

Niangua Basin Conservation Strategies

- Restore woodlands, prairies, savannas and glades where appropriate.
- Restore bottomland forests and woodlands.
- Improve water quality and stream habitats.
- Conserve caves and springs.
- Implement appropriate recovery actions for eastern hellbender conservation.
- Provide public outreach and education, highlighting management activities.
- Increase recreational opportunities, especially in the lower part of the river (below Tunnel Dam), encouraging low impact activities such as canoeing and hiking.



Paul Nelson, U.S. Forest Service

Bennett Spring Savanna (owned by The Nature Conservancy) displays many native grasses and wildflowers. Its history of frequent ground fires goes back more than 50 years.

Priority Research and Inventory Needs

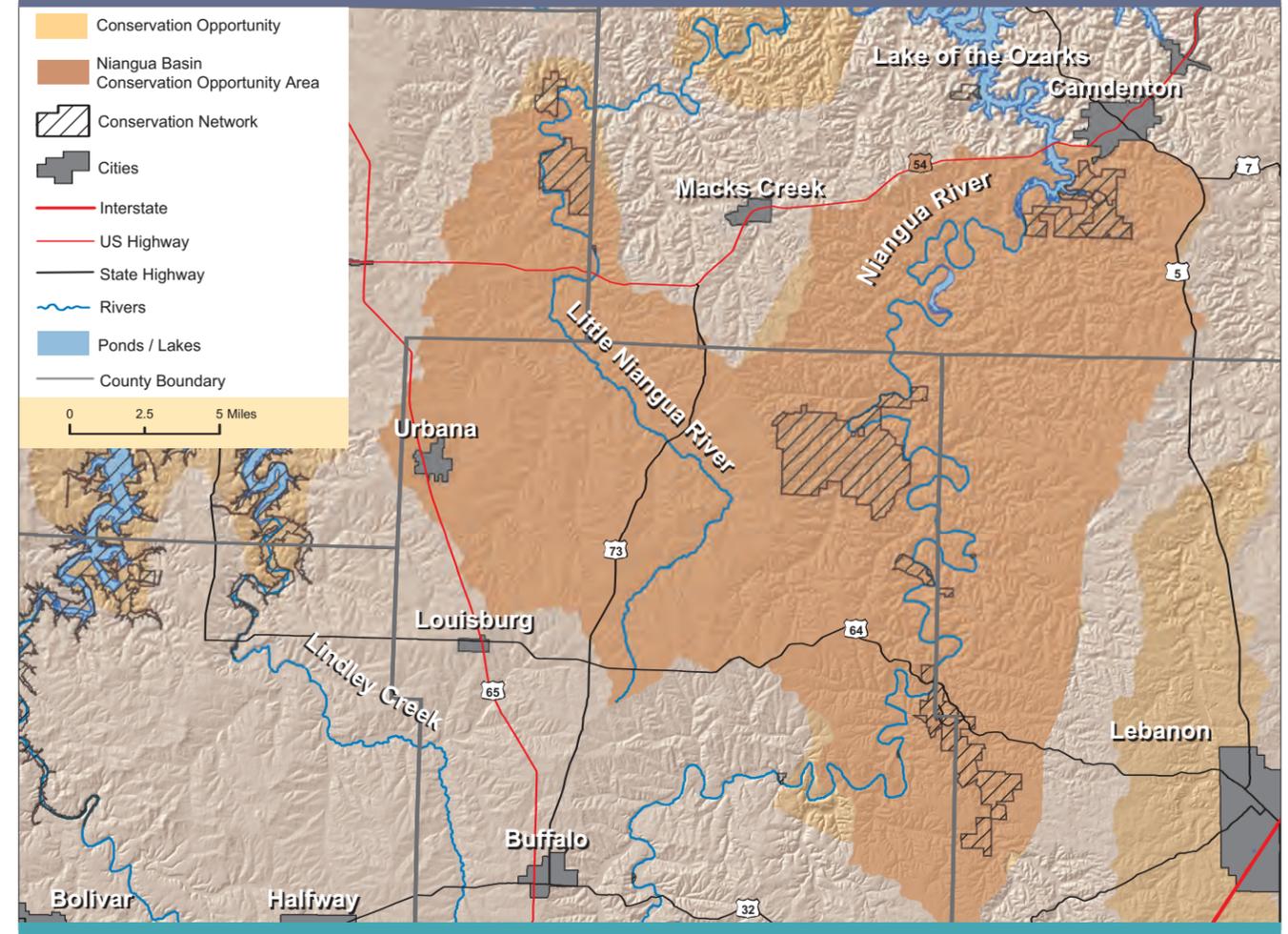
- Inventory targeted natural communities.
- Determine indicator plants and animals related to high quality terrestrial and aquatic natural communities.
- Assess and inventory environmental threats.
- Assess and inventory species of conservation concern.
- Determine ecological landtypes (ELT) and ELT phases.

Conservation Partners

Existing: The Nature Conservancy – Missouri Chapter (TNC); Missouri Conservation Heritage Foundation (MCHF); U.S. Fish and Wildlife Service (USFWS); Laclede County Natural Resource Conservation Service (NRCS); Laclede County Soil and Water Conservation District; Missouri Department of Natural Resources (DNR); Missouri Department of Conservation (MDC)

Potential: Audubon Missouri; Missouri Prairie Foundation; American Fisheries Society; National Wild Turkey Federation; Niangua River Paddlers Association; Heart of America Fly Fishers; Missouri cave grottos; Stream Teams; Ozark Regional Land Trust; private landowners

Niangua Basin Conservation Opportunity Area



Funding Sources

Existing: TNC annual budget; DNR annual budget; MDC annual budget; MDC Wildlife Diversity Funds; MDC Private Lands Cost Share Program; USFWS Partners for Fish and Wildlife Program; USFWS Fish Passage Program; MCHF Stream Stewardship Trust Fund; Farm Service Agency Conservation Reserve Program; NRCS Wildlife Habitat Incentive Program; NRCS Environmental Quality Incentives Program

Promising Future Sources: MDC State Wildlife Grants; MDC Landowner Incentive Program; National Fish and Wildlife Foundation Grants

Existing Conservation Network

Lead Mine Conservation Area; Ha Ha Tonka State Park (Ha Ha Tonka Savanna Natural Area, Ha Ha Tonka Karst Natural Area); Bennett Spring State Park (Bennett Spring Fish Hatchery and Trout Park, Bennett Spring Hanging Fen Natural Area); Mule Shoe Conservation Area; Berry Bluff Conservation Area; Barclay Conservation Area; Coffin Cave Conservation Area; Bennett Spring Savanna Preserve; Bennett Spring Access; Prosperine Access; Moon Valley Access; Branch Towersite; Plad Towersite



Niangua darters are sensitive to water pollution and sedimentation. Landowners can help Niangua darters by planting trees along stream banks and moving cattle watering areas into pastures, away from streams.

Jim Rathert, Missouri Department of Conservation

Prescribed Fire



A fire line at Ha Ha Tonka State Park demonstrates the difference that fire makes in Ozark woodlands. The area on the right was burned 10 times in 20 years prior to this photo, compared to the left side that has had no fire management for decades.

Paul W. Nelson, U.S. Forest Service

Conservation Challenges

The Niangua Basin COA provides an excellent opportunity to restore woodland, savanna and Ozark stream habitats. Many native grasslands, savannas and woodlands have been converted to nonnative pasture or cut over and allowed to grow up in dense timber in the absence of fire. Restoration of the native grassland and woodland landscape will not

only benefit native plants and animals, but can also provide forage and timber resources and enhance watershed protection and tourism. Potential challenges to conservation success include limited landowner participation, funding, staff time and the coordination and ability of multiple agencies and organizations to work together.

To learn more about the Niangua Basin Conservation Opportunity Area, please contact:



Missouri Department of Conservation
Wildlife Division
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Niangua Basin

Conservation Opportunity Area



Ozark
Highlands



Barclay Spring is one of several springs that release cool underground water into the Niangua River.

Jim Rathert, Missouri Department of Conservation

The Niangua Basin Conservation Opportunity Area (COA) features forests, woodlands, savannas and prairies along the Niangua and Little Niangua rivers. Springs, sinkholes and fens are signs of the region's vast underground network of caves. Water moves rapidly between the surface and groundwater in cave landscapes, allowing pollutants to easily affect water quality.

The Little Niangua River contains one of the last remaining populations of the Niangua Darter, a federally endangered fish. Niangua darters live in clear upland creeks and small to medium-sized rivers with slight to moderate currents. They require continuously flowing streams with silt-free gravel and rock bottoms.

The Niangua Basin COA supports several high-use

recreational areas. The Niangua River is one of the most popular floating and fishing streams in the Missouri Ozarks. Numerous privately owned canoe liveries and campgrounds are located along the upper stretch of the Niangua River, with a noticeable absence of camping and canoe accesses in the Lower Niangua River (especially below Tunnel Dam). Ha Ha Tonka State Park features Ha Ha Tonka spring, sinkholes, caves, a natural bridge, castle ruins, hiking trails, picnic sites and shelters, two natural areas and a visitor's center. Bennett Spring State Park is the most visited trout park in Missouri.

Well known for its recreational fishing, hiking and canoeing, the Niangua Basin COA offers an excellent opportunity to keep these resources healthy.

North Fork Conservation Strategies

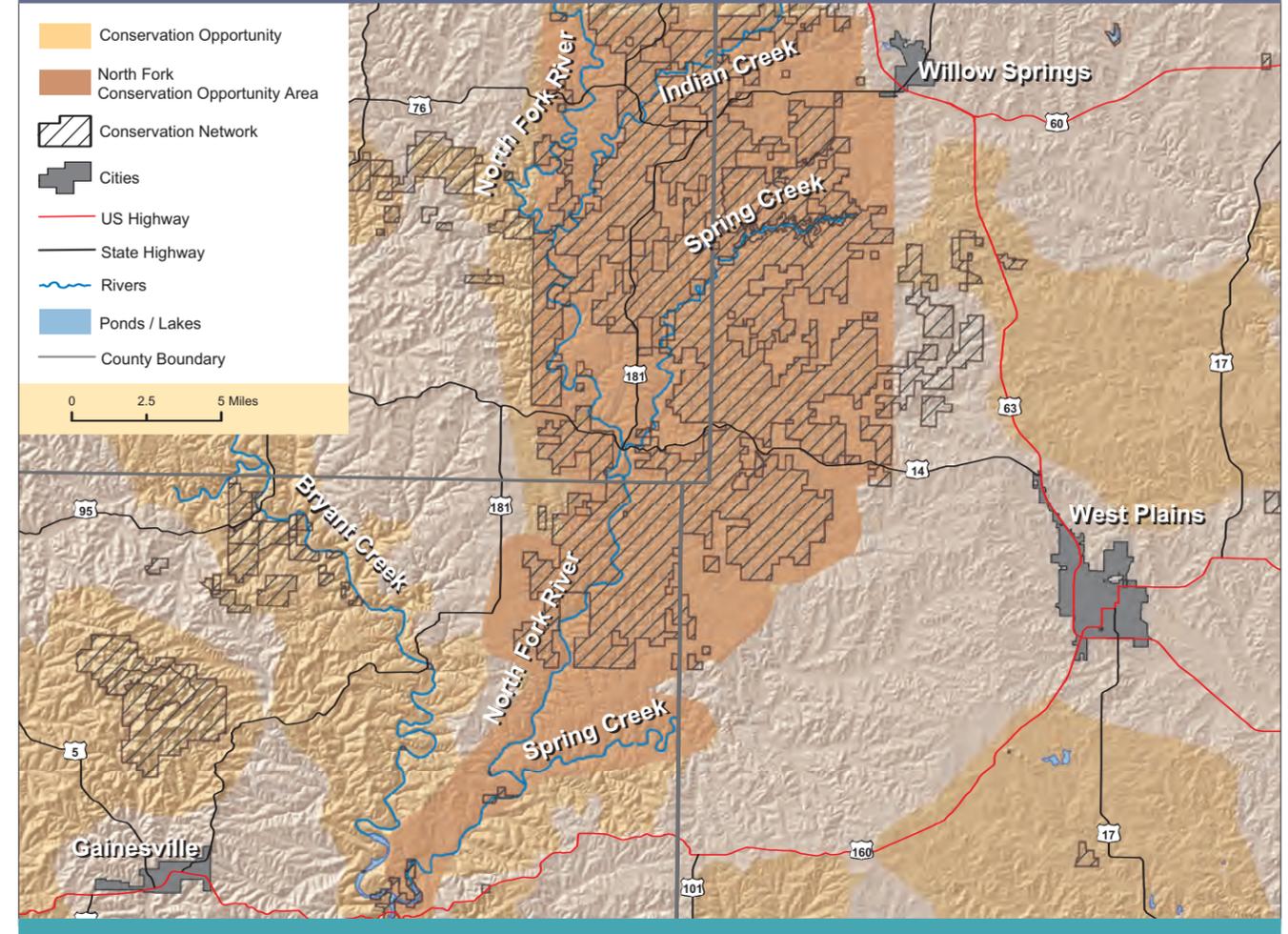
- Increase the connectivity of glades, savannas and woodlands.
- Increase pine-oak woodland management as recommended in the Mark Twain National Forest Land and Resource Management Plan.
- Maintain existing 95% forested riparian corridor.
- Establish riparian buffers for 75% of cave entrances and spring branches.
- Reduce or eliminate impacts from invasive plants on 50% of natural and restored communities.
- Increase managed forest acres and forest connectivity on private lands.
- Conduct landowner contact programs, emphasizing riparian landowners.
- Increase use of long-term and permanent conservation easements.
- Implement recovery plan objectives for hellbenders.
- Develop and implement management plans for springs and river accesses.
- Reduce erosion, sedimentation and water pollution from cattle, gravel roads and forest land conversion.



After several months of low rainfall, North Fork river levels drop, exposing large gravel bars that quickly revegetate.

Tom Stanton, Missouri Department of Conservation

North Fork Conservation Opportunity Area



Priority Research and Inventory Needs

- Conduct a biological inventory of the North Fork COA.
- Use satellite and aerial imagery to review forest cover.
- Establish a baseline for water quality.
- Establish a baseline for measuring sedimentation of streams; determine the impacts of sedimentation on stream health.
- Locate sinkholes, losing streams and other natural features that impact North Fork's water quality.
- Document spring recharge areas.

Conservation Partners

Existing: Ozark Regional Land Trust; National Wild Turkey Federation (NWTF); Missouri State University's Bull Shoals Field Station; Missouri Department of Conservation (MDC); U.S. Forest Service (USFS)

Potential: Central Hardwoods Joint Venture; Missouri Audubon; Greater Ozarks Audubon Society; The Nature Conservancy – Missouri Chapter; Missouri Conservation Heritage Foundation (MCHF); St. Louis Zoo; Wonders of Wildlife; Bass Anglers Sportsman Society; Trout Unlimited; U.S. Fish and Wildlife Service; Natural Resources Conservation Service

Funding Sources

Existing: USFS annual budget; MDC annual budget; NWTF Wild Turkey Super Fund

Promising Future Sources: MDC Landowner Incentive Program; MDC State Wildlife Grants; MDC Wildlife Diversity Funds; MDC Forest Legacy Program; Missouri Bird Conservation Initiative Grants; MCHF Stream Stewardship Trust Funds; MCHF Grants; USACE Section 1135 Program

Existing Conservation Network

Mark Twain National Forest – Willow Springs District (Devil's Backbone Wilderness Area, Carman Springs Natural Area); Norfork Lake; Patrick Bridge Access; Hebron Access; Blair Bridge Access



The ovenbird is a forest interior bird. It nests in large tracts of upland forest.

Jim Rathert, Missouri Department of Conservation

Ozark Hellbenders



The Ozark hellbender is a large aquatic salamander found only in south central Missouri and north central Arkansas. They need cool, clear, unpolluted water to survive, making them an indicator of overall river health.

Jeff Briggler, Missouri Department of Conservation

North Fork

Conservation Opportunity Area



Ozark
Highlands



The North Fork River flows through Devil's Backbone Wilderness Area in Mark Twain National Forest.

Tom Stanton, Missouri Department of Conservation

Conservation Challenges

The North Fork Conservation Opportunity Area provides an excellent opportunity for oak and pine woodland and forest management. Potential obstacles to conservation success include lack of staff time, development pressure along the river,

landowner resistance, invasive and exotic plants, U.S. Forest Service policy on exotic plants, water quality outside the COA and the need to improve communication and coordination among non-profit partners.

To learn more about the North Fork Conservation Opportunity Area, please contact:



Missouri Department of Conservation
Wildlife Division
P.O. Box 180
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Surrounded by oak and pine woodlands and forests, much of the North Fork of the White River is located within Mark Twain National Forest. Historically, pine-oak woodlands occupied high elevations and graded into oak-pine and mixed-oak forests in deep valleys. Today, dense second-growth forest is the dominant land cover with scattered pine plantations. Overgrown glade openings line cliff tops and exposed slopes. Most riparian corridors are protected, land conversion is minimal and forest harvests are managed with Best Management Plans.

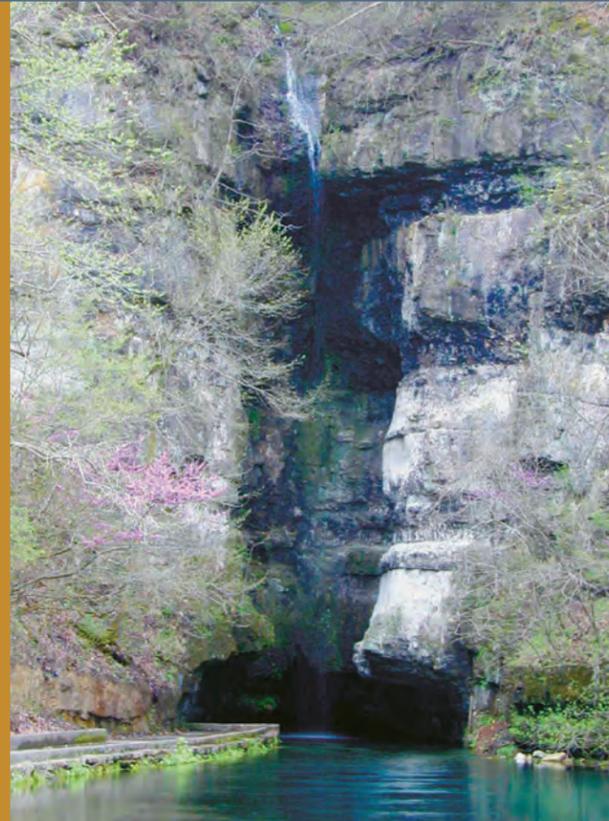
Caves, springs, sinkholes and losing streams are prominent features of the North Fork Conservation Opportunity Area (COA). The two largest springs in the watershed are Double (Rainbow) and North Fork springs. Both springs emerge close together on the lower part of the river. Water quality in the North Fork River is considered good, but the potential for groundwater

pollution is a general concern. Over 75 kinds of fish inhabit the river. Prominent sport fish include smallmouth bass, largemouth bass and introduced rainbow and brown trout. The Ozark hellbender, an aquatic salamander, lives in the North Fork River; their numbers are declining. Other aquatic species of conservation concern include checkered madtoms and Ozark shiners.

The Nature Conservancy and Missouri Department of Conservation have independently identified the North Fork River and its surrounding landscapes as aquatic and terrestrial focus areas. Audubon Missouri and the Central Hardwoods Joint Venture selected the North Fork COA for its importance to woodland and forest birds. A portion of the COA has also been identified as a Mark Twain National Forest Ecosystem Management Area.

Roaring River Conservation Strategies

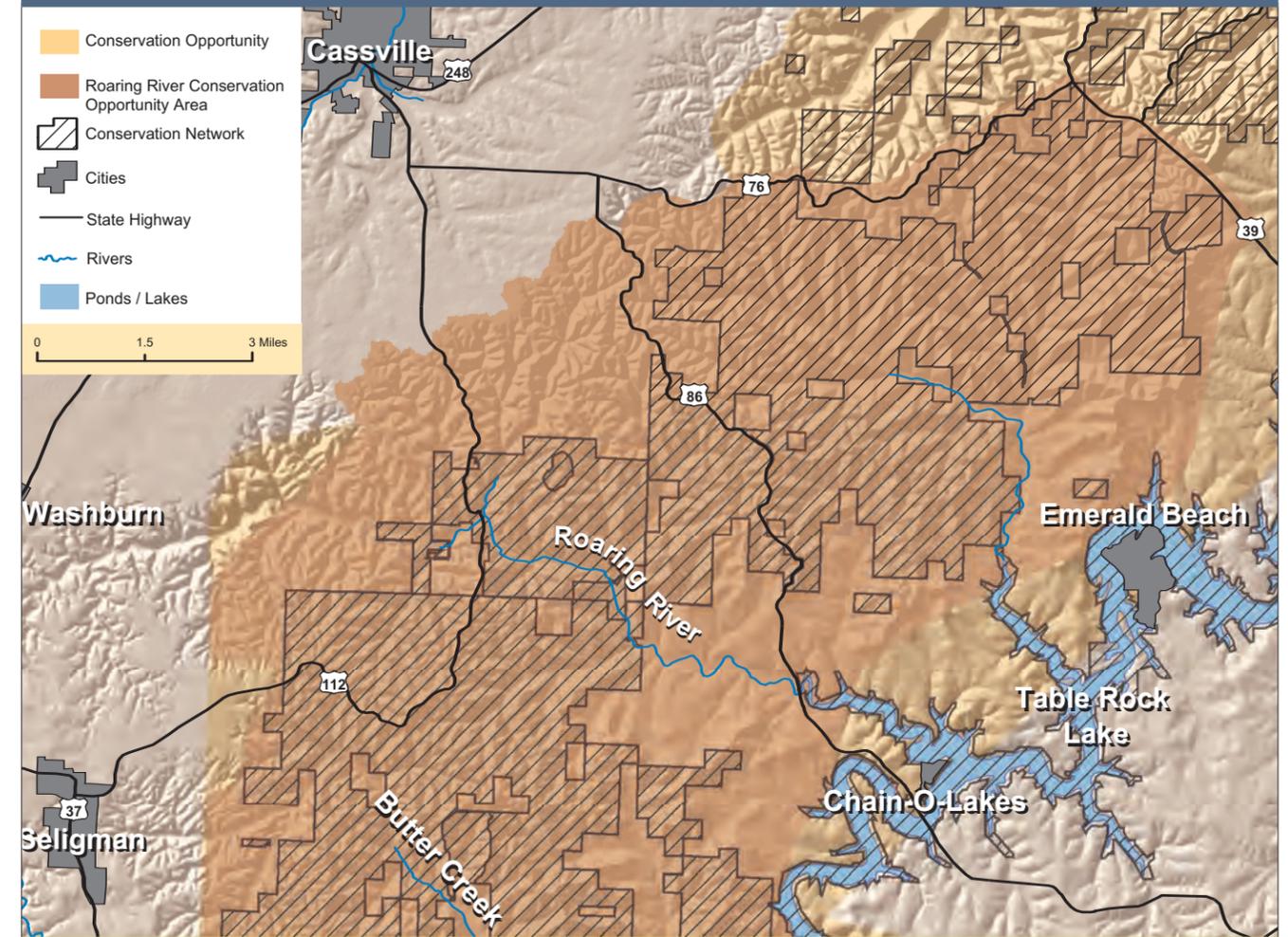
- Restore woodland and glade natural communities.
- Improve riparian forests, water quality and stream habitat.
- Protect caves and springs.
- Use outreach and education opportunities to highlight management activities.
- Eliminate unwanted invasive plants and animals (e.g. sercia lespedeza and tall fescue).
- Work with willing private landowners to protect and manage native plants and animals.
- Restore habitats for species of conservation concern.



John Logan, Missouri Department of Natural Resources

Roaring River Spring releases an average of 20.4 million gallons of cool, underground water each day. Water enters the ground from sinkholes only to resurface miles away at Roaring River.

Roaring River Conservation Opportunity Area



Priority Research and Inventory Needs

- Determine specific glade and woodland restoration sites.
- Identify locations to reduce and eliminate invasive plants and animals.
- Inventory species of conservation concern.
- Inventory aquatic plants and animals.
- Inventory caves and sinkholes.
- Delineate Roaring River Spring recharge area.
- Identify river and stream valleys that need reforestation.

Conservation Partners

Existing: Missouri Department of Natural Resources (DNR); Missouri Department of Conservation (MDC); U.S. Forest Service (USFS)

Potential: Audubon Missouri; Central Hardwoods Joint Venture; MAKO Fly Fishers; The Nature Conservancy – Missouri Chapter; Missouri Prairie Foundation; National Wild Turkey Federation (NWTf); Ozark Regional Land Trust; Sierra Club; Trout Unlimited; Missouri Conservation Heritage Foundation (MCHF); private landowners; U.S. Fish and Wildlife Service (USFWS); Natural Resources Conservation Service (NRCS)

Funding Sources

Existing: USFS annual budget; DNR annual budget; MDC annual budget; MDC Private Lands Cost Share Program; NRCS Wildlife Habitat Incentive Program; NRCS Environmental Quality Incentives Program

Promising Future Sources: Farm Service Agency Conservation Reserve Program; USFWS Partners for Fish and Wildlife Program; USFWS Fish Passage Grants; MDC State Wildlife Grants; MDC Wildlife Diversity Funds; MDC Landowner Incentive Program; NWTf Wild Turkey Super Fund; MCHF Stream Stewardship Trust Fund; DNR 319 Grants

Existing Conservation Network

Mark Twain National Forest – Cassville District; (Butler Hollow Glades Natural Area); Roaring River State Park; (Roaring River Cove Hardwoods Natural Area); Roaring River Conservation Area



Jim Rathert, Missouri Department of Conservation

Eastern collared lizards (a species of conservation concern) require open, rocky glades for their survival. Thick groves of eastern red cedar now cover over 95% of collared lizard habitat in the Roaring River COA.

Glade Management



The suppression of fires for more than 50 years has allowed cedars to grow large enough to survive prescribed burns. Often, **cedars must be manually removed** before fire can be effective.

Cliff White, Missouri Department of Conservation

Conservation Challenges

The most significant threat to the Roaring River Conservation Opportunity Area remains the invasion of eastern red cedars. Other obstacles to success may include funding and staff

time shortages, differing agency management regulations, lack of understanding from the public and an inadequate market for selling small cedars.

To learn more about the Roaring River Conservation Opportunity Area, please contact:



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Roaring River

Conservation Opportunity Area



Ozark
Highlands



Dolomite glades top the hills of Roaring River State Park.

Department of Natural Resources

In a snow-filled December of 1845, the first General Land Office land surveyors in the Roaring River area wrote “high, steep, and rocky Mountains are so Slippery that it is not possible to Travel over them without indangering ones life.” They left to find more gentle terrain, but before doing so recorded their observations of scattered oak woodlands and expansive grassy glades. True forests occurred only in the rich bottomland valleys.

Frequent, low-intensity fires shaped this glade and woodland landscape for thousands of years. Although local fires may sometimes have started from lightning strikes or human sources, they more often spread into

the Roaring River hills from nearby prairies and savannas. Glade and woodland plants and animals depend on fire management to maintain the open, sunny landscape they require. Until very recently, fire has been purposefully excluded, leading to dense second-growth forests and cedar thickets on former glades.

The cool, clear waters of Roaring River are currently revered for their trout fishing, but Roaring River Spring also offers a glimpse of the region’s underground features. The rapid movement of water between the surface and groundwater creates sinkholes, caves and springs throughout the Ozarks. Protecting water quality is integral to sustaining local fish and wildlife populations.

Shoal Creek Conservation Strategies

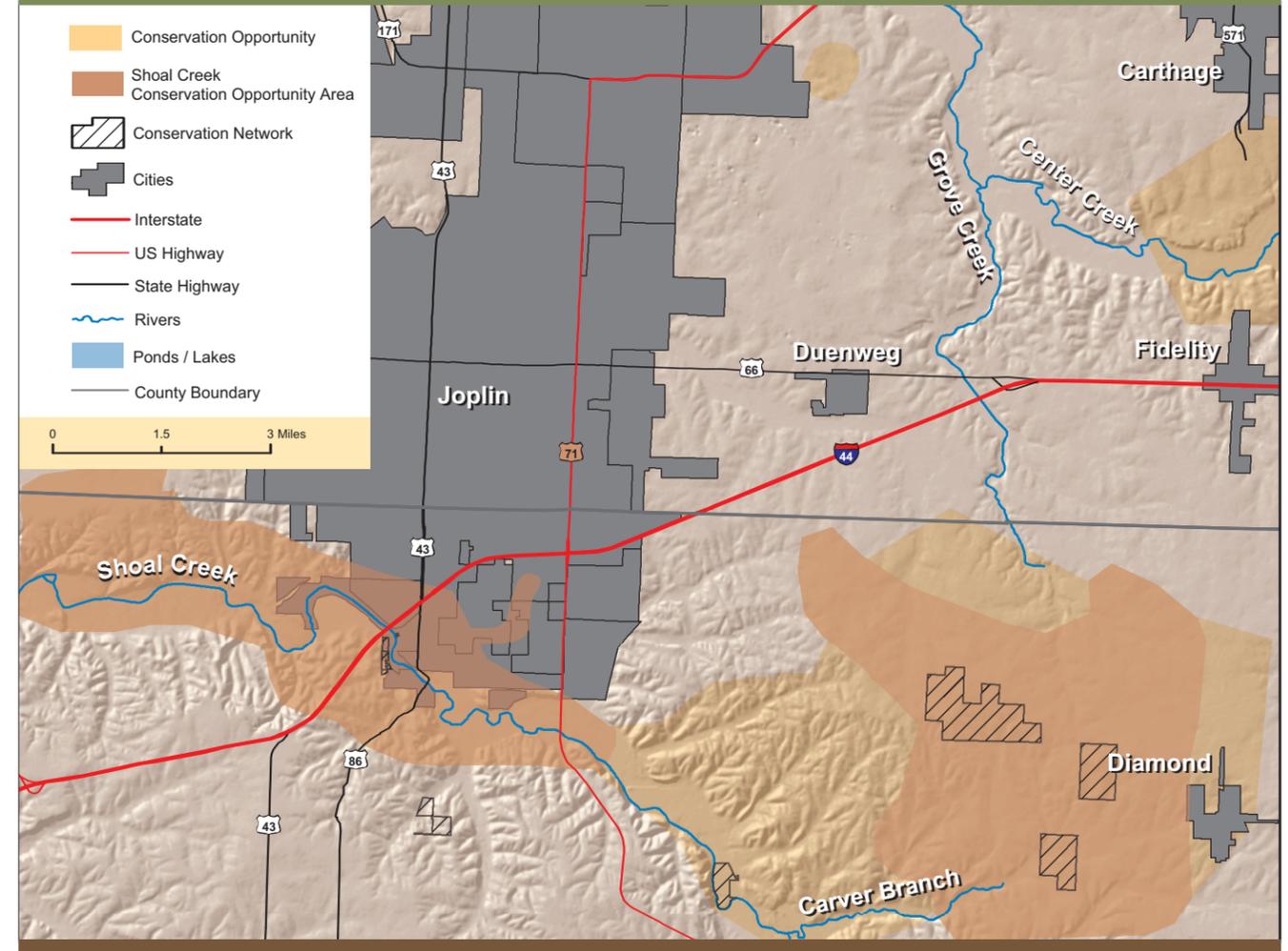
- Restore riparian corridors.
- Restore natural communities (including chert glades, tallgrass prairies and riparian woodlands) on public and private lands.
- Identify habitat restoration opportunities for willing private landowners.
- Improve water quality and stream habitat by working with communities and willing landowners to implement Best Management Practices.
- Educate the public and policy makers about the value of natural community restoration.
- Develop an active volunteer base.



Thin soil, cracks and crevice fractures provide limited moisture for desert-adapted plants and animals at Wildcat Glade Natural Area.

Jim Rathert, Missouri Department of Conservation

Shoal Creek Conservation Opportunity Area



Priority Research and Inventory Needs

- Determine the health of riparian corridors using aerial photographs.
- Inventory natural communities.
- Identify potential sources that negatively affect water quality (runoff, erosion etc.).
- Inventory in-stream habitats.
- Develop plant and animal inventories.
- Conduct public attitude surveys.

Conservation Partners

Existing: Audubon Missouri; Missouri Stream Team #2011; Ozark Regional Land Trust; Missouri Southern State University; Southwest Missouri State University; City of Joplin; Newton County Soil and Water Conservation District (SWCD); Southwest Missouri Resource Conservation and Development; Missouri Department of Natural Resources (DNR); Missouri Department of Conservation (MDC); U.S. Fish and Wildlife Service (USFWS)

Potential: Ducks Unlimited; Sierra Club – Ozark Chapter; Jasper County Master Gardeners; Hill ‘n’ Hollow Master Gardeners; Missouri Master Naturalists – Joplin Chapter; Shoal Creek Watershed Improvement Group; Conservation Federation of Missouri; private landowners; Upper Shoal Creek Basin Total Maximum Daily Load Planning Group; National Park Service

Funding Sources

Existing: MDC annual budget; MDC Private Lands Cost Share Program; MDC Wildlife Diversity Funds; NPS annual budget; City of Joplin annual budget; Audubon Missouri annual budget; Environmental Protection Agency Mini-grants Program; DNR 319 Grants; DNR Recreational Trails Program; DNR Watershed Management Plan Development Grant; SWCD State Cost Share Funds; U.S. Department of Agriculture Sustainable Practices Grant; USFWS Endangered Species Landowner Incentive Program; USFWS Mined Lands Restoration Fund
Promising Future Sources: MDC State Wildlife Grants; Missouri Natural Heritage Foundation Grants

Existing Conservation Network

Diamond Grove Prairie Conservation Area (Diamond Grove Prairie Natural Area); George Washington Carver National Monument; Wildcat Park (Wildcat Glade Natural Area, Wildcat Glades Conservation and Audubon Center, Wildcat Access)



Jim Rathert, Missouri Department of Conservation

Lichen grasshoppers blend with the lichen-covered rocks on chert glades, becoming visible only when they jump.

Wildcat Glades Conservation and Audubon Center



Wildcat Glade Natural Area provides the best example of a chert glade in Missouri. The glade vegetation ranges from lichen-covered rocks to patches of gnarled, stunted oaks. Glade plants are especially colorful in the spring and include prickly pear, glade wild onion, rock pink and Barbara's buttons. Audubon Missouri, the Missouri Department of Conservation and the City of Joplin plan to showcase Wildcat glades with the Wildcat Glades Conservation and Audubon Center, scheduled to open in late 2006.

Jim Rathert, Missouri
Department of Conservation

Conservation Challenges

Chert glades are highly susceptible to development, including home and business construction, utility corridors, land filling and recreational use. Past overgrazing and fire suppression have resulted in some invasion by woody plants, especially winged sumac and the introduced cheatgrass (*Bromus tectorum*). Because so few high quality chert glades

and prairies remain in and around Joplin, conservation organizations and agencies will continue working with city administrators and private landowners to protect remaining examples. Exotic species and impacts from recreational use should be monitored, and prescribed fire applied to maintain glades, prairies, savannas and woodlands.

To learn more about the Shoal Creek Conservation Opportunity Area, please contact:



Missouri Department of Conservation
Wildlife Division
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Shoal Creek

Conservation Opportunity Area



Ozark
Highlands



Shoal Creek is home to many rare fish and mussels.

Tony Robyn, Audubon Missouri

Located in the Spring River watershed in southwest Missouri, Shoal Creek Conservation Opportunity Area (COA) highlights a high quality stream, the highest continuously flowing waterfall in the state, several tallgrass prairie restoration sites and the best remaining chert glades in Missouri. Shoal Creek flows through Joplin, providing an excellent opportunity to involve area citizens in habitat restoration and conservation.

Wildcat Park in Joplin includes 27 acres of high quality, publicly owned chert glades, chert cliffs, a spring and a one mile corridor of Shoal Creek stream bank habitat. Important chert glade plants and animals include prickly pear cactus, fame flower, blunt lobe woodsia, common least daisy, collared lizards and lichen grasshoppers.

Shoal Creek is a biologically significant stream, providing

habitat for rare aquatic mussels and fish such as Neosho mucklets, purple lilliputs, Arkansas darters, least darters and Ouachita kidneyshells. Joplin and Neosho utilize the stream for 90% of their public water consumption needs, as well as for recreation. Historically, oak savannas and woodlands surrounded Shoal Creek. Today, the landscape is a mosaic of pasture and dense second-growth oak forest.

Tallgrass prairies once dominated the broad, flat portions of the landscape. Diamond Grove Prairie is the COA's largest remnant tallgrass prairie. The prairie is home to prairie animals (including greater prairie-chickens and Henslow's sparrow) and interesting plants (royal catchfly, Muhlenberg's nut-rush and blue star). The George Washington Carver National Monument includes an 80 acre restored tallgrass prairie.

Spring River Conservation Strategies:

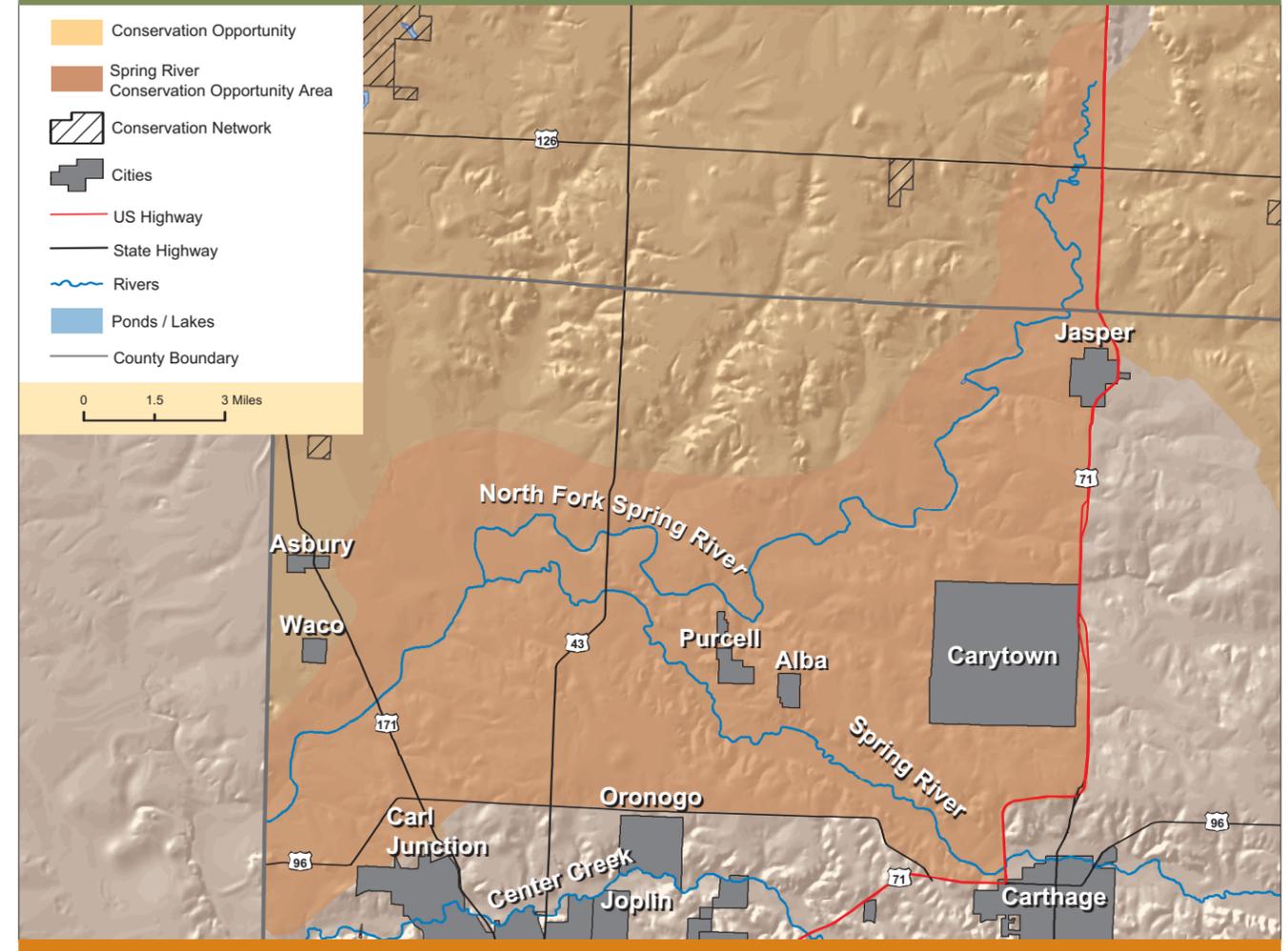
- Increase acreage of high quality bottomland woodlands, oak savannas and riverfront forests.
- Increase conservation of karst, cave and spring features.
- Enhance water quality and stream habitat.
- Increase acres of reclaimed abandoned mine sites.
- Work with willing landowners to deliver conservation actions that favor healthy aquatic habitats and terrestrial natural communities.
- Increase outreach and education opportunities to provide information on the importance of landscape conservation and management practices.



Ken McCarty, Missouri Department of Natural Resources

Hardpan prairies were once common in the Spring River COA. Hardpan prairies are named for an impervious layer of soil that stays saturated in winter and spring, but dries rock-hard during summer.

Spring River Conservation Opportunity Area



Priority Research and Inventory Needs

- Inventory aquatic animals and species of conservation concern.
- Identify target sites for bottomland woodland, oak savanna and riverfront forest restoration.
- Identify target areas for karst, spring and cave management.
- Compile existing baseline water quality data.

Conservation Partners

Existing: Ozark Regional Land Trust; Stream Teams; U.S. Fish and Wildlife Service (USFWS); Missouri Department of Conservation (MDC)

Potential: Audubon Missouri; MAKO (Missouri, Arkansas, Kansas, Oklahoma) Fly Fishers; Missouri Conservation Heritage Foundation (MCHF); National Wild Turkey Federation (NWTF); Ducks Unlimited (DU); Private Landowners; Southwest Missouri Resource Conservation and Development; Natural Resources Conservation Service (NRCS)



Jim Rathert, Missouri Department of Conservation

Ringed crayfish are found in southwest Missouri, northwest Arkansas and northeast Oklahoma. They occur in clear, rocky permanent-flowing streams and rivers. Soil erosion and sediment pollution may make streams unsuitable for ringed crayfish and other aquatic animals.

Funding Sources

Existing: MDC Private Lands Cost Share Program; USFWS Partners for Fish and Wildlife Program; Soil and Water Conservation District State Cost Share Funds; Farm Service Agency Conservation Reserve Program; NRCS Environmental Quality Incentives Program

Promising Future Sources: DU Conservation Projects Program; NWTF Wild Turkey Super Fund; Missouri Department of Natural Resources (DNR) Special Area Land Treatment Program; DNR 319 Grants; MCHF Stream Stewardship Trust Fund; MDC State Wildlife Grants

Existing Conservation Network

Private land initiative

Stream Flow



Unlike many stream basins, there are no large reservoirs in the Missouri portion of the Spring River Basin. River flows are lowest in the summer and early fall, with much of the river being too low to paddle during periods of drought.

Missouri Department of Conservation

Conservation Challenges

The Spring River Conservation Opportunity Area offers one of the best places to conserve a distinctive group of fish, crayfish and mussels. In the past 200 years, the landscape has been transformed from tallgrass prairie to fescue pasture and hay meadows with scattered cropland. This change in land cover has affected the terrestrial and aquatic wildlife of the Spring River COA. The North Fork Spring River is included on the

Missouri Department of Natural Resources 2002 "List of Impaired Waters" for sediment pollution. Sediment pollution is one of the leading threats for aquatic species of conservation concern, including those found in the Spring River and North Fork Spring River. Other potential obstacles to conservation success include gaining landowner participation and acceptance and limited funding and staff time.

To learn more about the Spring River Conservation Opportunity Area, please contact:



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Spring River

Conservation Opportunity Area



Ozark
Highlands



The Spring River in southwest Missouri contains several fish, crayfish and mussels found nowhere else in the state.

Missouri Department of Conservation

The Spring River is located in southwest Missouri and flows west into Kansas and Oklahoma. Natural springs are numerous along the river, but most are small. Because of its location between the Ozarks and prairie regions, the Spring River supports one of Missouri's most distinctive combinations of fish, crayfish and mussels.

A total of 86 fish, 35 mussels and 4 crayfish live in Missouri's Spring River basin. Common sportfish include smallmouth bass, largemouth bass, spotted bass and rock bass. The Neosho madtom, redbfin darter, bluntnose shiner and Neosho mucket are aquatic species of conservation concern within the Spring River and North Fork of the Spring River. Other fish, including redspot chubs, cardinal shiners and channel

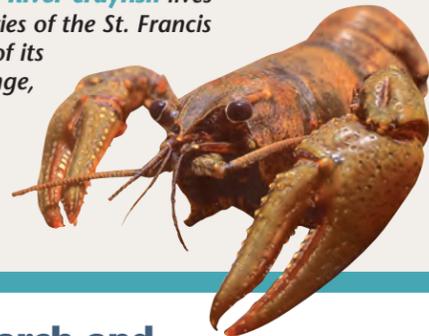
darters, occur almost nowhere else in the state.

The Spring River Conservation Opportunity Area (COA) includes the land surrounding the western portions of Spring River and North Fork Spring River. Historically, native tallgrass prairie dominated the landscape. Oak savannas, bottomland woodlands and riverfront forests occurred along rivers and streams. Major goals for the COA include improved water quality, better aquatic and terrestrial habitat conditions, maintenance of diverse and abundant populations of native aquatic fish, crayfish and mussels and increased public appreciation for Spring River stream resources. Private landowners play an important role in helping to keep the Spring River and its tributaries healthy.

St. Francois Knobs Conservation Strategies

- Restore natural processes and habitats by promoting the use of prescribed fire and timber stand thinning on glades and woodlands.
- Convert non-native grasslands to restored natural communities.
- Reduce erosion by reforesting river banks and bottomland forests.
- Improve water quality and aquatic habitats.
- Work with willing private landowners to protect and manage native plants and animals.
- Increase public outreach and education. Work cooperatively with local partnership groups and landowners.

The *St. Francis River crayfish* lives only in tributaries of the St. Francis River. Because of its small home range, this species is vulnerable to extinction from pollution and other threats.



Hughes Mountain Natural Area features igneous glades and woodlands on thin, rocky soils.

Jim Rathert, Missouri Department of Conservation

Priority Research and Inventory Needs

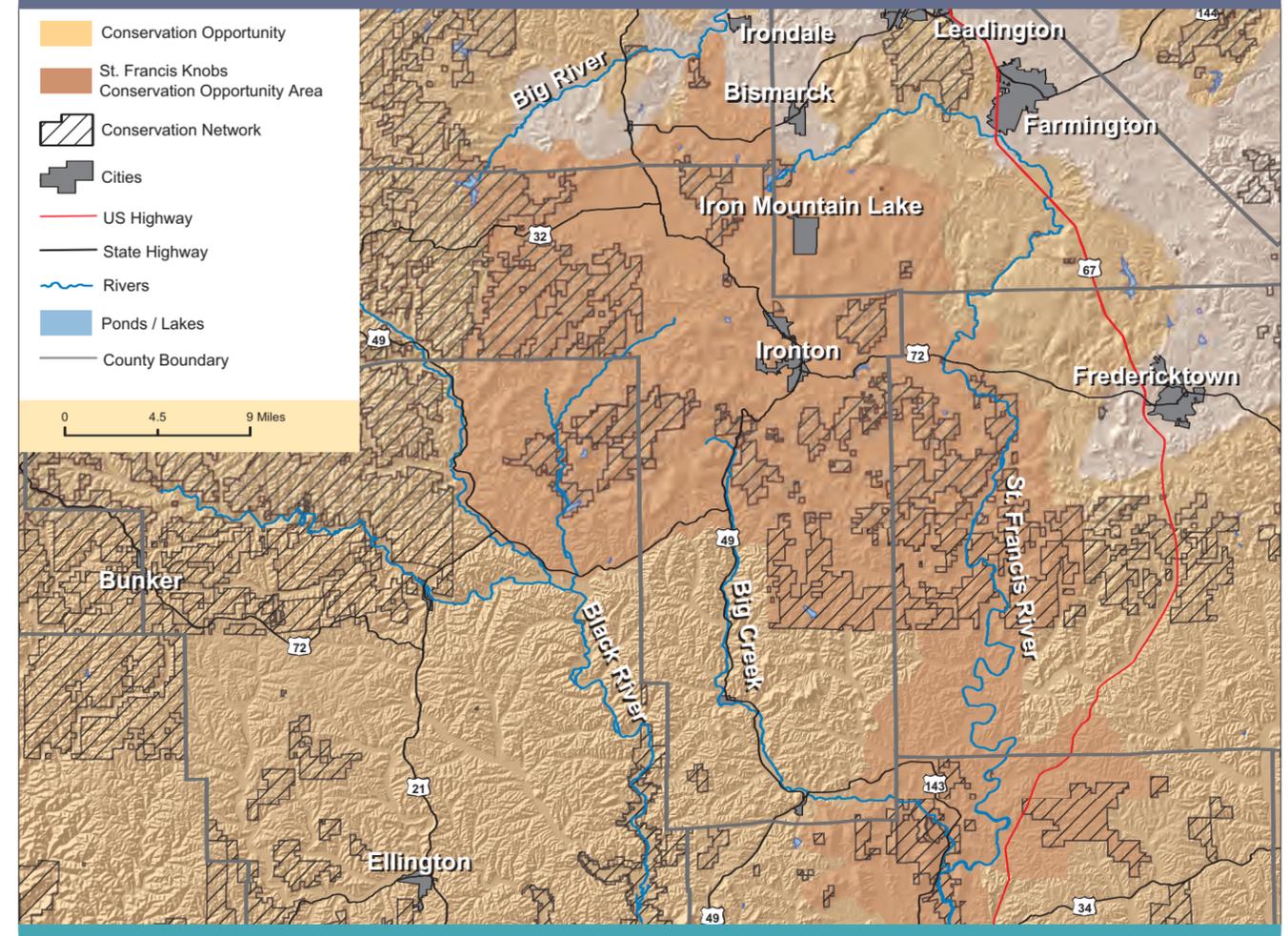
- Assess feral hog populations and implement control strategies.
- Inventory private forest resources; update Best Management Practices.
- Determine prescribed fire burn rotations and management regimes best suited for glade and woodland restoration.
- Quantify soil loss during prescribed fire management.
- Assess oak decline and define strategies to improve the health of timbered communities.
- Monitor populations of aquatic invertebrates including big creek crayfish, St. Francis River crayfish and belted crayfish.
- Monitor bat populations and inventory cave life.
- Inventory fens, fish, mussels, forest interior birds and amphibians and reptiles.
- Determine the causes of increased gravel in the Black River.

Conservation Partners

Existing: Missouri Bird Conservation Initiative; Central Hardwoods Joint Venture; National Wild Turkey Federation (NWTF); Otahki Girl Scouts; Missouri Department of Conservation (MDC); Missouri Department of Natural Resources (DNR); U.S. Forest Service (USFS); U.S. Fish and Wildlife Service (USFWS)

Potential: Audubon Missouri; Sierra Club; The Nature Conservancy – Missouri Chapter; Missouri Prairie Foundation; Ozark Society; Ozark Regional Land Trust; Stream Teams; Missouri Parks Association; Eastern Ozark Forestry Council; Bat Conservation International; U.S. Army Corp of Engineers (USACE); Natural Resources Conservation Service (NRCS)

St. Francois Knobs Conservation Opportunity Area



Funding Sources

Existing: DNR annual budget; USFS annual budget; USFWS annual budget; MDC annual budget; MDC State Wildlife Grants; MDC Private Lands Cost Share Program; Farm Service Agency Conservation Reserve Program; NRCS Wetland Reserve Program; NRCS Environmental Quality Incentives Program; NRCS Wildlife Habitat Incentive Program

Promising Future Sources: MDC Landowner Incentive Program; MDC Wildlife Diversity funds; USFWS Partners for Fish and Wildlife Program; USFWS North America Wetlands Conservation Act grants; National Fish and Wildlife Foundation grants; NWTF Wild Turkey Super Fund; Missouri Bird Conservation Initiative Grants; Ducks Unlimited grants; SWCD State Cost Share Funds

Existing Conservation Network

Bismarck Conservation Area; Buck Mountain Conservation Area and Natural Area; Buford Mountain Conservation Area; Cedar Mountain Conservation Area; Coldwater Conservation Area; Graves Mountain Conservation Area; Iron Mountain Lake; Ketcherside Mountain Conservation Area (Royal Gorge Natural Area); Lower Taum Sauk Lake; Millstream Gardens Conservation Area (St. Francis River Natural Area); Sam A. Baker State Park (Mudlick Mountain Natural Area); Taum Sauk Mountain State Park (St. Francois Mountains Natural Area); Johnson's Shut-ins State Park (Johnson's Shut-ins Natural Area, Johnson's Shut-ins Dolomite Glade Natural Area, Johnson's Shut-ins Fen Natural Area); Elephant Rocks State Park and Natural Area; Fort Davidson State Historic Site; Mark Twain National Forest – Salem/Potosi and Fredericktown Districts (Rockpile Wilderness; Bell Mountain Wilderness; Silver Mines Recreation Area); Wappapello Reservoir; Hughes Mountain Natural Area; Pilot Knob National Wildlife Refuge; Roselle Access

Ozark Shut-ins



Most streams and rivers in the St. Francois Knobs COA occur on privately owned land. Over 100 kinds of fish, mussels and crayfish can be found in their reaches. Canyon-like gorges called "shut-ins" form in streams that cut through areas of erosion-resistant igneous rock.

Jim Rathert, Missouri Department of Conservation

Conservation Challenges

The St. Francois Knobs' igneous features are well represented in the existing conservation network. Continuing to work with willing private landowners will help manage the landscape's rare plants, animals and natural communities. Streams containing rare fish and crayfish are particularly important to conserve on private land. Continued

and expanded use of prescribed fire can restore igneous glade and woodland natural communities. Potential challenges to conservation success include funding and staff shortages and the public's lack of understanding of natural processes, habitats and restoration methods.

To learn more about the St. Francois Knobs Conservation Opportunity Area, please contact:



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St. Francois Knobs

Conservation Opportunity Area



Ozark Highlands



The St. Francois Mountains in southeast Missouri are among the oldest mountains in the world.

Jim Rathert, Missouri Department of Conservation

The St. Francois Mountains formed 1.5 billion years ago at a time when molten lava still flowed over much of the Earth's surface. Huge pockets of magma welled up in dome shapes and then slowly cooled, forming igneous rock. Over time, these domes sank beneath oceans and were capped with hundreds of feet of sedimentary rock. Later, geologic forces raised the land again. Erosion wore away overlying layers of dolomite and sandstone, and the rounded igneous domes, or knobs, became the characteristic mountains of the Ozarks.

The St. Francois Knobs Conservation Opportunity Area (COA) is the primary igneous rock landscape in Missouri. This landscape of forests, woodlands, glades, caves, fens and creeks is also the place to see the tallest

waterfall in the state. Missouri's highest mountain, Taum Sauk Mountain, reaches 1,772 feet in elevation. The headwaters of three Ozark rivers (St. Francis River, Black River and Big River) begin in this high elevation region.

Igneous glades persist on the rockiest and most exposed sites. These glades support an unexpected population of Mead's Milkweed, a federally threatened tallgrass prairie plant. Oak and short-leaf pine woodlands surround the glades. Historically, the patchwork of woodlands and glades in the St. Francois Knobs were created and maintained by periodic natural fires. Today, restoration efforts include using fire to prevent cedars and other trees from taking over open spaces.