *Sericea lespedeza*, Autumn Olive, Chinese Privet and Japanese Honeysuckle have become established in mesic hardwood forests that appear to be displacing native understory plants and may alter native plant communities and habitat conditions for wildlife species of conservation need.
12. Feral hogs may be causing substantial ecological damage to vernal pools within bottomland forests and may compete with native wildlife for food.

*Conservation Actions:*

- Evaluate the severity and magnitude of the ecological damage done by exotic plant and animal species (e.g., displacement of native vegetation, predation on native animal populations, or hybridization with native species) to identify those exotic species causing the greatest impact to species of greatest conservation need.
- Develop control or management plans (e.g., controlled burning programs, herbicide treatment, and mechanical removal) for the exotic species that cause the greatest ecological damage and develop monitoring programs to measure and evaluate the effectiveness of these control measures.
- Develop cost-share or incentives programs for private landowners to encourage them to control invasive and exotic species.
- Develop educational materials about the ecological damage done by invasive and exotic vegetation and introduced plant diseases.

*Potential indicators for monitoring the effectiveness of the conservation actions:*

- Changes in number of forested acres in floodplains and the species composition of these acres.
- Number or percentage of acres acquired or placed into conservation programs (incentive programs).
- Percent of available habitat in conservation programs (e.g., measure net gain or loss of habitat).

- Relative condition (populations/trends) of species of greatest conservation need and key indicator species.
- Relative condition and quantity of habitat.
- Snag count as part of monitoring habitat.
- Stand health, composition structure.
- Stream flow and habitat quality (e.g., measure return of stream flow with range of natural variation).

## Conservation Landscape: Gravel (hard)-bottom Streams and Associated Riparian Forests

The relative condition of Gravel (hard)-bottom Streams and Associated Riparian Forests habitat is currently poor with a declining trend. Streams with bedrock, cobble, or gravel substrates are common in the Ouachita Mountains portion of this Region and are typically found above the 500-foot elevation contour. Most streams in the Ouachita Mountains flow over sections of bedrock, boulders, or cobble and few of these streams could accurately be considered gravel-bottom streams. The hard-bottom streams in this Region are diverse but most have well defined pool and riffle sections. They are moderately entrenched and are wider than they are deep. Most have relatively few meanders and narrow floodplains and riparian zones. Riparian forests are dominated by Red Maple (*Acer rubrum*), Sycamore (*Platanus occidentalis*), River Birch (*Betula nigra*), and Sweetgum (*Liquidambar styraciflua*) with an understory dominated by Silky Dogwood (*Cornus amomum*), Spring Witch-hazel (*Hamamelis vernalis*), Smooth Alder (*Alnus serrulata*), wild indigo (*Amorpha sp.*), Deciduous Holly (*Ilex deciduas*), and St. John's-wort (*Hypericum sp.*).

Recognized riparian plant associations in this habitat type include:

- American/Red Elm – Chinquapin Oak Temporarily Flooded Forest
- American/Red Elm – Sugarberry/Hackberry – Green Ash Temporarily Flooded Forest
- Giant Cane Temporarily Flooded Shrubland
- Green Ash – American Elm Temporarily Flooded Forest
- Green Hawthorn – Cockspur Hawthorn – Downy Hawthorn Temporarily Flooded Shrubland
- River Birch – Sycamore – Smooth Alder Temporarily Flooded Forest
- Silver Maple – Boxelder Temporarily Flooded Forest
- Smooth Alder – False Indigo Temporarily Flooded Shrubland
- Spring Witch-Hazel – Silky Dogwood Temporarily Flooded Shrubland
- Swamp Privet – Buttonbush Semi-permanently Flooded Shrubland
- Sycamore – Boxelder Temporarily Flooded Forest

The species of greatest conservation need found in this habitat are listed in the following table. The population abundance and trend of each species are described in relative terms. The best professional judgment of the advisory group and technical experts was used to identify each species status and trend. Species are sorted alphabetically within groups of amphibians (Amph), birds, fish, invertebrates (Inve), mammals (Mamm), and reptiles (Rept) for easy reference.

Species status definitions:

Low – species is rare, has a small population size, and/or occurs in only a small portion of the Region.

Medium – species is uncommon and occurs over a large portion of the Region or species is common but occurs in only a small part of the Region.

Abundant – species is common and widespread within the Region in appropriate habitat.

Unknown – the status of this species is not known.

Species of Greatest Conservation Need		Status				Trend			
Group	Common Name	Low	Medium	Abundant	Unknown	Declining	Stable	Increasing	Unknown
Amph	Many-ribbed Salamander				X				X
Amph	Ouachita Dusky Salamander				X				X
Amph	Ringed Salamander				X				X
Amph	Sequoyah Slimy Salamander				X				X
Amph	Kiamichi Slimy Salamander				X				X

Species of Greatest Conservation Need		Status				Trend			
Group	Common Name	Low	Medium	Abundant	Unknown	Declining	Stable	Increasing	Unknown
Bird	American Woodcock	X							X
Bird	Hooded Warbler	X							X
Bird	Kentucky Warbler		X						X
Bird	Little Blue Heron		X						X
Bird	Louisiana Waterthrush		X						X
Bird	Prothonotary Warbler		X						X
Bird	Red-headed Woodpecker		X			X			
Bird	Whip-poor-will		X						X
Fish	Kiamichi Shiner	X				X			
Fish	Orangebelly Darter			X			X		
Fish	Ouachita Mountain Shiner		X				X		
Fish	Rocky Shiner		X						X
Inve	Kiamichi Crayfish		X					X	
Inve	Orconectes menae				X				X
Inve	Orconectes nana				X				X
Mamm	Eastern Spotted Skunk				X				X
Mamm	Long-tailed Weasel				X				X
Mamm	Northern Long-eared Myotis				X				X
Mamm	River Otter		X					X	
Mamm	Swamp Rabbit				X				X
Rept	Alligator Snapping Turtle				X				X
Rept	Eastern River Cooter				X				X
Rept	Midland Smooth Softshell				X				X
Rept	Mississippi Map Turtle				X				X
Rept	Ouachita Map Turtle				X				X
Rept	Razor-backed Musk Turtle				X				X
Rept	Spiny Softshell Turtle				X				X
Rept	Western Chicken Turtle				X				X

The following conservation issues and actions are listed in general priority order.

*Conservation Issue: Incomplete data concerning species of greatest conservation need (refer to the matrix above) and habitat, an impediment for effective conservation planning and implementation:*

1. Data are incomplete for species of greatest conservation need (particularly those whose populations are low or unknown and for those whose status and trends of are declining or unknown) thus making it difficult to identify management issues and establish effective corrective strategies.
2. There are limited historic data from which to evaluate the condition of streams and riparian forests prior to large-scale human alteration of this habitat.
3. The resources of riparian forests and streams are difficult to monitor because most of the habitat occurs on private land and is distributed in small tracts across many individual landowners.
4. There is incomplete information from which land managers can predict the effect of habitat changes on populations of species of greatest conservation need.

*Conservation Actions:*

- Survey taxonomic experts to determine why species of greatest conservation need have small and/or declining populations.
- Conduct research on species of greatest conservation need to determine what factors limit their population size and distribution.
- Conduct research on species of greatest conservation need to establish baseline population size, density, distribution, and habitat relationships.
- Conduct biological inventories of amphibian, fish, crayfish, and mussel populations in streams to increase the knowledge of biological communities within specific watersheds.
- Summarize and verify existing data.
- Conduct literature reviews and focused studies to establish what stream and riparian habitats looked like historically to establish a target condition for stream and riparian restoration efforts.
- Promote the addition of data to the Oklahoma Natural Heritage Inventory Database for both existing and future data concerning species of greatest conservation need and other rare species.
- Use surveys, workshops, and data acquisition to update the Comprehensive Wildlife Conservation Strategy.
- Develop local watershed councils, stream teams, and citizen's groups to address local concerns through education and to monitor water quality and wildlife populations.

*Conservation Issue: Water quality changes that negatively affect both habitat and species:*

5. The presence of many confined animal feeding operations such as cattle feedlots, poultry houses, and hog farms, and waste application fields close to streams and drainages.
6. Additional nutrients enter streams as a result of cattle/livestock watering in streams and grazing in riparian areas.
7. Increased nutrient levels in streams increases the abundance of algae, which can result in other water quality impacts such as increased fluctuations in dissolved oxygen.
8. Endocrine disrupters and other pollutants from pesticides enter streams in storm water runoff from agricultural fields and alter the growth, reproduction and/or survival of fish, amphibians, and invertebrates in the streams.

*Conservation Actions:*

- Develop conservation easements or acquire land to maintain, or restore natural riparian vegetation along streams to reduce or limit agricultural development in and adjacent to riparian areas.
- Establish set back distances between streams and captive animal farming operations, waste lagoons, and land application areas.
- Provide cost-share funding to construct fencing along streams and riparian areas to control/limit their access by cattle.
- Provide cost-share funding or increase promotion of existing programs to restore riparian vegetation along streams.
- Develop better cost sharing programs to increase the acceptability and use of Best Management Practices to control nutrients and pesticides by landowners.
- Reduce the use of herbicides and other pesticides in floodplains and riparian areas.
- Develop local watershed councils, stream teams, and citizen's groups to address local concerns through education and to monitor water quality and wildlife populations.
- Improve the knowledge of and access to Farm Bill incentives and cost-share programs to improve water quality through the implementation of Best Management Practices and establishment of streamside buffer zones.

*Conservation Issue: Altered patterns of water flow that negatively affect both habitat and species:*

9. Water is being pumped from streams for irrigation.
10. Groundwater is being pumped from shallow aquifers for municipal and agricultural purposes, lowering water tables and reducing the flow volume of springs and seeps that feed streams.
11. Increased pond construction may be lowering the inflow that sustains streams.
12. Bridges can impact streams by altering stream channels.
13. Some types of culverts can become barriers to the movement of fish during low-flow conditions.
14. Dams and bridges across streams can create fish barriers that affect the populations of fish and freshwater mussels.
15. Dams and diversion structures alter the natural flow patterns and other processes of streams, especially the frequency and magnitude of natural flooding events.

*Conservation Actions:*

- Establish minimum in-stream flow levels on all biologically important streams (e.g., those streams that support populations of species of greatest conservation need or diverse aquatic communities).
- Manage water withdrawals to have the least impact on aquatic biota.
- Stop the proposals to sell water outside of the state or the transfer of water between basins within Oklahoma.
- Provide results of ecological studies to water use planners and those who issue permits.
- Support the development of a state water management plan with sound biological data that demonstrate the ecological impact of water sales, water withdrawals, and inter-basin transfers of water.
- Pursue improved ability to reserve stream flows for nonconsumptive uses and specifically maintenance of aquatic species and ecosystems.
- Remove ponds and impoundment that are obsolete but have been shown to block the movement of fish species of conservation need.
- Remove or rehabilitate culverts and road crossing with new structures that do not create barriers to fish.
- Replace ponds that have been constructed on streams with alternative water sources (e.g., for livestock).
- Modify pond and reservoir management to ensure that minimum in-stream flows are maintained below these structures.

*Conservation Issue: Habitat loss and fragmentation from land management practices:*

16. The abundance and diversity of understory vegetation has declined in riparian areas as a result of livestock grazing, especially during the growing season.
17. Riparian Forests have been cleared and converted to crop fields or introduced pastures of exotic grasses such as Fescue and Bermuda.
18. Fragmentation of riparian forests by roads, houses, pastures, and utility right-of-ways.
19. Clearing of riparian vegetation reduces stream bank stability which subsequently increases erosion and alters the width/depth ratios of streams
20. Streams and riparian habitats are fragile and easily disturbed or modified.
21. Loss of riparian vegetation, increasing erosion and sedimentation.
22. Lack of headwaters protection allows for more sediment, nutrients, pesticides, and other pollutants to enter streams.
23. Livestock grazing along stream banks increases bank erosion and increases the sediment load in the stream.

24. Loss of stream shading as a result of reduced riparian vegetation, increasing water temperatures and affecting the aquatic animal community.
25. Increased sediment in the stream can fill or alter riffles and gravel beds which serve as spawning areas for fish and habitats for freshwater mussels.

*Conservation Actions:*

- Provide cost-share funding or grants to fence riparian forests to control/limit access by cattle.
- Purchase easements to protect or enhance existing riparian vegetation or to restore riparian forests.
- Encourage the planting/construction of alternative shading for livestock to reduce their use of riparian areas.
- Provide landowner incentives or cost-share programs to protect or restore riparian forests, stream banks and in-stream habitat.
- Use fee-title purchase of stream and riparian habitat to place these lands into conservation ownership to conserve or enhance existing habitat.
- Fee-title acquisition of headwaters to streams to control/limit the introduction of sediment, nutrients, and chemical pollutants.
- Develop new and promote existing Best Management Practices for the grazing of cattle in or adjacent to riparian zones.
- Increase the availability of aquatic resource educational information in the public schools.
- Work with the U.S. Fish and Wildlife Service to develop appropriate riparian buffers, including buffers in temporary-flowing sections, for areas with aquatic species of greatest conservation need.

*Conservation Issue: Invasive and exotic plants and animals that are detrimental to species of greatest conservation need:*

26. Exotic plant species such as Chinese Privet, Salt Cedar, and Japanese Honeysuckle have become established and are becoming more abundant in riparian forests, which compete with native plants and alter the structure of the habitat that can be used by animals.
27. Exotic predatory fish such as trout may compete with native predatory fish such as bass, and create increased predation pressure on stream fish or invertebrates.
28. Feral hogs that forage in streams and along stream banks damage riparian vegetation and reduce bank stability.
29. Some native plants and animals have become more abundant in riparian forests.
  - Eastern Redcedar has increased in abundance due to heavy grazing and reduced fire frequency in riparian areas.
  - Brown-headed Cowbirds have become more abundant in riparian areas due to cattle grazing. Brown-headed Cowbirds lay their eggs in the nests of other birds thus reducing the number of chicks from the host species.

*Conservation Actions:*

- Work with U.S. Fish and Wildlife Service to develop an invasive/nuisance species management plan.
- Conduct studies to quantify the impact of exotic species on riparian forest communities or on aquatic animal communities
- Increase educational efforts and public awareness of the ecological and economic impacts of exotic plant and animal populations.

*Conservation Issue: Habitat loss and fragmentation from geomorphic alteration and instability of river channels:*

30. Many streams in the Region have been channelized/straightened, becoming incised and no longer connected with their riparian vegetation.

31. Streams with incised channels have cut banks that are prone to erosion which increases sediment loads in the streams.
32. Lack of connection between streams and riparian vegetation due to the channelization and incising of streams resulting in reduced riparian vegetation and a loss of wetlands within the stream floodplain.
33. In-stream gravel mining reduces bank stability upstream and downstream of the mining area increasing bank erosion and altering the width to depth ratio of the stream by making it wider and shallower.
34. In-stream gravel mining can remove or reduce riffles, gravel beds, and other stream structures that are important habitat for aquatic wildlife.

*Conservation Actions:*

- Provide cost-share funding or grants to restore stream channels and establish natural vegetation on stream banks for stability.
- Restore or construct seasonal wetlands/vernal pools within the riparian zones or floodplains of streams.
- Reconnect stream and riparian vegetation through the restoration of stream channels.
- Develop regulations to eliminate gravel mining from within streams.
- Work with local communities and counties to reduce stream channel impacts including in-stream gravel mining, placement of rip-rap on stream banks at bridge crossings, and recreational use of streams by off-road vehicles.

*Potential indicators for monitoring the effectiveness of the conservation actions:*

- Acres acquired or proportion of acres protected/acquired within a given watershed.
- Amount of gravel mining reduction.
- Denied applications for exotic species introductions.
- Easements obtained.
- Analysis of stream/riparian habitat change using GIS and aerial photography.
- Landowners participating in conservation practices.
- Locations and quantities of in-stream flows reserved for aquatic ecosystem conservation.
- Miles of degraded and restored streams.
- New local conservation groups and their effectiveness.
- Partnerships with local governments.
- Public opinion toward conservation actions.
- Recreation users of streams.
- Relative condition (populations/trends) of species of greatest conservation need and key indicator species.
- Relative condition and quantity of habitat.
- Stream flow and habitat quality (e.g., measure return of stream flow with range of natural variation).
- Water quality parameters.

## Conservation Landscape: Shortleaf Pine/Oak Woodland or Savannah

The relative condition of Shortleaf Pine/Oak Woodland or Savannah habitat is currently poor with a declining trend. This is an uncommon and locally occurring plant community that is typically found on slopes with a southern or western aspect in the Ouachita Mountains. The Shortleaf Pine (*Pinus echinata*) savannah and woodland habitat type is a fire-maintained plant community that relies on frequent fire to suppress oaks and to reduce the density of pines (Masters et al. 1996). The understory in this habitat type is dominated by grasses and forbs, particularly Little Bluestem (*Schizachyrium scoparium*), Narrowleaf Woodoats (*Chasmanthium sessiliflorum*), Panic Grasses (*Dichantherium sp.*), Pale Purple Coneflower (*Echinacea pallida*), Beebalm (*Monarda russeliana*), and Elmleaf Goldenrod (*Solidago ulmifolia*). Understory shrub density is related to fire frequency. Shrubs may have been sparse historically. Woody development and canopy closure increases rapidly as a result of fire suppression. Much of this habitat has changed, as a result of fire suppression and succession, to mixed Shortleaf Pine/oak (*Quercus sp.*) forest or has been converted to industrial pine plantations.

Recognized plant associations within this habitat type include:  
Shortleaf Pine/Little Bluestem Woodland

The species of greatest conservation need found in this habitat are listed in the following table. The population abundance and trend of each species are described in relative terms. The best professional judgment of the advisory group and technical experts was used to identify each species status and trend. Species are sorted alphabetically within groups of amphibians (Amph), birds, fish, invertebrates (Inve), mammals (Mamm), and reptiles (Rept) for easy reference.

Species status definitions:

Low – species is rare, has a small population size, and/or occurs in only a small portion of the Region.

Medium – species is uncommon and occurs over a large portion of the Region or species is common but occurs in only a small part of the Region.

Abundant – species is common and widespread within the Region in appropriate habitat.

Unknown – the status of this species is not known.

Species of Greatest Conservation Need		Status				Trend			
Relative Priority	Common Name	Low	Medium	Abundant	Unknown	Declining	Stable	Increasing	Unknown
Bird	American Woodcock	X							X
Bird	Bachman's Sparrow	X							X
Bird	Barn Owl	X							X
Bird	Brown-headed Nuthatch	X							X
Bird	Kentucky Warbler		X						X
Bird	Loggerhead Shrike		X			X			
Bird	Northern Bobwhite		X			X			
Bird	Painted Bunting		X						X
Bird	Prairie Warbler		X						X
Bird	Red-cockaded Woodpecker	X				X			
Bird	Red-headed Woodpecker		X			X			
Bird	Whip-poor-will		X						X
Inve	American Burying Beetle		X						X
Inve	Diana Fritillary	X							X

Species of Greatest Conservation Need		Status				Trend			
Relative Priority	Common Name	Low	Medium	Abundant	Unknown	Declining	Stable	Increasing	Unknown
Mamm	Long-tailed Weasel				X				X
Mamm	Northern Long-eared Myotis				X				X
Rept	Western Diamond-backed Rattlesnake				X				X

The following conservation issues and actions are listed in general priority order.

*Conservation Issue: Incomplete data concerning species of greatest conservation need (refer to the matrix above) and habitat, an impediment for effective conservation planning and implementation:*

1. Data are incomplete to determine the habitat needs and geographic distributions of many Tier I and Tier II species of greatest conservation need that use this habitat type. In order to establish effective conservation actions, more complete data are needed to determine the population status and trend for many species and more thorough evaluations are needed to determine the factors that limit population sizes or are responsible for declines.
2. The Shortleaf Pine/Oak community historically existed as a mosaic of woodlands and forests. Data are needed to more accurately determine the historic and current distribution and condition of this habitat type.

*Conservation Actions:*

- Conduct surveys of existing literature, reports, and museum records to evaluate historic distributions, abundances, and habitat affinities of species of greatest conservation need, and examine possible causes of suspected population declines.
- Conduct field surveys to establish baseline conditions for the current distributions, abundances, and habitat affinities of species of greatest conservation need.
- Verify the accuracy of existing data; and assess changes over time.
- Develop and maintain databases to store and analyze distributional and ecological data for species of greatest conservation need.
- Conduct ecological studies of Tier I and Tier II species of greatest conservation need (e.g., Bachman's Sparrow, Brown-headed Nuthatch, and Northern Long-eared Myotis) to:
  - identify factors that limit population sizes,
  - evaluate factors that may be responsible for population declines, and
  - develop recommendations to enhance populations (i.e., through enhancement of habitat conditions).
- Develop a method to accurately identify and map the distribution and the condition of this habitat to establish a current baseline.
- Assess historic literature and conduct field studies to evaluate the probable historic distribution and condition of this habitat type, to include the identification of a range of target vegetation conditions for restoration or management efforts.
- Use the results of these surveys and studies to update the Comprehensive Wildlife Conservation Strategy via adaptive resource management.

*Conservation Issue: Altered vegetation structure and condition as a result of current and historic land management practices:*

3. Relatively little of this plant community exists in a woodland condition. Intact areas of this community that historically existed as a mosaic of woodlands and forests have gradually changed to a more uniform forest-like condition. This change appears to be the result of a loss of historic fire regimes due to active fire suppression.

4. Much of this habitat type currently exists as even-aged forest. This change from woodlands comprised of trees of diverse ages and heights to forests of relatively even-aged trees appears to be a result of historic large-scale timber harvest that occurred in this Region during the late 1800s and early 1900s.
5. The combination of even-aged stands and decades of fire suppression appear to be responsible for greater tree densities than probably occurred historically; continued lack of periodic fire and dense canopy conditions may result in a further reduction in the successful recruitment of shortleaf pines and oaks in the future.
6. Constraints including insufficient personnel and financial resources, air quality concerns, insufficient technical guidance/assistance, logistical difficulties, and landowner liability issues limit the use of management tools such as prescribed burning and selective timber harvest to restore woodland conditions for the benefit of species of greatest conservation need.
7. The effects of prescribed burning on many species of greatest conservation concern are poorly known.
8. Prescribed burning is likely to be beneficial to all or most species, but the timing, frequency, and size of burns probably affect species differently.
9. Because changes in vegetation structure have occurred gradually, many landowners are not aware of changes.
10. Landowners that wish to restore vegetation structure or enhance habitat conditions for the benefit of species of greatest conservation need do not have information or technical assistance available to them.
11. Several exotic plant species such as *Sericea lespedeza*, Tall Fescue, and Japanese Honeysuckle have become established outside of cultivation and appear to displace native plants and plant communities which alter the habitat conditions for wildlife species of conservation need.
12. In local areas, heavy cattle grazing within Shortleaf Pine/Oak woodlands may reduce the abundance and diversity of understory vegetation, contribute to erosion on steep slopes and enhance the spread of undesirable exotic vegetation such as Japanese Brome and other weeds.

*Conservation Actions:*

- Use studies of historic fire regimes and the historic distribution of this woodland habitat to develop site-specific recommendations for the use of prescribed burning. These recommendations should evaluate the timing (i.e., season), sizes and frequencies of prescribed burns to balance the needs of fire dependent species (e.g., pines and some birds) and fire sensitive species (e.g., amphibians).
- Evaluate ways to reduce the impediments and constraints that reduce the use of prescribed fire as a management tool. These may include:
  - providing funding to organizations or agencies to assist with conducting controlled burns on private property,
  - developing technical assistance materials for landowners (e.g., publications, burning guidelines, workshops, and equipment rentals),
  - developing demonstration areas on public lands to show the results of management practices,
  - providing financial assistance or incentives to landowners to encourage woodland restoration,
  - developing burn cooperatives to work with agencies and landowners to increase the use of burning, and
  - looking for ways to reduce landowner liability while conducting burns (e.g., use of official burn protocols).
- Where appropriate, evaluate the use of regeneration cutting, thinning, or midstory reduction to diversify stand ages and/or decrease tree densities.
- Develop monitoring programs to evaluate the effects of management techniques such as prescribed fire and midstory tree thinning on populations of species of greatest conservation need and vegetation structure.

- Develop informational materials to inform landowners and the general public about the benefits of woodland restoration, the importance of fire in maintaining shortleaf pine-oak-hickory woodlands, and the wildlife diversity of this habitat type.
- Evaluate the severity and magnitude of the ecological damage done by exotic plant and animal species (e.g., displacement of native plant communities, predation on native animal populations, or hybridization with native species).
- Identify those exotic species causing the greatest impact to this habitat and species of greatest conservation need and develop control or management plans for them (e.g., controlled burns, herbicide treatment, and mechanical removal).
- Develop cost-share or incentives programs for private landowners to encourage them to control invasive and exotic species and develop monitoring programs to measure and evaluate the effectiveness of these control measures.
- Provide incentive payments to establish rotational grazing programs or to defer grazing on some areas during the growing season.

*Conservation Issue: Fragmentation and conversion of Shortleaf Pine/Oak communities:*

13. Fragmentation and loss of habitat caused by the conversion of Shortleaf Pine/Oak woodlands and forests to other land uses such as Loblolly Pine plantations, rangeland, or Fescue pastures.
14. Fragmentation and loss of habitat due to increasing numbers of residential developments including secondary homes, cabins, and ranchettes.
15. Fragmentation and loss of habitat due to expanding infrastructure including roads, utility lines, and pipelines.
16. Fragmentation of land ownership (i.e., more individuals owning smaller tracts of land).
17. Potential for increasing numbers of trails as recreational use of all-terrain vehicles and off-road vehicles increases, which may increase soil erosion in some areas or increase the spread of exotic weedy vegetation.

*Conservation Actions:*

- Develop ways to help families stay on the land and pass down large tracts of land from one generation to the next.
- Evaluate means to make it economically feasible for private landowners to maintain their land in Shortleaf Pine/Oak woodlands (e.g., encourage markets for oak and hickory timber or encourage groups of landowners to work together as a block to manage habitat for hardwood timber production or hunting leases).
- Develop programs to maintain large tracts of Shortleaf Pine/Oak woodlands such as conservation easements, conservation leases, or willing-seller land acquisitions, preceded by a landscape-level assessment of habitat conditions to identify focus areas of greatest conservation value in order to get the greatest “bang for the buck” or conservation efficiency.
- Evaluate methods to restore Shortleaf Pine/Oak woodlands from pastures or pine plantations, and develop cost-share programs, grants or financial incentives to encourage willing landowners to restore/replant these areas to pine/oak woodlands in order to increase acreage or tract size.
- Limit or regulate the recreational use of all-terrain and off-road vehicles on public lands but be sensitive need for these vehicles by some outdoor users such as nonambulatory/handicapped sportsmen.
- Coordinate with other agencies and research institutions to develop Best Management Practices and management recommendations to minimize the disturbance caused by and the ecological footprint left by road, pipeline, and utility line construction and right-of-way maintenance.
- Develop and distribute informational materials with Best Management Practices and recommendations to landowners, agencies, and utility companies for their consideration and use.

*Potential indicators for monitoring the effectiveness of the conservation actions:*

- Acres acquired and number of acres restored.
- Amount of technical assistance being provided.
- Number of landowners participating in landowner incentive programs.
- Relative condition (populations/trends) of species of greatest conservation need and key indicator species.
- Relative condition and quantity of habitat.
- Use of fire on the landscape.
- Vegetation response to fire (e.g., grasses and woody plants).

## Conservation Landscape: Shortleaf Pine/Oak Woodland and Forest

The relative condition of Shortleaf Pine/Oak Woodland and Forest habitat is currently poor with a declining trend except for the McCurtain County Wilderness and the 400,000 acres managed by the Ouachita National Forest. This is the most widespread and abundant habitat type in this Region and is comprised of a mosaic of woodlands and forests dominated by Shortleaf Pine (*Pinus echinata*), and several species of oaks and hickories. These woodlands and forests are found on ridge tops, rocky east, south, and west-facing slopes, as well as the upper slopes of the broad valleys that separate the ridges within the Ouachita Mountains. The species composition of this habitat type is greatly influenced by slope aspect. This woodland community is dominated by an association of Shortleaf Pine–Post Oak (*Quercus stellata*)–Blackjack Oak (*Quercus marilandica*) on mid to lower slopes with an eastern, southern, or western aspect. Other common trees include Black Hickory (*Carya texana*) and Black Oak (*Quercus velutina*) with an herbaceous and short-shrub understory dominated by Little Bluestem (*Schizachyrium scoparium*), Lowbush Blueberry (*Vaccinium pallidum*), False Indigo (*Baptisia alba*), St John’s Wort (*Hypericum hypericoides*), and Stiff Sunflower (*Helianthus divaricatus/hirsutus*). On upper slopes with a northern or eastern aspect, the woodland community is dominated by Shortleaf Pine, White Oak (*Quercus alba*), Black Oak (*Quercus velutina*) and Northern Red Oak (*Quercus rubra*). Other common trees in this community include Mockernut Hickory (*Carya tomentosa*) and Black Hickory (*Carya texana*) with a predominately shrubby understory of blueberry (*Vaccinium arboreum V. pallidum*), Winged Sumac (*Rhus copallina*), Blackberries (*Rubus sp.*), and American Beautyberry (*Callicarpa americana*).

Though data are sparse, historic accounts suggest that much of this habitat once occurred in a more open woodland condition (James 1823). Widespread tree harvest occurred in this habitat type in the early decades of the 1900s and this period has been followed by six or more decades of reduced fire frequency due to active fire suppression. As a result of the combination of large-scale harvesting and fire suppression, most of the current habitat is a more densely stocked, relatively even-aged, second-growth forest. In recent decades, some of these forests have been harvested a second time and replaced with forest stands that are heavily dominated by Shortleaf Pine or planted to Loblolly Pine plantations.

Recognized plant associations within this habitat type include:

- Shortleaf Pine – Northern Red Oak – Black Oak Forest
- Shortleaf Pine – Post Oak – Blackjack Oak Forest
- Shortleaf Pine – White Oak – Black Oak Forest

The species of greatest conservation need found in this habitat are listed in the following table. The population abundance and trend of each species are described in relative terms. The best professional judgment of the advisory group and technical experts was used to identify each species status and trend. Species are sorted alphabetically within groups of amphibians (Amph), birds, fish, invertebrates (Inve), mammals (Mamm), and reptiles (Rept) for easy reference.

Species status definitions:

Low – species is rare, has a small population size, and/or occurs in only a small portion of the Region.

Medium – species is uncommon and occurs over a large portion of the Region or species is common but occurs in only a small part of the Region.

Abundant – species is common and widespread within the Region in appropriate habitat.

Unknown – the status of this species is not known.

Species of Greatest Conservation Need		Status				Trend			
Group	Common Name	Low	Medium	Abundant	Unknown	Declining	Stable	Increasing	Unknown
Bird	American Woodcock	X							X
Bird	Bachman's Sparrow	X							X
Bird	Brown-headed Nuthatch	X							X
Bird	Kentucky Warbler		X						X
Bird	Northern Bobwhite		X			X			
Bird	Painted Bunting		X						X
Bird	Prairie Warbler		X						X
Bird	Red-cockaded Woodpecker	X				X			
Bird	Red-headed Woodpecker		X			X			
Bird	Whip-poor-will		X						X
Inve	American Burying Beetle		X						X
Inve	Diana Fritillary	X							X
Mamm	Long-tailed Weasel				X				X
Mamm	Northern Long-eared Myotis				X				X

The following conservation issues and actions are listed in general priority order.

*Conservation Issue: Incomplete data concerning species of greatest conservation need (refer to the matrix above) and habitat, an impediment for effective conservation planning and implementation:*

1. Data are incomplete for species of greatest conservation need making it difficult to identify management issues and establish effective corrective strategies.
2. Baseline knowledge about flora/fauna and both the historic and current distribution and condition of this habitat type is incomplete.

*Conservation Actions:*

- Conduct research to determine why species of greatest conservation need are low and/or declining, and establish baseline population data/information.
- Assess the historic literature and conduct field investigations to evaluate the current and historic distributions and structural conditions of this habitat type.
- Use surveys, workshops and data acquisition to update the Comprehensive Wildlife Conservation Strategy.

*Conservation Issue: Habitat loss and fragmentation from land management practices:*

1. Relatively little of this habitat exists in a woodland condition, as much of it has gradually changed to a more forest-like condition, apparently the result of a loss of historic fire regimes due to active fire suppression.
2. Much of this habitat type currently exists as even-aged forest. This change from a woodland comprised of trees of diverse ages and heights to a forest of relatively even-aged trees appears to be an artifact of the widespread timber harvest that occurred in this region during the late 1800s and early 1900s.
3. The combination of even-aged stands and decades of fire suppression appear to be responsible for greater tree densities than probably occurred historically. If the lack of periodic fire and dense forest canopy conditions continues, it may reduce the successful recruitment of shortleaf pines and some species of oaks in the future.

4. There are constraints to using management tools such as prescribed burning to restore woodland conditions to stands that are currently forests. These include insufficient personnel and financial resources, lack of technical guidance/assistance, logistical difficulties, and landowner liability issues.
5. The effects of prescribed burning on many species of conservation concern are poorly known. It is likely to be beneficial to all or most species but the timing, frequency, and size of burns probably affect species differently.
6. Many landowners are not aware of the changes that have occurred in the condition of this habitat and do not have information or technical assistance available to them to restore habitats or enhance habitat structure for species of conservation need.
7. Fragmentation and loss of habitat caused by the conversion of mixed pine-hardwood woodlands to other land uses such as pine plantations, rangeland, secondary homes, cabins, and expanding infrastructure including roads, utility lines, and pipelines.
8. Fragmentation of land ownership (more individuals owning smaller tracts of land).
9. Continuous grazing within shortleaf pine-oak-hickory woodlands may reduce the abundance of understory vegetation, limit the recruitment of some forb and tree species, and spread undesirable exotic vegetation such as Brome and pasture weeds.

*Conservation Actions:*

- Use studies of historic fire regimes and the historic distribution of this woodland habitat to develop site-specific recommendations for the use of prescribed burning. These recommendations should evaluate the timing (i.e., season), sizes and frequencies of prescribed burns to balance the needs of fire dependent species (e.g., pines, some birds) and fire sensitive species (e.g., amphibians).
- Evaluate ways to reduce the impediments and constraints that reduce the use of prescribed fire as a management tool. These may include:
  - developing technical assistance materials for landowners (e.g., publications, burning guidelines, workshops, equipment rentals, and demonstration areas)
  - providing financial assistance or incentives to landowners to encourage woodland restoration,
  - developing burn cooperatives to work with agencies and landowners to increase the use of burning,
- Develop informational materials to inform landowners and the general public about the benefits of woodland restoration, the importance of fire in maintaining shortleaf pine-oak-hickory woodlands and the wildlife diversity of this habitat type.
- Evaluate means to make it economically feasible for private landowners to maintain their land in shortleaf pine-oak woodlands (e.g., encourage markets for oak and hickory timber, or encourage groups of landowners to work together as a block to manage habitat for hardwood timber production or hunting leases).
- Develop programs to maintain large tracts of shortleaf pine-oak-hickory woodlands such as conservation easements, conservation leases, or willing-seller land acquisitions, preceded by a landscape-level assessment of habitat conditions to identify focus areas of greatest conservation value.
- Develop and distribute informational materials with Best Management Practices and recommendations to landowners, agencies and utility companies for their consideration and use.

*Potential indicators for monitoring the effectiveness of the conservation actions:*

- Acres burned or treated, and the response by native vegetation.
- Changes in acreage of exotic vegetation & acres of native plant communities restored or enhanced.
- Number of landowners participating in landowner incentive programs.
- Number of acres acquired or placed under easements.
- Relative condition (population size and trends) of species of greatest conservation need and key indicator species.

## Conservation Landscape: Large River

The relative condition of Large River (Arkansas and Red Rivers) habitat is currently poor with a declining trend. The Arkansas River flows through the Arkansas River Valley that forms the northern edge of the Region. The Red River flows along and forms the southern border of the Region. Both rivers were historically deep, slow-moving, and turbid with a seasonal period of high flow in the spring months followed by a period of low flow during the summer months. The seasonal fluctuation in water volume maintains a dynamic mosaic of sandbars, mudflats, willow thickets, and sloughs along and within the river channels. Collectively these smaller habitat types are included in the habitat type that is referred to in this Strategy as the large river habitat. This mosaic of smaller habitats within the large river habitat system supports a diversity of species including the Least Tern on sandbars, shorebirds on mudflats, wading birds, amphibians and aquatic reptiles in sloughs, and the Bell's Vireo and Willow Flycatcher in willow thickets.

Both large river systems in the Region have been modified by the construction of upstream reservoirs, flood control projects, and the removal of riparian vegetation for agricultural purposes. The Arkansas River throughout this Region has been modified further by the construction of a commercial navigation system with a series of locks and dams along its length. All of these modifications have altered the normal season fluctuation in flow rates and the magnitude of annual flood events and have thus affected the ephemeral habitats such as sandbars, mudflats, and willow thickets associated with the rivers.

The species of greatest conservation need found in this habitat are listed in the following table. The population abundance and trend of each species are described in relative terms. The best professional judgment of the advisory group and technical experts was used to identify each species status and trend. Species are sorted alphabetically within groups of amphibians (Amph), birds, fish, invertebrates (Inve), mammals (Mamm), and reptiles (Rept) for easy reference.

Species status definitions:

Low – species is rare, has a small population size, and/or occurs in only a small portion of the Region.

Medium – species is uncommon and occurs over a large portion of the Region or species is common but occurs in only a small part of the Region.

Abundant – species is common and widespread within the Region in appropriate habitat.

Unknown – the status of this species is not known.

Species of Greatest Conservation Need		Status				Trend			
Group	Common Name	Low	Medium	Abundant	Unknown	Declining	Stable	Increasing	Unknown
Bird	American Golden Plover		X						X
Bird	Bald Eagle	X						X	
Bird	Canvasback	X							X
Bird	Interior Least Tern	X							X
Bird	Lesser Scaup		X			X			
Bird	Little Blue Heron		X						X
Bird	Northern Pintail		X			X			
Bird	Peregrine Falcon	X							X
Bird	Prothonotary Warbler		X						X
Bird	Sandhill Crane		X				X		
Bird	Snowy Egret								
Bird	Snowy Plover	X							X

Species of Greatest Conservation Need		Status				Trend			
Group	Common Name	Low	Medium	Abundant	Unknown	Declining	Stable	Increasing	Unknown
Bird	Solitary Sandpiper	X							X
Bird	Trumpeter Swan	X							X
Bird	Western Sandpiper	X							X
Bird	Wood Stork		X				X		
Fish	Alabama Shad	X							X
Fish	Alligator Gar	X				X			
Fish	Arkansas River Shiner	X				X			
Fish	Black Buffalo	X							X
Fish	Blue Sucker	X							X
Fish	Chub Shiner				X				X
Fish	Crystal Darter	X							X
Fish	Paddlefish		X				X		
Fish	Pallid Shiner (Chub)	X							X
Fish	Plains Minnow			X		X			
Fish	Red River Pupfish			X			X		
Fish	Red River Shiner			X			X		
Fish	River Darter	X					X		
Fish	Shorthead Redhorse	X							X
Fish	Shovelnose Sturgeon	X							X
Fish	Western Sand Darter	X							X
Inve	Black Sandshell	X				X			
Inve	Bleufer			X			X		
Inve	Monkeyface Mussel			X			X		
Inve	Mooneye	X				X			
Inve	Ohio River Pigtoe	X				X			
Inve	Ozark Pigtoe	X							X
Inve	Plain Pocketbook		X			X			
Inve	Threeridge Mussel			X			X		
Inve	Washboard			X			X		
Mamm	Indiana Myotis	X				X			
Mamm	Northern Long-eared Myotis				X				X
Mamm	Rafinesque's Big-eared Bat				X				X
Mamm	River Otter		X					X	
Mamm	Southeastern Myotis				X				X
Rept	Alligator Snapping Turtle				X				X
Rept	American Alligator				X				X
Rept	Eastern River Cooter				X				X
Rept	Midland Smooth Softshell				X				X
Rept	Mississippi Map Turtle				X				X
Rept	Ouachita Map Turtle				X				X
Rept	Spiny Softshell Turtle				X				X

The following conservation issues and actions are listed in general priority order.

*Conservation Issue: Incomplete data concerning species of greatest conservation need (refer to the matrix above) and habitat, an impediment for effective conservation planning and implementation:*

1. Data are incomplete regarding the distribution and ecology of several species of greatest conservation need that occupy the large rivers in the Region. In order to establish effective conservation actions, more complete data are needed to determine the population status and trend for many species.
2. More thorough evaluations are needed to determine the factors that limit population sizes or are responsible for apparent declines.
3. More complete data are needed to determine management practices that may enhance populations of species of greatest conservation need, particularly for some species of fish and freshwater mussels.
4. Few data exist regarding the historic (presettlement) condition of large river habitat in Oklahoma. This information is important because this condition may serve as the desired goal for conservation efforts to achieve.

*Conservation Actions:*

- Conduct surveys of existing literature, reports, and museum records to evaluate historic distributions, abundances and habitat affinities of species of greatest conservation need, and examine possible causes of population declines where these are suspected.
- Conduct field surveys to establish baseline conditions for the current distributions, abundances, and habitat affinities of species of greatest conservation need. Taxonomic groups in greatest need of surveys include freshwater mussels and fish.
- Verify the accuracy of existing data and assess changes in populations over time.
- Develop and maintain a database to store and analyze distributional and ecological data for species of greatest conservation need. Make these data available to natural resource planners (e.g., wildlife agencies and environmental agencies).
- Conduct surveys to identify important spawning areas for fish species of greatest conservation need. These sites could be the focus areas for habitat management, enhancement or restoration efforts.
- Conduct ecological studies on priority species of greatest conservation need to:
  - identify factors that limit population sizes,
  - evaluate factors that may be responsible for population declines, and
  - develop recommendations to enhance populations (i.e., through enhancement of habitat conditions).
- Use historic literature and maps in conjunction with present-day field studies to evaluate the historic and present conditions (e.g., channel morphology, flow patterns, and water quality) of large rivers.
- Develop a monitoring program to track habitat condition/quality and the status of species of greatest conservation need over time.
- Use the results of surveys and studies to update the Comprehensive Wildlife Conservation Strategy via adaptive resource management and share these results with water conservation and regulatory agencies.

*Conservation Issue: Altered patterns of flow and decreasing water quantity:*

5. Flow patterns have been modified on all of Oklahoma's large rivers as a result of reservoir construction. Reservoirs have been constructed to reduce the magnitude of naturally occurring floods to aid in the development of river floodplains. Reservoir construction on river mainstems and major tributaries alters the historic flooding frequencies and flow patterns. Reservoirs can reduce the magnitude of small floods especially the annual spring and early summer floods that naturally occur on

Oklahoma rivers. Reservoirs can reduce flow rates during normal summer low-flow periods by holding back water.

6. Groundwater in shallow aquifers and alluvial deposits that are connected to the river may be pumped for irrigation and residential uses, potentially affecting water inflows into the river and be especially problematic during drought and summer low-flow periods.
7. Reservoirs, flood control impoundments, and recreational ponds hold storm water runoff and can reduce the volume of surface flows that reach rivers and streams.
8. The loss of wetlands and the reduction in floodplain size due to levees and dikes reduces the ability of the land to hold and slowly release water, resulting in “flashier” stream and river flows in which flow is accelerated during storm events, but then rapidly drops afterward.
9. Surface flows are diverted from the river by impoundments on tributaries and then withdrawn from the system for irrigation and residential use. (In this Region, there has been discussion of further withdrawal of surface water in order to sell it to developing areas in northern Texas.)

*Conservation Actions:*

- Conduct studies of the habitat and flow needs for species of greatest conservation need.
- Establish minimum in-stream flow standards/requirements that will meet the needs of these species and conserve populations within the watershed.
- Ensure that the results of ecological studies are provided to water conservation and regulatory agencies (e.g., U.S. Army Corps of Engineers and Oklahoma Water Resources Board) so that water use decisions can be made using the best available information.
- Cultivate greater coordination and data sharing between the wildlife conservation organizations and the water regulatory agencies.
- Conduct studies assessing and comparing current and historic flow patterns on small rivers. Where changes in flow patterns are documented, evaluate methods to restore historic patterns such as modifying reservoir management to release water to mimic historic flows.
- Purchase conservation easements from private landowners or acquire property in title from willing sellers in the floodplains of river and streams.
- Restore, enhance or create wetlands on these acres to hold storm water and slowly release it to the river to limit development within sensitive floodplains and improve habitat conditions for wildlife species of greatest conservation need.
- Support and promote water conservation programs and public education efforts directed at water conservation.
- Develop monitoring programs for wildlife populations and habitat quality to assess the effects of flow management, habitat restoration, and conservation easement programs.
- Research alternative methods for flood control including levee removal and creation of floodplain wetlands.
- Increase the consideration that fisheries, wildlife, and recreation receive on federal reservoirs relative to the consideration received by hydropower and flood control.
- Explore the use of mitigation funds to offset the impacts of reservoirs and hydropower operations and the loss of fish populations due to entrainment and stranding.
- Discourage residential and infrastructure development within river floodplains that would contribute to efforts to channelize rivers, construct flood control impoundments, or remove wetlands.

*Conservation Issue: Geomorphic alteration and fragmentation of river channels:*

10. Large rivers normally meander through their floodplains and expand into their floodplains during major flood events. In an effort to control flooding on large rivers and to develop river floodplains, some human activities have taken place altering the channel structure. In addition to reservoir construction, these actions include:
  - construction of levees and dikes along rivers and within river floodplains to block channel movement or flood waters,
  - in-stream sand mining, and
  - creating channel constrictions or channelizing portions of rivers by dredging channels to make them deeper and narrower.
11. Dams alter the movement of sand, gravel, and other sediment within rivers by increasing their deposition within reservoirs. Over time, this alters the substrate below dams making these reaches of river rockier.
12. The construction of reservoirs reduces the amount of shallow moving water and increases the amount of deep, still, or slow-moving water.
13. Increased deposition of fine sediment from eroding banks settles into gravel beds and riffles impairs their quality as spawning areas for fish and habitat for freshwater mussels.
14. Dams, culverts, and some bridge designs can act as impediments to the upstream movements of fish and other aquatic wildlife.

*Conservation Actions:*

- Develop cost-share programs or grant programs to provide funding for landowners and conservation districts to restore the morphology of river channels.
- Support research into and possible use of alternative bank stabilization and channel restoration techniques that incorporate fluvial geomorphology principles.
- Increase the use of existing cost-share programs to restore riparian habitat and wetlands that stabilize banks, serve as filters of storm water, and as wildlife habitat.
- Improve the acceptability of these programs to private landowners or develop new programs.
- Purchase conservation easements from private landowners or acquire property in title from willing sellers within the floodplains of rivers and streams and in the headwaters of streams.
- Restore, enhance or create wetlands and riparian vegetation on these acres to stabilize stream banks and filter sediment to limit development within sensitive floodplains and improve habitat conditions for wildlife species of greatest conservation need.
- Develop monitoring programs for wildlife populations, habitat quality, and water quality to assess the effects of habitat restoration and conservation easement programs.
- Research the use of tax incentives or other programs to discourage residential and infrastructure development within river floodplains.
- Develop regulations that restrict or prohibit channel modifications, in-stream gravel and sand mining, and channel dredging.
- Evaluate the impact of structures that isolate populations of species of greatest conservation need or prevent these species from recolonizing reaches of rivers.
- Conduct studies of methods to minimize, reduce, or mitigate for these impacts.
- Research alternative methods of flood control such as levee removal or wetland restoration within floodplains.

*Conservation Issue: Water quality changes as a result of nutrients, sediment, and other pollutants:*

15. Nutrients are contributed to the rivers by several sources including concentrated animal operations (e.g., dairies, poultry houses, and their land application fields), septic systems from homes, nursery operations, fertilized crop fields, and municipal discharges.

16. The impairment of water quality in streams and small rivers ultimately affects water quality in large rivers.
17. Endocrine system disrupters in storm water runoff from agricultural fields and confined animal feeding operations enter rivers and may affect the reproduction and development of freshwater mussels and fish.
18. Septic systems and animal waste application fields that occur on porous soils in river floodplains can contribute nutrients and other pollutants to rivers through groundwater connections.
19. Wetlands within river floodplains have been filled or drained to create land for agricultural and residential purposes, reducing their values as important filters of storm water runoff keeping sediment and nutrients out of rivers, and as important breeding areas for amphibians and feeding areas for waterfowl and shorebirds.

*Conservation Actions:*

- Increase the use of Best Management Practices and conservation cost-share programs throughout the watershed to control nutrients and sediment in storm water runoff.
- Evaluate the need for better cost-share arrangements, more acceptable landowner incentives and revision of Best Management Practices to increase their use or benefit to species of conservation need.
- Provide cost-share funding for the construction of fences and alternative sources of water for livestock in order to keep cattle out of rivers and riparian areas.
- Develop and distribute educational materials to schools and landowners about Best Management Practices to control nutrients and sediment, the interconnection of rivers, wetlands and groundwater, and the importance of riparian vegetation and wetlands as filters for nutrients and sediment.
- Increase the use of existing cost-share programs to restore riparian habitat and wetlands that serve as filters of storm water and as wildlife habitat.
- Improve the acceptability of these programs to private landowners or develop new programs.
- Purchase conservation easements from private landowners or acquire property in title from willing sellers in the floodplains of river and streams and in the headwaters of streams.
- Restore, enhance or create wetlands and riparian vegetation on these acres to stabilize stream banks and filter sediment, nutrients, and other pollutants and to limit development within sensitive floodplains and improve habitat conditions for wildlife species of greatest conservation need.
- Develop monitoring programs for wildlife populations, habitat quality, and water quality to assess the effects of habitat restoration and conservation easement programs.
- Discourage residential development and confined animal feeding operations within river floodplains.
- Develop local stream teams or watershed groups comprised of citizens and/or governmental organizations to address local concerns, monitor water quality, monitor wildlife populations, and provide public outreach and education.

*Conservation Issue: Invasive and exotic plants and animals:*

20. Several exotic aquatic plant species may become established in the Red and Arkansas Rivers and these may affect habitat for other plant and wildlife species.
21. Exotic aquatic animals including Zebra Mussels and Bighead Carp could expand their ranges within the Red and Arkansas Rivers and affect native mussel, fish, and plant populations.

*Conservation Actions:*

- Evaluate the severity and magnitude of the ecological damage done by exotic plant and animal species (e.g., displacement of native plant communities and predation or competition with native animal populations) to identify those exotic species causing the greatest impact to this habitat and species of greatest conservation need.
- Provide the results of studies of exotic species impacts to landowners and conservation agencies/organizations.
- Improve coordination between wildlife biologists, conservation agencies, and agricultural organizations so that these groups can share information about the negative effects of using exotic animals and plants.
- Develop control or management plans for the exotic species that cause the greatest ecological damage (e.g., herbicide treatment and mechanical removal).
- Develop monitoring programs to measure and evaluate the effectiveness of these control measures.
- Develop cost-share or incentives programs for private landowners to encourage them to control invasive and exotic species.

*Potential indicators for monitoring the effectiveness of the conservation actions:*

- Invasive species survey.
- Oklahoma Water Resources Board (e.g., water quality standards).
- Quantities of in-stream flows reserved for aquatic ecosystem conservation.
- Relative condition (populations/trends) of species of greatest conservation need and key indicator species.
- U.S. Geological Survey gauging station for flows.

### Conservation Landscape: Mesic Loblolly Pine/Oak Forest:

This habitat type is confined to the West Gulf Coastal Plain portion of the Region in southern McCurtain and eastern Choctaw counties. It occurs on relatively level, dry to mesic loamy and sandy soils. The dominant canopy trees include Loblolly Pine (*Pinus taeda*), Southern Red Oak (*Quercus falcata*), Water Oak (*Quercus nigra*), American Elm (*Ulmus americana*), Sweetgum (*Liquidambar styraciflua*), Green Ash (*Fraxinus pennsylvanica*), and Shumard Oak (*Quercus shumardii*). Common understory plants include Southern Waxmyrtle (*Myrica cerifera*), American Holly (*Ilex opaca*), Red Maple (*Acer rubra*), and Parsley Hawthorn (*Crataegus marshallii*), and Rattan Vine. In the Red River Valley, much of this habitat type has been converted to Loblolly Pine plantations or cleared for pasture or crop land.

Recognized plant associations (Hoagland 2000) include:

- Loblolly Pine – Green Ash - American Elm Forest Association
- Loblolly Pine – Sweetgum Forest Association

Habitat condition, species of greatest conservation need, conservation issues, conservation actions, and potential indicators for monitoring are incomplete.

The species of greatest conservation need found in this habitat are listed in the following table. The population abundance (status and trend) of each species is described in relative terms. The best professional judgment of the advisory group and technical experts was used to identify each species status and trend. Species are sorted alphabetically within groups of amphibians (Amph), birds, fish, invertebrates (Inve), mammals (Mamm), and reptiles (Rept) for easy reference.

Species status definitions:

Low – species is rare, has a small population size, and/or occurs in only a small portion of the Region.

Medium – species is uncommon and occurs over a large portion of the Region or species is common but occurs in only a small part of the Region.

Abundant – species is common and widespread within the Region in appropriate habitat.

Unknown – the status of this species is not known.

Species of Greatest Conservation Need		Status				Trend			
Group	Common Name	Low	Medium	Abundant	Unknown	Declining	Stable	Increasing	Unknown
Amph	Mole Salamander				X				X
Amph	Sequoyah Slimy Salamander				X				X
Bird	American Woodcock	X							X
Bird	Bachman's Sparrow	X							X
Bird	Brown-headed Nuthatch	X							X
Bird	Kentucky Warbler		X						X
Bird	Prairie Warbler		X			X			
Bird	Red-headed Woodpecker		X			X			
Inve	American Burying Beetle		X						X
Inve	Diana Fritillary	X							X
Mamm	Eastern Spotted Skunk				X				X
Mamm	Northern Long-eared Myotis				X				X
Mamm	Rafinesque's Big-eared Bat				X				X

The following conservation issues and actions are listed in general priority order.

*Conservation Issue: Incomplete data concerning species of greatest conservation need (refer to the matrix above) and habitat, an impediment for effective conservation planning and implementation:*

1. Data are incomplete for species of greatest conservation need (particularly those whose populations are low or unknown and for those whose status and trends are declining or unknown) thus making it difficult to identify management issues and establish effective corrective strategies.
2. Data are incomplete regarding both the historic and current distribution and condition of this habitat type.

*Conservation Actions:*

- Conduct surveys of existing literature, reports, and museum records to evaluate historic distributions, abundances and habitat affinities of species of greatest conservation need, and examine possible causes of suspected population declines.
- Conduct field surveys to establish baseline conditions for the current distributions, abundances and habitat affinities of species of greatest conservation need; to verify the accuracy of existing data; and to assess changes over time.
- Develop and maintain databases to store and analyze distributional and ecological data for species of greatest conservation need.
- Conduct ecological studies on priority species of greatest conservation need to:
  - identify factors that limit population sizes, and evaluate factors that may be responsible for population declines,
  - develop recommendations to enhance populations (i.e., through enhancement of habitat conditions),
  - develop a method to accurately identify and map the distribution, and if possible the condition, of this habitat to establish a current baseline, and
  - assess historic literature and conduct field studies to evaluate the probable historic distribution and condition of this habitat type. This should include the identification of a range of target vegetation conditions for restoration or management efforts.

*Conservation Issue: Habitat loss and fragmentation from land management practices:*

3. Much of this habitat type currently exists as even-aged forest as a result of historic logging.
4. Habitat loss and fragmentation has occurred as a result of the conversion of loblolly pine/oak forest to other land uses such as loblolly pine plantations and pastures that are planted to Tall Fescue.
5. Secondary home developments, roads, and utility lines have further fragmented this habitat type.

*Conservation Actions:*

- Develop monitoring programs to evaluate the effects of management techniques such as prescribed fire and midstory tree thinning on populations of species of greatest conservation need and vegetation structure.
- Develop informational materials to inform landowners and the general public about the ecology and wildlife diversity of this habitat type.
- Evaluate means to make it economically feasible for private landowners to maintain their land in mixed loblolly pine-oak forest (e.g., encourage markets for oak and hickory timber, or encourage groups of landowners to work together as a block to manage habitat for hardwood timber production or hunting leases).
- Develop programs to maintain large tracts of mixed loblolly pine-oak-hickory forest such as conservation easements, conservation leases, or willing-seller land acquisitions, preceded by a landscape-level assessment of habitat conditions to identify focus areas of greatest conservation value.

- Evaluate methods to restore loblolly pine-oak forests from pastures or crop fields, and develop cost-share programs, grants, or financial incentives to encourage landowners to restore/replant these areas to pine-oak forest.
- Coordinate with other agencies and research institutions to develop Best Management Practices and management recommendations to minimize the disturbance caused by and the ecological footprint left by road, pipeline, and utility line construction, and right-of-way maintenance.
- Develop and distribute informational materials with Best Management Practices and recommendations to landowners, agencies and utility companies for their consideration and use.
- Purchase grazing rights to remove cattle or establish rotational grazing programs to defer grazing on some areas during the growing season or during some years, while still providing income for landowners.

*Conservation Issue: Invasive and exotic plants and animals that are detrimental to species of greatest conservation need:*

6. Several exotic plant species including Sericea lespedeza, Chinese Privet and Japanese Honeysuckle have become established outside of cultivation and appear to be displacing native plants and altering habitat conditions for wildlife species of conservation need.

*Conservation Actions:*

- Evaluate the severity and magnitude of the ecological damage done by exotic plant and animal species including displacement of native vegetation/plant communities, predation on native animal populations, or hybridization with native species.
- Identify those exotic species causing the greatest impact to this habitat and species of greatest conservation need.
- Develop control or management plans for the exotic species that cause the greatest ecological damage (e.g., controlled burning programs, herbicide treatment, and mechanical removal).
- Develop monitoring programs to measure and evaluate the effectiveness of these control measures.
- Develop an invasive/nuisance species management plan.
- Develop cost-share, or incentives programs for private landowners to encourage them to control invasive and exotic species.

*Potential indicators for monitoring the effectiveness of the conservation actions:*

- Acres burned/treated.
- Changes in acreage/coverage of exotic vegetation.
- Easements secured and acreage protected.
- Acres of native plant communities (species composition) restored.
- Relative condition (populations/trends) of species of greatest conservation need and key indicator species.
- Relative condition and quantity of habitat.

## Conservation Landscape: Springs and Seeps:

Springs and Seeps are uncommon and very localized habitats that are typically found in association with wetlands or the headwaters of streams. Relative to the karst formations of the Ozark Plateau and the Arbuckle Mountains, the Ouachita Mountains have relatively few groundwater aquifers and springs. The few springs that are found at the headwaters of Ouachita Mountain streams are important to regionally endemic amphibians and invertebrates including the Ouachita Dusky Salamander (*Desmognathus brimelyorum*). Other Springs and Seeps occur in the West Gulf Coastal Plain portion of this Region in southern McCurtain, eastern Choctaw, and southern Atoka counties. These springs are typically found in areas of sandy soil near the bases of ridges and sandhills. These springs often support bog-like plant communities of ferns, aroids, orchids and Sphagnum Moss. The distribution and biological composition of springs and seeps is poorly known throughout this Region.

The species of greatest conservation need found in this habitat are listed in the following table. The population abundance and trend of each species are described in relative terms. The best professional judgment of the advisory group and technical experts was used to identify each species status and trend. Species are sorted alphabetically within groups of amphibians (Amph), birds, fish, invertebrates (Inve), mammals (Mamm), and reptiles (Rept) for easy reference.

Species status definitions:

Low – species is rare, has a small population size, and/or occurs in only a small portion of the Region.

Medium – species is uncommon and occurs over a large portion of the Region or species is common but occurs in only a small part of the Region.

Abundant – species is common and widespread within the Region in appropriate habitat.

Unknown – the status of this species is not known.

Species of Greatest Conservation Need		Status				Trend			
Group	Common Name	Low	Medium	Abundant	Unknown	Declining	Stable	Increasing	Unknown
Amph	Four-toed Salamander				X				X
Amph	Many-ribbed Salamander				X				X
Amph	Ouachita Dusky Salamander				X				X
Amph	Ringed Salamander				X				X
Bird	Louisiana Waterthrush		X						X
Fish	Goldstripe Darter	X							X
Fish	Orangebelly Darter			X			X		
Inve	Kiamichi Crayfish		X					X	
Inve	Orconectes menae				X				X

The following conservation issues and actions are listed in general priority order.

*Conservation Issue: Incomplete data concerning species of greatest conservation need (refer to the matrix above) and habitat, an impediment for effective conservation planning and implementation:*

1. Data are incomplete for species of greatest conservation need thus making it difficult to identify management issues and establish effective corrective strategies.
2. Data are incomplete regarding the distribution and ecology of species of greatest conservation need that use this habitat type. In order to establish effective

conservation actions, data are needed to determine the population status and trends for species in this habitat.

3. Because springs and seeps are small locally occurring habitats that are found primarily on private property, they are difficult to locate and monitor. Additionally, springs and seeps are often overlooked in landscape planning because of their small size and difficulty to locate and map. As a result, the knowledge of spring locations and their biological compositions is incompletely known. Surveys and biological inventories of springs are needed for better conservation planning and implementation.

*Conservation Actions:*

- Conduct survey of technical experts to describe this habitat and identify its species of greatest conservation need.
- Conduct surveys of existing literature, reports, and museum records to evaluate historic distributions, abundances, and habitat affinities of species of greatest conservation need (e.g., salamanders, crayfish, and aquatic insects), and examine possible causes of population declines where these are suspected.
- Conduct field surveys to establish baseline conditions for the current distributions, abundances, and habitat affinities of species of greatest conservation need. Taxonomic groups in greatest need of surveys include amphibians, crayfish, and fish.
- Verify the accuracy of existing data and assess changes in populations over time.
- Develop and maintain a database to store and analyze distributional and ecological data for species of greatest conservation need.
- Develop and maintain a database to track the locations of springs, the biological communities, and water quality.
- Conduct ecological studies on priority species of greatest conservation need to:
  - identify factors that limit population sizes,
  - evaluate factors that may be responsible for population declines, and
  - develop recommendations to enhance populations (e.g., through enhancement of habitat conditions).
- Use historic literature and existing maps in conjunction with field studies to determine the distribution and condition of springs.
- Use the results of surveys and studies to update the Comprehensive Wildlife Conservation Strategy via adaptive resource management.

*Conservation Issue: Modifications of springs and seeps as a result of management practices:*

4. Some springs have been physically modified by the installation of pipes or the construction of low concrete dams to create pools for recreation uses or to water livestock.
5. Springs are small fragile habitats that can be easily modified by activities around them. Riparian and aquatic vegetation has been mechanically cleared around some springs, and grazed/browsed by livestock around others. Loss or degradation of vegetation surrounding springs and seeps increases their susceptibility to siltation and changes in water temperature.
6. Man-made ponds and lakes have been constructed over springs and seeps, inundating them with deeper water, and altering their normal habitat structure.

*Conservation Actions:*

- Identify those springs and seeps that support species of greatest conservation need and are sites of high conservation priority.
- Develop a program to provide landowners with financial incentives to protect springs or place springs under conservation programs through the purchase of conservation easements on springs or acquisition of springs from willing sellers.

- Provide cost-share funding or grants to landowners to restore the structure of springs and the riparian vegetation around them. These actions can include removal of pipes, concrete, low dams, or fencing of springs to limit their access by livestock.
- Develop a monitoring program to measure the effectiveness of efforts to protect or restore springs and seeps on populations of species of greatest conservation need.
- Develop and distribute educational materials to landowners including Best Management Practices for use around springs, the biological diversity of springs, and the interconnection of springs, groundwater, and surface streams.

*Conservation Issue: Changes in water quality and quantity affect springs:*

7. Local groundwater withdrawal can reduce the flow of springs and streams.
8. In areas with coarse sandy soils, surface water enters the water table with very little filtration by the soil, easily carrying pesticides, fertilizers, animal wastes, and other water-soluble chemicals into the groundwater, surfacing at springs and negatively affecting aquatic life in springs and streams.
9. Water quality within springs may be affected by cattle and feral hogs watering in and grazing around springs and seeps through increased siltation of springs and increased nutrients in the water.

*Conservation Actions:*

- Identify springs and seeps that support populations of species of greatest conservation need, assess their current water quality/quantity, and evaluate the sources of existing or potential future water quality/quantity degradation.
- Conduct hydrological studies to delineate the recharge area surrounding biologically important springs to determine the surface acreage that needs the attention of conservation programs.
- Develop, publish, and distribute information about Best Management Practices and conservation recommendations for landowners to implement in order to protect groundwater quality/quantity around springs.
- Evaluate the existing conservation assistance programs for landowners (e.g., Farm Bill programs) to determine the applicability of these to the protection of springs and the quality of groundwater around springs.
- Help promote existing programs or increase the acceptability of these programs to landowners by providing better cost-share opportunities or more acceptable landowner incentives.
- Develop new cost-share programs to help landowners conserve groundwater quantity and protect groundwater quality within the recharge areas of biologically important.
- Construct fences around springs and provide alternative water sources for livestock in order to keep livestock and feral hogs out of springs.
- Develop monitoring programs for populations of species of greatest conservation need, water quality and water quantity to assess the effectiveness of groundwater conservation programs.
- Where feasible, involve the landowners by providing them with the equipment and supplies to conduct monitoring activities, or encourage the development of local citizen volunteer groups to conduct monitoring.
- Provide the results of water quality and quantity monitoring programs to the appropriate regulatory or landowner assistance agencies (e.g., Oklahoma Water Resources Board, Oklahoma Department of Environmental Quality, Oklahoma Conservation Commission, local Conservation District, and Natural Resources Conservation Service).
- Encourage programs to conserve groundwater.
- Discourage the selling of groundwater to users outside of the Region.

*Potential indicators for monitoring the effectiveness of the conservation actions:*

- Amount of gravel mining reduction.
- Citizen's groups formed.
- Easements obtained.
- Protected springs/streams.
- Recreation users of streams.
- Relative condition (populations/trends) of species of greatest conservation need and key indicator species.
- Relative condition and quantity of habitat.
- Stream and spring flow.
- Stream miles degraded.
- Water quality.

## Conservation Landscape: Herbaceous Wetland

The relative condition of Herbaceous Wetland habitat is currently poor with a declining trend. Herbaceous wetlands in this Region are typically small patches of seasonally flooded habitat embedded within bottomland forests, prairies, and river floodplains. Vernal pools, which are seasonally flooded wetlands, could also be considered herbaceous wetlands though they do not often support diverse plant communities. Common herbaceous wetland plant associations include Ravensfoot Sedge (*Carex crus-corvi*) seasonally flooded marsh, Common Rush (*Juncus effusus*) seasonally flooded marsh, Softstem Bullrush (*Scripus tabernaemontani*), Spikerush (*Eleocharis sp.*) semi-permanently flooded marsh, and Broadleaf Cattail (*Typha latifolia*) semi-permanently flooded marsh. Other important herbaceous wetland plants include Barnyard Grass (*Echinochloa crus-galli*), Marsh Willowprimrose (*Ludwigia palustris*), and Sweetscent (*Pluchea odorata*) in seasonally flooded wetlands and Torrey Rush (*Juncus torreyi*), Broadleaf Arrowhead (*Sagittaria latifolia*), and Pickerelweed (*Pontederia cordata*) in semi-permanently flooded wetlands. More work is needed to identify the spatial distribution of herbaceous wetlands and the wildlife populations that use these.

Recognized herbaceous plant associations within this habitat include:

- American Water-willow Temporarily Flooded Wetlands
- Broadleaf Arrowhead – Longbar Arrowhead Semi-permanently Flooded Wetland
- Broadleaf Cattail – Powdery Thalia Semi-permanently Flooded Marsh
- Broadleaf Cattail Semi-permanently Flooded Marsh
- Common Reed Semi-permanently Flooded Marsh
- Common Rush Seasonally Flooded Marsh
- Narrowleaf Cattail – Southern Cattail Semi-permanently Flooded Marsh
- Pennsylvania Smartweed – Curlytop Smartweed Semi-permanently Flooded Wetland
- Ravenfoot Sedge Seasonally Flooded Marsh
- Softstem Bulrush – Common Spike Rush Semi-permanently Flooded Marsh
- Water Smartweed Semi-permanently Flooded Wetland

The species of greatest conservation need found in this habitat are listed in the following table. The population abundance and trend of each species are described in relative terms. The best professional judgment of the advisory group and technical experts was used to identify each species status and trend. Species are sorted alphabetically within groups of amphibians (Amph), birds, fish, invertebrates (Inve), mammals (Mamm), and reptiles (Rept) for easy reference.

Species status definitions:

Low – species is rare, has a small population size, and/or occurs in only a small portion of the Region.

Medium – species is uncommon and occurs over a large portion of the Region or species is common but occurs in only a small part of the Region.

Abundant – species is common and widespread within the Region in appropriate habitat.

Unknown – the status of this species is not known.

Species of Greatest Conservation Need		Status				Trend			
Group	Common Name	Low	Medium	Abundant	Unknown	Declining	Stable	Increasing	Unknown
Amph	Crawfish Frog				X				X
Amph	Mole Salamander	X				X			
Amph	Three-toed Amphiuma				X				X
Amph	Western Lesser Siren				X				X

Species of Greatest Conservation Need		Status				Trend			
Group	Common Name	Low	Medium	Abundant	Unknown	Declining	Stable	Increasing	Unknown
Bird	American Golden Plover		X						X
Bird	American Woodcock	X							X
Bird	Bald Eagle	X						X	
Bird	Black Rail	X							X
Bird	Buff-breasted Sandpiper	X				X			
Bird	Canvasback	X							X
Bird	Hudsonian Godwit				X				X
Bird	Interior Least Tern	X							X
Bird	King Rail				X				X
Bird	LeConte's Sparrow		X						X
Bird	Lesser Scaup		X			X			
Bird	Little Blue Heron		X						X
Bird	Nelson's Sharp-tailed Sparrow	X							X
Bird	Northern Pintail		X			X			
Bird	Peregrine Falcon	X							X
Bird	Piping Plover	X							X
Bird	Prothonotary Warbler		X						X
Bird	Sandhill Crane		X				X		
Bird	Short-eared Owl				X				X
Bird	Snowy Egret								
Bird	Solitary Sandpiper	X							X
Bird	Trumpeter Swan	X							X
Bird	Upland Sandpiper				X		X		
Bird	Western Sandpiper	X							X
Bird	Willow Flycatcher	X							X
Bird	Wilson's Phalarope				X				X
Bird	Wood Stork		X				X		
Bird	Yellow Rail				X				X
Inve	Oklahoma Clubtail	X							X
Inve	Ozark Emerald	X							X
Mamm	Marsh Rice Rat				X				X
Mamm	Northern Long-eared Myotis				X				X
Mamm	Rafinesque's Big-eared Bat				X				X
Mamm	River Otter		X					X	
Mamm	Swamp Rabbit				X				X
Rept	Alligator Snapping Turtle				X				X
Rept	American Alligator				X				X
Rept	Gulf Crayfish Snake				X				X
Rept	Midland Smooth Softshell				X				X
Rept	Spiny Softshell Turtle				X				X
Rept	Western Chicken Turtle				X				X
Rept	Western Mudsnake				X				X

The following conservation issues and actions are listed in general priority order.

*Conservation Issue: Incomplete data concerning species of greatest conservation need (refer to the matrix above) and habitat, an impediment for effective conservation planning and implementation:*

1. Data are incomplete for species of greatest conservation need (particularly those whose populations are low or unknown and for those whose status and trends of are declining or unknown) thus making it difficult to identify management issues and establish effective corrective strategies.
2. Incomplete information regarding the distribution and locations of wetland habitats.
3. Incomplete information regarding the distributions and ecological needs of wetland wildlife species (e.g., which wildlife species occupy which wetland types).
4. The small size of wetlands makes them difficult to locate within larger habitat types such as prairies and woodlands.
5. There is incomplete knowledge about wetland ecology and the needs of wetland wildlife such that land landowners and conservation agency personnel lack knowledge regarding the effects of management practices on wetlands animals and plant communities.

*Conservation Actions:*

- Conduct regional survey for wetlands.
- Develop a database of wetland locations and conditions.
- Conduct biological inventories of wetlands to determine plant community composition and the distribution and abundances of wildlife species of conservation need.
- Conduct studies to determine the ecological needs of wetland wildlife species (e.g., types of plant communities and the timing and duration of flooding needed for each wildlife species).
- Produce educational information for landowners and conservation agency staff regarding the ecology of herbaceous wetlands by region and wetland type.
- Develop descriptions of what quality wetland habitats look like to serve as the target condition for wetland restoration and enhancement efforts.
- Use surveys, workshops, and data acquisition to update the Comprehensive Wildlife Conservation Strategy.

*Conservation Issue: Water quality changes which negatively affect both habitat and species:*

6. Feedlots, dairies, hog farms, and chicken houses are often located near wetlands. Animal waste from these operations collects in wetlands basins and closed depressions.
7. Land application of animal wastes often occurs on fields near wetlands or that drain into wetlands where nutrients, hormones, pesticides, and other waste products collect.
8. Many wetlands lack buffer vegetation around them to control the movement of sediment, pesticides, and nutrients into the wetlands through storm water runoff from pastures, crop fields and residential areas.
9. Endocrine disrupters from animal hormones, pesticides, and agricultural chemicals enter wetlands in storm water runoff negatively affecting the growth, reproduction, and survival of amphibians, fish, and invertebrates.
10. Increased nutrient inputs due to crop/pasture fertilizers and land application of animal waste result in increased algae and bacteria in wetlands.
11. Grazing of wetlands by cattle increases nutrient inputs and alters the structure and diversity of wetland vegetation.

*Conservation Actions:*

- Increase the knowledge of and utilization of Farm Bill programs that improve water quality and protect wetlands (e.g., Wetland Reserve Program, planting of buffer strips, and buffer vegetation).
- Provide cost-share funding to landowners to construct fencing around wetlands to control access by cattle.
- Restore/plant native vegetation around wetlands to serve as a filter for storm water runoff to aid in the removal of sediment and nutrients in storm water runoff.
- Develop certification programs to recognize conservationists and land stewards of wetlands.
- Improve small landowner access and use of existing cost-share programs.
- Develop new or update existing Best Management Practices for controlling nutrients and sediment around wetlands.

*Conservation Issue: Invasive and exotic plants and animals that are detrimental to species of greatest conservation need:*

12. Invasive and exotic plant species become established in wetlands and compete with native vegetation.
13. Exotic plant species can dominate wetlands and reduce overall plant diversity and structural diversity reducing the wetlands' value as wildlife habitat.

*Conservation Actions:*

- Work with U.S. Fish and Wildlife Service to develop an invasive/nuisance species management plan.
- Remove exotic wetland plants and restore native plant communities.

*Conservation Issue: Habitat loss and fragmentation from land management practices:*

14. Woody plants such as willows and Salt Cedar encroach on and dominate herbaceous wetlands because of fire suppression and/or past overgrazing.
15. Heavy grazing of wetlands by cattle removes plant cover for wildlife, reduces the abundance of some wetland plants, and can lower overall plant diversity.
16. Seasonal wetlands are plowed and cropped which reduces perennial vegetation and alters the plant community composition and structure.
17. Wetlands are drained or filled to convert these lands to residential, agricultural, or industrial uses.
18. Water may be pumped from wetlands for irrigation.
19. Irrigation around wetlands may lower the water table in some areas and alter the time during which the soil is saturated.
20. Some wetlands are dredged or deepened to create ponds to hold irrigation water, to store water for cattle, or to create ponds for fishing resulting in a loss of shallow water habitat and may result in the introduction and establishment of predatory fish.

*Conservation Actions:*

- Use fire or mechanical cutting to remove woody vegetation that has encroached upon herbaceous wetlands.
- Provide cost-share funding or grants to construct fencing around wetlands to control the access to this habitat by cattle.
- Use land acquisition, perpetual easement program, or non-development easement program to place wetlands into conservation ownership or stewardship.
- Acquire wetlands or purchase conservation easements on cropped wetlands then restore these.
- Improve the incentives for Wetland Reserve Program enrollments.
- Provide incentives or funding to cover the costs of maintaining wetlands.
- Provide cost-share funding or grants to restore farmed wetlands.

- Provide information to landowners and the public regarding the ecological values of wetlands, especially seasonal wetlands.
- Improve the technology of irrigation to conserve groundwater, and reduce groundwater withdrawals.
- Produce education and outreach materials about swampbusting laws and practices.
- Increase the knowledge of and utilization of Farm Bill programs to conserve wetlands such as the Wetland Reserve Program.
- Use land acquisition and conservation easement programs to place herbaceous wetlands under conservation ownership or stewardship.
- Acquire former wetlands and restore these through a combination of dredging, diking, and re-vegetation.
- Facilitate crop selection and diversification to move agriculture away from crops with high water needs.
- Improve landowner access to cost-share programs (e.g., improve cost-share ratios and economic incentives).
- Develop tax breaks for landowners that maintain wetlands.
- Connect wetland owners with entities seeking wetland mitigation credits.
- Improve the economic incentive to retain wetlands in agricultural areas.
- Provide funding or incentives to cover the costs of maintaining wetlands.
- Increase Conservation Reserve Enhancement Program enrollments.
- Help the Natural Resources Conservation Service conduct wetland conservation planning.

*Potential indicators for monitoring the effectiveness of the conservation actions:*

- Acres in conservation programs.
- National Wetland Inventory.
- Relative condition (populations/trends) of species of greatest conservation need and key indicator species.
- Relative condition and quantity of habitat.

## Conservation Landscape: Tallgrass Prairie

The relative condition of Tallgrass Prairie habitat is currently poor with a declining trend. Tallgrass prairie habitat is uncommon in this Region and occurs locally as small tracts in the Arkansas River valley, Red River valley, and the broad valleys that separate the western ridges of the Ouachita Mountains. More research is needed to evaluate the historic distribution and composition of tallgrass prairies in this Region and to identify existing tracts of native prairie. Historically, Tallgrass Prairie occurred on sites that possessed deep soils and were subject to frequent fires. The tallgrass prairie community is dominated by Big Bluestem (*Andropogon gerardi*) and Indian Grass (*Sorghastrum nutans*). Other common grasses and forbs include Eastern Gamagrass (*Tripsacum dactyloides*), Switchgrass (*Panicum virgatum*), Tall Dropseed (*Sporobolus asper*), Little Bluestem (*Schizachyrium scoparium*), Purple Prairie Clover (*Dalea purpurea*), Blazing Star (*Liatis pycnostachya*), Narrow-leaved Sunflower (*Helianthus angustifolius*), Rosinweed (*Silphium laciniatum*), Giant Coneflower (*Rudbeckia grandiflora*), and Wild Indigo (*Baptisia alba*).

Recognized plant associations within this habitat type include:

- Big Bluestem – Little Bluestem – Indian Grass Grassland
- Big Bluestem – Switchgrass Grassland
- Little Bluestem – Big Bluestem Grassland
- Little Bluestem – Indian Grass Grassland
- Switchgrass – Eastern Gamagrass Grassland

The species of greatest conservation need found in this habitat are listed in the following table. The population abundance and trend of each species are described in relative terms. The best professional judgment of the advisory group and technical experts was used to identify each species status and trend. Species are sorted alphabetically within groups of amphibians (Amph), birds, fish, invertebrates (Inve), mammals (Mamm), and reptiles (Rept) for easy reference.

Species status definitions:

Low – species is rare, has a small population size, and/or occurs in only a small portion of the Region.

Medium – species is uncommon and occurs over a large portion of the Region or species is common but occurs in only a small part of the Region.

Abundant – species is common and widespread within the Region in appropriate habitat.

Unknown – the status of this species is not known.

Species of Greatest Conservation Need		Status				Trend			
Group	Common Name	Low	Medium	Abundant	Unknown	Declining	Stable	Increasing	Unknown
Amph	Crawfish Frog				X				X
Bird	American Golden Plover		X						X
Bird	American Woodcock	X							X
Bird	Barn Owl	X							X
Bird	Bell's Vireo		X			X			
Bird	Buff-breasted Sandpiper	X				X			
Bird	Harris's Sparrow		X						X
Bird	Henslow's Sparrow	X							X
Bird	LeConte's Sparrow		X						X
Bird	Loggerhead Shrike		X			X			

Species of Greatest Conservation Need		Status				Trend			
Group	Common Name	Low	Medium	Abundant	Unknown	Declining	Stable	Increasing	Unknown
Bird	Northern Bobwhite		X			X			
Bird	Painted Bunting		X						X
Bird	Red-headed Woodpecker		X			X			
Bird	Sandhill Crane		X				X		
Bird	Short-eared Owl				X				X
Bird	Smith's Longspur	X							X
Bird	Sprague's Pipit				X				X
Bird	Swainson's Hawk		X						X
Bird	Upland Sandpiper				X		X		
Inve	American Burying Beetle		X						X
Inve	Prairie Mole Cricket	X				X			
Mamm	Eastern Harvest Mouse				X				X
Mamm	Long-tailed Weasel				X				X

The following conservation issues and actions are listed in general priority order.

*Conservation Issue: Incomplete data concerning species of greatest conservation need (refer to the matrix above) and habitat, an impediment for effective conservation planning and implementation:*

1. Data are incomplete regarding the status and distribution of several species of greatest conservation need that occur in Tallgrass Prairie communities. In order to establish effective conservation actions, more complete data are needed to determine the population status and trend for many species, and more thorough evaluations are needed to determine the factors that limit population sizes or are responsible for apparent population declines.
2. Much of the Tallgrass Prairie community has been altered or converted to other uses. Better data are needed regarding the current and historic extent and location of Tallgrass Prairie and the factors that determine vegetation structure and maintained prairies historically.

*Conservation Actions:*

- Conduct surveys of existing literature, reports, and museum records to evaluate historic distributions, abundances, and habitat affinities of Tier I and Tier II species of greatest conservation need (e.g., Loggerhead Shrike and Northern Bobwhite) and examine possible causes of suspected population declines.
- Conduct field surveys to establish baseline conditions for the current distributions, abundances and habitat affinities of species of greatest conservation need.
- Verify the accuracy of existing data and assess changes over time.
- Develop databases to store and analyze distributional and ecological data for species of greatest conservation need.
- Conduct ecological studies on priority species of greatest conservation need to:
  - identify factors that limit population sizes,
  - evaluate factors that may be responsible for population declines, and
  - develop recommendations to enhance populations (e.g., through enhancement of habitat conditions).
- Develop a method to accurately identify and map the distribution and the condition of Tallgrass Prairie habitat to establish a current baseline.

- Assess historic literature and conduct field studies to evaluate the probable historic distribution and condition of this habitat type. Soil survey maps may be helpful tools in conducting this process.
- Use the results of these surveys and studies to update the Comprehensive Wildlife Conservation Strategy via adaptive resource management.

*Conservation Issue: Habitat fragmentation and conversion of Tallgrass Prairies to other land uses:*

3. Prairies are often level and possess deep or rich soils which make them desirable areas for residential and agricultural uses.
4. Much of the Tallgrass Prairie acreage in this Region has been converted to crop fields or Fescue pastures, causing loss of seasonal wetlands that are important to amphibians and birds.
5. Fragmentation and loss of prairie habitat due to expanding infrastructure including roads, utility lines, and pipelines.
6. Herbicide use in right-of-way management may reduce the abundance and diversity of native forbs and shrubs that are food and habitat for some species of greatest conservation need (e.g., Bell's Vireo and Northern Bobwhite).
7. Fragmentation of land ownership, with a trend for more individuals owning smaller tracts of land.

*Conservation Actions:*

- Evaluate means to make it economically attractive for private landowners to maintain prairie habitat on their land or to restore introduced pastures to native grasses and forbs (e.g., conduct studies on the cost/benefit ratio of raising livestock on native prairie versus introduced pasture, encourage markets for native prairie hay, or encourage groups of landowners to work together as a block to manage habitat for hunting leases).
- Develop ways to help families stay on the land and pass down large tracts of land from one generation to the next (e.g., tax breaks or ranch diversification incorporating hunting leases or agritourism as additional sources of income).
- Develop programs to maintain biologically meaningful tracts of native prairie habitat such as conservation easements, conservation leases, or willing-seller land acquisitions, preceded by a landscape-level assessment of habitat conditions to identify focus areas of greatest conservation value in order to get the greatest "bang for the buck" or conservation efficiency.
- Evaluate techniques for restoring Fescue pastures and crop fields to native prairie grasses and forbs.
- Develop cost-share programs, grants, or financial incentives to assist willing landowners who wish to restore these areas to native Tallgrass Prairie.
- Coordinate with other agencies and research institutions to develop or update Best Management Practices and management recommendations to minimize the disturbance caused by and the ecological footprint left by road, pipeline, and utility line construction and right-of-way maintenance activities such as herbicide use and mowing.
- Develop and distribute informational materials with Best Management Practices and recommendations to landowners, agencies, and utility companies for their consideration and use.
- Modify or remove federal cost-share and subsidy programs that encourage the fragmentation or conversion of untilled prairies.
- Modify or remove government loan programs that require or encourage private landowners to convert native prairies and shrublands to tame pastures.
- Encourage the use of native grasses and forbs in the reclamation of surface coal mines and natural gas drilling sites.

*Conservation Issue: Altered vegetation structure as a result of current and historic land management practices:*

8. Long-term fire suppression and the loss of historic fire regimes have changed the structure of many prairies by allowing for increases in some prolific woody plant species including sumacs, Winged Elm, and Eastern Redcedar, and have fostered the spread of invasive non-native grasses and forbs (e.g., *Seracia Lespedeza* and Tall Fescue).
9. Several constraints discourage landowners and agencies from using prescribed burning as a land management tool to maintain prairies. These constraints include limited personnel and financial capacity to conduct burns, landowner liability issues, air quality concerns, logistical difficulties conducting burns in developed areas, and lack of technical assistance in conducting burns.
10. There is a scarcity of data from which to evaluate the effects of controlled burning on many species of greatest conservation need. Because periodic fire is required to maintain prairie habitats, it is almost certain that most prairie-dependent species will benefit from prescribed burning, but the populations of individual species are likely to respond differently to the timing, frequency, and spatial scale of prescribed burns.
11. Herbicide use may decrease native forb abundance and diversity. Aerial applications of herbicides have been used to control/remove shrubs and oaks from prairies, and prairie edges. Shrub and forb diversity is a natural part of prairie habitat in this Region and is important to several species of conservation need including Bell's Vireo and Northern Bobwhite.
12. Tallgrass prairie communities historically were maintained by periodic fire and seasonal grazing. Fire probably played a greater role than grazing in maintaining the structure and species diversity of Tallgrass Prairie in this Region.
13. Continuous grazing by livestock often results in a decline in abundance of some grasses and forbs (e.g., Eastern Gamagrass and Compass Plant) and increases in other less desirable species (e.g., winter annuals, exotic pasture weeds, and Japanese Brome). Presettlement grazing activity was probably seasonal or occurred sporadically, while present day livestock grazing is often continuous.
14. Cattle grazing may enhance local populations of Brown-headed Cowbirds, which parasitize the nests of Prairie Warblers and other songbird species of conservation need.

*Conservation Actions:*

- Use studies of historic fire regimes and the historic distribution of this woodland habitat to develop site-specific recommendations for the use of prescribed burning based on evaluations of the timing (i.e., season), sizes and frequencies of prescribed burns to balance the needs of the range of fire dependent species (e.g., prairie grasses and birds).
- Modify or remove federal cost-share and subsidy programs that encourage the application of herbicides on prairies in ways that reduce native plant diversity or negatively alter prairie structure.
- Support herbicide use to control exotic and invasive vegetation, but not to encourage tame grasses at the expense of native grasses.
- Evaluate ways to reduce the impediments and constraints that reduce the use of prescribed fire as a management tool. These may include:
  - providing funding to agencies to assist with conducting controlled burns on private property,
  - developing technical assistance materials for landowners (e.g., publications, burning guidelines, workshops, and equipment rentals),
  - developing demonstration areas on public lands to show the results of prescribed burning and other land management recommendations,
  - providing financial assistance or incentives to landowners to encourage woodland restoration.

- developing burn cooperatives to work with agencies and landowners to increase the use of burning, and
- looking for ways to reduce landowner liability while conducting burns (e.g., use of official burn protocols).
- Evaluate the use of mowing or brush-hogging as alternatives to conducting burns in developed areas.
- Develop monitoring programs to evaluate the effects of prescribed fire on populations of species of greatest conservation need, prairie diversity, and vegetation structure.
- Develop informational materials to inform landowners and the general public about the biological diversity of native Tallgrass Prairies and the importance of fire in maintaining prairie communities.
- Provide payments to defer grazing while still providing income for landowners or to establish rotational grazing programs to defer grazing on some areas during the growing season or for periods of one or more years.

*Conservation Issue: Invasive and exotic plants and animals:*

15. Several exotic plant species such as *Sericea lespedeza* and Tall Fescue have become established in prairie habitats and are displacing native plants and altering prairie habitat conditions for wildlife species of conservation need.
16. Tall Fescue that has been planted for introduced pastures has spread beyond pastures and into native habitats.
17. Some agencies and organizations are promoting exotic plants for erosion control, livestock forage, beautification programs, and wildlife habitat that are invasive.

*Conservation Actions:*

- Evaluate the severity and magnitude of the ecological damage done by exotic plant and animal species (e.g., displacement of native vegetation/plant communities, predation on native animal populations, or hybridization with native species) to identify those exotic species causing the greatest impact to prairie communities and species of greatest conservation need.
- Provide the results of studies of exotic species impacts to landowners and conservation agencies/organizations.
- Improve coordination between wildlife biologists, conservation agencies, and agricultural organizations so that these groups can share information about the negative effects of using exotic plant materials.
- Reduce the number of invasive and exotic species being recommended for erosion control (e.g., *Sericea lespedeza*) and other uses.
- Develop control or management plans (e.g., controlled burning programs, herbicide treatment, and mechanical removal) for the exotic species that cause the greatest ecological damage.
- Develop monitoring programs to measure and evaluate the effectiveness of these control measures.
- Develop cost-share or incentives programs for private landowners to encourage them to control invasive and exotic species

*Potential indicators for monitoring the effectiveness of the conservation actions:*

- Acres burned/treated.
- Changes in acreage/coverage of exotic vegetation.
- Easements secured and acreage protected.
- Acres of native plant communities (species composition) restored.
- Relative condition (populations/trends) of species of greatest conservation need and key indicator species.
- Relative condition and quantity of habitat.
- Species declining outside Oklahoma but still common in this habitat.

## Conservation Landscape: Sandy (soft)-bottom Streams and Associated Riparian Forests

The relative condition of Sandy (soft)-bottom Streams and Associated Riparian Forests habitat is currently poor with a declining trend. Streams with a sandy, silty, or other fine substrate are found in relatively level, low-elevation landscapes throughout the Region including broad valleys between mountain ridges in the Ouachita Mountains and most of the West Gulf Coastal Plain and Arkansas River Valley areas. Though data are limited, the majority of these streams appear to have once been slightly entrenched with a low width to depth ratio and with a moderate to high number of meanders (i.e., degree of sinuosity). While some streams retain this look, many have been modified or channelized during the past century. These streams support riparian forests along their banks, but the width of these riparian forests is often narrower now than historically due to the conversion of forest to other land uses. Riparian forests in this habitat type are variable in their species composition, but are typically dominated by Sycamore (*Platanus occidentalis*), Black Willow (*Salix nigra*), Sugarberry (*Celtis laevigata*), River Birch (*Betula nigra*), Red Elm (*Ulmus rubra*), Water Oak (*Quercus nigra*), and Green Ash (*Fraxinus pennsylvanica*). Understory vegetation is often abundant and includes Deciduous Holly (*Ilex decidua*), Hawthorns (*Crataegus* sp.), Buttonbush (*Cephalanthus occidentalis*), Smooth Alder (*Alnus serrulata*), and Roughleaf Dogwood (*Cornus drummondii*). Extensive shrublands of Giant Cane (*Arundinaria gigantea*) once occurred along many of the larger soft-bottom streams but the extent of this plant community is currently much reduced.

Recognized riparian plant associations within this habitat include:

- American/Red Elm – Chinquapin Oak Temporarily Flooded Forest
- American/Red Elm – Sugarberry/Hackberry – Green Ash Temporarily Flooded Forest
- Eastern Cottonwood – American Elm – Sugarberry Temporarily Flooded Forest
- Eastern Cottonwood – Black Willow Temporarily Flooded Forest
- Giant Cane Temporarily Flooded Shrubland
- Green Ash – American Elm Temporarily Flooded Forest
- Green Ash – Cedar Elm – Sugarberry Temporarily Flooded Forest
- Green Hawthorn – Cockspur Hawthorn – Downy Hawthorn Temporarily Flooded Shrubland
- River Birch – Sycamore – Smooth Alder Temporarily Flooded Forest
- Silver Maple – Boxelder Temporarily Flooded Forest
- Smooth Alder – False Indigo Temporarily Flooded Shrubland
- Spring Witch-Hazel – Silky Dogwood Temporarily Flooded Shrubland
- Swamp Privet – Buttonbush Semi-permanently Flooded Shrubland
- Sycamore – Boxelder Temporarily Flooded Forest

The species of greatest conservation need found in this habitat are listed in the following table. The population abundance and trend of each species are described in relative terms. The best professional judgment of the advisory group and technical experts was used to identify each species status and trend. Species are sorted alphabetically within groups of amphibians (Amph), birds, fish, invertebrates (Inve), mammals (Mamm), and reptiles (Rept) for easy reference.

Species status definitions:

Low – species is rare, has a small population size, and/or occurs in only a small portion of the Region.

Medium – species is uncommon and occurs over a large portion of the Region or species is common but occurs in only a small part of the Region.

Abundant – species is common and widespread within the Region in appropriate habitat.

Unknown – the status of this species is not known.

Species of Greatest Conservation Need		Status				Trend			
Group	Common Name	Low	Medium	Abundant	Unknown	Declining	Stable	Increasing	Unknown
Bird	Bald Eagle	X						X	
Bird	Canvasback	X							X
Bird	Lesser Scaup		X			X			
Bird	Little Blue Heron		X						X
Bird	Louisiana Waterthrush		X						X
Bird	Northern Pintail		X			X			
Bird	Snowy Egret								
Bird	Solitary Sandpiper	X							X
Fish	Blackspot Shiner	X							X
Fish	Creole Darter	X							X
Fish	Cypress Minnow	X							X
Fish	Goldstripe Darter	X							X
Fish	Pallid Shiner (Chub)	X							X
Mamm	Northern Long-eared Myotis				X				X
Mamm	Rafinesque's Big-eared Bat				X				X
Mamm	River Otter		X					X	
Mamm	Seminole Bat				X				X
Mamm	Southeastern Myotis				X				X
Rept	Alligator Snapping Turtle				X				X
Rept	American Alligator				X				X
Rept	Eastern River Cooter				X				X
Rept	Midland Smooth Softshell				X				X
Rept	Spiny Softshell Turtle				X				X

The following conservation issues and actions are listed in general priority order.

*Conservation Issue: Incomplete data concerning species of greatest conservation need (refer to the matrix above) and habitat, an impediment for effective conservation planning and implementation:*

1. Data are incomplete for species of greatest conservation need (particularly those whose populations are low or unknown and for those whose status and trends of are declining or unknown) thus making it difficult to identify management issues and establish effective corrective strategies.
2. Baseline knowledge about flora/fauna and both the historic and current distribution and condition of this habitat type is incomplete.

*Conservation Actions:*

- Conduct research to determine why species of greatest conservation need are low and/or declining.
- Conduct research on species of greatest conservation need to determine why populations are low and/or declining.
- Conduct research on species of greatest conservation need to establish baseline population data/information.
- Verify existing data.
- Use surveys, workshops and data acquisition to update the Comprehensive Wildlife Conservation Strategy.

*Conservation Issue: Water quality changes which negatively affect both habitat and species:*

3. The presence of confined animal feeding operations such as cattle feedlots, poultry houses, and hog farms multiply the effects of waste application fields that may runoff into streams and drainages.
4. Additional nutrients enter streams as a result of cattle and livestock watering in streams and grazing in riparian areas.
5. Increased nutrient levels in streams increases the abundance of algae, which can result in other water quality impacts such as increased fluctuations in dissolved oxygen.
6. Endocrine disrupters and other pollutants enter streams in storm water runoff from agricultural fields that alter the growth, reproduction and/or survival of fish, amphibians and invertebrates in the streams.

*Conservation Actions:*

- Reduce nutrient inputs (i.e., point and non-point source) through Best Management Practices, Farm Bill cost-share programs, and landowner incentives programs.
- Provide alternative water sources for livestock to keep them out of streams.
- Increase landowner education efforts regarding: the watershed concept, importance of riparian habitat, Best Management Practices for controlling nutrients, and existing Farm Bill conservation programs to control nutrients.
- Develop conservation easements or acquire land to maintain, or restore natural riparian vegetation along streams to reduce or limit agricultural development in and adjacent to riparian areas.
- Establish set back distances between streams and confined animal feeding operations, waste lagoons, and land application areas.
- Provide cost-share funding to construct fencing along streams and riparian areas to control/limit their access by cattle.
- Provide cost-share funding or increase promotion of existing programs to restore riparian vegetation along streams.
- Develop better cost sharing programs to increase the acceptability and use of Best Management Practices to control nutrients and pesticides by landowners.
- Reduce the use of herbicides and other pesticides in floodplains and riparian areas.
- Conduct management pilot studies to determine successful strategies.
- Develop local watershed councils, stream teams, and citizen's groups to address local concerns through education and to monitor water quality and wildlife populations.
- Improve the knowledge of and access to Farm Bill incentives and cost-share programs to improve water quality through the implementation of Best Management Practices and establishment of streamside buffer zones.

*Conservation Issue: Water quality changes that negatively affect both habitat and species:*

7. Many streams in the Region have been channelized and straightened, causing them to become deeply incised and the no longer connected with their riparian vegetation.
8. Streams with incised channels have cut banks that are prone to erosion that increases sediment loads in the streams.
9. Lack of connection between streams and riparian vegetation due to the channelization and incising of streams resulting in reduced riparian vegetation and a loss of wetlands within the stream floodplain.
10. Water is being pumped from streams for irrigation.
11. Groundwater is being pumped from shallow aquifers for municipal and agricultural purposes, lowering water tables and reducing the flow volume of springs and seeps that feed streams.
12. Increased pond construction may be lowering the inflow that sustains streams.
13. Bridges can impact streams by altering stream channels, erosion, and flow.
14. Some types of culverts can become barriers to the movement of fish during low-flow conditions.

15. Dams and bridges across streams can create fish barriers that affect the populations of fish and freshwater mussels.
16. Dams and diversion structures alter the natural flow patterns and other processes of streams, especially the frequency and magnitude of natural flooding events that are required to maintain downstream channels and banks.

*Conservation Actions:*

- Provide cost-share funding or grants to restore stream channels and establish natural vegetation on stream banks for stability.
- Restore or construct seasonal wetlands/vernal pools within the riparian zones or floodplains of streams.
- Conduct management pilot studies to determine successful management strategies.
- Reconnect stream and riparian vegetation through the restoration of stream channels.
- Establish minimum in-stream flow levels on all biologically important streams (e.g., those streams that support populations of species of greatest conservation need or diverse aquatic communities).
- Manage water withdrawals to have the least impact on aquatic biota.
- Anticipate and articulate the potential affect of proposals to sell water outside of the state, or the transfer of water between basins within Oklahoma to Legislature and the Congressional delegation.
- Provide the results of ecological studies to water use planners and those who issue permits.
- Support the development of a state water management plan with sound biological data that demonstrates the ecological impact of water sales, water withdrawals, and inter-basin transfers of water.
- Work collaboratively with landowners to remove ponds and impoundments that have been shown to block the movement of fish species of conservation need.
- Work collaboratively with landowners to remove or rehabilitate culverts and road crossing with new structures that do not create barriers to fish.
- Work collaboratively with landowners to replace ponds that have been constructed on streams with alternative water sources (e.g., for livestock).
- Work collaboratively with public managers to modify pond and reservoir management to ensure that minimum in-stream flows are maintained.

*Conservation Issue: Invasive and exotic plants and animals that are detrimental to species of greatest conservation need:*

17. Invasive species encroachment (e.g., Privet and Japanese Honeysuckle).

*Conservation Actions:*

- Control invasive species and avoid new introductions of exotic species.
- Create burn cooperatives.
- Re-evaluate burning laws in Oklahoma.
- Educate landowners and general public about impacts of invasive and exotic plants and animals.

*Potential indicators for monitoring the effectiveness of the conservation actions:*

- Number of denied applications for exotic species introductions.
- Quantities of in-stream flows reserved for aquatic ecosystem conservation.
- Relative condition (populations/trends) of species of greatest conservation need and key indicator species.
- Relative condition and quantity of habitat.
- U.S. Geological Survey monitoring stations.

## Conservation Landscape: Post Oak/Blackjack Oak Woodland

The relative condition of Post Oak/Blackjack Oak Woodland habitat is currently poor with a declining trend. Dry upland forests of Post Oak (*Quercus stellata*) and Blackjack Oak (*Quercus marilandica*) are uncommon in this Region and are found primarily on rocky sandstone ridges in the western margin of the Ouachita Mountains and the Arkansas River valley. Where these forests occur, the dominant Post Oaks and Blackjack Oaks are found with Black Hickory (*Carya texana*), Winged Elm (*Ulmus alata*), and Black Oak (*Quercus velutina*). Common understory plants include Lowbush Blueberries (*Vaccinium pallida*), Mexican Plum (*Prunus mexicana*), and Winged Sumac (*Rhus copallina*). This habitat type resembles an eastern extension of the Post Oak/Blackjack Oak Woodlands that are the dominant habitat in the Crosstimbers Region.

Recognized plant associations within this habitat type include:

- Post Oak – Blackjack Oak – Black Hickory (Farkleberry) Forest
- Post Oak – Winged Elm Forest

The species of greatest conservation need found in this habitat are listed in the following table. The population abundance and trend of each species are described in relative terms. The best professional judgment of the advisory group and technical experts was used to identify each species status and trend. Species are sorted alphabetically within groups of amphibians (Amph), birds, fish, invertebrates (Inve), mammals (Mamm), and reptiles (Rept) for easy reference.

Species status definitions:

Low – species is rare, has a small population size, and/or occurs in only a small portion of the Region.

Medium – species is uncommon and occurs over a large portion of the Region or species is common but occurs in only a small part of the Region.

Abundant – species is common and widespread within the Region in appropriate habitat.

Unknown – the status of this species is not known.

Species of Greatest Conservation Need		Status				Trend			
Group	Common Name	Low	Medium	Abundant	Unknown	Declining	Stable	Increasing	Unknown
Bird	Bachman's Sparrow	X							X
Bird	Harris's Sparrow		X						X
Bird	Kentucky Warbler		X						X
Bird	Northern Bobwhite		X			X			
Bird	Painted Bunting		X						X
Bird	Prairie Warbler		X						X
Bird	Red-headed Woodpecker		X			X			
Inve	American Burying Beetle		X						X
Mamm	Eastern Spotted Skunk				X				X
Mamm	Long-tailed Weasel				X				X
Rept	Northern Scarletsnake				X				X
Rept	Western Diamond-backed Rattlesnake				X				X

The following conservation issues and actions are listed in general priority order.

*Conservation Issue: Incomplete data concerning species of greatest conservation need (refer to the matrix above) and habitat, an impediment for effective conservation planning and implementation:*

1. Data are incomplete regarding the habitat needs, geographic distribution, and population status of many Tier I and Tier II species of greatest conservation need that use this habitat type. In order to establish effective conservation actions, more complete data are needed to determine the population status and trend for many species and a more thorough evaluation is needed to determine the factors that limit population sizes or are responsible for declines.
2. More complete information is needed to determine the distribution and acreage of this habitat and the factors that shape vegetation structure (i.e., where forests and woodlands occurred historically) to assess site-specific habitat condition goals.

*Conservation Actions:*

- Conduct surveys of existing literature, reports, and museum records to evaluate historic distributions, abundances, habitat affinities of species of greatest conservation need (e.g., Bachman's Sparrow and Eastern Spotted Skunk), and develop hypotheses to test to examine the causes of suspected population declines.
- Conduct field surveys to establish a baseline conditions for the current distributions, abundances and vegetation affinities of all species of greatest conservation need.
- Verify the accuracy of existing data and assess population changes over time.
- Develop and maintain databases to store and analyze distributional and ecological data for species of greatest conservation need.
- Conduct ecological studies on priority species of greatest conservation need (e.g., Prairie Warbler, Bachman's Sparrow, Eastern Spotted Skunk, and Scarlet Snake) to:
  - identify factors that limit population sizes,
  - evaluate factors that may be responsible for population declines, and
  - develop recommendations to enhance populations (i.e., through enhancement of habitat conditions).
- Develop a method to accurately identify and map the distribution and the condition of this habitat to establish a current baseline.
- Assess historic literature and conduct field studies to evaluate the probable historic distribution and condition of this vegetation community, including identification of the probable locations and distributions of oak-hickory vegetation in forest, woodland, and savannah conditions.
- Use the results of surveys and studies to update the Comprehensive Wildlife Conservation Strategy via adaptive resource management.

*Conservation Issue: Altered habitat structure and condition as a result of historic and current land management practices:*

3. Relatively little of this habitat exists in a woodland condition. Much of the intact oak/hickory community has gradually changed from a mosaic of woodlands and forests to a more uniformly forest-like condition, most likely because of is the loss of historic fire regimes due to active fire suppression and reduced fire frequencies.
4. Many acres of habitat exist as even-aged forests. This change from woodlands and forests comprised of trees of diverse ages and heights to large even-aged stands is probably the result of widespread timber harvest during a relatively short period of time in the late 1800s or early 1900s.
5. The combination of even-aged stand structure and long-term fire suppression appear to be responsible for greater tree densities than probably occurred historically and for an increase in abundance of some tree species such as Eastern Redcedar.
6. Several constraints limit the use of management tools such as prescribed burning and selective tree harvest to restore woodland conditions to stands that are currently

forests, and to diversify the structure of existing forests and woodlands. These constraints include: insufficient personnel and financial resources, air quality concerns, insufficient guidance/assistance, logistical difficulties, and landowner liability issues.

7. Because habitat structure has changed slowly, many people are unaware that changes have occurred. Landowners who wish to restore or enhance oak/hickory woodlands and forests and benefit wildlife species of greatest conservation need do not have information or technical assistance available to them.
8. In some areas, continuous grazing within oak/hickory woodlands and forests appears to have reduced the abundance of herbaceous understory vegetation and increased the abundance of Eastern Redcedar, which may enhance the spread of undesirable exotic vegetation such as Japanese Brome or enhance populations of Brown-headed Cowbirds which parasitize the nests of Prairie Warblers and other songbird species of conservation need.
9. Several exotic plant species such as *Sericea lespedeza* and Japanese Honeysuckle have become established outside of cultivation and appear to displace native plants and to alter the habitat conditions for wildlife species of conservation need.

*Conservation Actions:*

- Conduct research into historic fire regimes and the historic distributions of woodlands and forests.
- Develop recommendations for the use of prescribed burning. Such recommendations should evaluate the timing (i.e., season), sizes and frequencies of prescribed burns to balance the needs of fire dependent (i.e., some birds and plants) and fire sensitive species (e.g. amphibians).
- Evaluate ways to reduce the impediments and constraints that reduce the use of prescribed fire as a management tool. These may include:
  - providing funding to agencies or organizations to assist with conducting controlled burns on private property,
  - developing technical assistance materials for landowners (e.g., publications, burning guidelines, workshops, and equipment rentals),
  - developing demonstration areas on public lands to show the results of recommended land management practices,
  - providing financial assistance or incentives to landowners to encourage woodland restoration,
  - developing burn cooperatives to work with agencies and landowners to increase the use of burning, and
  - looking for ways to reduce landowner liability while conducting burns (e.g., use of official burn protocols).
- Evaluate the use of mowing or brush-hogging as an alternative to conducting burns particularly in urbanizing areas.
- Develop monitoring programs to evaluate the effects of management techniques such as prescribed fire and tree harvest on populations of species of greatest conservation need and vegetation structure.
- Develop informational materials to inform landowners and the general public about the benefits of woodland restoration, the importance of fire in maintaining oak and hickory habitats, and the wildlife diversity of oak/hickory habitats.
- Provide payments to reduce cattle densities or establish rotational grazing programs to defer grazing on some areas during the growing season.
- Evaluate the severity and magnitude of the ecological damage done by exotic plant and animal species. Type of damage may include displacement of native vegetation/plant communities, predation on native animal populations, or hybridization with native species.
- Identify those exotic species causing the greatest impact to this habitat and species of greatest conservation need and develop control or management plans for these

species (e.g., controlled burning programs, herbicide treatment, and mechanical removal).

- Develop monitoring programs to measure and evaluate the effectiveness of these control measures.

*Conservation Issue: Fragmentation and conversion of habitat:*

10. Fragmentation and loss of habitat caused by the conversion of oak/hickory woodlands and forests to other land uses such as Loblolly Pine plantations, rangeland, or introduced pastures that are planted to Tall Fescue.
11. Fragmentation and loss of habitat due to increasing number of residential developments including secondary homes, cabins, and ranchettes.
12. Fragmentation and loss of habitat due to expanding infrastructure including roads, utility lines, and pipelines.
13. Fragmentation of land ownership with more individuals owning smaller tracts of land.

*Conservation Actions:*

- Develop ways to help families pass down large tracts of land from one generation to the next.
- Evaluate means to make it economically feasible for private landowners to maintain their land in oak/hickory vegetation (e.g., encourage markets for mature oak and hickory timber or encourage groups of landowners to work together as a block to manage habitat for hardwood timber production or hunting leases).
- Develop programs to maintain large tracts of oak/hickory woodlands and forests such as conservation easements, conservation leases, or willing-seller land acquisitions, preceded by a landscape-level assessment of habitat conditions to identify focus areas of greatest conservation value in order to get the greatest “bang for the buck” or efficiency.
- Evaluate methods to restore oak/hickory woodlands from pastures or crop fields.
- Develop cost-share programs, grants or financial incentives to assist willing landowners who wish to restore/replant these areas to oak/hickory woodlands.
- Coordinate with other agencies and research institutions to develop Best Management Practices and management recommendations to minimize the ecological footprint left by road, pipeline, utility line construction, and right-of-way maintenance.
- Develop and distribute informational materials with Best Management Practices and recommendations to landowners, agencies, and utility companies for their consideration and use.

*Potential indicators for monitoring the effectiveness of the conservation actions:*

- Acres burned/treated.
- Changes in acreage/coverage of exotic vegetation.
- Acres of native plant communities (species composition) restored.
- Number of easements secured and acreage protected.
- Relative condition (populations/trends) of species of greatest conservation need and key indicator species.
- Relative condition and quantity of habitat.
- Species declining outside Oklahoma but still common in this habitat.

*Potential partnerships to deliver conservation for Ouachita Region:*

State Government

- Arkansas Natural Heritage Commission
- Arkansas/Oklahoma Compact Commission
- Oklahoma Biological Survey
- Oklahoma Corporation Commission
- Oklahoma Department of Agriculture and Forestry Service
- Oklahoma Department of Environmental Quality
- Oklahoma Legislature
- Oklahoma Natural Heritage Inventory
- Oklahoma State University, Cooperative Extension Service
- Oklahoma Tourism and Recreation Department & State Parks
- Oklahoma Department of Wildlife Conservation
- Oklahoma Water Resources Board
- Other state universities and departments
- Other state-funded museums
- State of Arkansas
- States of Arkansas and Texas
- University of Oklahoma, Oklahoma Biological Station

Federal Government

- U.S. Army Corps of Engineers
- U.S. Bureau of Reclamation
- U.S. Department of Agriculture, Farm Service Agency
- U.S. Department of Agriculture, Forest Service, Ouachita National Forest
- U.S. Department of Agriculture, Natural Resources Conservation Service
- U.S. Department of Agriculture, Resource Conservation and Development Councils
- U.S. Department of the Interior, Bureau of Land Management
- U.S. Department of the Interior, National Park Service
- U.S. Environmental Protection Agency
- U.S. Fish and Wildlife Service
- U.S. Fish and Wildlife Service, Little River National Wildlife Refuge
- U.S. Fish and Wildlife Service, Sequoyah National Wildlife Refuge
- U.S. Geological Survey

Local Government

- Municipalities in Oklahoma, Arkansas, and Texas
- Municipalities wanting to buy water
- Tribal governments

Businesses, Citizens and Citizen Groups

- Local Audubon Societies
- Bat Conservation International
- Canoe Operators Association
- Central Hardwoods Joint Venture
- Chambers of Commerce
- Ducks Unlimited and local Oklahoma chapters
- Farm Bureau
- Farmers Union
- Hunting cooperatives
- Kerr Center for Sustainable Agriculture
- Land Legacy Initiative

- Local citizen's groups
- Lower Mississippi Valley Joint Venture
- National Rivers Society
- National Wild Turkey Federation and local Oklahoma chapters
- Oklahoma Anglers United
- Oklahoma Cattlemen's Association
- Oklahoma Forestry Association
- Oklahoma Native Plant Society
- Oklahoma Ornithological Society
- Oklahoma Section of the Society for Range Management
- Other sportsmen's groups
- Private landowners
- Sardis Lake Water Alliance
- Sierra Club
- Small Woodland Owner's Association
- Southern Oklahoma Water Alliance
- The Nature Conservancy
- The Wildlife Society
- Timber Companies
- Urban development groups
- Vernal Pool Society
- West Gulf Coastal Plain Bird Conservation Initiative