Appendix A. Missouri Fish and Wildlife Information System (MOFWIS) Database – Representative Record

Missouri Fish and Wildlife Information System
0400324
WARBLER, CERULEAN

****

***** Taxonomy *****

Phylum CHORDATA
Class AVES
Order PASSERIFORMES
Family PARULIDAE
Genus DENDROICA
Species CERULEA

Taxonomic Authority: (WILSON)

Taxonomy References: 002

***** Status *****

GLOBAL RANK G4
NONGAME
STATE RANK S2S3

status References: 005, 027, 029, 036

***** Habitat Summary *****

Primary Habitat:
Forest - bottomland

Occurs in large deciduous forests with little undergrowth but good herbaceous ground cover. Highest populations often occur in floodplain forests.

References: 009

***** Distribution *****

General Occurrence in State:
Uncommon summer resident in south, rare in north *01*. Has been identified as a "species of management concern" regarding viability of populations in the midwest *29*.

References for distribution: 001, 009, 013, 014, 015, 016, 017, 018, 019, 020, 022, 024, 029, 035, 040, 041, 021

*** County Occurrence ***

Known	Likely	Unknown	Not Likely
ADAIR	ATCHISON		
ANDREW	AUDRAIN		
BARRY	BARTON		
BATES	BUCHANAN		
BENTON	CALDWELL		
BOLLINGER	CALLAWAY		
BOONE	CARROLL		
BUTLER	CASS		
CAMDEN	CEDAR		
CAPE GIRARDEAU	CHARITON		
CARTER	CLARK		
CHRISTIAN	CLAY		
CRAWFORD	CLINTON		
DENT	COLE		
DOUGLAS	COOPER		
FRANKLIN	DADE		
GRUNDY	DALLAS		
IRON	DAVIESS		
JACKSON	DEKALB		
JASPER	DUNKLIN		
JEFFERSON	GASCONADE		
JOHNSON	GENTRY		
LEWIS	GREENE		
LINCOLN	HARRISON		
MADISON	HENRY		
MARIES	HICKORY		
MERCER	HOLT		
MISSISSIPPI	HOWARD		
MONTGOMERY	HOWELL		
MORGAN	KNOX		
NEWTON	LACLEDE		
OREGON	LAFAYETTE		
OZARK	LAWRENCE		
PHELPS	LINN		
PULASKI	LIVINGSTON		
RAY	MACON		
REYNOLDS	MARION		
RIPLEY	MCDONALD		
SCOTT	MILLER		
SHANNON	MONITEAU		
ST. CHARLES	MONROE		
ST. CLAIR	NEW MADRID		

ST. FRANCOIS	NODAWAY
ST. LOUIS	OSAGE
STE. GENEVIEVE	PEMISCOT
STODDARD	PERRY
TANEY	PETTIS
TEXAS	PIKE
VERNON	PLATTE
WARREN	POLK
WASHINGTON	PUTNAM
WAYNE	RALLS
	RANDOLPH
	SALINE
	SCHUYLER
	SCOTLAND
	SHELBY
	STONE
	SULLIVAN
	WEBSTER
	WORTH

Historical Extirpated

*** Distribution by Watersheds ***

North Fabius R. and Middle Fabius R.
South Fabius R.
Miss. R. from Des Moines R. to MO. R.; and North R.
North Fork from Headwaters to South Fork
Cuivre R.
Dardenne Creek
Miss. R. from St. Louis to River Aux Vases
Meramec R.
Bourbeuse R.
Big R.
Miss. R. from River Aux Vases to Ohio R.
Castor R. and Castor R. Diversion Channel
St. John's Ditch and Blue Ditch
St. Francis R. from Headwaters to Wappapello Dam
St. Francis R. from Wappapello Dam to Arkansas Border
Little R.
Area Bordered by Black R. and St. Francis R. South of Quintan, MO
Nodaway R.
Mo.R. from Nodaway to Kansas City
Platte R.
One Hundred and Two R.
Thompson R.
Grand R. from Shoal Creek to MO. R.
Chariton R. from Headwaters to Shuteye Creek
Chariton R. from Shuteye Creek to Mo. R.
Little Chariton R.
Marais Des Cygnes from Headwaters to Little Osage R.
Little Osage R.

Marmaton R.
Osage R. from Headwaters to Warsaw, MO.
Sac R.
Pomme De Terre R.
South Grand R.
Osage R. from Warsaw to Bagnell Dam
Niangua R.
Osage R. from Bagnell Dam to Mo. R.
Gasconade R. from Headwaters to Big Piney R.
Big Piney R.
Gasconade R. from Big Piney R. to Mo. R.
Mo. R. from Kansas City to Little Chariton R.
Mo. R. from Little Chariton R. to Gasconade R.
Lamine R.
Blackwater R.
Mo. R. from Gasconade R. to Miss. R.
White R. above Tablerock Dam
James R.
White R. below Tablerock Dam and Little North Fork White R.
North Fork White R.
Black R.
Current R.
Fourche Creek
Warm Fork Spring R. and South Fork
Eleven Point R.
Lost Creek
Spring R.
Indian Creek

Comments:
LIKELY TO OCCUR IN UNITS LISTED, BASED ON COUNTY OCCURRENCE.

*** Distribution by Ecoregions ***

Central Till Plains
Mississippi River Alluvial Plains
Osage Plains
Ozark Highlands

*** Distribution by Potential Natural Vegetation ***

Bluestem Prairie/Oak Hickory Forest
Cedar Glades
Oak-Hickory Forest
Oak-Hickory-Pine Forest
Southern Floodplain Forest
ALL

*** Distribution by Natural Divisions of Missouri ***

Glaciated Plains: Western
Glaciated Plains: Grand River
Glaciated Plains: Eastern
Glaciated Plains: Lincoln Hills
Big Rivers
Big Rivers: Upper Missouri
Big Rivers: Lower Missouri

Big Rivers: Upper Mississippi
Big Rivers: Lower Mississippi
Ozark Border
Ozark Border: Missouri River
Ozark Border: Mississippi River
Ozark
Ozark: Springfield Plateau
Ozark: Upper Ozark
Ozark: St. Francois Mountains
Ozark: Elk River
Ozark: White River
Ozark: Lower Ozark
Mississippi Lowlands
Mississippi Lowlands: Crowley's Ridge
Mississippi Lowlands: Lowlands
Osage Plains

***** Habitat Associations *****

Species is associated with Terrestrial habitats

National Wetlands Inventory Association:
Palustrine
Riverine

* Aquatic Associations:
Riverine, lower perennial
Riverine, upper perennial
Palustrine, Forested, broad-leaved deciduous

References for Aquatic Associations:
009

Vegetative Components:
Oak-Hickory Old Growth
Wooded Riparian and Bottomland Hardwood
Swamp
Permanent Stream

Reference for Vegetative Components:
004

Terrestrial Natural Communities:
Upland Limestone/Dolomite Forest
Forest
Dry Forest
Dry-Mesic Forest
Mesic Forest
Dry Limestone/Dolomite Forest
Dry-Mesic Limestone/Dolomite Forest
Mesic Limestone/Dolomite Forest
Dry Chert Forest

Dry-Mesic Chert Forest
Dry Sandstone Forest
Dry-Mesic Sandstone Forest
Mesic Sandstone Forest
Dry Sand Forest
Dry-Mesic Sand Forest
Mesic Sand Forest
Dry Igneous Forest
Dry-Mesic Igneous Forest
Mesic Igneous Forest
Dry-Mesic Bottomland Forest
Mesic Bottomland Forest
Wet-Mesic Bottomland Forest
Flatwoods
Wetland
Swamp
Pond Swamp
Bottomland Forest
Upland forest
Swamps
Upland Chert Forest
Upland Sandstone Forest
Upland Sand Forest
Upland Igneous Forest

References for Terrestrial Natural Communities:
009, 004

***** Food Habits *****

TROPHIC LEVEL - Carnivore

LARVAL FOOD HABITS

References for larval food habits:

JUVENILE FOOD HABITS

References for juvenile food habits:

ADULT FOOD HABITS
Plants
Insects Insects
Orthoptera (grasshoppers, crickets, mantids)
Coleoptera (beetles)
Lepidoptera (butterflies);Larva stage
Hymenoptera (sawflies, ants, wasps, bees)
Terrestrial Insects

References for adult food habits: 006, 011

***** Niche Requirements *****

BREEDING ADULT NICHE REQUIREMENTS
Floodplain specified in comments
Inland wetlands: swamp
Inland wetlands: permanent stream
General habitat association specified in comments
Natural features: bottomland
Natural features: ridges
Natural features specified in comments
Natural features: ravines
Slope specified in comments
Edge: woodland/water edge
Size of forest stand positively correlated with species' occurrence
Habitat size dependent on size of continuous forested stand
Size of continuous forest stand specified in comments
Successional stage: climax forest
Successional stage specified in comments
Canopy closure (%) of conifers negatively correlated with species' occurrence
Canopy height specified in comments
Subcanopy closure specified in comments
Foliage density >2 M above ground specified in comments
Shrubs: gooseberry
Herbaceous cover (%) positively correlated with species' occurrence
Basal area positively correlated with species' occurrence
Other niche requirements specified in comments

References for breeding adult niche requirements:008, 011, 025, 026, 030, 031, 032, 034, 037

FEEDING ADULT NICHE REQUIREMENTS
Inland wetlands: swamp
Inland wetlands: permanent stream
General habitat association specified in comments
Natural features: bottomland
Natural features: hills
Edge: woodland/water edge
Successional stage: climax forest
Forest openings specified in comments
Canopy closure (%) of preferred trees specified in comments

References for feeding adult niche requirements:006, 008, 010, 011, 012, 039

RESTING ADULT NICHE REQUIREMENTS
General habitat association specified in comments

References for resting adult niche requirements:006, 008, 010, 011, 012

NICHE REQUIREMENT SUMMARY
Inland wetlands: swamp
Inland wetlands: permanent stream
General habitat association specified in comments
Natural features: bottomland
Natural features: hills
Natural features: ridges
Natural features specified in comments
Natural features: ravines
Slope specified in comments

Edge: woodland/water edge
Size of forest stand positively correlated with species' occurrence
Habitat size dependent on size of continuous forested stand
Size of continuous forest stand specified in comments
Successional stage: climax forest
Successional stage specified in comments
Forest openings specified in comments
Floodplain specified in comments
Canopy closure (%) of preferred trees specified in comments
Canopy closure (%) of conifers negatively correlated with species' occurrence
Canopy height specified in comments
Subcanopy closure specified in comments
Foliage density >2 M above ground specified in comments
Shrubs: gooseberry
Herbaceous cover (%) positively correlated with species' occurrence
Basal area positively correlated with species' occurrence
Other niche requirements specified in comments

Comments for all niche requirement fields:

00220: HIGH POPULATIONS OCCUR IN FLOODPLAIN FORESTS *30*. NEST IN FLOODPLAIN FORESTS IN IA *31,32*. IN IL NEST ON NATURAL LEVEES ALONG THE CACHE RIVER *34*.

00270: PREFERS OPEN STANDS OF TALL TREES ALONG RIVERBANKS OR DENSE DECIDUOUS FORESTS WITH LITTLE UNDERGROWTH *11,12*. ASSOCIATED MOST OFTEN WITH MATURE HARDWOOD-DOMINATED FORESTS, OPENINGS ADJACENT TO THE LARGEST TREES IN A STAND, MATURE FOREST ADJACENT TO ROADWAYS, AND AREAS RECENTLY SUBJECTED TO SHELTERWOOD CUTS OR SEVERE STORM DAMAGE *042*. GENERALLY OCCUPIES UPPER CANOPY *11*. IN IL OCCURRED IN DRY-MESIC WHITE OAK WITH DENSE UNDERSTORY. APPEARED TO PREFER TALL STANDS DOMINATED BY WHITE PINE ALONG TOPS OR EDGES OF STEEP SLOPES *30*. IN ONTARIO, TERRITORIES WERE CHARACTERIZED BY WELL-SPACED LARGE TREES AND HIGH CANOPIES *37*.

00280: IN IL OCCUR IN RAVINES WITH MATURE FOREST *30*.

00330: IN IL OCCURRED IN PLOTS WITH STEEP SLOPES *30*.

00360: IN EAST COAST STUDY, MINIMUM FOREST SIZE WHERE FOUND 138 HA. MINIMUM SUGGESTED FOREST SIZE FOR BREEDING POPULATION WAS 700 HA, FOREST SIZE WHERE PROBABILITY OF OCCURRENCE WAS AT MAXIMUM WAS >3000 HA. *25*. AVERAGE SIZE OF FOREST WHERE POPULATIONS WERE FOUND 1086 HA, MINIMUM SIZE 50 HA *26*.

00370: TALL, OLD TREES ARE IMPORTANT *34*.

00377: USE FOREST GAPS DURING SPRING AND/OR FALL MIGRATION *38*.

00570: IN IL BOTTOMLAND HARDWOODS SHOWED STRONG PREFERENCE FOR FORAGING ON KINGNUT HICKORY, AND AVOIDED RED MAPLE *39*.

00575: PREFER SITES WITH HIGH CANOPIES *37*.

00600: IN IL OCCURRED IN FOREST WITH VERY DENSE SHRUB/SAPLING LAYER OF SUGAR MAPLE, GOOSEBERRY AND BUCKTHORN *30*.

00603: IN ONTARIO, TERRITORIES WERE CHARACTERIZED BY DENSE FOLIAGE FROM 12-18 M; NEST HABITAT HAD DENSE FOLIAGE ABOVE 18 M, ALSO *37*.

99999: IN IL APPEARED TO PREFER NESTING IN BOXELDERS. MAY REQUIRE SOME RIVER-GENERATED DISTURBANCE *34*. IN ONTARIO, 56% OF NESTS WERE IN MAPLES, 17% IN ELMS AND 13% IN BITTERNUT HICKORY *37*.

***** Life History Information *****

Origin in state: native
Seasonal distribution in state: spring/summer/fall
Seasonal distribution in state: neotropical migrants
Foraging strategy: gleaning
Foraging strategy: hawking
Foraging strategy: flycatching
Foraging sites: air
Foraging sites: branches of tree
Foraging sites: leaves of tree
Foraging sites: trunk of tree
Display site: perch
Nest/den site: trees
Nest height specified in comments
Nest materials: grasses
Nest materials: vegetative down
Nest materials: bark
Nest materials: hair or feathers
Nest materials: moss
Clutch/litter size specified in comments
Development of young at birth/hatching: altricial
Parental care of young: female
Breeding season specified in comments
Display site specified in comments
Nest/den site specified in comments
Nest materials specified in comments
Nest dimensions specified in comments
Migration patterns specified in comments

Comments on life history:

007: CLUTCHES ARE COMPLETED FROM EARLY MAY TO LATE JUNE *07*.

010: IN IA FLOODPLAIN FOREST STUDY, PERCHED IN TALLEST TREE AVAILABLE IN FOREST PATCH *32*

011: NESTS ON A HORIZONTAL BRANCH OVER AN OPEN AREA *06,12,10,07*

014: NEST HEIGHT IS 18-60' *07,12*.

015: ALSO USES SPIDER SILK IN NEST BUILDING *10,12*.

016: NEST DIMENSIONS ARE OUTSIDE DIAMETER 2 IN", HEIGHT 1 -2", INSIDE DIAMETER 1", DEPTH 1" *12*.

018: CLUTCH SIZE IS 3-5 EGGS *06,12,10*.

033: IN KY, SPECIES ARRIVES IN MID-APRIL. IN THE FALL, MOST ARE GONE BY EARLY SEPTEMBER *07*

References for life history:
001, 006, 007, 009, 010, 011, 012, 030, 032

***** Management *****

Beneficial Management Practices:
Forest - maintain wilderness environment
Forest - maintain riparian habitats
Forest - develop/maintain edge (ecotones)
Forest - maintain streambanks
Forest - maintain streamside vegetation

Forest - reforestation
Forest - maintain old growth forests
Water - develop/maintain wetlands
Water - develop/maintain streamside vegetation
Water - stabilize streambanks

Beneficial Management References: 009, 023, 034

Adverse Management Practices:
Forest - application of herbicides
Forest - application of pesticides
Forest - application of insecticides
Water - application of herbicides
Water - application of pesticides
Water - application of insecticides
Water - stream channelization

Adverse Management References: 009

Comments on Management:
IN PA STUDY, WERE NOT SEEN ON SITES WITH DEER DENSITY OF 7.9 DEER/SQ. KM *28*. IN IL, WERE MORE ABUNDANT IN UNLOGGED FORESTS. BENEFICIAL TO MAINTAIN UNLOGGED CORE WITHIN LARGE FOREST TRACTS AND WHITE-OAK DOMINATED RIDGETOPS AND STEEP SLOPES *30*. IN IA FLOODPLAIN STUDY, ABUNDANCE INCREASED ON FLOODED PLOTS *32*. IN SOUTHEASTERN U.S., DESIRABLE CONDITIONS IN MATURE OAK/GUM/CYPRESS STANDS INCLUDE TALL TREES, MODERATELY CLOSED CANOPY AND LITTLE UNDERSTORY, IN LARGE BLOCKS OF CONTIGUOUS HABITAT (> 4000 HA) *33*. PLANTING WHITE OAK IN UPLANDS AND SYCAMORE, PECAN AND SWAMP OAK ALONG NATURAL LEVEES IS BENEFICIAL. MAY REQUIRE SOME RIVER-GENERATED DISTURBANCE *34*.

References for Management Comments: 028, 030, 032, 033, 034

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Appendix B. Missouri Natural Heritage Database (Representative Element Occurrence Records)

Element Occurrence Record

HERITAGE BIOLOGIST and LAB USE ONLY

Eoid: 16298 ***Elcode:*** ABPBX03240 ***Eonum:*** 18 ***Track:*** Y

Srank S2S3 ***Grank:*** G4 ***State Status:*** ***Federal Status:***

ELEMENT IDENTIFICATION and LOCATION

Scientific (or Community) Name: Dendroica cerulea

Common Name: Cerulean Warbler

Survey Site Name: St. Francis River - Wappapello Lake

Directions to the survey site: St. Francis River - Wappapello Lake. E side of island immediately (0.8 mi) upstream of Holiday Landing.

County: Wayne ***Quadname:*** Greenville SW ***UTM-Northing (Y):*** 4103284.335 ***Latitude:*** 370252N

Township/Range T0N R0 ***Section:*** 0 ***UTM-Easting (X):*** 729284.7098 ***Longitude:*** 0902518W

SURVEY INFORMATION

Survey Date: 2002-07-10 ***Location Use Class:***

Last Observed: 2002-07-10

First Observed: 2002-07-10

TOPOGRAPHIC MAP

This update requires additional mapping (circle one): Y N If Yes, please attach new map.

Locational Uncertainty Areal - Estimated ***Locational Uncertainty Distance (in meters):*** 80

ELEMENT OCCURRENCE DATA

Eodata (include associated species for natural community EOs):

2002-07-10:Troughton, T, & Thurston, - 1 warbler heard in 3.5 hrs (am).

Condition (quality of biotic and abiotic factors/processes within the EO):

Observer acres: 0 ***GIS acres:*** 5 ***Geology (substrate):***

General Description: 2002-07-10:Habitat of low suitability for warbler. Trees less mature and much disturbance from river traffic.

Landscape Context (quality of biotic and abiotic factors/processes surrounding the EO):

CONSERVATION INFORMATION

Name of Managed Area(s):

Owner:

Management Comments:

Protection Comments:

Monitoring and Research Comments:

General Comments (include associated species for plant and animal EOs):

2002-07-10:Points grouped following EOSpecs 4/18/01 for Woodland Passerines. All points within 2 km of another point are considered the same EO. Beyond 2 km, observation points represent a separate EO.

Element Occurrence Record

Form completed by: Sternburg, Janet ***Date:*** 2002-12-07

TO BE COMPLETED BY HERITAGE BIOLOGIST

Eorank: E ***Origin*** ***Eorank Date:***

Eorank comments: Extant - Probable breeding, within safedates.

Community Significance: ***Gelcode:*** ***Gelcode Confidence Level:***

Reference:

Element Occurrence Record

HERITAGE BIOLOGIST and LAB USE ONLY

Eoid: 13896 ***Elcode:*** CTFMB11720 ***Eonum:*** 36 ***Track:*** Y

Srank S2 ***Grank:*** GNR ***State Status:*** ***Federal Status:***

ELEMENT IDENTIFICATION and LOCATION

Scientific (or Community) Name: Mesic bottomland forest

Common Name:

Survey Site Name: THREE CREEKS CA

Directions to the survey site: THREE CREEKS CA. CA IS APPROX 5 MI NNW OF ASHLAND. SITE IS INSIDE SE BOUNDARY OF CA, ABOUT 0.75 AIR MI W OF LOG PROVIDENCE CHURCH.

County: Boone ***Quadname:*** Ashland ***UTM-Northing (Y):*** 4298455.162 ***Latitude:*** 384958N

Township/Range: T47N R12W ***Section:*** 28 ***UTM-Easting (X):*** 562111.5307 ***Longitude:*** 0921704W

SURVEY INFORMATION

Survey Date: 2001-09-00 ***Location Use Class:***

Last Observed: 2001-09-00

First Observed: 1999-00-00

TOPOGRAPHIC MAP

This update requires additional mapping (circle one): Y N If Yes, please attach new map.

Locational Uncertainty Type: Areal - Delimited ***Locational Uncertainty Distance (in meters):*** 0

ELEMENT OCCURRENCE DATA

Eodata (include associated species for natural community EOs):

2001-09:LEAHY - JUGLAN, NIGRA-ACER, SACCHARUM-PLATANUS, OCCIDENTALIS/ASIMINA TRILOGA.

Condition (quality of biotic and abiotic factors/processes within the EOs):

Observer acres: 13.1 ***GIS acres:*** 13 ***Geology (substrate):***

General Description: 2001:SMALL TERRACE ALONG BASS CREEK.

Landscape Context (quality of biotic and abiotic factors/processes surrounding the EO):

CONSERVATION INFORMATION

Name of Managed Area(s):

Owner: MDC

Management Comments:

Protection Comments:

Monitoring and Research Comments:

General Comments (include associated species for plant and animal EOs):

2002:KRAMER DETERMINED COMM TYPE WITH THE DRAFT TERRESTRIAL NATURAL COMMUNITY CLASSIFICATION REVISION.

Element Occurrence Record

Form completed by: ***Date:***

TO BE COMPLETED BY HERITAGE BIOLOGIST

Eorank: B ***Origin Subrank:*** ***Eorank Date:***

Eorank Comments: MODERATE DIVERSITY. MATURE GROWTH.

Community Significance: N ***Gelcode:*** ***Gelcode Confidence Level:***

Reference: LEAHY, MIKE. 2001. NATURAL HISTORY REGIONAL BIOLOGIST, CENTRAL REGION. MDC - NATURAL HISTORY DIVISION.

Appendix C. Wildlife Lists by Ecological Section and Primary Habitat Type

Wildlife of the Central Dissected Till Plains

Forest

Ringed Salamander • Small-mouthed Salamander • Spotted Salamander • Four-toed Salamander • Gray Treefrog • Pickerel Frog • Wood Frog

Osage Copperhead • Western Worm Snake • Ground Skink • Northern Red-bellied Snake

Cooper's Hawk • Sharp-shinned Hawk • Red-shouldered Hawk • Broad-winged Hawk • Mississippi Kite • American Woodcock • Barred Owl • Ruby-throated Hummingbird • Pileated Woodpecker • Hairy Woodpecker • Olive-sided Flycatcher • Acadian Flycatcher • Yellow-bellied Flycatcher • Fish Crow • Black-capped Chickadee • Tufted Titmouse • Red-breasted Nuthatch • White-breasted Nuthatch • Brown Creeper • Carolina Wren • Winter Wren • Ruby-crowned Kinglet • Golden-crowned Kinglet • Swainson's Thrush • Wood Thrush • Veery • Gray-cheeked Thrush • Yellow-billed Cuckoo • Black-billed Cuckoo • Scarlet Tanager • Blue-headed Vireo • Yellow-throated Vireo • Red-eyed Vireo • Philadelphia Vireo • Ovenbird • Louisiana Waterthrush • Northern Waterthrush • American Redstart • Tennessee Warbler • Bay-breasted Warbler • Cerulean Warbler • Yellow-throated Warbler • Blackpoll Warbler • Blackburnian Warbler • Magnolia Warbler • Black-throated Green Warbler • Kentucky Warbler • Nashville Warbler • Mourning Warbler • Northern Parula • Prothonotary Warbler • Black-and-white Warbler • Worm-eating Warbler • Purple Finch

Northern Short-tailed Shrew • **Masked Shrew** • Elliot's Short-tailed Shrew • Southern Flying Squirrel • Gray Squirrel • Gray Fox • Evening Bat

Woodland

Central Newt

Timber Rattlesnake • Smooth Earth Snake • Common Five-lined Skink • Three-toed Box Turtle

Ruffed Grouse • Wild Turkey • Eastern Screech Owl • Chuck-will's Widow • Whip-poor-will • Red-bellied Woodpecker • Downy Woodpecker • Northern Flicker • Red-headed Woodpecker • Yellow-bellied Sapsucker • Eastern Phoebe • Great Crested Flycatcher • Eastern Wood-pewee • Least Flycatcher • Blue-gray Gnatcatcher • Cedar Waxwing • Warbling Vireo • Summer Tanager • Canada Warbler • Wilson's Warbler • Orange-crowned Warbler • Rose-breasted Grosbeak • Chipping Sparrow • Fox Sparrow • Dark-eyed Junco • Baltimore Oriole • Orchard Oriole

Hoary Bat • Silver-haired Bat • Northern Long-eared Bat • Fox Squirrel

Savanna

Eastern Tiger Salamander

• Broad-headed Skink • Eastern Hog-nosed Snake • Rough Green Snake

American Kestrel • Northern Bobwhite • Eastern Kingbird • House Wren • Bewick's Wren • Hermit Thrush • Eastern Bluebird • Brown Thrasher • White-eyed Vireo • Golden-winged Warbler • Blue-winged Warbler • Yellow-breasted Chat • Prairie Warbler • Chestnut-sided Warbler • American Tree Sparrow • White-throated Sparrow • White-crowned Sparrow • Field Sparrow • Harris's Sparrow • Lincoln's Sparrow • Song Sparrow • Eastern Towhee • Blue Grosbeak

Least Shrew • Woodland Vole • Indiana Bat

Bold = Occurs only in this Ecological Section in Missouri
Underline = Assessment Target
*= Missouri Endemic
Δ= Ozark endemic

Prairie

Grassland Crayfish

Prairie Mound Ant • Sand Grasshopper • Regal Fritillary • An Ant (*Formica fossaceps*)

Great Plains Toad • Great Plains Narrow-mouthed Toad • Plains Spadefoot • Western Chorus Frog • Northern Crawfish Frog • Plains Leopard Frog

Bullsnake • Prairie Racerunner • **Western Fox Snake** • Red Milk Snake • **Western Plains Garter Snake** • **Plains Hog-nosed Snake** • Eastern Plains Garter Snake • Lined Snake • **Northern Prairie Skink** • Great Plains Skink • Western Slender Glass Lizard • Ornate Box Turtle • **Illinois Mud Turtle**

Northern Harrier • Rough-legged Hawk • Greater Prairie Chicken • Upland Sandpiper • Short-eared Owl • Barn Owl • Western Kingbird • Horned Lark • Sprague's Pipit • Loggerhead Shrike • Bell's Vireo • Henslow's Sparrow • Nelson's Sharp-tailed Sparrow • Grasshopper Sparrow • LeConte's Sparrow • Savannah Sparrow • Vesper Sparrow • Lark Sparrow • Clay-colored Sparrow • Lapland Longspur • Smith's Longspur • Dickcissel • Eastern Meadowlark • Western Meadowlark • Bobolink

Plains Pocket Gopher • Prairie Vole • **Meadow Vole** • **Plains Pocket Mouse** • Meadow Jumping Mouse • Western Harvest Mouse • Hispid Cotton Rat • **Franklin's Ground Squirrel** • Thirteen-lined Ground Squirrel • Badger • **Least Weasel**

Glades and Cliffs

Eastern Collared Lizard

Common Nighthawk

Wetlands

Marsh Pondsnail • Thread-like Naiad

Thread-like Naiad • Slightly-musical Conehead Katydid • Round-tipped Conehead Katydid • Bog Conehead Katydid

Fowler's Toad • Woodhouse's Toad • Green Frog • **Northern Leopard Frog**

Blanding's Turtle • Common Musk Turtle • Diamond-backed Water Snake • Graham's Crayfish Snake • **Eastern Massasauga** • Western Fox Snake

Horned Grebe • Eared Grebe • Pied-billed Grebe • American White Pelican • Double-crested Cormorant • Little Blue Heron • Great Blue Heron • Black-crowned Night Heron • Yellow-crowned Night Heron • Green Heron • Great Egret • Cattle Egret • Snowy Egret • American Bittern • Least Bittern • White-faced Ibis • Northern Pintail • American Wigeon • Ruddy Duck • Northern Shoveler • Green-winged Teal • Blue-winged Teal • Wood Duck • Mallard • American Black Duck • Gadwall • Lesser Scaup • Redhead • Ring-necked Duck • Canvasback • Bufflehead • Common Goldeneye • Snow Goose • Ross's Goose • Greater White-fronted Goose • Trumpeter Swan • Hooded Merganser • Common Merganser • Red-breasted Merganser • Common Moorhen • American Coot • Osprey • Bald Eagle • Peregrine Falcon • Merlin • Sora • King Rail • Virginia Rail • Yellow Rail • **Black Rail** • American Golden Plover • Black-bellied Plover • Piping Plover • Semipalmated Plover • American Avocet • Ruddy Turnstone • Sanderling • Dunlin • Baird's Sandpiper • White-rumped Sandpiper • Stilt Sandpiper • Pectoral Sandpiper • Spotted Sandpiper • Least Sandpiper • Semipalmated Sandpiper • Willet • Lesser Yellowlegs • Greater Yellowlegs • Solitary Sandpiper • Buff-breasted Sandpiper • Wilson's Phalarope • Common Snipe • Short-billed Dowitcher • Long-billed Dowitcher • Marbled Godwit • Hudsonian Godwit • Ring-billed Gull • Franklin's Gull • Least Tern • Caspian Tern • Forster's Tern • Common Tern • Black Tern • Belted Kingfisher • Alder Flycatcher • Willow Flycatcher • Bank Swallow • Northern Rough-winged Swallow • Tree Swallow • Marsh Wren • Sedge Wren • Cliff Swallow • American Pipit • Yellow Warbler • Swamp Sparrow • Yellow-headed Blackbird • Rusty Blackbird

Southeastern Shrew • Southern Bog Lemming

Caves

Cavernicolous Pseudoscorpion

Gray Bat

Rivers and Streams

Devil Crayfish • Golden Crayfish • Northern Crayfish • Papershell Crayfish • Shufeldt's Dwarf Crayfish • Spothanded Crayfish • White River Crayfish

Black Sandshell • Butterfly • Creeper • Deertoe • Ebonyshell • Elktoe • Fatmucket • Fat Pocketbook • Fawnsfoot • Flat Floater • Flutedshell • Fragile Papershell • Giant Floater • Hickorynut • Lilliput • Mapleleaf • Monkeyface • Paper Pondshell • Pimpleback • Pink Heelsplitter • Pink Mucket • Pink Papershell • Pistolgrip • Pondhorn • Pondmussel • Purple Wartyback • Rock Pocketbook • Round Pigtoe • Sheepnose • Spectaclecase • Spike • Threehorn Wartyback • Threeridge • Wabash Pigtoe • Wartyback • Washboard • White Heelsplitter • Yellow Sandshell

Elusive Clubtail • Giant Stonefly

American Eel • Bigeye Shiner • Bigmouth Buffalo • Bigmouth Shiner • Black Buffalo • Black Crappie • Black Redhorse • Blacknose Shiner • Blackside Darter • Blackstripe Topminnow • Blue Catfish • Blue Sucker • Bluntnose Darter • Bluntnose Minnow • Bowfin • Brassy Minnow • Brook Silverside • Bullhead Minnow • Central Mudminnow • Central Stoneroller • Common Shiner • Emerald Shiner • Fantail Darter • Fathead Minnow • Flathead Catfish • Flathead Chub • Freckled Madtom • Freshwater Drum • Ghost Shiner • Golden Redhorse • Goldeye • Gravel Chub • Highfin Carpsucker • Johnny Darter • Logperch • Longnose Gar • Mooneye • Northern Pike • Orangespotted Sunfish • Orangethroat Darter • Paddlefish • Pallid Sturgeon • Pirate Perch • Plains Killifish • Plains Minnow • Quillback • Red Shiner • Redfin Shiner • River Carpsucker • River Darter • River Shiner • Sauger • Shorthead Redhorse • Shortnose Gar • Shovelnose Sturgeon • Sicklefin Chub • Silver Chub • Silver Lamprey • Silver Redhorse • Silverband Shiner • Silvery Minnow • Skipjack Herring • Slender Madtom • Slenderhead Darter • Slough Darter • Smallmouth Bass • Smallmouth Buffalo • Speckled Chub • Spotfin Shiner • Spottail Shiner • Spotted Sucker • Stonecat • Sturgeon Chub • Suckermouth Minnow • Tadpole Madtom • Threadfin Shad • Topeka Shiner • Trout-perch • Walleye • Western Golden Shiner • Western Sand Darter • White Bass • White Crappie • White Sucker • Yellow Bass

Common Mudpuppy

Common Map Turtle • False Map Turtle • Midland Smooth Softshell • Mississippi Map Turtle

Occurs only in Cuivre River in this ecoregion:

Banded Sculpin • Largescale Stoneroller • Mimic Shiner • Northern Hog Sucker • Northern Studfish • Southern Redbelly Dace • Steelcolor Shiner • Striped Shiner

Wildlife of the Osage Plains

Forest

Small-mouthed Salamander • Osage Copperhead • Western Worm Snake • Timber Rattlesnake • Ground Skink

Red-shouldered Hawk • Broad-winged Hawk • Cooper's Hawk • Sharp-shinned Hawk • American Woodcock • Barred Owl • Ruby-throated Hummingbird • Pileated Woodpecker • Hairy Woodpecker • Acadian Flycatcher • Yellow-bellied Flycatcher • Carolina Chickadee • Black-capped Chickadee • House Wren • Tufted Titmouse • White-breasted Nuthatch • Carolina Wren • Winter Wren • Ruby-crowned Kinglet • Golden-crowned Kinglet • Veery • Gray-cheeked Thrush • Wood Thrush • Swainson's Thrush • Yellow-billed Cuckoo • Black-billed Cuckoo • Yellow-throated Vireo • Red-eyed Vireo • Blue-headed Vireo • Scarlet Tanager • Bay-breasted Warbler • Cerulean Warbler • Yellow-throated Warbler • Blackpoll Warbler • Blackburnian Warbler • Black-throated Green Warbler • Prothonotary Warbler • Black-and-white Warbler • Kentucky Warbler • Nashville Warbler • Mourning Warbler • Northern Parula • Ovenbird • Louisiana Waterthrush • Northern Waterthrush • American Redstart • Tennessee Warbler • Worm-eating Warbler • Purple Finch

Elliot's Short-tailed Shrew • Southern Flying Squirrel • Silver-haired Bat • Eastern Woodrat • Evening Bat • Gray Squirrel • Gray Fox • Black Bear

Woodland

• Southern Coal Skink • Common Five-lined Skink • Northern Fence Lizard • Great Plains Rat Snake • Western Earth Snake • Rough Earth Snake • Three-toed Box Turtle

Wild Turkey • Eastern Screech Owl • Chuck-will's-widow • Whip-poor-will • Northern Flicker • Red-headed Woodpecker • Downy Woodpecker • Red-bellied Woodpecker • Yellow-bellied Sapsucker • Great Crested Flycatcher • Eastern Phoebe • Least Flycatcher • Eastern Wood-pewee • Blue-gray Gnatcatcher • Hermit Thrush • Cedar Waxwing • Warbling Vireo • Summer Tanager • Canada Warbler • Wilson's Warbler • Orange-crowned Warbler • Rose-breasted Grosbeak • Chipping Sparrow • Dark-eyed Junco • Fox Sparrow • Baltimore Oriole • Orchard Oriole

Hoary Bat • Fox Squirrel

Savanna

Eastern Tiger Salamander

• Eastern Hog-nosed Snake • Rough Green Snake

American Kestrel • Northern Bobwhite • Eastern Kingbird • Bewick's Wren • Eastern Bluebird • Brown Thrasher • Gray Catbird • White-eyed Vireo • Prairie Warbler • Chestnut-sided Warbler • Golden-winged Warbler • Blue-winged Warbler • Yellow-breasted Chat • Blue Grosbeak • Eastern Towhee • American Tree Sparrow • White-throated Sparrow • White-crowned Sparrow • Field Sparrow • Harris's Sparrow • Lincoln's Sparrow • Song Sparrow

Least Shrew • Woodland Vole

Prairie

Grassland Crayfish

An Andrenid Bee (*Andrena beameri*) • Prairie Mole Cricket • Regal Fritillary • Prairie Meadow Katydid • A Leaf Beetle (*Phyllobrotica physostegiae*) • A Leaf Beetle (*Phyllobrotica lengi*)

Great Plains Narrow-mouthed Toad • Western Chorus Frog • Northern Crawfish Frog • Plains Leopard Frog • Prairie Racerunner • Great Plains Skink • **Southern Prairie Skink** • Western Slender Glass Lizard • Texas Horned Lizard • Bullsnake • Ornate Box Turtle • Lined Snake • Red Milk Snake

Upland Sandpiper • Rough-legged Hawk • Swainson's Hawk • Northern Harrier • Greater Prairie Chicken • Short-eared Owl • Barn Owl • Scissor-tailed Flycatcher • Horned Lark • Sprague's Pipit • Loggerhead Shrike • Bell's Vireo • Dickcissel • Henslow's Sparrow • Nelson's Sharp-tailed Sparrow • Grasshopper Sparrow • LeConte's Sparrow • Lark Sparrow • Savannah Sparrow • Vesper Sparrow • Clay-colored Sparrow • Lapland Longspur • Smith's Longspur • Eastern Meadowlark • Western Meadowlark • Bobolink

Plains Pocket Gopher • Black-tailed Jackrabbit • Prairie Vole • Western Harvest Mouse • Hispid Cotton Rat • Thirteen-lined Ground Squirrel • Badger • Meadow Jumping Mouse

Glades and Cliffs

Eastern Coachwhip • Flat-headed Snake

Common Nighthawk

Wetland

Diamond-backed Water Snake • Graham's Crayfish Snake • Common Musk Turtle

Horned Grebe • Eared Grebe • Pied-billed Grebe • American White Pelican • Double-crested Cormorant • Snowy Egret • Cattle Egret • Great Egret • Great Blue Heron • Green Heron • Little Blue Heron • Yellow-crowned Night Heron • Black-crowned Night Heron • American Bittern • White-faced Ibis • American Coot • Northern Pintail • American Wigeon • Northern Shoveler • Green-winged Teal • Blue-winged Teal • Wood Duck • Mallard • Gadwall • Ruddy Duck • Lesser Scaup • Redhead • Ring-necked Duck • Canvasback • Bufflehead • Common Goldeneye • Snow Goose • Ross's Goose • Greater White-fronted Goose • Common Merganser • Red-breasted Merganser • Hooded Merganser • Osprey • Bald Eagle • Peregrine Falcon • Merlin • Sora • King Rail • Virginia Rail • Semipalmated Plover • American Golden Plover • Marbled Godwit • Hudsonian Godwit • Lesser Yellowlegs • Buff-breasted Sandpiper • Sanderling • Dunlin • Baird's Sandpiper • White-rumped Sandpiper • Stilt Sandpiper • Pectoral Sandpiper • Willet • Spotted Sandpiper • Ruddy Turnstone • Wilson's Phalarope • Common Snipe • Ring-billed Gull • Franklin's Gull • Caspian Tern • Forster's Tern • Black Tern • Belted Kingfisher • Willow Flycatcher • Bank Swallow • Northern Rough-winged Swallow • Cliff Swallow • Tree Swallow • Marsh Wren • Sedge Wren • American Pipit • Yellow Warbler • Rusty Blackbird • Yellow-headed Blackbird • Swamp Sparrow

Southern Bog Lemming

Rivers and Streams

Black Sandshell • Creeper • Deertoe • Ellipse • Fatmucket • Fawnsfoot • Fragile Papershell • Giant Floater • Mapleleaf • Monkeyface • Paper Pondshell • Pimpleback • Pink Heelsplitter • Pink Papershell • Pistolgrip • Pondhorn • Pondmussel • Rock Pocketbook • Round Pigtoe • Spike • Threehorn Wartyback • Threeridge • Wabash Pigtoe • Wartyback • Washboard • White Heelsplitter • Yellow Sandshell

Devil Crayfish • Golden Crayfish • Northern Crayfish • Papershell Crayfish

Banded Sculpin • Bigmouth Buffalo • Black Buffalo • Black Crappie • Blacknose Shiner • Blackstripe Topminnow • Blue Catfish • Brook Silverside • Central Stoneroller • Emerald Shiner • Fathead Minnow • Flathead Catfish • Freckled Madtom • Freshwater Drum • Ghost Shiner • Golden Shiner • Greenside Darter • Highfin Carpsucker • Johnny Darter • Logperch • Longnose Gar • Orangespotted Sunfish • Orangethroat Darter • Paddlefish • Quillback • Red Shiner • Redfin Darter • Redfin Shiner • River Carpsucker • Sand Shiner • Shorthead Redhorse • Silver Slender Madtom • Slenderhead Darter • Slough Darter • Smallmouth Buffalo • Stonecat • Suckermouth Minnow • Tadpole Madtom • Walleye • White Crappie • White Sucker

Common Mudpuppy

Midland Smooth Softshell

Wildlife of the Ozark Highlands

Forest

Northern Metalmark

Ringed Salamander • Spotted Salamander • Marbled Salamander • **Long-tailed Salamander** • **Dark-sided Salamander** • Four-toed Salamander • **Western Slimy Salamander** • **Ozark Zigzag Salamander Δ**• **Southern Red-backed Salamander** • Pickerel Frog • Wood Frog

Osage Copperhead • Western Worm Snake • Northern Red-bellied Snake

Cooper's Hawk • Sharp-shinned Hawk • Mississippi Kite • Red-shouldered Hawk • Broad-winged Hawk • American Woodcock • Barred Owl • Yellow-billed Cuckoo • Fish Crow • Ruby-throated Hummingbird • Pileated Woodpecker • Hairy Woodpecker • Acadian Flycatcher • Olive-sided Flycatcher • Yellow-bellied Flycatcher • Carolina Chickadee • Black-capped Chickadee • Tufted Titmouse • Ruby-crowned Kinglet • Golden-crowned Kinglet • Red-breasted Nuthatch • White-breasted Nuthatch • Brown Creeper • Carolina Wren • Winter Wren • Veery • Swainson's Thrush • Gray-cheeked Thrush • Wood Thrush • Scarlet Tanager • Yellow-throated Vireo • Red-eyed Vireo • Blue-headed Vireo • Philadelphia Vireo • Prothonotary Warbler • Ovenbird • Louisiana Waterthrush • Northern Waterthrush • American Redstart • Bay-breasted Warbler • Cerulean Warbler • Yellow-throated Warbler • Blackburnian Warbler • Magnolia Warbler • Tennessee Warbler • Hooded Warbler • Nashville Warbler • Black-throated Green Warbler • Worm-eating Warbler • Kentucky Warbler • Mourning Warbler • Blackpoll Warbler • Northern Parula • Black-and-white Warbler • Swainson's Warbler • Purple Finch

Elliot's Short-tailed Shrew • Southern Flying Squirrel • Silver-haired Bat • Eastern Wood Rat • Golden Mouse • Gray Squirrel • Swamp Rabbit • Gray Fox

Woodland

Ozark Swallowtail Δ • **Buck Moth**

Central Newt

Three-toed Box Turtle • Great Plains Rat Snake • Southern Copperhead • **Northern Scarlet Snake** • Timber Rattlesnake • Rough Earth Snake • Smooth Earth Snake • Northern Fence Lizard • Ground Skink • Southern Coal Skink • Common Five-lined Skink

Ruffed Grouse • Eastern Screech Owl • Chuck-will's-widow • Whip-poor-will • Red-headed Woodpecker • Northern Flicker • Red-bellied Woodpecker • Yellow-bellied Sapsucker • Downy Woodpecker • Great Crested Flycatcher • Eastern Wood-pewee • Eastern Phoebe • Least Flycatcher • Tree Swallow • House Wren • Hermit Thrush • Cedar Waxwing • Warbling Vireo • Summer Tanager • Blue-gray Gnatcatcher • Orange-crowned Warbler • Canada Warbler • Wilson's Warbler • **Pine Warbler** • Rose-breasted Grosbeak • Baltimore Oriole • Orchard Oriole • Chipping Sparrow • Fox Sparrow • Dark-eyed Junco

Hoary Bat • Fox Squirrel • **Eastern Chipmunk** • Black Bear • Woodland Vole • Plains Spotted Skunk

Savanna

Eastern Tiger Salamander

Broad-headed Skink • Eastern Hog-nosed Snake • Rough Green Snake

Northern Bobwhite • American Kestrel • Eastern Kingbird • White-eyed Vireo • Eastern Bluebird • Brown Thrasher • Gray Catbird • Bewick's Wren • Golden-winged Warbler • Blue-winged Warbler • Prairie Warbler • Chestnut-sided Warbler • Yellow-breasted Chat • American Tree Sparrow • Lincoln's Sparrow • Song Sparrow • Field Sparrow • White-throated Sparrow • White-crowned Sparrow • Harris's Sparrow • Bachman's Sparrow • Eastern Towhee • Blue Grosbeak

Least Shrew • **Fulvous Harvest Mouse**

Prairie

Regal Fritillary • Prairie Mole Cricket

Grassland Crayfish

Great Plains Narrow-mouthed Toad • Western Chorus Frog • Northern Crawfish Frog • Plains Leopard Frog

Great Plains Skink • Western Slender Glass Lizard • Ornate Box Turtle • Eastern Plains Garter Snake • Lined Snake • Bullsnake

Swainson's Hawk • Rough-legged Hawk • Northern Harrier • Greater Prairie-chicken • Upland Sandpiper • Barn Owl • Short-eared Owl • Scissor-tailed Flycatcher • Horned Lark • Sprague's Pipit • Loggerhead Shrike • Bell's Vireo • Henslow's Sparrow • Nelson's Sharp-tailed Sparrow • Grasshopper Sparrow • LeConte's Sparrow • Lapland Longspur • Smith's Longspur • Lark Sparrow • Savannah Sparrow • Vesper Sparrow • Dickcissel • Bobolink • Eastern Meadowlark

Plains Pocket Gopher • Black-tailed Jackrabbit • Prairie Vole • Western Harvest Mouse • Hispid Cotton Rat • Badger • Meadow Jumping Mouse

Glades/Cliffs

Bluff Vertigo • Variable Vertigo

Missouri Tarantula • Black Widow Spider • Striped Scorpion • Giant Redheaded Centipede • Short-horned Grasshopper • Lichen Grasshopper

Eastern Narrow-mouthed Toad

Eastern Collared Lizard • Eastern Coachwhip • **Western Pygmy Rattlesnake** • **Ground Snake** • Flat-headed Snake • Prairie Racerunner • Red Milk Snake

Common Nighthawk • **Greater Roadrunner** • **Painted Bunting**

Attwater's Mouse

Wetlands

Hine's Emerald Dragonfly • **Swamp Metalmark** • **Gray Petaltail** • **Saline Spring Tiger Beetle** • Duke’s Skipper

Vernal Crayfish

Chain Pickerel • Starhead Topminnow

Great Plains Toad • Plains Spadefoot • Fowler's Toad • Woodhouse's Toad • Common Musk Turtle • **Yellow Mud Turtle**

Horned Grebe • Eared Grebe • Pied-billed Grebe • American White Pelican • Double-crested Cormorant • Trumpeter Swan • Least Bittern • American Bittern • Cattle Egret • Snowy Egret • Great Egret • Black-crowned Night Heron • Yellow-crowned Night Heron • Little Blue Heron • Green Heron • White-faced Ibis • Greater White-fronted Goose • Lesser Snow Goose • Ross’s Goose • Wood Duck Northern Pintail • American Wigeon • Northern Shoveler • Green-winged Teal • Blue-winged Teal • Mallard • Gadwall • Yellow Rail • Ruddy Turnstone • Lesser Scaup • Redhead • Ring-necked Duck • Canvasback • Bufflehead • Common Goldeneye • Ruddy Duck • Common Merganser • Red-breasted Merganser • Hooded Merganser • Osprey • Bald Eagle • Peregrine Falcon • Merlin • Wilson’s Phalarope • American Golden Plover • Black-bellied Plover • American Avocet • Lesser Yellowlegs • Greater Yellowlegs • Solitary Sandpiper • Buff-breasted Sandpiper • Spotted Sandpiper • Sanderling • Dunlin • Baird’s Sandpiper • White-rumped Sandpiper • Stilt Sandpiper • Pectoral Sandpiper • Least Sandpiper • Semipalmated Sandpiper • Willet • Piping Plover • Semipalmated Plover • Common Snipe • Short-billed Dowitcher • Long-billed Dowitcher • Marbled Godwit • Hudsonian Godwit • Sora • King Rail • Virginia Rail • American Coot • Common Moorhen • Interior Least Tern • Caspian Tern • Forster's Tern • Common Tern • Black Tern • Ring-billed Gull • Franklin's Gull • Belted Kingfisher • Alder Flycatcher • Willow Flycatcher • Cliff Swallow • Bank Swallow • Northern Rough-winged Swallow • Tree Swallow • American Pipit • Marsh Wren • Sedge Wren • Yellow Warbler • Swamp Sparrow • Rusty Blackbird

Southeastern Shrew • Southern Bog Lemming • Rice Rat

Caves

Pink Planarian • **Enigmatic Cavesnail** • **Proserpine Cavesnail** • **Tumbling Creek Cavesnail*** • **Central Missouri Cave Amphipod*** • **Hubricht's Long-tailed Amphipod** • **Onondaga Cave Amphipod*** • **Ozark Cave Amphipod** • **Two-morphed Cave Isopod** Δ • **Avita Cave Springtail** • **Espana Cave Springtail*** • **Scoterpes Cave Millipede**Δ* • **Zosteractis Cave Millipede***Δ • **A Troglobitic Pseudoscorpion** • **Salem Cave Crayfish*** • **Bristly Cave Crayfish**Δ • **Caney Mountain Cave Crayfish***Δ

Ozark Cavefish Δ • **Southern Cavefish** • **Grotto Sculpin**

Cave Salamander • **Grotto Salamander** Δ

Ozark Big-eared Bat Δ• **Gray Bat** • **Eastern Small-footed Myotis** • Northern Myotis • Indiana Bat

Rivers/Streams

Chert Pebblesnail • **Arkansas Brokenray** Δ• Bankclimber • Black Sandshell • **Bleedingtooth Mussel** Δ• Bleufer • Butterfly • Creeper • **Curtis's Pearlymussel** Δ• **Cylindrical Papershell** • Deertoe • Ebonyshell • **Elephantear** • Elktoe • Ellipse • Fatmucket • Fawnsfoot • Flat Floater • Flutedshell • Fragile Papershell • Giant Floater • Hickorynut • Lilliput • Little Spectaclecase • Mapleleaf • Monkeyface • Mucket • **Neosho Mucket** Δ• **Northern Brokenray** Δ• **Ouachita Kidneyshell** Δ• **Ozark Brokenray** Δ• **Ozark Pigtoe** Δ• Pimpleback • Pink Heelsplitter • Pink Mucket • Pink Papershell • Pistolgrip • Pondhorn • Pondmussel • **Purple Lilliput** • Purple Wartyback • Rabbitsfoot • **Rainbow** • Rock Pocketbook • Round Pigtoe • **Salamander Mussel** • **Scaleshell** • **Sheepnose** • **Slippershell Mussel** • **Snuffbox** • Southern Hickorynut • Spectaclecase • Spike • Texas Lilliput • Threehorn Wartyback • Threeridge • Wabash Pigtoe • Washboard • Western Fanshell • White Heelsplitter • Yellow Sandshell

Freshwater Shrimp • **Belted Crayfish*** • **Big Creek Crayfish*** • **Coldwater Crayfish** Δ • Devil Crayfish • Digger Crayfish • **Freckled Crayfish*** • Golden Crayfish • Gray-speckled Crayfish • **Hubbs's Crayfish** Δ • **Long-pincered Crayfish** Δ • **Mammoth Spring Crayfish** Δ • **Meek's Crayfish** Δ • **Neosho Midget Crayfish** Δ • Northern Crayfish • **Ozark Crayfish** Δ• Papershell Crayfish • **Ringed Crayfish** • **Saddlebacked Crayfish*** • Shield Crayfish • Spothanded Crayfish Δ • **St. Francis River Crayfish*** • White River Crayfish • **Williams's Crayfish** Δ • **Woodland Crayfish***

A Heptageniid Mayfly • Greer Springs Micro-caddisfly • Westfall's Snaketail • **Ozark Stonefly** • **Pygmy Stonefly** • **Ozark Clubtail** • **Artesian Agapetus Caddisfly** • **Net Spinning Caddisfly** • **Ozark Emerald** • **Gilded River Cruiser** • **Longhorn Forestfly** • **Austin Springfly** • **Giant Stonefly** • **Pygmy Snowfly**

Alabama Shad • Alligator Gar • American Brook Lamprey • American Eel • **Arkansas Darter** • **Arkansas Saddled Darter** Δ• **Banded Darter** • Banded Sculpin • **Bigeye Chub** • Bigeye Shiner • Bigmouth Buffalo • Bigmouth Shiner • Black Buffalo • Black Crappie • Black Redhorse • Blacknose Shiner • Blackside Darter • Blackspotted Topminnow • Blackstripe Topminnow • Blacktail Shiner • **Bleeding Shiner** Δ• Blue Catfish • Blue Sucker • **Bluestripe Darter*** • Bluntface Shiner • Bluntnose Darter • Bowfin • Brindled Madtom • Brook Darter Δ• Brook Silverside • Bullhead Minnow • **Cardinal Shiner** • Central Stoneroller • Channel Darter • Channel Shiner • **Checkered Madtom** Δ• Chestnut Lamprey • Common Shiner • Creek Chubsucker • Crystal Darter • **Current Darter** Δ• Cypress Darter • **Dollar Sunfish** • Dusky Darter • **Duskystripe Shiner** Δ• **Eastern Slim Minnow** Δ• Emerald Shiner • Fantail Darter • Fathead Minnow • Flathead Catfish • Flathead Chub • Flier • Freckled Madtom • Freshwater Drum • Ghost Shiner • **Gilt Darter** • Golden Redhorse • Golden Shiner • Goldeye • Grass Pickerel • Gravel Chub • Greenside Darter • Highfin Carpsucker • Hornyhead Chub • Inland Silverside • Johnny Darter • Lake Chubsucker • Largescale Stoneroller • **Least Brook Lamprey** • **Least Darter** • Logperch • Longear Sunfish • **Longnose Darter** Δ• Longnose Gar • Mimic Shiner • Mississippi Silvery Minnow • **Missouri Saddled Darter*** • Mooneye • **Mottled Sculpin** • **Mountain Madtom** • Mud Darter • **Neosho Madtom** Δ• **Niangua Darter*** • **Northern Brook Lamprey** • Northern Hog Sucker • Northern Studfish • Orangespotted Sunfish • Orangethroat Darter • **Ozark Bass** Δ• **Ozark Chub** Δ• **Ozark Madtom** Δ• **Ozark Minnow** • **Ozark Sculpin** Δ• **Ozark Shiner** Δ• Paddlefish • Pallid Sturgeon • Pirate Perch • Plains Killifish • Plains Minnow • **Plains Topminnow** • Pumpkinseed • Quillback • Rainbow Darter • Red Shiner • Redear Sunfish • Redfin Darter • Redfin Shiner • **Redspot Chub** • Redspotted Sunfish • Ribbon Shiner • River Carpsucker • River Darter • River Redhorse • River Shiner • Rock Bass • **Rosyface Shiner** • Saddleback Darter • Sand Shiner • Sauger • Scaly Sand Darter • Shadow Bass • Shorthead Redhorse • Shortnose Gar • Shovelnose Sturgeon • Sicklefin Chub • Silver Chub • Silver Lamprey • Silver Redhorse • Silverband Shiner • **Silverjaw Minnow** • Skipjack Herring • Slender Madtom • Slenderhead Darter • Slough Darter • Smallmouth Bass •

Smallmouth Buffalo • **Southern Brook Lamprey** • Southern Redbelly Dace • Speckled Chub • Speckled Darter • Spotfin Shiner • Spotted Bass • Spotted Gar • Spotted Sucker • **Stargazing Darter** • Starhead Topminnow • Steelcolor Shiner • **Stippled Darter** Δ• Stonecat • Striped Shiner • Sturgeon Chub • Suckermouth Minnow • Tadpole Madtom • **Telescope Shiner** • Threadfin Shad • Topeka Shiner • Trout-perch • Walleye • Warmouth • **Wedgespot Shiner** Δ• Weed Shiner • Western Sand Darter • Western Silvery Minnow • **Western Slim Minnow** • White Bass • White Crappie • White Sucker • **Whitetail Shiner** • Yellow Bass • **Yoke Darter** Δ

Common Mudpuppy • Eastern Hellbender • Gray-bellied Salamander • Ozark Hellbender Δ • Red River Mudpuppy

Alligator Snapping Turtle • Common Map Turtle • False Map Turtle • Midland Smooth Softshell • Mississippi Map Turtle • Ouachita Map Turtle • Western Cottonmouth

Wildlife of the Mississippi Alluvial Basin

Forest

Spotted Salamander • Marbled Salamander • **Mole Salamander** • Small-mouthed Salamander • **Upland Chorus Frog**

Red-shouldered Hawk • Broad-winged Hawk • Cooper's Hawk • Sharp-shinned Hawk • Mississippi Kite • American Woodcock • Barred Owl • Ruby-throated Hummingbird • Pileated Woodpecker • Hairy Woodpecker • Olive-sided Flycatcher • Acadian Flycatcher • Yellow-bellied Flycatcher • Fish Crow • Carolina Chickadee • Tufted Titmouse • White-breasted Nuthatch • Brown Creeper • Carolina Wren • Winter Wren • Golden-crowned Kinglet • Ruby-crowned Kinglet • Wood Thrush • Swainson's Thrush • Veery • Gray-cheeked Thrush • Yellow-billed Cuckoo • Yellow-throated Vireo • Red-eyed Vireo • Philadelphia Vireo • Scarlet Tanager • Tennessee Warbler • Hooded Warbler • Prothonotary Warbler • Bay-breasted Warbler • Cerulean Warbler • Yellow-throated Warbler • Blackburnian Warbler • Magnolia Warbler • Blackpoll Warbler • Black-throated Green Warbler • Ovenbird • Louisiana Waterthrush • Northern Waterthrush • American Redstart • Swainson's Warbler • Worm-eating Warbler • Kentucky Warbler • Mourning Warbler • Nashville Warbler • Northern Parula • Black-and-white Warbler • Purple Finch

Southern Short-tailed Shrew • Southern Flying Squirrel • Gray Squirrel • **Rafinesque's Big-eared Bat** • Silver-haired Bat • Evening Bat • Eastern Wood Rat • Golden Mouse • **Cotton Mouse** • Swamp Rabbit • Gray Fox

Woodland

Eastern Narrow-mouthed Toad

Southern Copperhead • Timber Rattlesnake • Rough Earth Snake • Great Plains Rat Snake • Smooth Earth Snake • Pygmy Rattlesnake • Common Five-lined Skink • Coal Skink • Northern Fence Lizard • Three-toed Box Turtle

Eastern Screech Owl • Chuck-will's Widow • Whip-poor-will • Downy Woodpecker • Red-bellied Woodpecker • Yellow-bellied Sapsucker • Red-headed Woodpecker • Northern Flicker • Eastern Wood-pewee • Eastern Phoebe • Least Flycatcher • Great Crested Flycatcher • House Wren • Hermit Thrush • Blue-gray Gnatcatcher • Cedar Waxwing • Warbling Vireo • Summer Tanager • Orange-crowned Warbler • Canada Warbler • Chipping Sparrow • Fox Sparrow • Dark-eyed Junco • Orchard Oriole • Baltimore Oriole

Hoary Bat • Fox Squirrel • Woodland Vole

Savanna

Eastern Hog-nosed Snake • Rough Green Snake

American Kestrel • Northern Bobwhite • Eastern Kingbird • Bewick's Wren • Eastern Bluebird • Gray Catbird • Brown Thrasher • Bell's Vireo • White-eyed Vireo • Prairie Warbler • Chestnut-sided Warbler • Golden-winged Warbler • Blue-winged Warbler • Yellow-breasted Chat • Blue Grosbeak • Eastern Towhee • Field Sparrow • White-throated Sparrow • White-crowned Sparrow • Lincoln's Sparrow • Song Sparrow • Bachman's Sparrow

Least Shrew

Prairie

Precious Underwing Moth •

Illinois Chorus Frog • Plains Leopard Frog • **Eastern Spadefoot**

Eastern Six-lined Racerunner • Prairie Racerunner • **Dusky Hog-nosed Snake** • Red Milk Snake

Rough-legged Hawk • Northern Harrier • Upland Sandpiper • Short-eared Owl • Barn Owl • Horned Lark • Common Nighthawk • Loggerhead Shrike • Dickcissel • Nelson's Sharp-tailed Sparrow • Grasshopper Sparrow • LeConte's Sparrow • Savannah Sparrow • Vesper Sparrow • Lark Sparrow • Lapland Longspur • Bobolink • Eastern Meadowlark

Prairie Vole • Western Harvest Mouse • Meadow Jumping Mouse • Hispid Cotton Rat

Wetlands

Bald Cypress Katydid • Hoosier Grasshopper • Round-tipped Conehead Katydid

Banded Pygmy Sunfish • **Bantam Sunfish** • Chain Pickerel • **Swamp Darter** • **Starhead Topminnow** • **Pugnose Minnow**

Three-toed Amphiuma • Fowler's Toad • **Green Treefrog** • **Bronze Frog**

Southern Black Racer • Western Mud Snake • Broad-banded Water Snake • Mississippi Green Water Snake • Diamond-backed Water Snake • Graham's Crayfish Snake • **Western Chicken Turtle** • Southern Painted Turtle • Common Musk Turtle

Pied-billed Grebe • Double-crested Cormorant • American White Pelican • American Bittern • Least Bittern • Little Blue Heron • Great Blue Heron • Great Egret • Snowy Egret • Black-crowned Night Heron • Yellow-crowned Night Heron • White-faced Ibis • Northern Pintail • American Wigeon • Northern Shoveler • Green-winged Teal • Blue-winged Teal • Mallard • Gadwall • Ruddy Duck • American Coot • Common Moorhen • Lesser Scaup • Redhead • Ring-necked Duck • Canvasback • Bufflehead • Common Merganser • Red-breasted Merganser • Hooded Merganser • Lesser Snow Goose • Greater White-fronted Goose • Osprey • Bald Eagle • Peregrine Falcon • Merlin • Sora • King Rail • Virginia Rail • Yellow Rail • American Golden Plover • Black-bellied Plover • Piping Plover • **Black-necked Stilt** • American Avocet • Lesser Yellowlegs • Greater Yellowlegs • Spotted Sandpiper • Solitary Sandpiper • Sanderling • Dunlin • Baird's Sandpiper • White-rumped Sandpiper • Stilt Sandpiper • Pectoral Sandpiper • Least Sandpiper • Semipalmated Sandpiper • Willet • Common Snipe • Short-billed Dowitcher • Long-billed Dowitcher • Hudsonian Godwit • Semipalmated Plover • Wilson's Phalarope • Ring-billed Gull • Least Tern • Caspian Tern • Forster's Tern • Common Tern • Black Tern • Belted Kingfisher • Willow Flycatcher • Bank Swallow • Northern Rough-winged Swallow • Tree Swallow • Cliff Swallow • Marsh Wren • Sedge Wren • Yellow Warbler • Swamp Sparrow • Rusty Blackbird

Rice Rat • Southern Bog Lemming • Southeastern Shrew

Cave

Spring Cavefish

Rivers and Streams

Bankclimber • Black Sandshell • Bleufer • Creeper • Fatmucket • Fawnsfoot • Flat Floater • Flutedshell • Fragile Papershell • Giant Floater • Little Spectaclecase • Mapleleaf • Monkeyface • Mucket • Paper Pondshell • Pimpleback • Pink Heelsplitter • Pink Papershell • Pistolgrip • Pondmussel • Rabbitsfoot • Rock Pocketbook • Round Pigtoe • Southern Hickorynut • Spike • Texas Lilliput • Wartyback • Threeridge • Wabash Pigtoe • Washboard • Western Fanshell • White Heelsplitter • Yellow Sandshell

Cajun Dwarf Crayfish • Shufeldt's Dwarf Crayfish • Devil Crayfish • Digger Crayfish • Shield Crayfish • **Shrimp Crayfish** • Gray-speckled Crayfish • White River Crayfish • Red Swamp Crayfish • Vernal Crayfish • Freshwater Shrimp

A Mayfly (*Baetisca obesa*)

Lake Sturgeon • Skipjack Herring • Shadow Bass • Black Bullhead • Brown Bullhead • Bowfin • Western Sand Darter • American Eel • Pirate Perch • Freshwater Drum • River Carpsucker • Quillback • Highfin Carpsucker • Flier • Crystal Darter • Blue Sucker • Red Shiner • Blacktail Shiner • Threadfin Shad • Lake Chubsucker • Grass Pickerel • Mud Darter • Bluntnose Darter • Slough Darter • **Harlequin Darter** • **Goldstripe Darter** • Cypress Darter • Speckled Darter • Scaly Sand Darter • Golden Topminnow • Blackstripe Topminnow • Blackspotted Topminnow • Goldeye • Mooneye • Western Silvery Minnow • **Cypress Minnow** • Mississippi Silvery Minnow • Plains Minnow • Chestnut Lamprey • Blue Catfish • Smallmouth Buffalo • Bigmouth Buffalo • Black Buffalo • Brook Silverside • Spotted Gar • Longnose Gar • Shortnose Gar • Alligator Gar • Warmouth • **Dollar Sunfish** • Orangespotted Sunfish • Longear Sunfish • Redspotted Sunfish • Ribbon Shiner • Redfin Shiner • Speckled Chub • Silver Chub • Sturgeon Chub • Sicklefin Chub • Inland Silverside • Spotted Bass • Spotted Sucker • White Bass • Silver Redhorse • Shorthead Redhorse • Striped Mullet • Golden Shiner • Pallid Shiner • Emerald Shiner • River Shiner • **Ironcolor Shiner** • **Taillight Shiner** • Silverband Shiner • Weed Shiner • Mimic Shiner • Channel Shiner • Tadpole Madtom • Brindled Madtom • Freckled Madtom • Blackside Darter • Saddleback Darter • Dusky Darter • River Darter •

Suckermouth Minnow • Bullhead Minnow • Flathead Chub • Paddlefish • White Crappie • Black Crappie • Flathead Catfish • Pallid Sturgeon • Shovelnose Sturgeon • Sauger • Walleye

Red River Mudpuppy

Western Cottonmouth • Midland Smooth Softshell • Mississippi Map Turtle • False Map Turtle • Alligator Snapping Turtle

Other Missouri Wildlife

Common and Widespread Species

These species are common and widespread throughout Missouri and seem to be less tied to a specific habitat type than many other species. Although we are not targeting these species in our assessment process, we assume that they are present in many of the Conservation Opportunity Areas we choose to go to work.

Black Bullhead • Yellow Bullhead • Bluegill • Bluntnose Minnow • Channel Catfish • Creek Chub • Gizzard Shad • Green Sunfish • Largemouth Bass

Blanchard's Cricket Frog • Northern Spring Peeper • Bullfrog • Southern Leopard Frog • Gray Treefrog • Cope's Gray Treefrog • Green Frog

Western Spiny Softshell • Common Snapping Turtle • Black Rat Snake • Prairie Kingsnake • Speckled Kingsnake • Western Ribbon Snake • Red-Eared Slider

Great Blue Heron • Red-Winged Blackbird • Canada Goose • Great Horned Owl • Red-Tailed Hawk • Northern Cardinal • American Goldfinch • Turkey Vulture • Killdeer • American Crow • Blue Jay • Yellow-Rumped Warbler • Palm Warbler • Mourning Dove • Brewer's Blackbird • Common Yellowthroat • Barn Swallow • Northern Mockingbird • Brown-Headed Cowbird • House Finch • Indigo Bunting • Common Grackle • American Robin • Wild Turkey • Wood Duck • Chimney Swift • Purple Martin

Coyote • Beaver • Virginia Opossum • River Otter • Bobcat • Red Fox • Striped Skunk • Long-Tailed Weasel • Mink • Big Brown Bat • Little Brown Bat • Eastern Pipistrelle • Evening Bat • Eastern Red Bat • White-Tailed Deer • Muskrat • White-Footed Mouse • Deer Mouse • Raccoon • Eastern Mole • Eastern Cottontail Rabbit • Woodchuck

Habitat Generalist

Although not necessarily common or widespread, these species utilize a wide variety of habitat types.

Yellow Bass • Western Mosquitofish

Eastern American Toad • Dwarf American Toad • Western Painted Turtle • Eastern Yellow-Bellied Racer • Prairie Ring-Necked Snake • Yellow-Bellied Water Snake • Blotched Water Snake • Midland Water Snake • Northern Water Snake • Missouri River Cooter • Texas Brown Snake • Midland Brown Snake • Red-Sided Garter Snake

Hoary Bat

Range Expanders

Historically absent from Missouri's fauna, these species are currently expanding their range into or throughout the state.

Black Vulture • Great-tailed Grackle

Nine-banded Armadillo • Least Weasel

Introduced Species

Non-native species currently residing in Missouri.

White Catfish • Goldfish • Bighead Carp • Common Carp • Grass Carp • Muskellunge • Rainbow Smelt • Rudd • Silver Carp • Striped Bass • Yellow Perch • Bighead Carp • Brown Trout • Rainbow Trout

Rock Dove • European Starling • House Sparrow

Extirpated

Species no longer existing in Missouri, but occurring elsewhere.

Winged Mapleleaf (Rivers/Streams)

American Burying Beetle (Woodland) • Pickle Springs Amphipod (Caves) • Plains Stripetail

Pallid Shiner (Rivers/Streams)

Mississippi Green Water Snake (Bottomland Forest) • Texas Horned Lizard (Prairie) • Dusty Hognose Snake (Prairie) • Plains Hognose Snake (Prairie) • Smooth Green Snake (Prairie)

Swallow-tailed Kite (Bottomland Forest) • Ivory-billed Woodpecker (Forest) • Red-cockaded Woodpecker (Pine Forest) • Brown-headed Nuthatch (Pine Woodlands) • Common Raven (Prairie) • Anhinga (Wetlands) • Black Tern (Wetland) • Trumpeter Swan (Wetlands)

Elk (Woodland) • American Bison (Prairie) • White-tailed Jackrabbit (Prairie) • Ozark Big-eared Bat (Caves) • Gray Wolf (Habitat Generalist) • Red Wolf (Habitat Generalist)

Extinct

Species that no longer exist, but historically occured in Missouri (within the past 200 years).

Harelip Sucker (Rivers/Streams)

Carolina Parakeet (Bottomland Forest) • Passenger Pigeon (Forest/Woodland) • Bachman's Warbler (Bottomland Forest)

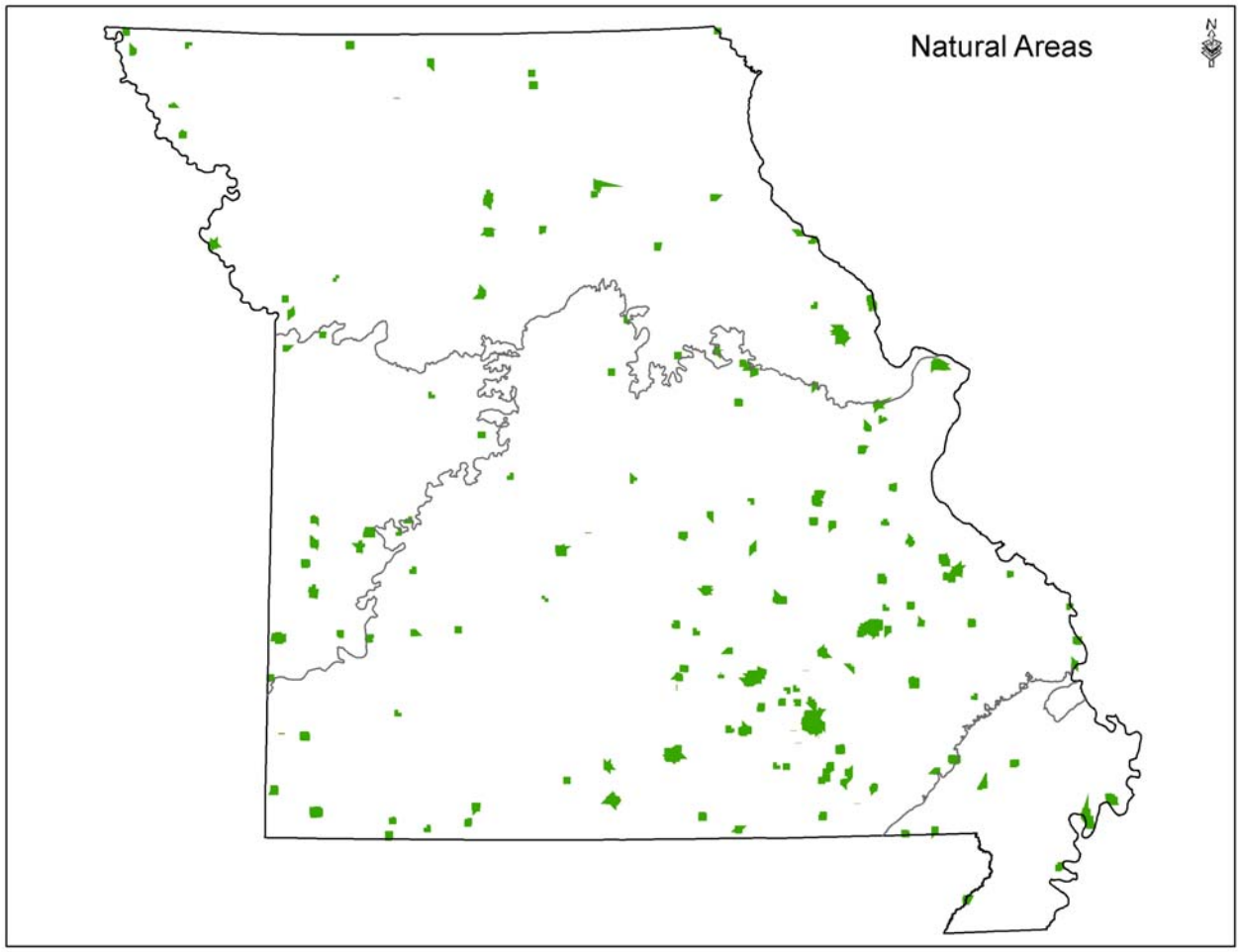
Appendix D. Expert Review List

The following people (listed with the expertise they represent) helped review and assign target species and species habitat assignments for Missouri's Comprehensive Wildlife Conservation Strategy.

- Jeff Briggler, herpetologist
- Tim Smith, botanist
- Brad Jacobs, ornithologist
- Andy Forbes, ornithologist
- Rick Clawson, bat biologist
- Jackie DeSanty-Combes, mammologist
- Bob DiStefano, crayfish biologist
- Bill Elliot, cave biologist
- Scott Faiman, malacologist
- Debby Fantz, zoologist
- Julie Flemming, database manager
- Peggy Horner, endangered species biologist
- Bill Mabee, aquatic biologist (invertebrates)
- Doug Novinger, ichthyologist
- Brian Root, bottomland/riparian forest systems ecologist
- Tim Nigh, ecologist
- Dennis Figg, landscape ecologist
- Karen Kramer, natural community ecologist
- Steve McMurray, malacologist
- Mike Arduser, insect ecologist
- Justin Pepper, wildlife biologist
- Paul Nelson, natural community ecologist (USFS)
- Amy Linsenbardt, wildlife biologist
- Courtney Kerns, wildlife biologist

Appendix E. Missouri's Natural Areas System Spatial Layer

Missouri Natural Areas recognize the highest quality examples of natural communities and may occur on public or private lands. By entering into an agreement, cooperators recognize that each holds in trust parts of Missouri's natural heritage. As of December 2004, the Missouri Natural Areas Committee has designated 181 Natural Areas totaling over 60,000 acres.

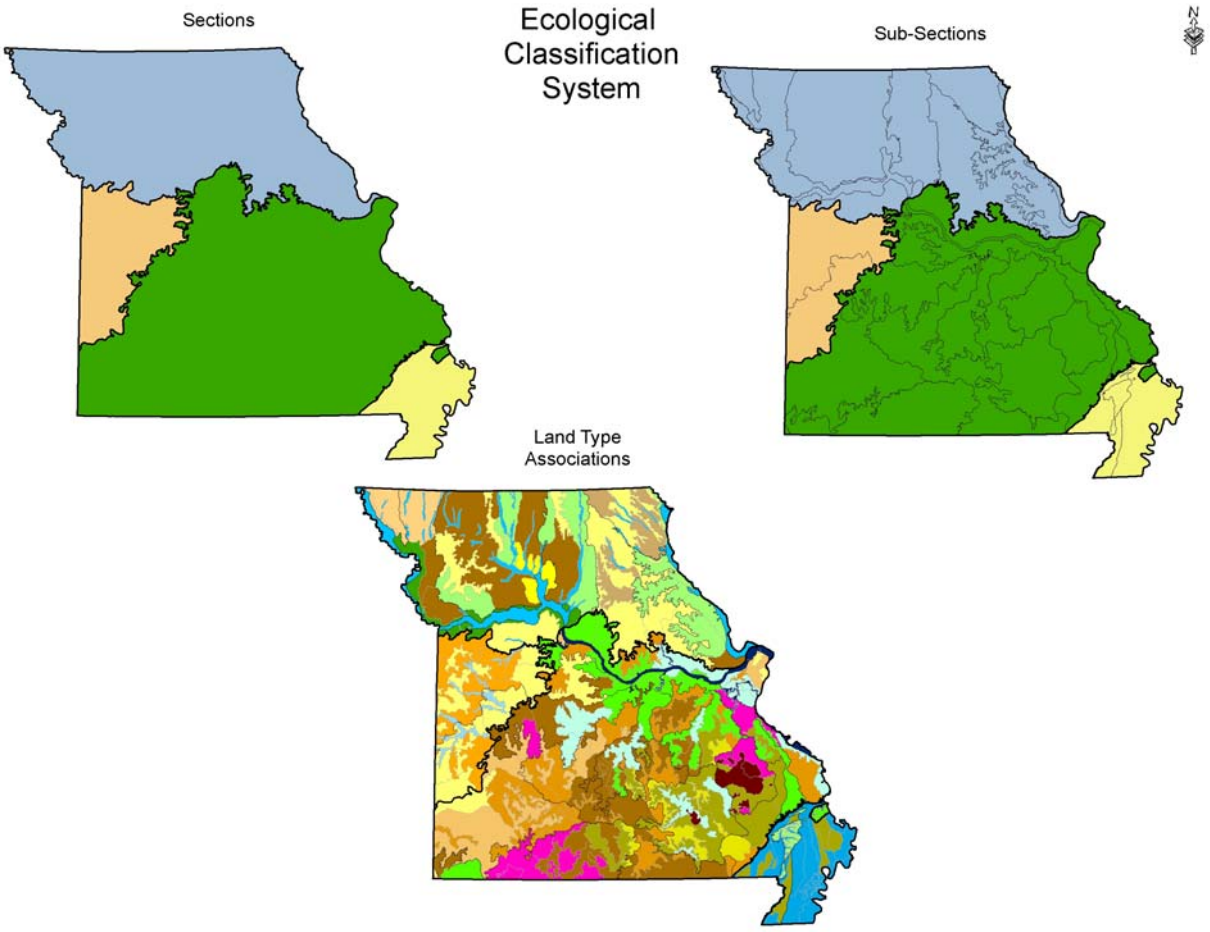


Appendix F. Assessment Spatial Data Layers

The following spatial data layers were integral in the development of our Strategy:

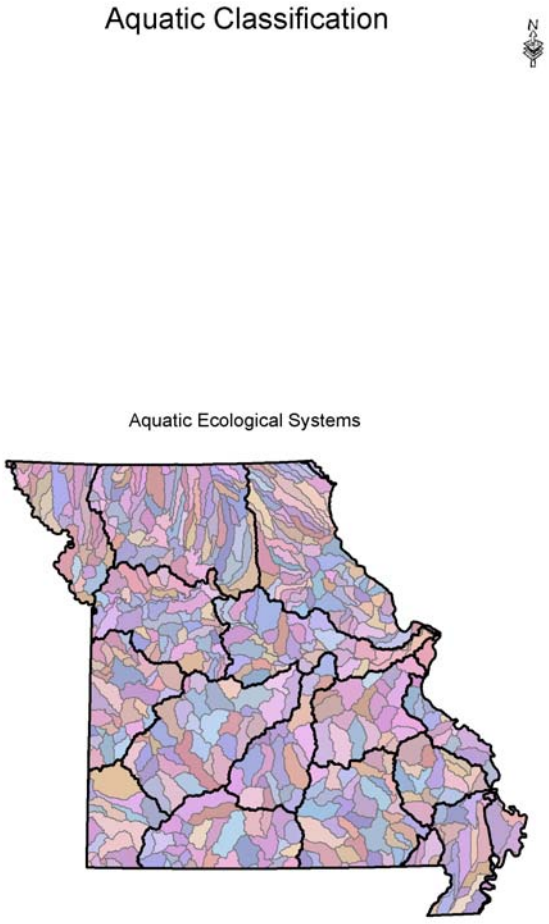
Base Data: (County Boundaries, Transportation, Hydrography, Digital OrthoQuads, etc.)
Basic datasets used for reference and contextual assistance.
Source: The Missouri Spatial Information Service

Ecological Classification System
A hierarchal framework of ecological units from large ecoregions down to Landtype Associations (LTAs). The units are compiled using various physical and biological characteristics.
Source: Tim Nigh, Missouri Department of Conservation

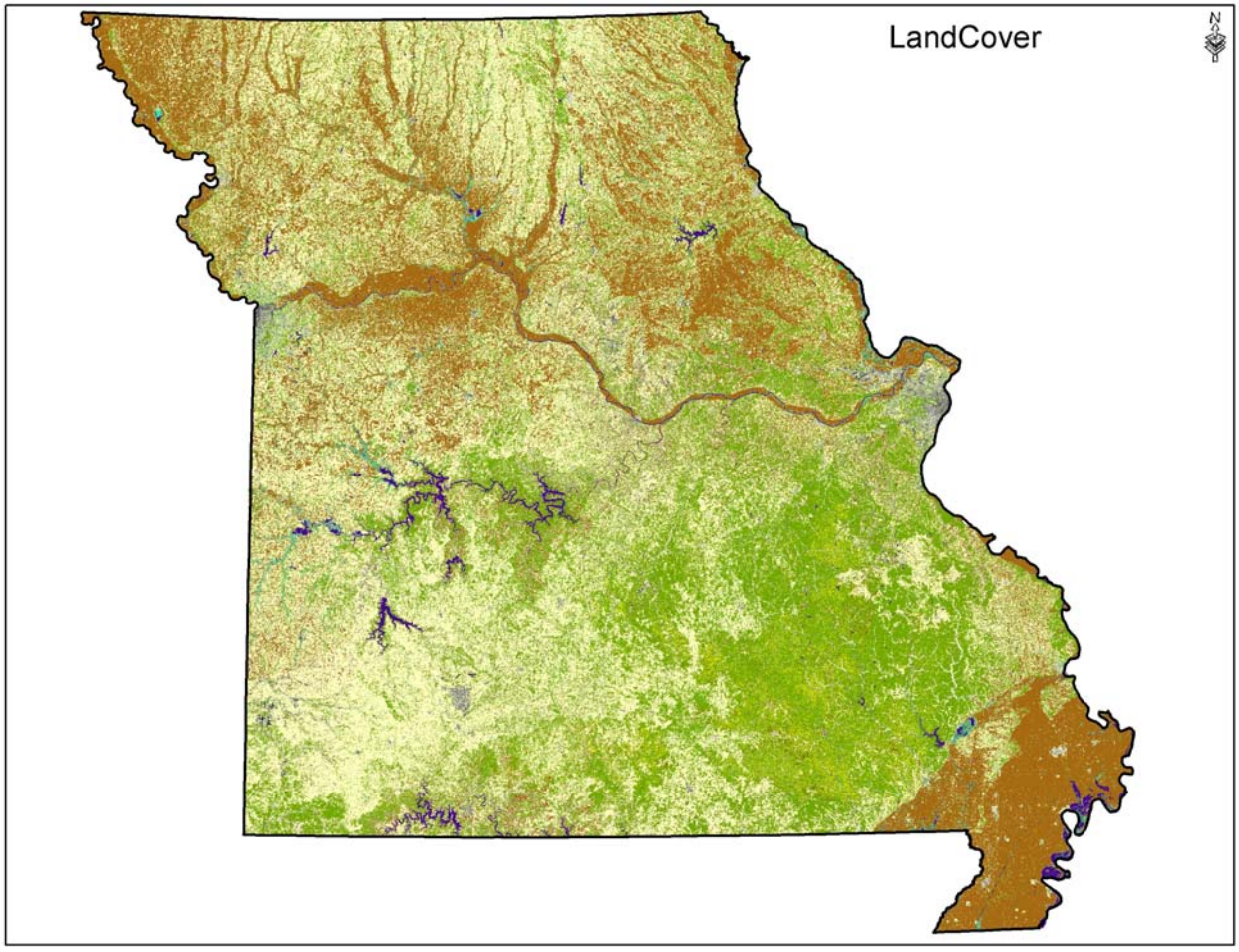


Ecological Drainage Units

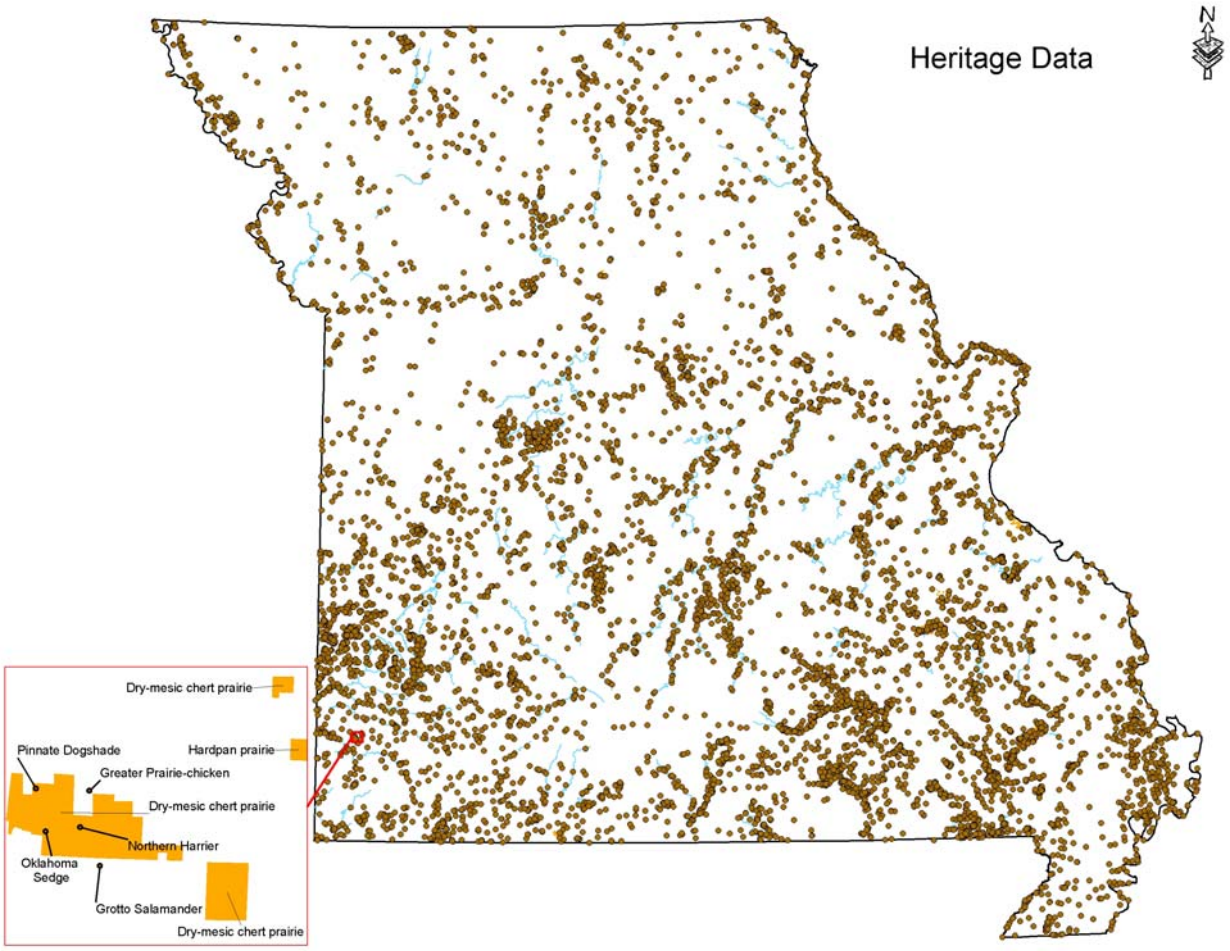
A hierarchal framework of aquatic ecological units from large ecoregions down to Valley Segment Types. The units are compiled using various physical and biological characteristics.
Source: Missouri Resource Assessment Partnership (MoRAP)



Land cover
Satellite data that is categorized into different classes to represent ground-cover. The original MoRAP land cover (1992) classification was revised using modeling techniques developed for the circa 2000 land cover mapping effort. The new classification for the southwestern portion of Missouri was recoded to match the original land cover classes, and then inserted in place of the original classification in those areas. The result is a combination of circa 2000 classification for the southwest, and the original classification in other portions of the state.
Source: Missouri Resource Assessment Partnership (MoRAP)



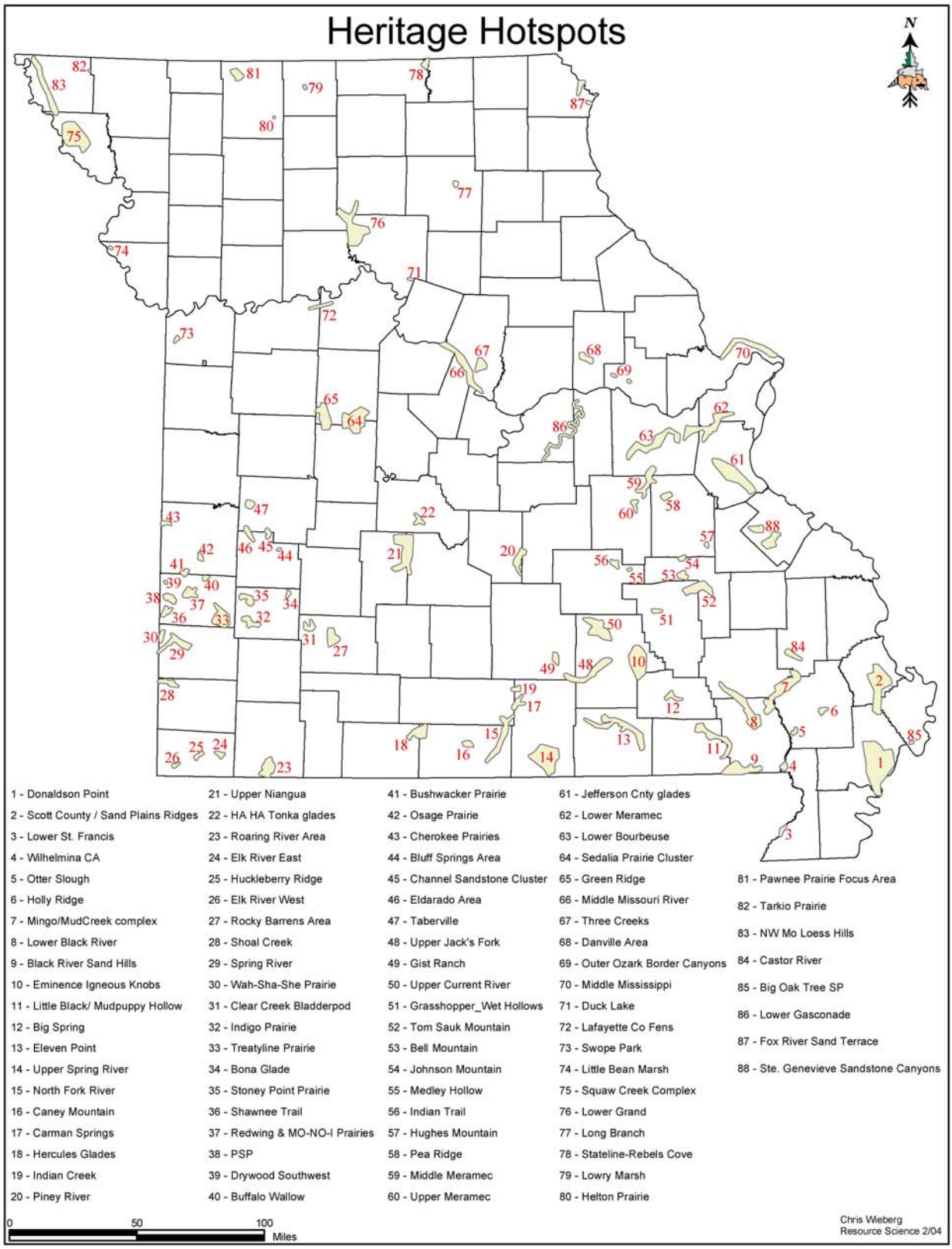
Heritage Database
Information about the location and description of species of conservation concern and high quality natural communities.
Source: Dorothy Butler, Missouri Department of Conservation



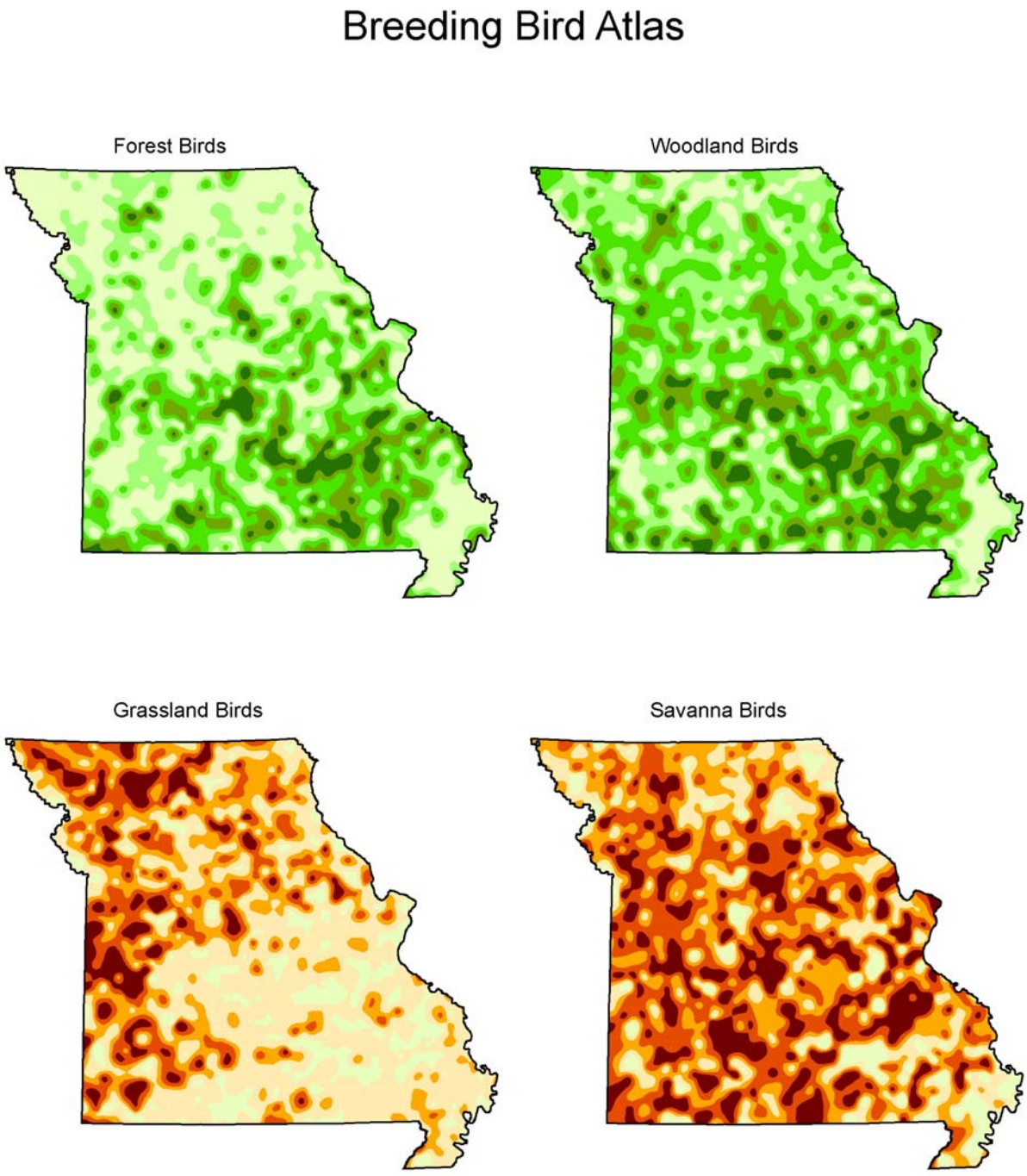
Heritage Hotspot

Heritage elements were ranked according to state and global ranks. They were also weighted according to a calculated endemism. These ranks helped create areas of high concentrations of high ranking elements.

Source: Chris Wieberg, Missouri Department of Conservation



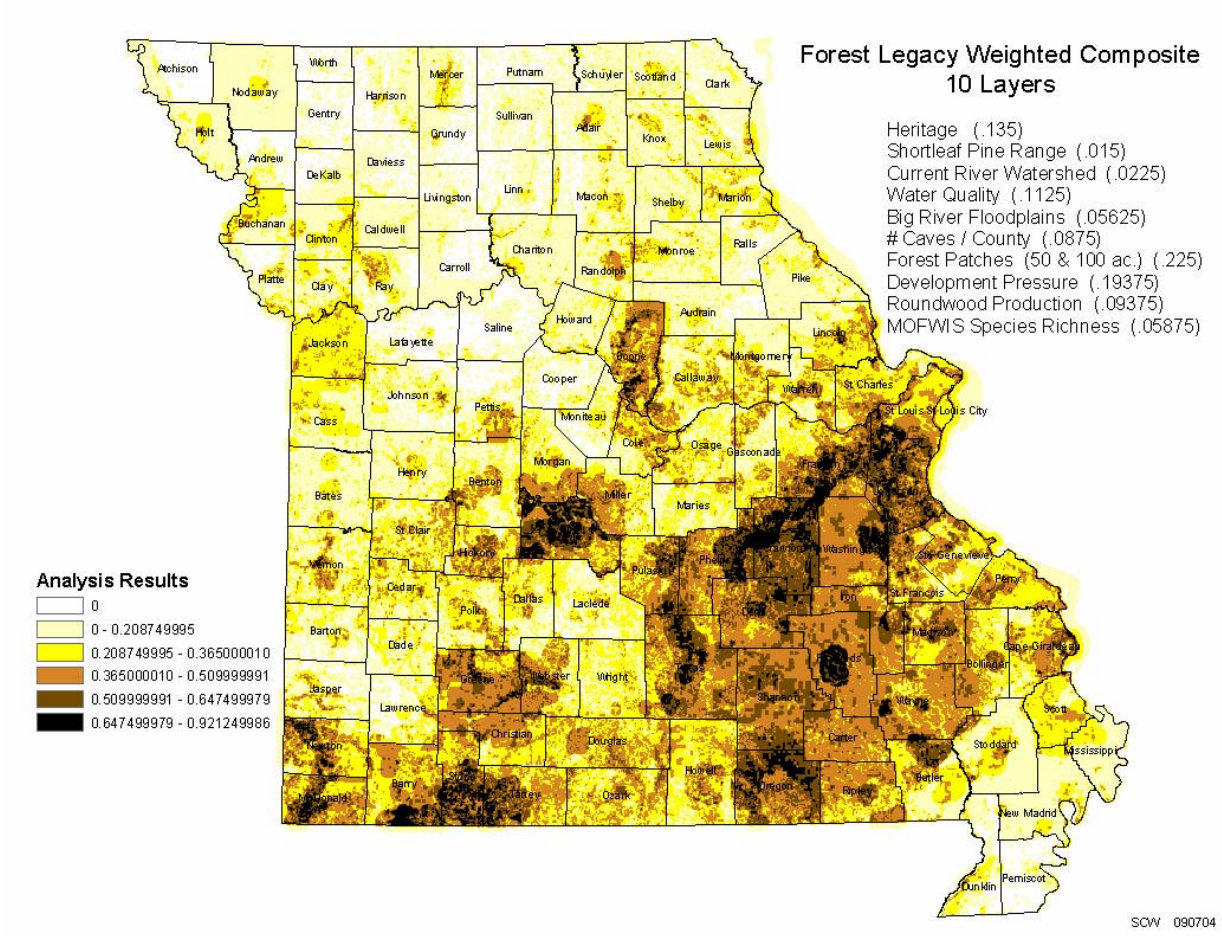
Breeding Bird Atlas
This is a calculated presence of habitat specific bird species. At different points along birding routes, species presence was recording, and the relationships of those points created a predicted distribution grid.
Source: Missouri Resource Assessment Partnership (MoRAP)



Forest Legacy Areas

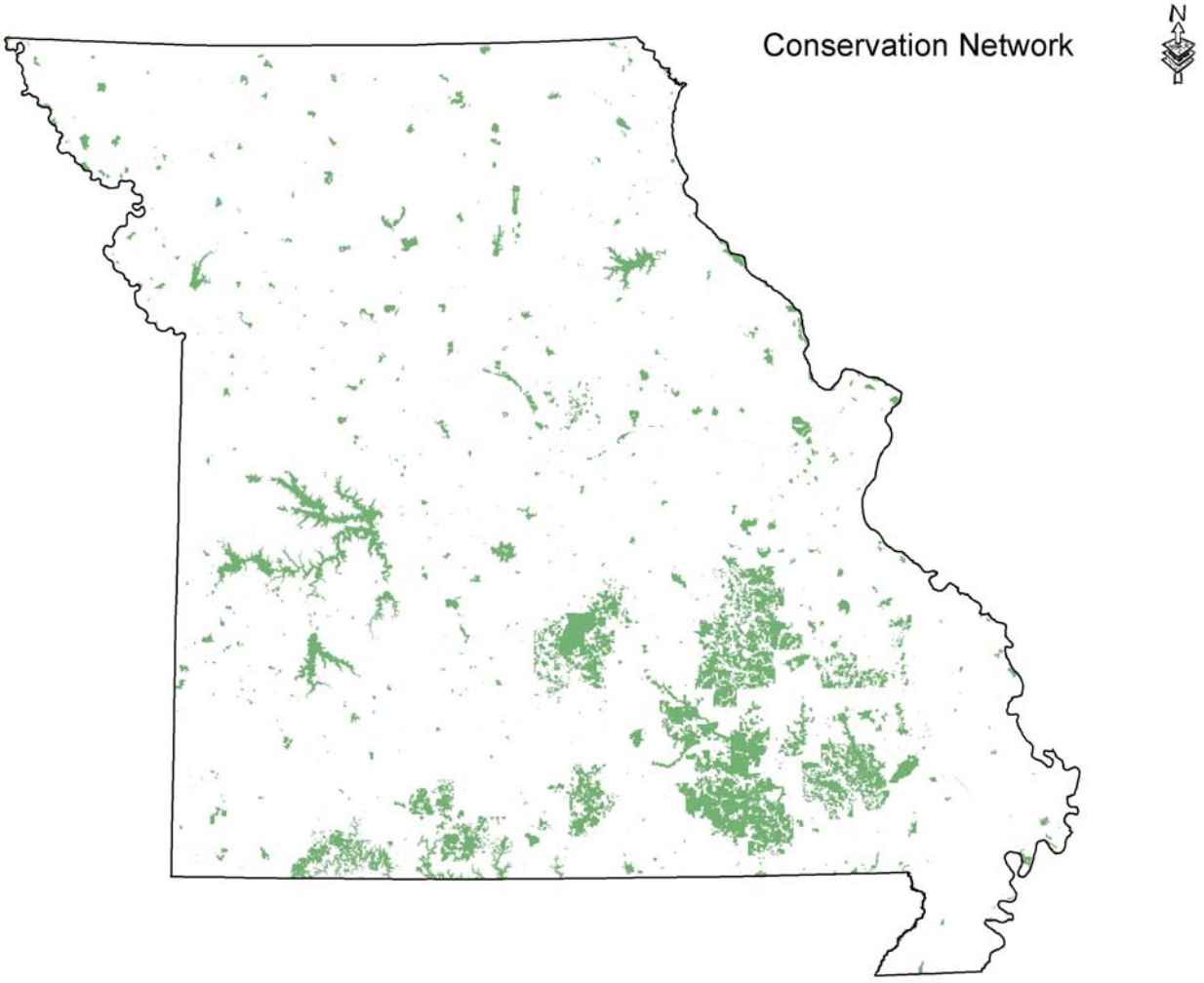
A calculated grid that identifies areas for conservation easements on lands to be kept in traditional forest management. Areas with the most threat of being converted to non-forest management are of highest priority.

Source: Steve Westin, Missouri Department of Conservation

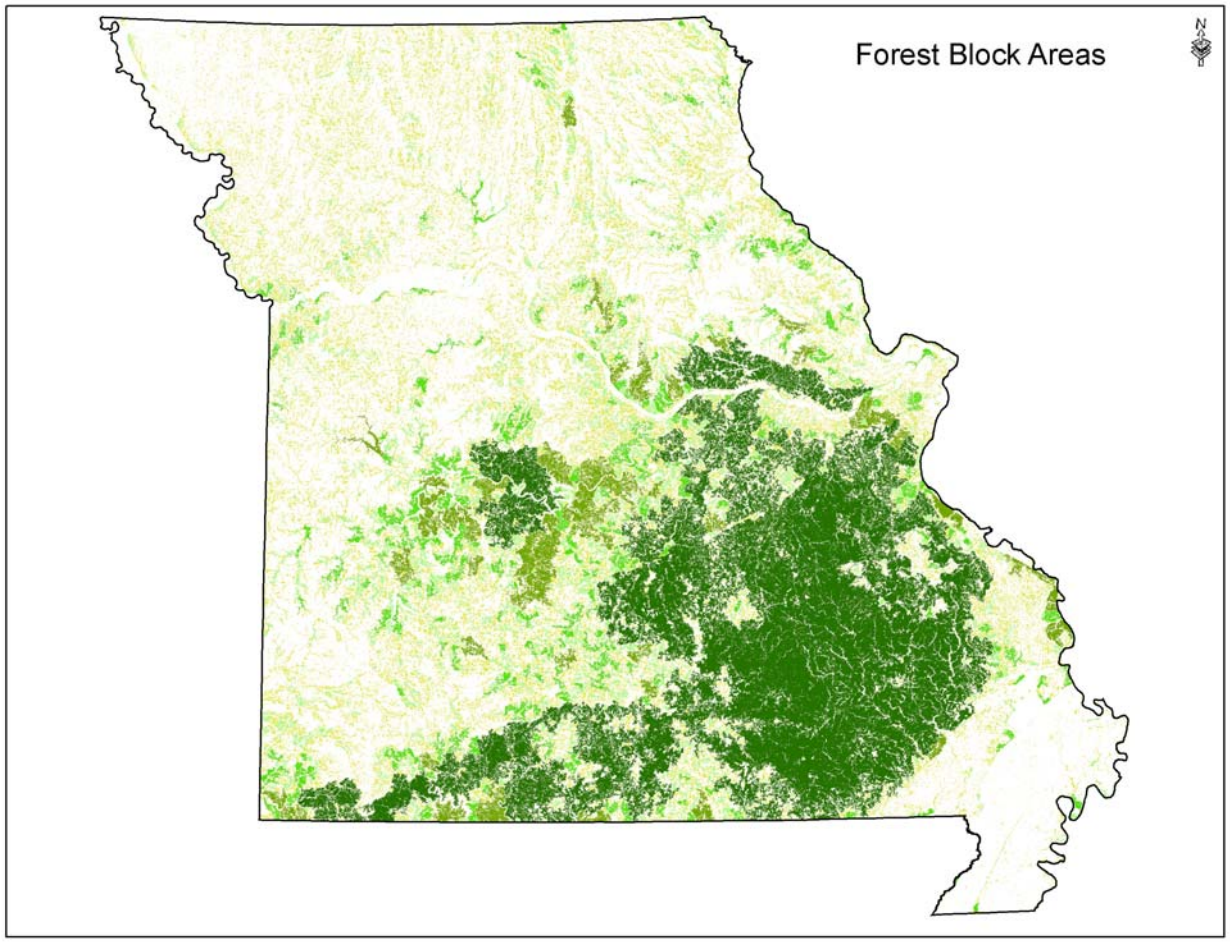


Existing Conservation Network

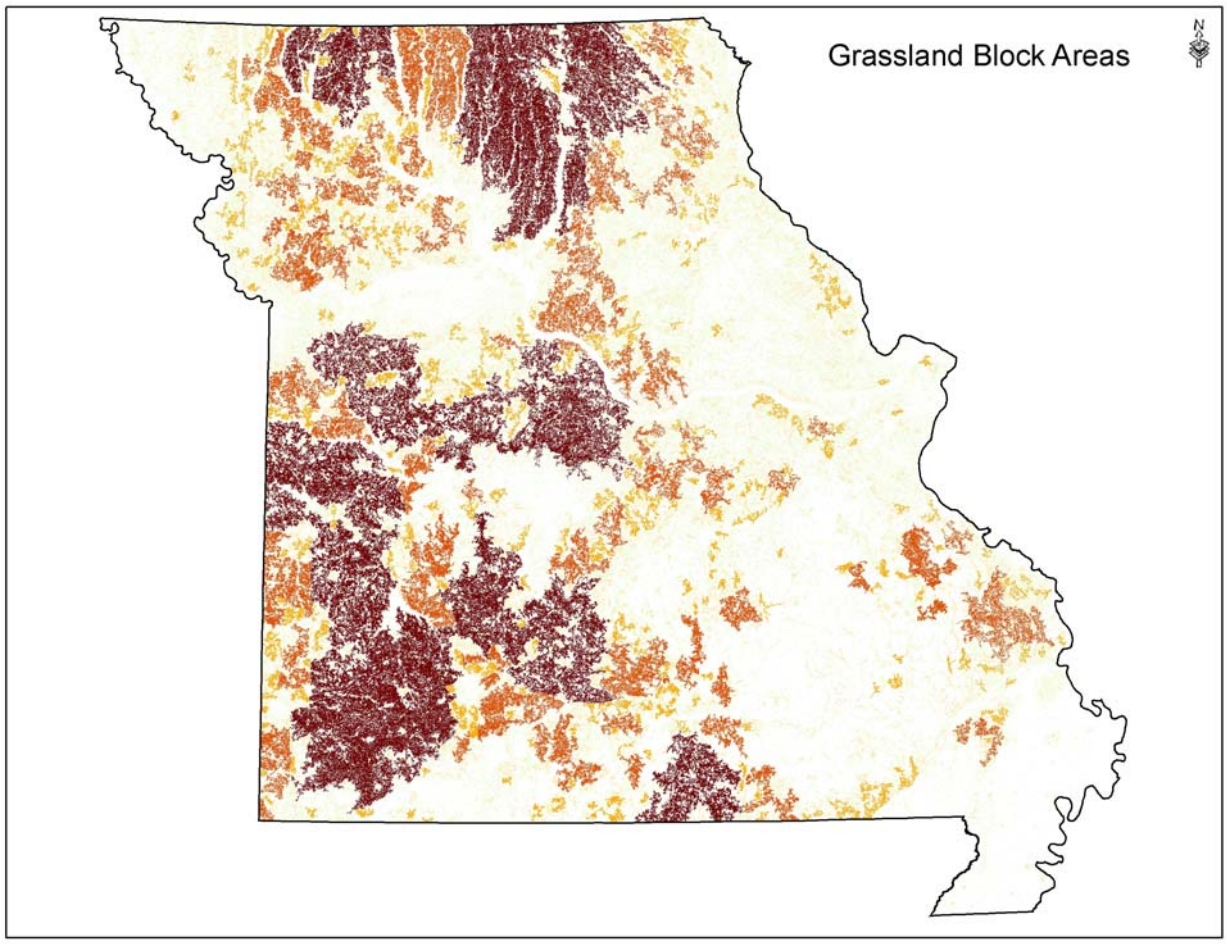
Areas owned or managed by Missouri Department of Conservation, Missouri Department of Natural Resources, U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers, The Nature Conservancy and U.S. Forest Service. Also includes areas identified through the Natural Areas program as being good representatives of high quality natural communities. Natural Areas occur on both public and private land.



Forest block areas
Using the Landcover data set. The areas that are identified as being forested were grouped and categorized according to the size of the region (group) they created.
Source: Tim Nigh, Missouri Department of Conservation

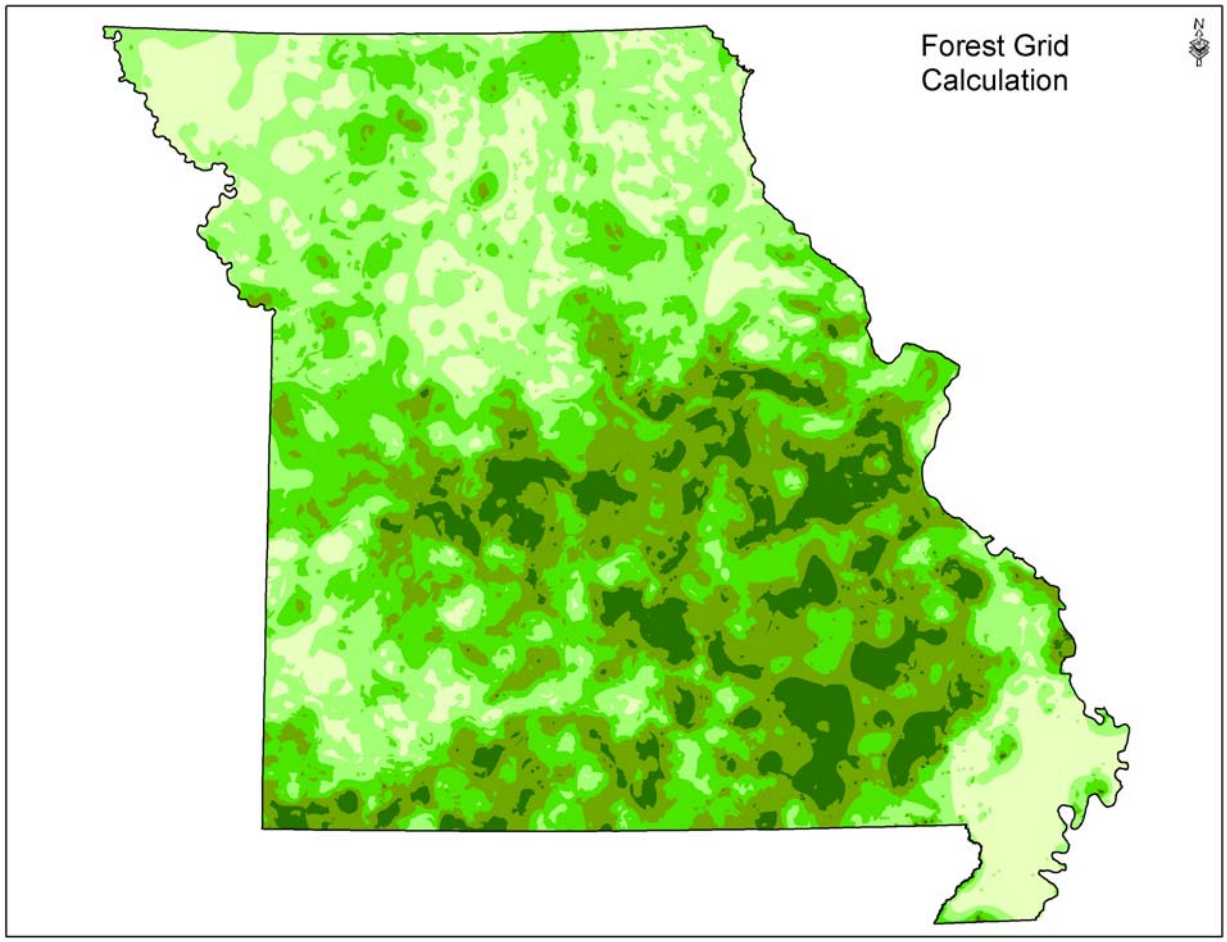


Grassland block areas
The areas that are identified as being grassland (via land cover data) were grouped and categorized according to the size of the region (group) they created.
Source: Tim Nigh, Missouri Department of Conservation

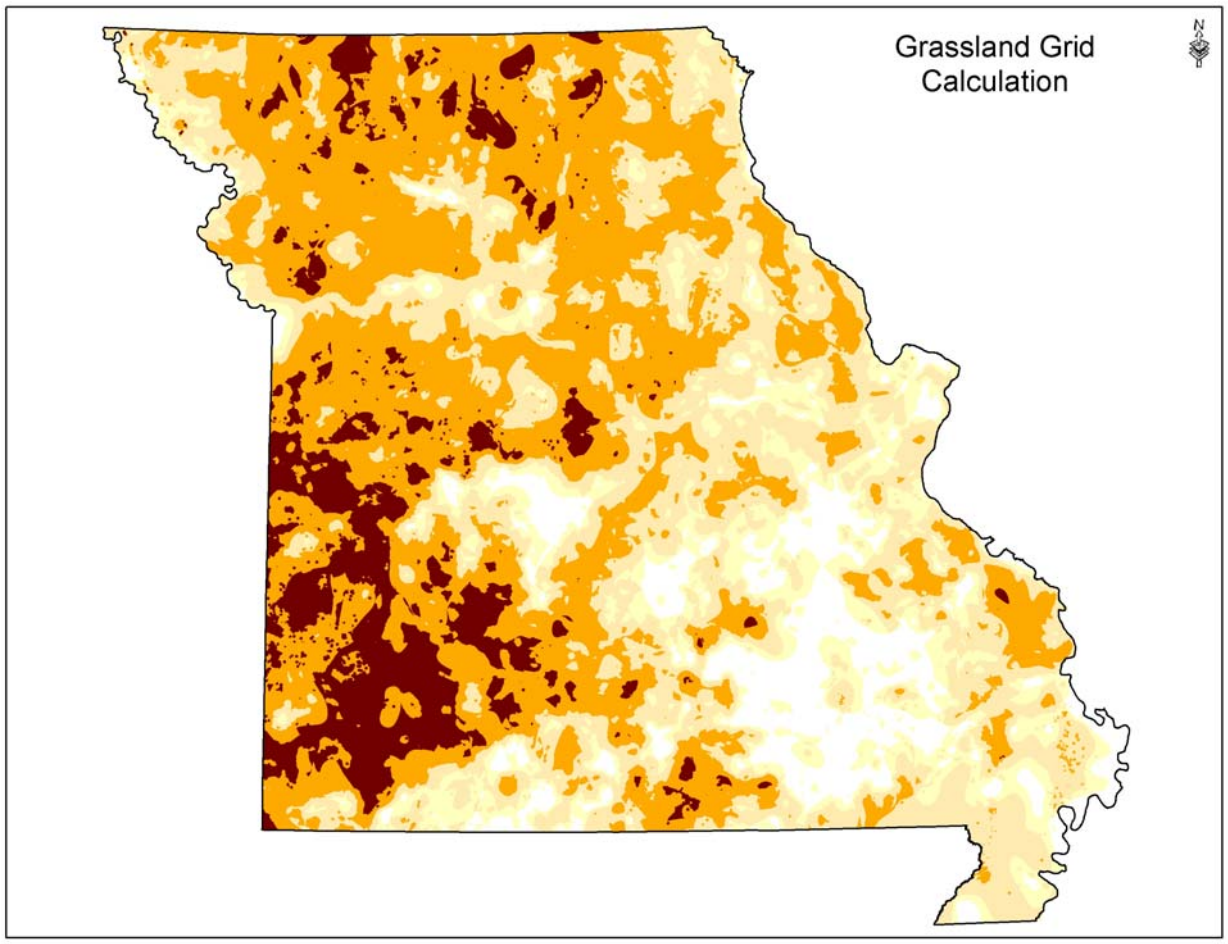


Forest grid calculation

Combination of three normalized datasets: 1) Heritage elements with forest habitat designation; 2) Forest block areas (derived from land cover); 3) Breeding Bird Atlas forest birds. These areas display intersections of the three datasets, and sites with the greatest potential for forest habitat. Source: Tim Nigh, Missouri Department of Conservation



Grassland grid calculation
Combination of three normalized datasets: 1) Heritage elements with grassland habitat designation; 2) Grassland block areas (derived from land cover); 3) Breeding Bird Atlas grassland birds. These areas display intersections of the three datasets, and sites with the greatest potential for grassland habitat.
Source: Tim Nigh, Missouri Department of Conservation



Appendix G. Heritage Hotspots

Natural Heritage Hotspots in Missouri
Tim Nigh and Chris Wieberg
February, 2004

Background

The Missouri Natural Heritage database contains over 12,000 records of state- listed species and high quality natural communities. These elements range widely in their rarity and importance for conservation. In order to facilitate the use of heritage in conservation planning, an effort to identify "hot spots" with concentrations of rare elements was undertaken. This is a brief summary of the process and results of an initial identification of Heritage Hot Spots.

Process

Each heritage element (species or community) was given a weight of 0-6 based on its rarity, endemism and importance for conservation action. State ranks, global ranks, and state and federal listing status were combined to assign the weight. Species with >80% of their occurrences in an ecological subsection or ecological drainage unit were classified as regional endemics and were given an additional point to their weight. The combination of these factors and their weights is outlined below. Historic and extirpated records were removed from the database for this exercise.

Weight	Federal Status	S rank	State Status	Global Rank
5	E or T	S1 – S3 Communities	E	G1 or G2
4	C	S1 Plant or Animal, Communities S4 - S5		
3		SU and S2 Plant or Animal		G3
2		S3 Plant or Animal		G4
1		S4 Plant or Animal		G5
0		SE		

Using a 30 meter grid of Missouri, a neighborhood analysis in which the weights of all occurrences were summed within a square mile circular neighborhood. This resulted in a continuous grid of Missouri in which each cell was assigned the summed weights of all occurrences within this neighborhood. This provided a visual depiction of heritage occurrences that could draw the user's eye to places with the highest concentrations of highly weighted elements.

Heritage biologists and GIS staff, then used this layer in combination with other relevant layers (i.e., Public lands, streams, counties, etc), to inspect hot spots and draw polygons around those with clusters of highly ranked elements. This was facilitated by projecting the GIS layers onto an erasable board that participants could draw on and erase once the boundaries were determined. Each hot spot was given a name and a summary of its contents.

Results

Hot Spots. There were a total of 89 hot spots identified by this initial process (See Map). They include 1,561,000 acres or 3.6% of Missouri's area. The hot spots ranged in size from 600 to 60,000 acres; Donaldson Point HS was 105,000 acres. The Till Plains had 15 hot spots, Osage Plains 16, Ozark Highlands 49, and the Mississippi Alluvial Plain 9.

The total scores of the hot spots (sum of all element occurrence weights) ranged from 15 to 788 (See Hot Spot Table). The total number of element occurrences within a hot spot ranged from 3-187, and the number of unique elements was 1-73. The average element score within the hot spots ranged from 3.2-5.3 (Springfield Lesquerella cluster had a mean of 6).

Record Capture. There were 10,835 total records included in the analysis; 4,487 (41%) were captured in the hot spots. 6,477 records had a weight of at least 4, and 2958 (45%) of these highly weighted records were captured.

Element Capture. There were 828 elements included in the analysis; 656 (79%) were captured at least once (See Element Tables). Of the 547 elements with scores of 4 or higher, 421 (77%) were captured at least once in the hot spots.

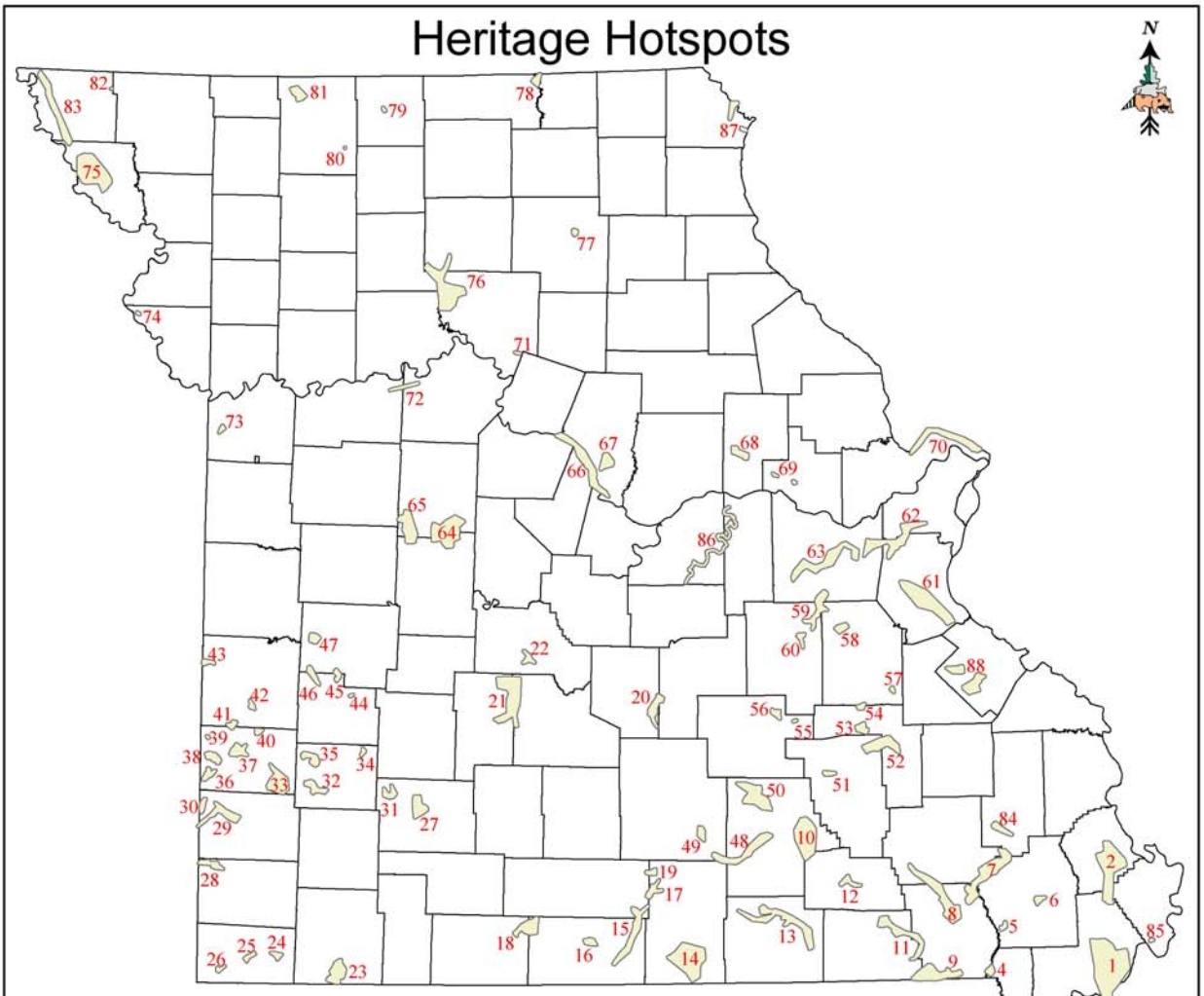
Highest Ranking Hot Spots. The score and rank of each hot spot is summarized in the Hot Spot Table. The top ten hot spots were.

Sedalia Prairie Cluster (788)
NW Missouri Loess Hills (677)
Scott County Sand Plains (598)
Black River Sand Hills (589)
Lower Black River (556)
Eleven Point Breaks (556)
Ste Genevieve Canyons (551)
Lower Meramec River (537)
Upper Jack's Fork (512)
Mingo/Mud Creek Complex (476)

Further Analysis

The Element Tables summarize the number of records captured versus their total number of occurrences for each element. There is a table for each major taxa available for review by respective biologists. Biologists will identify which species may not be adequately represented, then using the heritage point file, will be able to choose those records that should be added to the hotspot coverage. These will then be used to revise the heritage hot spot layer for use in conservation planning.

Heritage Hotspots



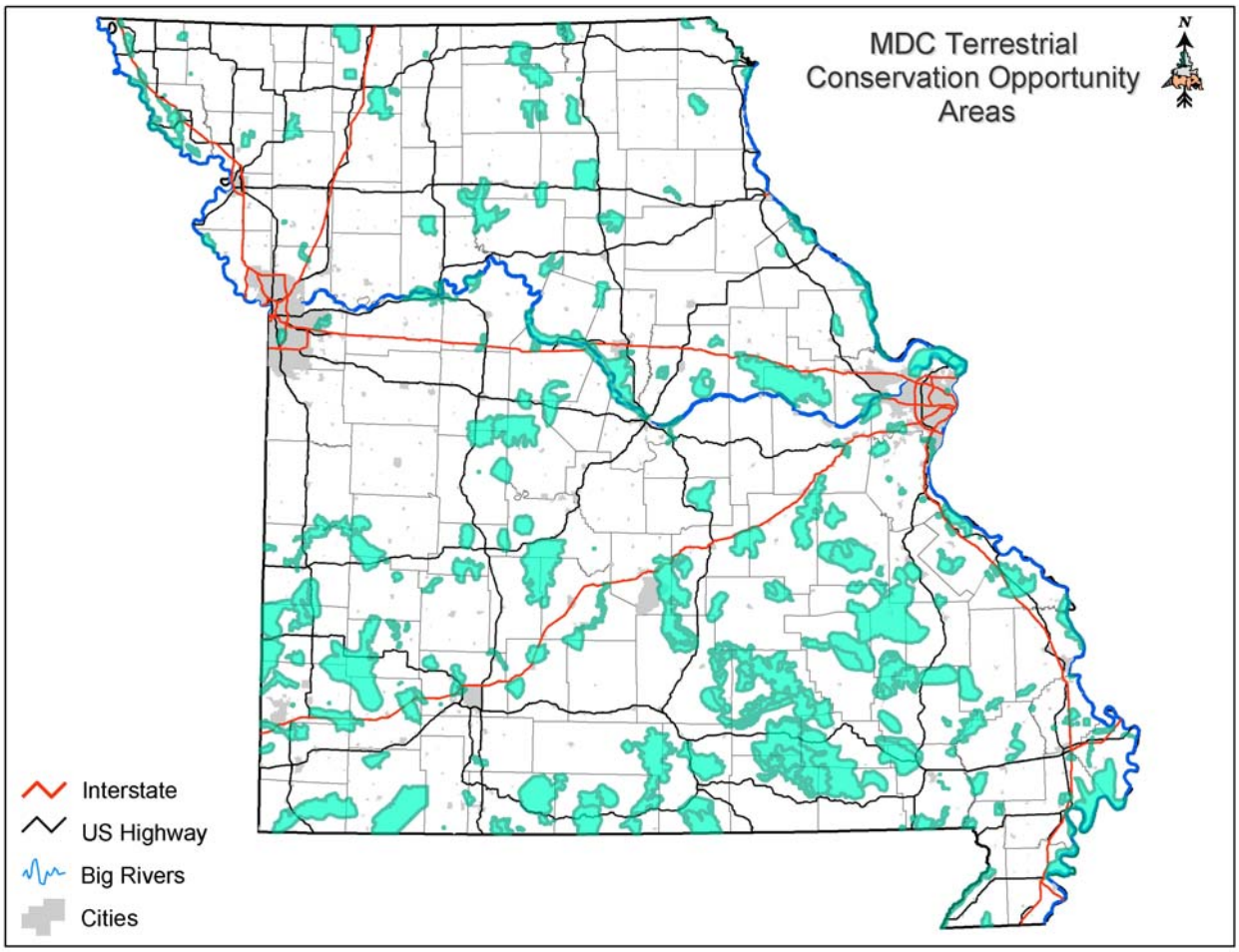
1 - Donaldson Point
2 - Scott County / Sand Plains Ridges
3 - Lower St. Francis
4 - Wilhelmina CA
5 - Otter Slough
6 - Holly Ridge
7 - Mingo/MudCreek complex
8 - Lower Black River
9 - Black River Sand Hills
10 - Eminence Igneous Knobs
11 - Little Black/ Mudpuppy Hollow
12 - Big Spring
13 - Eleven Point
14 - Upper Spring River
15 - North Fork River
16 - Caney Mountain
17 - Carman Springs
18 - Hercules Glades
19 - Indian Creek
20 - Piney River
21 - Upper Niangua
22 - HA HA Tonka glades
23 - Roaring River Area
24 - Elk River East
25 - Huckleberry Ridge
26 - Elk River West
27 - Rocky Barrens Area
28 - Shoal Creek
29 - Spring River
30 - Wah-Sha-She Prairie
31 - Clear Creek Bladderpod
32 - Indigo Prairie
33 - Treatyline Prairie
34 - Bona Glade
35 - Stoney Point Prairie
36 - Shawnee Trail
37 - Redwing & MO-NO-I Prairies
38 - PSP
39 - Drywood Southwest
40 - Buffalo Wallow
41 - Bushwacker Prairie
42 - Osage Prairie
43 - Cherokee Prairies
44 - Bluff Springs Area
45 - Channel Sandstone Cluster
46 - Eldarado Area
47 - Taberville
48 - Upper Jack's Fork
49 - Gist Ranch
50 - Upper Current River
51 - Grasshopper_Wet Hollows
52 - Tom Sauk Mountain
53 - Bell Mountain
54 - Johnson Mountain
55 - Medley Hollow
56 - Indian Trail
57 - Hughes Mountain
58 - Pea Ridge
59 - Middle Meramec
60 - Upper Meramec
61 - Jefferson Cnty glades
62 - Lower Meramec
63 - Lower Bourbeuse
64 - Sedalia Prairie Cluster
65 - Green Ridge
66 - Middle Missouri River
67 - Three Creeks
68 - Danville Area
69 - Outer Ozark Border Canyons
70 - Middle Mississippi
71 - Duck Lake
72 - Lafayette Co Fens
73 - Swope Park
74 - Little Bean Marsh
75 - Squaw Creek Complex
76 - Lower Grand
77 - Long Branch
78 - Stateline-Rebels Cove
79 - Lowry Marsh
80 - Helton Prairie
81 - Pawnee Prairie Focus Area
82 - Tarkio Prairie
83 - NW Mo Loess Hills
84 - Castor River
85 - Big Oak Tree SP
86 - Lower Gasconade
87 - Fox River Sand Terrace
88 - Ste. Genevieve Sandstone Canyons

0 50 100 Miles

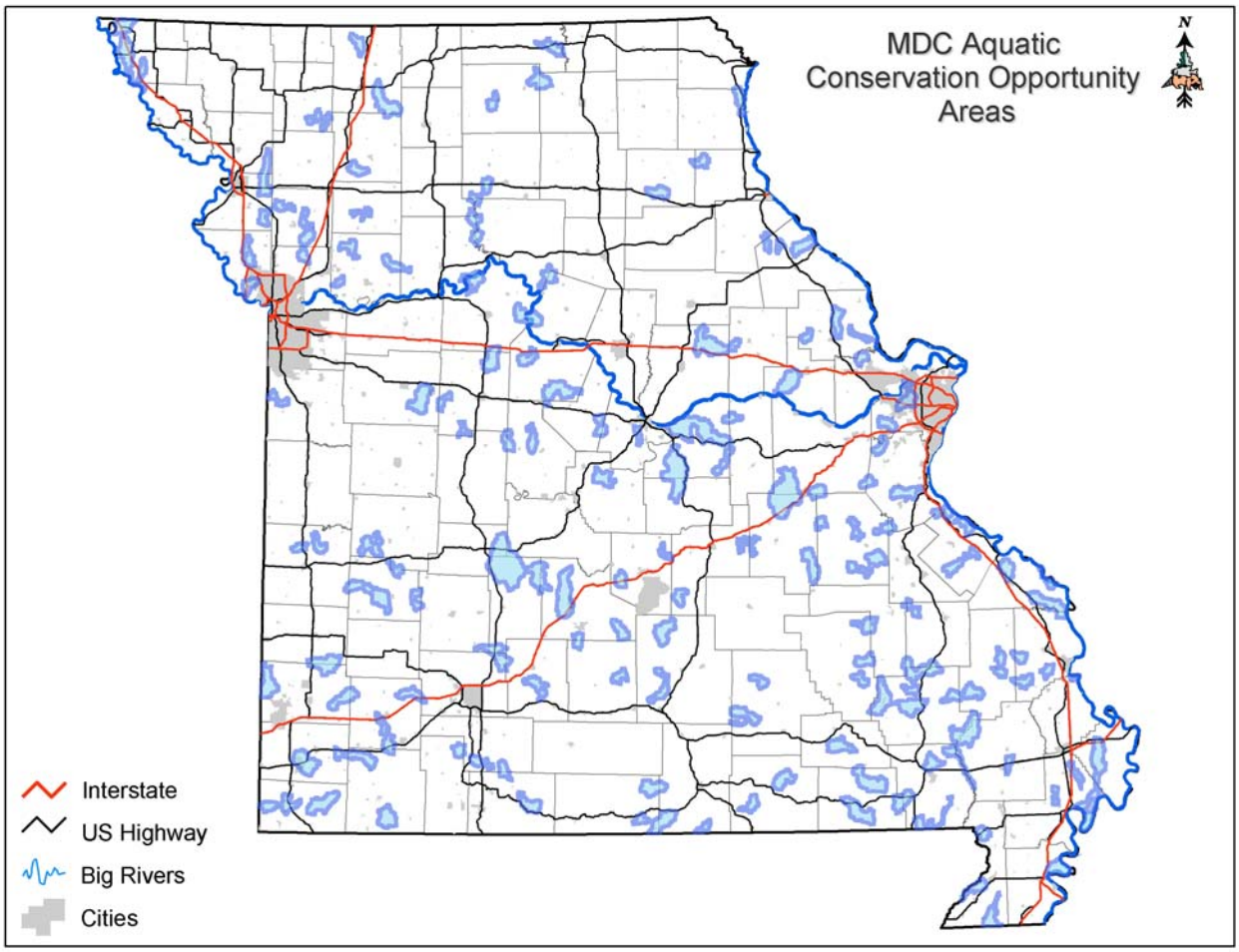
Chris Wieberg
Resource Science 2/04

Appendix H. Conservation Opportunity Spatial Data Layers (MDC and Partners)

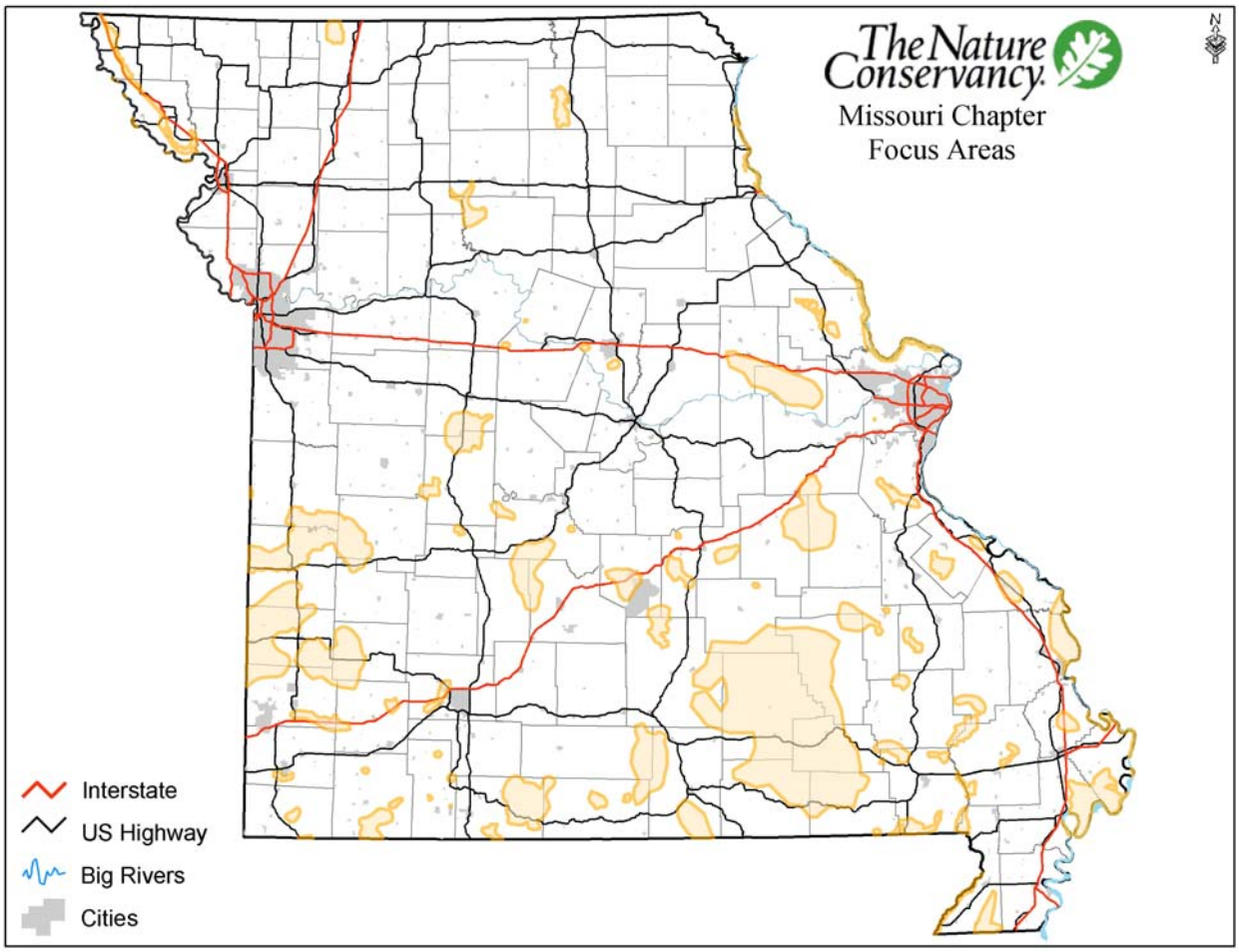
Missouri Department of Conservation, Terrestrial Conservation Opportunity Areas
Geographies that best represent the native ecosystems, species and ecological processes of all Landtype Association Types (LTA Types) in all of Missouri's Ecological Sections.
Source: Tim Nigh, Missouri Department of Conservation



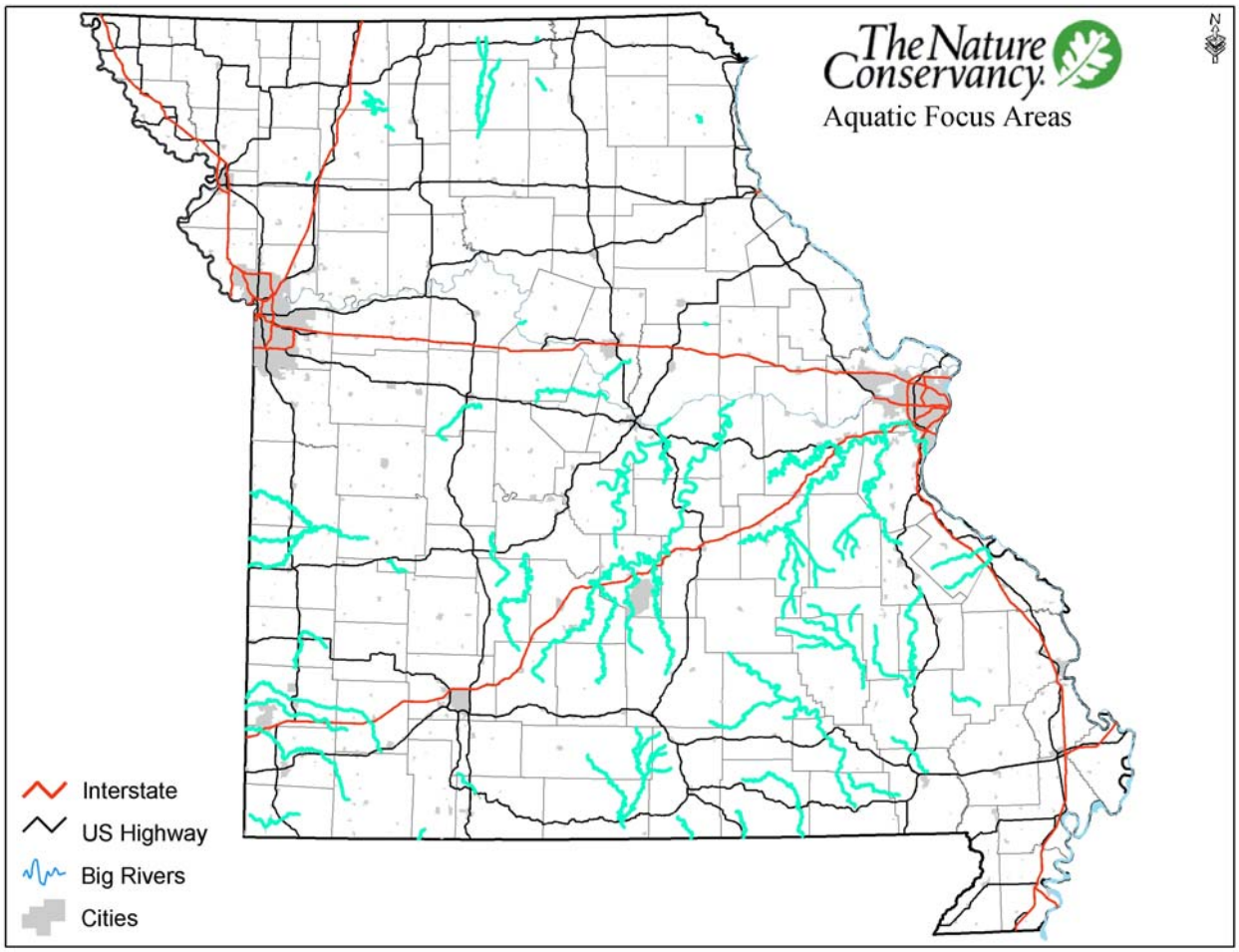
Missouri Department of Conservation, Aquatic Conservation Opportunity Areas
These geographies represent small watersheds to focus efforts to conserve native aquatic plant and animal communities, and the processes that sustain them.
Source: Tim Nigh, Missouri Department of Conservation



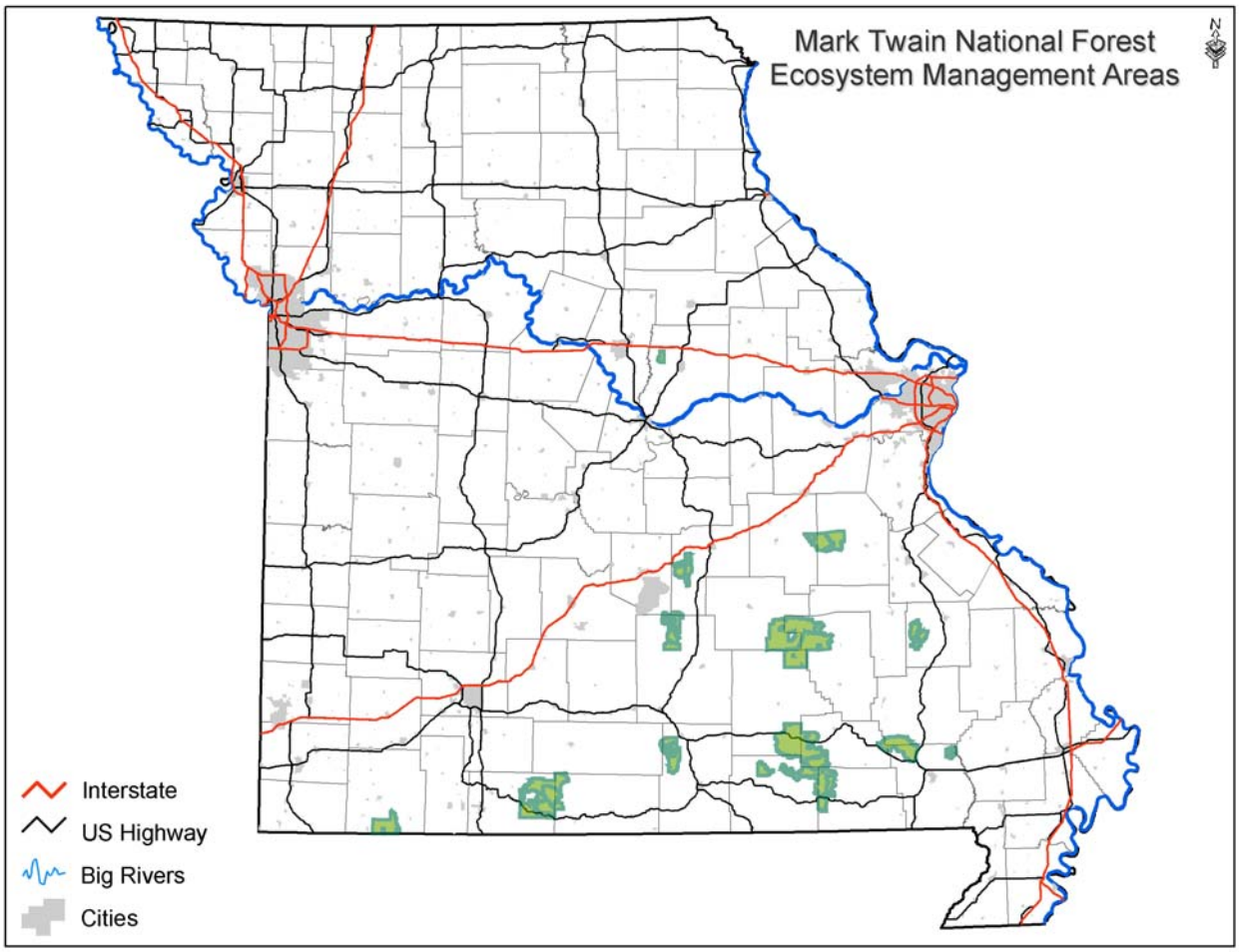
The Nature Conservancy, Ecoregional Portfolio Sites
These areas identify the globally significant species, natural communities and ecological systems in each of four ecoregions of Missouri.
Source: Adrian Brown, The Nature Conservancy



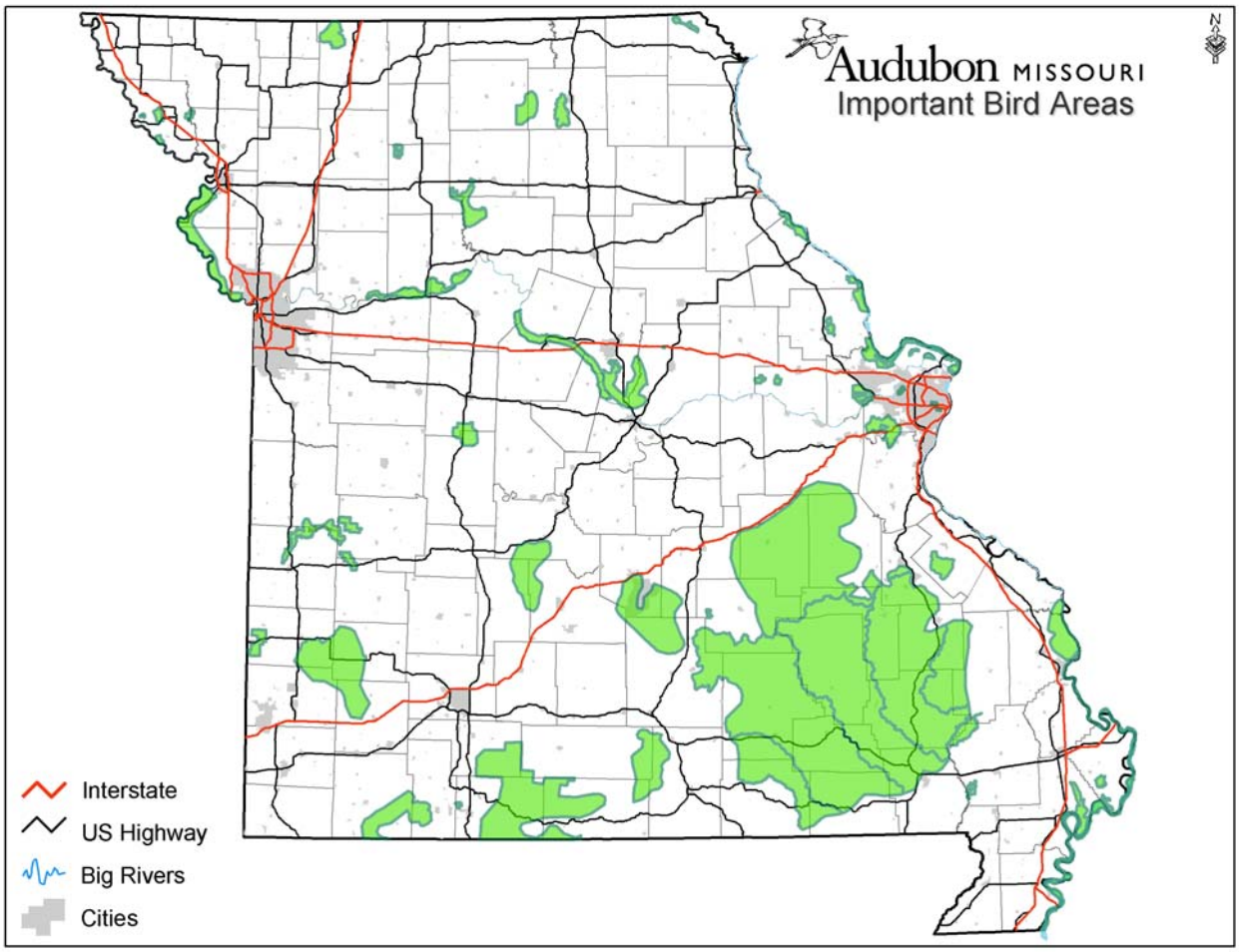
The Nature Conservancy, Aquatic Priority Sites
These areas identify globally significant aquatic species, natural communities and ecological systems.
Source: Adrian Brown, The Nature Conservancy



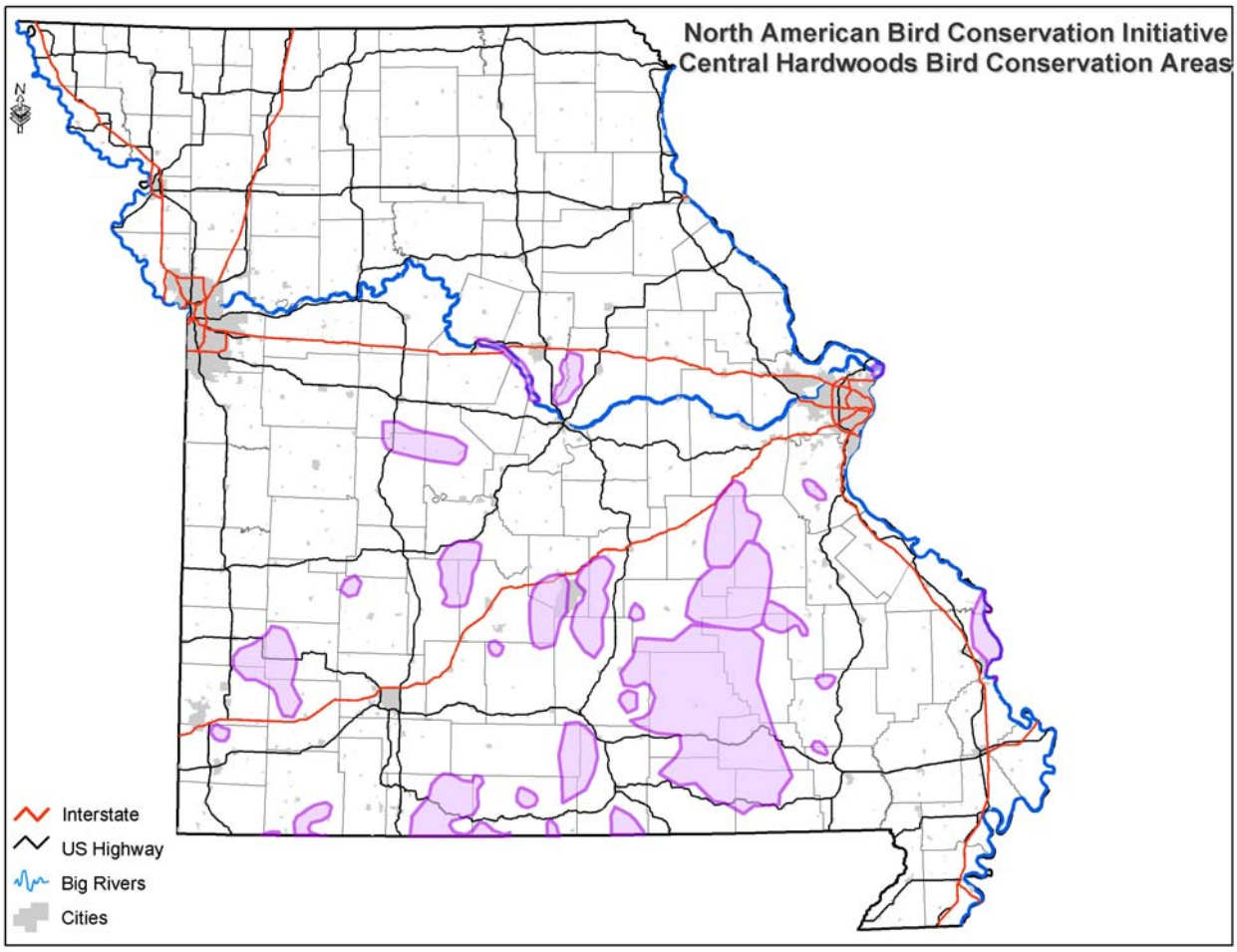
Mark Twain National Forest, Ecosystem Management Areas
Draft ecosystem management units within Mark Twain National Forest; part of the 2005 Forest Service Plan.
Source: Paul Nelson, Mark Twain National Forest



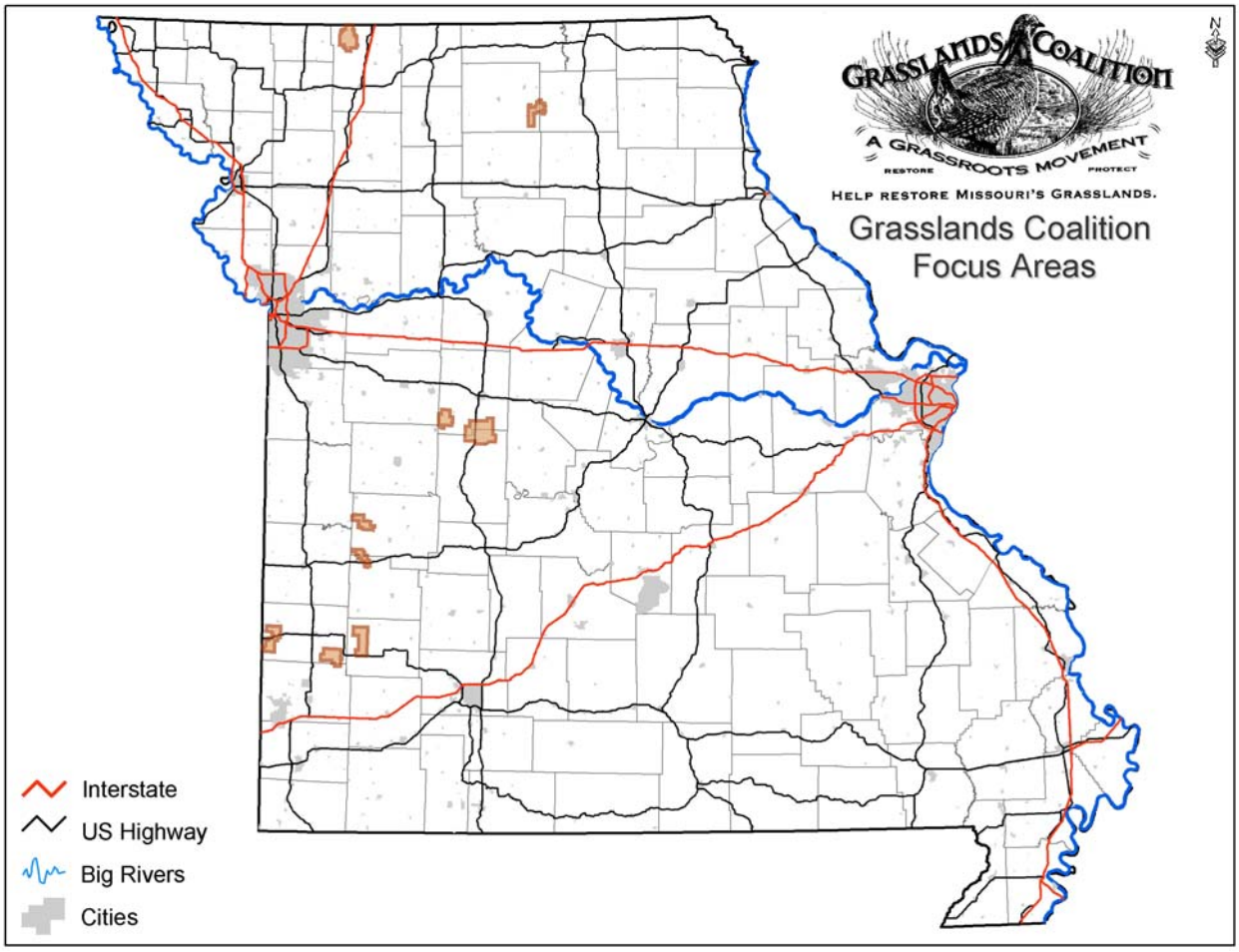
Missouri Audubon, Important Bird Areas (IBAs)
The IBA program is a global effort to identify the areas that are the most important for maintaining bird populations, and to focus conservation efforts on these areas.
Source: Andy Forbes, Missouri Audubon



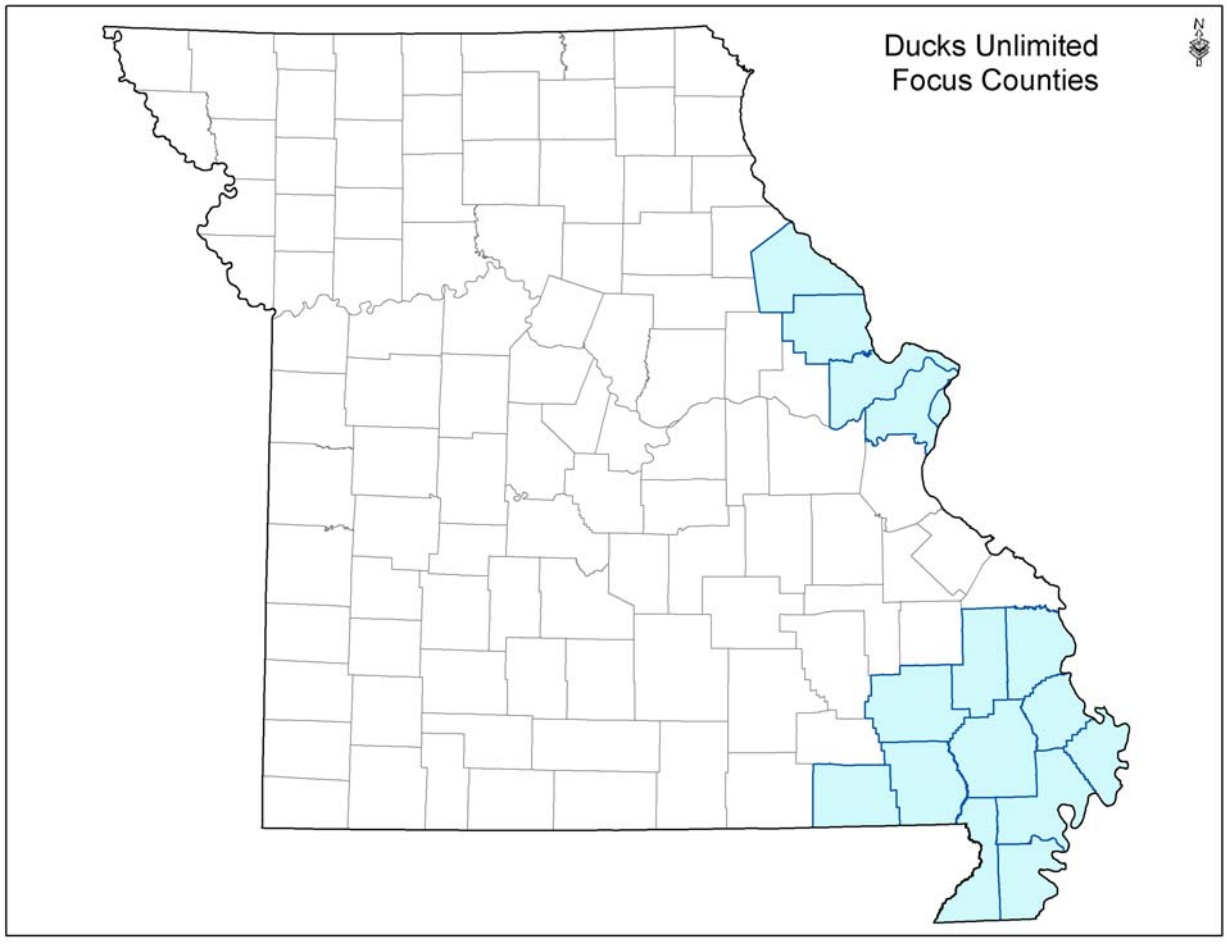
Central Hardwoods Joint Venture
These areas represent sites for bird conservation in the Central Hardwoods Bird Conservation Region.
Source: Jane Fitzgerald, American Bird Conservancy



Grassland Coalition Focus Areas
The Grasslands Coalition (GC) is a public-private partnership for grassland wildlife conservation, using the prairie chicken as a key indicator of grassland health. In 1998, the Coalition identified nine Focus Areas in Missouri in which to concentrate their resources to benefit grassland restoration and wildlife habitat.
Source: Max Allegar, Missouri Department of Conservation



Ducks Unlimited Focus Areas
Priority counties for wetland restoration.
Source: Ducks Unlimited

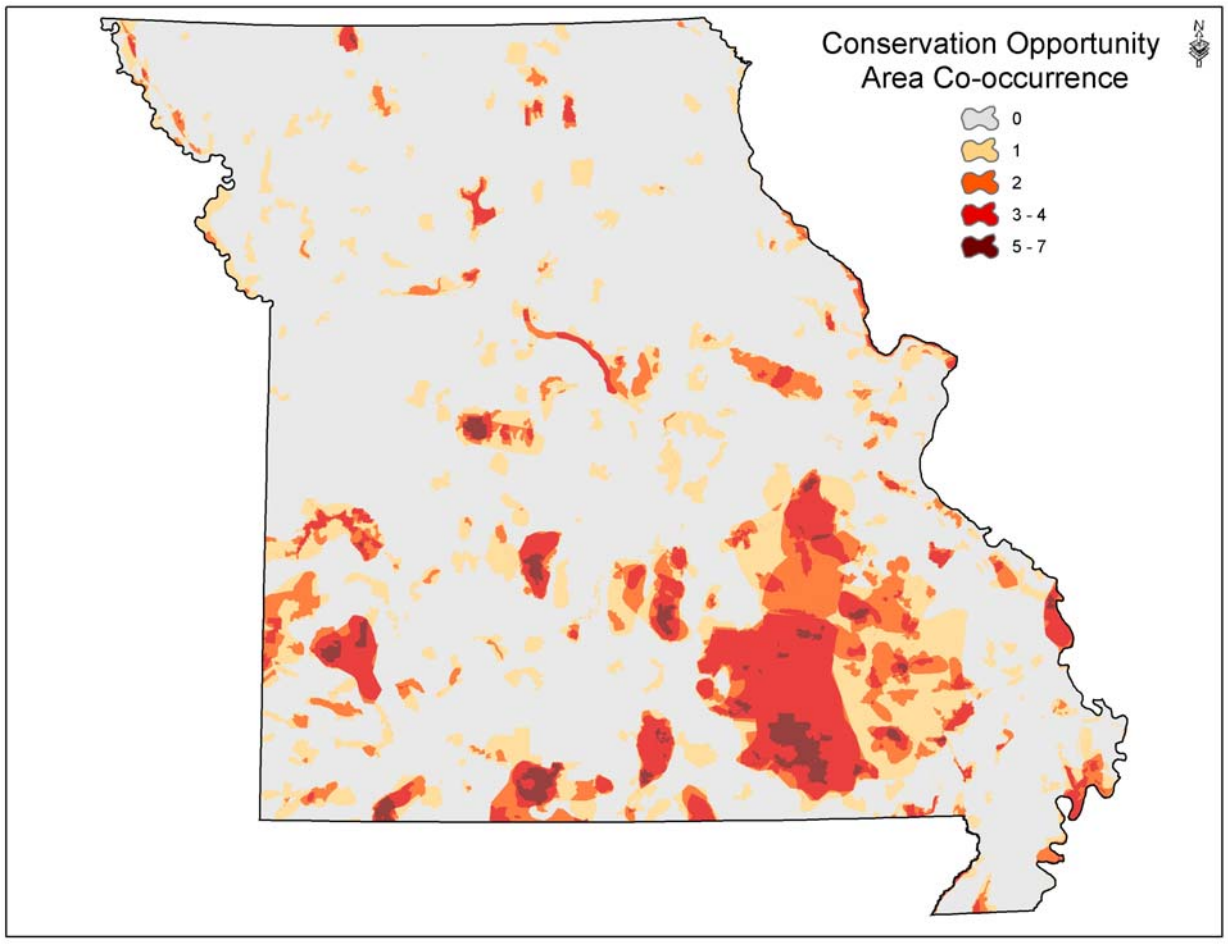


Appendix I. Conservation Opportunity Area Co-Occurrence

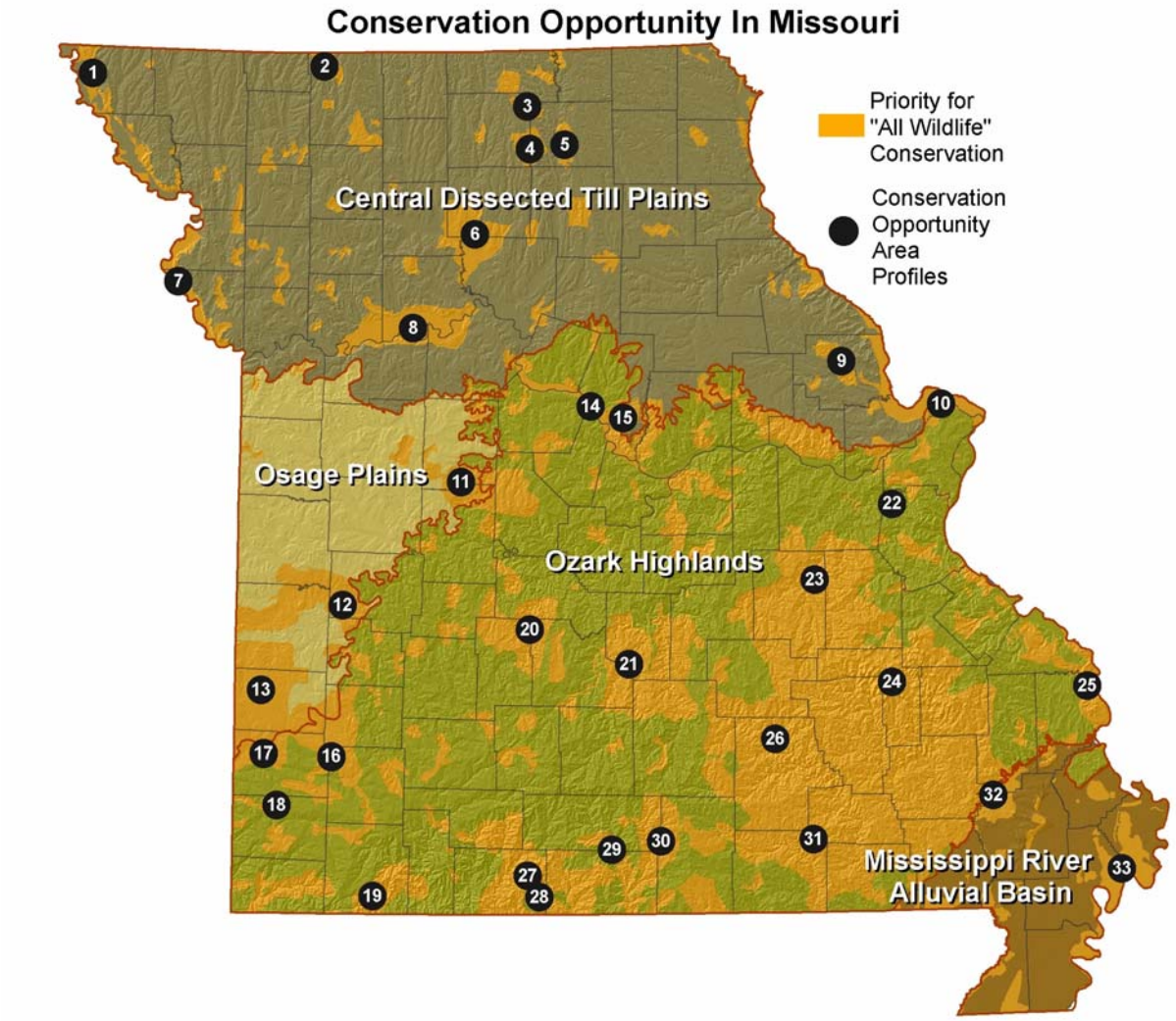
This is a dataset that combines the following focus areas:

- Missouri Department of Conservation, Terrestrial Conservation Opportunity Areas
- Missouri Department of Conservation, Aquatic Conservation Opportunity Areas
- The Nature Conservancy, Ecoregional Portfolio Sites
- The Nature Conservancy, Aquatic Priority Site
- Mark Twain National Forest, Ecosystem Management Areas
- Central Hardwoods Joint Venture
- Missouri Audubon, Important Bird Areas

The darker the color, the more layers that overlap; or in theory, the more partners that want to work together in that geography.



Appendix J. Conservation Opportunity in Missouri



Central Dissected Till Plains

1 - Loess Hills
2 - Grand River Grasslands
3 - Union Ridge
4 - Mystic Plains
5 - Thousand Hills
6 - Lower Grand River
7 - Iaton / Weston Missouri River Corridor
8 - Wakenda Bottoms
9 - Cuivre River Hills
10 - Missouri / Mississippi River Confluence

Osage Plains

11 - Cole Camp / Hi Lonesome
12 - Marmaton / Wah'Kon-Tah
13 - Western Cherokee Grasslands

Ozark Highlands

14 - Manitou Bluffs
15 - Bonne Femme Karst
16 - Golden Grasslands
17 - Spring River
18 - Shoal Creek
19 - Roaring River
20 - Niangua Basin
21 - Upper Gasconade
22 - LaBarque Creek Watershed
23 - Middle Meramec
24 - St. Francis Knobs
25 - Cape Hills
26 - Current River Hills
27 - White River Glades and Woodlands
28 - Tumbling Creek Cave Ecosystem
29 - Bryant Creek
30 - North Fork
31 - Eleven Point Hills

Mississippi River Alluvial Basin

32 - Mingo Basin
33 - River Bends

Modified 2001-2006 T&E Species Action Plans
July 2005-June 2006

PLANTS

Common name: **Decurrent false aster**	Scientific Name: *Boltonia decurrens*
State Status: Endangered	Federal Status: Threatened
Goals: Management and Protection	Recovery Leader: Mike Arduser

The two known populations on public land in eastern St. Charles County have been monitored about 5 times in the last 10 years and are relatively secure. Both sites are owned by the U.S. Corps of Engineers (COE) and have management plans. Under the Federal Recovery Plan (1990), Missouri has met several of the objectives that will lead to recovery of this species. In the next five years the Department plans to

- maintain suitable habitat for the decurrent false aster on General Plan Lands owned by the COE and managed by MDC
- work with partners to assist in the implementation of the COE Decurrent False Aster Management Plan for Riverlands Environmental Demonstration Area
- continue to collaborate with MO Dept of Transportation (MODOT) to implement their 5-yr mitigation plan at West Alton as part of the Spatterdock Bottoms population
- monitor each of the two known populations at least once, and if population has declined, repeat the following year
- contact private landowners near known populations to conduct surveys and provide management guidelines when needed
- collaborate with Illinois agencies/institutions on a unified monitoring and research program

Common name: **Geocarpon**	Scientific Name: *Geocarpon minimum*
State Status: Endangered	Federal Status: Threatened
Goals: Monitor and Management	Recovery Leader: Tim Smith

There are 24 extant populations in Missouri that are secure and with no immediate threats to most populations. The federal Recovery Plan was finalized in 1993. During the next five years the Department plans to

- annually monitor two populations on public lands (COE and MODOT), St. Clair and Dade counties
- update the status of at least one population per year
- conduct surveys for new populations around Truman Lake in Henry County
- collaborate with Central MO State University to monitor the Flint Hill Glades population (Dade Co.) and publish data from the past 10 years.
- continue to work with COE and MODOT to advise on management and protection strategies for populations found on their property

- cooperate with the Center for Plant Conservation (CPC) to conduct genetic studies on Missouri populations
- work with regional biologists and resources managers to work with private landowners to develop voluntary management/conservation agreements
- investigate opportunities to collaborate with TNC on statewide monitoring efforts
- implement the Section 6 project:

  E-1-43: The Status and Viability of Populations of Three Federally Listed Plants in Missouri

Common name: **Hall's bulrush**	Scientific Name: *Schoenoplectus hallii*
State Status: Species of Concern	Federal Status: Region 3 Species of Concern
Goals: Monitor, Research, and Protection	Recovery Leader: Bob Gillespie

Although widely distributed, this species is rare throughout its range due to habitat specificity. A status review has been completed, and this species may be considered for candidate status. In Missouri, Hall's bulrush is known from two sites in Howell County and one site in Scott County. All three sites are on private land, and in 2000, one of the sites disappeared, probably due to drought conditions. It is unknown whether the population is extirpated or whether there is a sufficient seed bank to naturally re-establish the population under improved conditions. In the next five years, the Department plans to

- consider land acquisition within the sand prairie region of southeast Missouri or investigate alternative protection methods such as voluntary conservation easements, or pre-listing agreements with private landowners
- visit private land populations every other year to assess status
- develop Best Management Practices based on results from Section 6 study
- offer field identification training to field biologists and other resource managers, including Westvaco biologists
- collect seed or plants from one established population and plant at a more secure site
- work with Westvaco to establish a population on their land in Scott County

Common name: **Mead's milkweed**	Scientific Name: *Asclepias meadii*
State Status: Endangered	Federal Status: Threatened
Goals: Monitor and Management	Recovery Leader: Emily Kathol

Although additional populations have been discovered in recent years, the long-term condition of many populations in Missouri is not clear and many of the Missouri populations are not sexually reproducing. About half of populations in Missouri (29 of 59 known populations) are protected on publicly managed land or by a conservation organization. During the next five years the Department plans to

- annually monitor populations on Paint Brush Prairie Natural Area in Pettis County to evaluate and determine Best Management Practices and cooperate with monitoring and restoration efforts by The Nature Conservancy (TNC) on Wah-Kon-Tah Prairie and other sites

- update the status of known populations in MO
- request the Service to finalize the federal Recovery Plan and assist with its implementation
- train field biologists and other resource managers on proper identification
- establish a Mead's milkweed working group to share information and recommend research, monitoring and management efforts
- initiate and implement the Section 6 project:

  E-1-43: The Status and Viability of Populations of Three Federally Listed Plants in Missouri

Common name: **Missouri bladderpod**	Scientific Name: *Lesquerella filiformis*
State Status: Endangered	Federal Status: Threatened
Goals: Survey, Monitor and Management	Recovery Leader: Mike Skinner

Urbanization, woody plant encroachment, and competition with exotic plants are impacting some populations, but the populations appear to be stable. The federal Recovery Plan was completed in 1988, and in 1998 MDC petitioned the FWS to reclassify this species as Threatened. The reclassification took place in 2003. During the next five years the Department plans to

- annually monitor populations at Rocky Barrens CA in Green County to track population trends and evaluate the effects of management
- update the status of at least 10 populations per year, so that all 50 populations are visited in the next 5 years
- conduct annual prescribed burns on Rocky Barrens CA and Bois D'Arc CA during August if possible
- train field biologists and other resource managers on proper identification and management
- continue work on elimination of sericea and Johnson grass infestations at Rocky Barrens CA
- initiate and implement the Section 6 project:

  E-1-43: The Status and Viability of Populations of Three Federally Listed Plants in Missouri

Common name: **Pondberry**	Scientific Name: *Lindera melissifolia*
State Status: Endangered	Federal Status: Endangered
Goals: Monitor and Management	Recovery Leader: Tim Smith

This species is known to occur in scattered populations across the southeastern US. The only natural population in Region 3 occurs in southern Missouri in Butler County. The federal Recovery Plan was completed in 1993. In the next five years the Department plans to

- monitor every other year the experimental population of seedlings on Corkwood CA in Ripley County
- annually update the status of the natural population on Sand Pond CA and Nancy B. Altvater Pondberry Preserve (TNC)

- train regional foresters to identify this species and look for them in southeast Missouri

Common name: **Running buffalo clover**	Scientific Name: *Trifolium stoloniferum*
State Status: Endangered	Federal Status: Endangered
Goals: Monitor, Management, and Education	Recovery Leader: Tim Smith

Missouri is on the western edge of the range of this species and has two small natural populations, one on private land in Madison County, and one on public land in Maries County. In addition, more than 25 experimental plantings on MDC land have been attempted but few have persisted. In the mid-1990s, state representatives met with the Service to review the federal Recovery Plan and provide updated criteria for recovery. Because it appeared this species was doing well in most of its range, it was recommended that this species be reclassified as Threatened. In the next five years, the Department plans to

- annually monitor the remaining experimental populations
- annually monitor the two naturally occurring populations
- distribute identification materials and offer identification training to field biologists and other resource managers

Common name: **Western prairie fringed orchid**	Scientific Name: *Platanthera praeclara*
State Status: Endangered	Federal Status: Threatened
Goals: Monitor and Management	Recovery Leader: Tom Nagel

Three extant populations are known from Missouri. All three populations are on property owned and managed by MDC in Harrison, Atchison, and Holt counties. Controlled greenhouse experiments have been conducted to determine seed germination success and other life history parameters that may aid in future reintroduction efforts. The federal Recovery Plan was completed in 1996. In the next five years the Department plans to

- annually monitor all three sites to establish long term population trends (Tarkio Prairie CA, Little Tarkio Prairie CA, and Helton Prairie NA)
- encourage Best Management Practices on all three sites
- buffer existing native prairies where this species occurs by establishing and maintaining prairie reconstruction at sites nearby with native ecotype seed
- search for remnant quality prairies in north and southwest Missouri and provide management assistance to willing landowners if new populations of this species are discovered on private land
- if new populations are discovered on private lands**,** when possible, develop safe harbor agreements with private landowners to restore suitable habitat
- in partnership with TNC, inventory for the species on Pawnee Prairie CA and Dunn Ranch Preserve

Common name: **Virginia sneezeweed**	Scientific Name: *Helenium virginicum*

State Status: Species of Concern	Federal Status: Threatened
Goals: Survey, Protection, and Education	Recovery Leader: Rhonda Rimer

Contingent upon resolution of lingering taxonomic questions, there is one potential location of this species in Missouri in Howell County on private land and highway right-of-way. In the next five years the Department plans to

- conduct additional surveys in sinkhole ponds and wet meadows in region
- inform and provide technical assistance to private landowners
- cooperate with CPC to protect the species through seed and living collections
- monitor reintroduced populations on public land in the area
- produce informational brochures
- offer identification training to field biologists and other resource managers
- review and publish current data
- convene a meeting with state experts to discuss future recovery actions

MOLLUSKS

Common name: **Curtis' pearlymussel**	Scientific Name: *Epioblasma florentina curtisi*
State Status: Endangered	Federal Status: Endangered
Goals: Survey	Recovery Leader: Steve McMurray

This species is known only from Missouri and Arkansas and is extremely rare in both states. In Missouri, its total range in 1980 was less than 14 miles of streams and has continued to decline throughout the 1980s. Only one male has been found since 1993, despite several search attempts. It is assumed extirpated from the state and is on the brink of extinction. In the next five years the Department plans to

- participate in a survey of selected watersheds in Arkansas and Missouri within the historic range of Curtis' pearlymussel to determine if it still exists in the last potential locations for this species, and if found, develop a protection and propagation plan for future reintroductions.

Common name: **Fat pocketbook mussel**	Scientific Name: *Potamilus capax*
State Status: Endangered	Federal Status: Endangered
Goals: Survey and Protection	Recovery Leader: Steve McMurray

In the 1980s, an experimental population of fat pocketbook mussels introduced into the Mississippi River was largely unsuccessful. In 1997, a small population was rediscovered from a three mile stretch of the Belle Fountain Ditch in southern Dunklin County in the Bootheel. During the next five years the Department plans to

- reassess and monitor the Belle Fountain Ditch population found in 1997 and develop a protection plan with the appropriate Drainage District
- evaluate the potential for artificial propagation or augmentation

Common name: **Neosho mucket**	Scientific Name: *Lampsilis rafinesqueana*
State Status: Species of Concern	Federal Status: Candidate
Goals: Research and Management	Recovery Leader: Scott Faiman

The Neosho mucket was added to the FWS Candidate List in 2001 due to declining numbers. Although its threats are not fully understood, captive propagation techniques have been determined and augmentation of juveniles back into streams is possible. During the next five years the Department plans to

- coordinate with researchers to determine fish host and other life history parameters necessary for artificial propagation and augmentation of non-reproducing populations

E-1-42: Propagation and Restoration of Mussel Species of Concern

- identify areas in Missouri where otters or other predators are posing threats to existing populations of Neosho muckets. If such areas are located, monitor some of these areas on annual basis to determine survivorship of marked individuals. If compatible, use this study to monitor key populations of Neosho muckets.
- identify other threats to key populations of Neosho muckets and general threats to watersheds containing Neosho muckets.

Common name: **Pink mucket**	Scientific Name: *Lampsilis abrupta*
State Status: Endangered	Federal Status: Endangered
Goals: Survey and Research	Recovery Leader: Steve McMurray

The status of populations in select watershed basins in Missouri has been recently assessed and additional surveys are needed. Future status assessments should include information on reproductions and recruitment to identify populations which may benefit from artificial propagation and augmentation. During the next five years the Department plans to implement the following actions outlined in the 1985 federal Recovery Plan:

- coordinate with researchers to determine fish host and other life history parameters necessary for artificial propagation and augmentation of non-reproducing populations

E-1-42: Propagation and Restoration of Mussel Species of Concern

- assess the current status in the lower Osage River below Bagnell Dam
- provide technical guidance to AmerenUE, a private electric company, during the federal relicensing process to protect and enhance populations impacted by Bagnell Dam
- monitor selected populations in parts of the lower Meramec River

Common name: **Scaleshell**	Scientific Name: *Leptodea leptodon*
State Status: Endangered	Federal Status: Endangered
Goals: Research and Management	Recovery Leader: Rob Pulliam

The final rule listing the scaleshell mussel as endangered was published in 2001. It is found in the Meramec, Gasconade, and Missouri Rivers. In the next five years the Department plans to

- coordinate with researchers to determine fish host and other life history parameters necessary for artificial propagation and augmentation of non-reproducing populations

E-1-42, Propagation and Restoration of Mussel Species of Concern

- initiate restoration and evaluation efforts with landowners on the Little Bourbeuse River Brush Creek, and Lick Creek Watersheds and implement Best Management that will improve downstream habitat for the scaleshell
- monitor select populations in the lower Meramec and/or Gasconade rivers
- provide technical guidance to AmerenUE, a private electric company, during the federal relicensing process to protect and enhance populations impacted by Bagnell Dam operations

Common name: **Sheepnose**	Scientific Name: *Plethobasus cyphyus*
State Status: Endangered	Federal Status: Candidate
Goals: Surveys, Research, Management	Recovery Leader: Kenda Flores

The sheepnose, already state listed as endangered, was listed as a FWS candidate species in May, 2004. In Missouri, it is found in the Meramec, Bourbeuse, and Osage Fork of the Gasconade rivers. Found in other states as well, the sheepnose has been eliminated from two-thirds of the streams from which it was historically known and only four of the remaining populations appear to be viable. In the next five years the Department plans to

- survey for new populations and revisit/monitor previously known populations when possible
- initiate discussions with FWS and state mussel experts on potential threats to this species in Missouri and identify restoration efforts with landowners to apply Best Management Practices on private property where appropriate
- determine the need to further identify host species and initiate artificial propagation efforts
- gather information pertinent to Missouri populations to determine high priority recovery actions

Common name: **Snuffbox**	Scientific Name: *Epioblasma triquetra*
State Status: Endangered	Federal Status: Species of Concern
Goals: Research	Recovery Leader: Steve McMurray

In March 2000, this species was added to the Missouri endangered species list. Rare throughout its range, it is a federal species of concern. The range of the snuffbox was once widespread, but in the last 50 years, its range has shrunk. In Missouri, there are fewer than an estimated 1000 individuals remaining. In the next five years the Department plans to

- coordinate with FWS, other agencies, and universities to develop artificial propagation techniques in MDC hatcheries, and if successful, augment the snuffbox population in the Bourbeuse River.
- initiate watershed restoration projects with private landowners to implement Best Management Practices that will improve habitat for snuffbox mussels.

- monitor selected populations in parts of the lower Meramec River.

Common name: **Spectaclecase**	Scientific Name: *Cumberlandia monodonta*
State Status: Species of Concern	Federal Status: Candidate
Goals: Surveys and Management	Recovery Leader: Rob Pulliam

The spectaclecase was listed as a FWS candidate species in May, 2004. In Missouri, it is found in the Meramec, Bourbeuse, Big, Big Piney, Gasconade, and Osage Fork of the Gasconade rivers. The spectaclecase was historically known from 45 streams in 15 states, but is now only known from 20 streams in 10 states. Of the 20 streams, 7 represent records of single specimens. In the next five years the Department plans to

- survey for new populations and revisit/monitor previously known populations when possible
- initiate discussions with FWS and state mussel experts on potential threats to this species in Missouri and identify restoration efforts with landowners to apply Best Management Practices on private property where appropriate
- determine the need to further identify host species and initiate artificial propagation efforts
- gather information pertinent to Missouri populations to determine high priority recovery actions

Common name: **Tumbling Creek Cavesnail**	Scientific Name: *Antrobia culveri*
State Status: Endangered	Federal Status: Endangered
Goals: Monitor and Protection	Recovery Leader: Bill Elliott

This troglobitic snail is restricted to one location in Missouri on private property. Populations appear to have declined despite considerable protection by a conservation minded private landowner. During the next five years the Department plans to

- investigate other caves and groundwater habitats in surrounding areas for TCCS
- investigate potential threats to the cave and species

E-1-41, Tumbling Creek Survey and Contaminant Study

- coordinate with FWS, the Ozark Underground Laboratory, and Missouri Western State College to conduct population monitoring and life history studies
- continue census work on gray bats in Tumbling Creek Cave
- collaborate with NRCS/SWCD/FWS to implement Best Management Practices along private stream frontage in the Tumbling Creek Cave recharge area
- investigate long term land protection options in the Tumbling Creek Cave recharge area (conservation easements, additional acquisitions)

Common name: **Winged mapleleaf**	Scientific Name: *Quadrula fragosa*
State Status: Endangered	Federal Status: Endangered

Goals: Survey	Recovery Leader: Steve McMurray

The winged mapleleaf has not been found in Missouri since 1920 despite a limited survey conducted in northeastern Missouri in 1991. In June 2000, a live individual that looks very much like the listed species was found in the Bourbeuse River. Positive identification has not yet been confirmed through genetic analysis. Given the possibility that positive identification of the above-mentioned specimens may be forthcoming, in the next five years the Department plans to

- conduct more surveys in appropriate habitat throughout the historic range if specimen is verified as *Q. fragosa*

INSECTS

Common name: **American burying beetle**	Scientific Name: *Nicrophorus americanus*
State Status: Endangered	Federal Status: Endangered
Goals: Survey	Recovery Leader: Mike Arduser

The American burying beetle was federally listed Endangered in 1989, and at that time was known only from Rhode Island and Oklahoma. In Missouri, the last American burying beetle specimens reported from the state were collected in Newton County in the mid-1970s and in Jasper County in the early 1980s. A very limited survey in the late 1980s was unsuccessful at relocating this species, as was a more intensive survey effort on prairie remnants in southwest Missouri in 2001. Since 1989, intensive survey efforts have successfully located the species in several Midwest states, including Kansas, Arkansas, Nebraska and South Dakota. Continued intensive survey efforts in Missouri could identify existing populations. In the next five years the Department plans to:

- coordinate surveys with universities, zoos, museums, or qualified individuals for the American burying beetle following techniques used by biologists in Arkansas, Kansas and Nebraska
- if found, conduct population assessment(s) of American burying beetle at extant sites
- if found, conduct long-term monitoring (i.e., five years as identified in recovery plan) of selected sites as appropriate
- conduct identification training for field biologists and other natural resource managers
- draft plan, and if feasible, initiate reintroduction in Missouri

Common name: **Hine's emerald dragonfly**	Scientific Name: *Somatochlora hineana*
State Status: Endangered	Federal Status: Endangered
Goals: Survey, Research, and Education	Recovery Leader: Bob Gillespie

The Hine's Emerald Dragonfly was federally listed in January 1995, and at that time, it was only known from Illinois, Michigan, and Wisconsin. In June 1999, the Hine's Emerald was discovered in Reynolds County, MO (Grasshopper Hollow Natural Area) and resurveyed and

verified in August 2000 and June 2001. In July 2001, two new populations were discovered in Reynolds County. In the next five years the Department plans to

- conduct additional surveys in suitable habitat

  SE-1-40, Hine's Emerald Dragonfly: search for additional populations and confirmation of larval use at new and existing sites
- coordinate with TNC to protect recharge areas of Grasshopper Hollow State Natural Area through acquisition, conservation easements, or conservation management agreements
- utilize existing private landowner incentive programs for the protection of privately owned deep muck fens through fencing and Alternative Watering Systems where appropriate
- determine the life history, demography, and habitat use of the Hine's emerald dragonfly and related Somatochlora dragonflies in Missouri
- conduct morphological and genetic studies within and between populations and genera
- determine potential adverse impacts to adults or larvae
- develop educational materials and fen management guidelines for private landowners
- Actively participate as a member of the Hine's Emerald Recovery Team
- offer identification training to field biologists and other resource managers

FISH

Common name: **Arkansas darter**	Scientific Name: *Etheostoma cragini*
State Status: Species of Concern	Federal Status: Candidate
Goals: Survey and Management	Recovery Leader: Tim Banek

The Arkansas darter is widespread and common in small streams of southwest Missouri, and there is no indication of a recent general decline in distribution or abundance and is apparently secure within the state. However, anticipated increases in urbanization and livestock production may affect it in the future. In the next five years the Department plans to

- co-host a meeting with FWS to discuss the status and management of the Arkansas darter among agency and university personnel from each of the five states within the Arkansas darter's range
- continue to improve habitat quality in the Spring River basin through riparian and watershed management
- request that FWS review the status of this species for potential removal from the Candidate List or request guidance for actions that would contribute to future removal of Arkansas darters from the Candidate list

Common name: **Crystal darter** **Longnosed darter**	Scientific Name: *Crystallaria asprella* *Percina nasuta*
State Status: Endangered	Federal Status: Region 3 Species of Concern

Goals: Survey	Recovery Leader: To Be Determined

Neither of these species has ever been common. Surveys conducted during the summers of 1999 and 2000, 11 crystal darters were collected in the Black River, 13 in the Meramec River, and 2 in the Gasconade River. Longnosed darters were historically known from the White River in Taney and Stone Counties (now covered by Table Rock and Bull Shoals reservoirs) and from the middle St. Francis River. In 2003, 30 sites on the St. Francis River were sampled and 12 adults, 1 juvenile longnose darters were collected. In the next five years the Department plans to:

- initiate and/or continue surveys in the known range of both darters to assess the extent of occurrence of these species
- develop and implement a monitoring plan
- train staff fisheries biologists in identification for future survey and monitoring efforts
- identify threats (sources of sedimentation?) and develop appropriate actions to alleviate threats
- determine future needs for these species

Common name: **Flathead chub**	Scientific Name: *Platygobio gracilis*
State Status: Endangered	Federal Status: Region 3 Species of Concern
Goals: Survey	Recovery Leader: Vince Travnichek

This species has been declining from Missouri River tributaries since the 1980's, although it seems to be more stable in neighboring states. In the next five years the Department plans to

- conduct a status survey using the newly developed BENTHIC trawl method on the Mississippi and Missouri Rivers
- formulate a 10-year species plan in conjunction with the U.S. Geological Survey (USGS), COE, and the Service
- cooperate with COE to promote and assist in restoration of suitable habitat in Mississippi and Missouri River side channels

Common name: **Grotto Sculpin**	Scientific Name: *Cottus sp., sp. nov*
State Status: Species of Concern	Federal Status: Candidate
Goals: Management and Protection	Recovery Leader: Brad Pobst

The Grotto sculpin, endemic to caves in Perry County, was listed as a federal candidate species in 2002 and assigned a priority number of 2. Due to the unstable nature of the cave environment in Perry County it is imperative to understand the basic biology of Grotto sculpins and the factors influencing their ability to repopulate caves in response to catastrophic event (e.g., a contaminant spill). During the next two years the Department plans to

- begin a long term water quality monitoring project in four know caves that have populations of Grotto sculpins

- develop and implement project to determine population size and habitat use of Grotto sculpins
- develop and implement project to quantify movement of individuals within a cave system
- secure funding to determine the genetic structure of Grotto sculpins in different cave systems
- secure funding to provide a more complete picture of groundwater connectivity
- secure funding for further recharge area evaluations
- work with the grotto clubs and invite them to participate in the recovery effort

Common name: **Lake Sturgeon**	Scientific Name: *Acipenser fulvescens*
State Status: Endangered	Federal Status: None
Goals: Management	Recovery Leader: Brian Todd

Lake sturgeon historically occupied the Missouri and Mississippi River drainages but sightings continued to decline throughout the 1900's. The species is long-lived with some individuals exceeded 100 years and a weight of 200 pounds or more. They do not become sexually mature until approximately age 20. MDC began stocking this species in the mid-1980's. To date, over 300,000 fingerlings have been reintroduced into the Mississippi and Missouri rivers. However, the population is still not self-sustaining. In the next five years the Department plans to

- track radio-tagged lake sturgeon and implant more sexually mature male lake sturgeon with radio transmitters to identify spring spawning sites and rest-of-year habitat use
- stock a target of 25,000 fingerlings annually
- revise state regulations for protection of this species
- initiate an awareness and appreciation campaign
- conduct further work on the development of a sampling protocol to assess the population
- cooperate with existing University of Missouri paddlefish study to include lake sturgeon as part of their study

Common name: **Neosho madtom**	Scientific Name: *Noturus placidus*
State Status: Endangered	Federal Status: Threatened
Goals: Monitor and Management	Recovery Leader: Doug Novinger

The federal Recovery Plan was completed in 1991. Only a small portion of the Neosho madtom range occurs in Missouri in Spring River, and populations are small but presumably vulnerable. Efforts are underway to improve water quality in the Spring River watershed. During the next five years the Department plans to

- monitor the presence of this species in the lower Spring River
- investigate the possibility of using artificial riffles to reestablish habitat for Neosho madtoms
- complete the MO Department of Natural Resources/EPA Section 319 project in the Spring River Basin to improve water quality
- promote Best Management Practices throughout the basin

Common name: **Niangua darter**	Scientific Name: *Etheostoma nianguae*
State Status: Endangered	Federal Status: Threatened
Goals: Monitor, Research, and Management	Recovery Leader: Craig Fuller

This species is endemic to the Osage River basin of the Ozarks and protection and recovery opportunities for the species are restricted to Missouri. Recovery of this species is being led by Craig Fuller, Recovery Team Leader, fisheries biologists in the Southwest, Kansas City and Central Regions, and biologists in the Resource Science Division. The federal Recovery Plan was completed in 1989 and critical habitat was designated. In 1998, a Section 6 study was completed (Mattingly and Galat - University of MO-Columbia) that provided ecological requirements needed by this species. In the next five years the Department plans to:

- conduct a Recovery Team meeting with the revised team membership in coordination with FWS
- continue the standardized ten year monitoring plan in 2004
- continue to define range expansions of currently known populations and search for new populations of Niangua darters
- continue to determine genetic lineages for all known Niangua darter populations as needed
- develop new educational material
- develop partnerships with other cooperating agencies to improve habitat
- work with Private Land Conservationists to promote forestry and stream Best Management Practices and secure additional funding for habitat restoration on private lands
- work with county commissions to replace or modify low water stream crossings for the purpose of improving fish passage and sediment transport by implementing the USFWS "Fish Passage Grant" and the Department of Interior "State Wildlife Grant-Osage River Basin"
- monitor the impact of low water crossing replacement projects on fish populations and habitat conditions

Common name: **Ozark cavefish**	Scientific Name: *Amblyopsis rosae*
State Status: Endangered	Federal Status: Threatened
Goals: Monitor and Protection	Recovery Leader: Rick Horton

During the last five years MDC has taken the lead on rangewide coordination of data sharing and communication about this species. The federal Recovery Plan was completed in 1989, followed by the Missouri State Action Plan in 1999. Fisheries biologists and Private Land Conservationists in southwest Missouri are addressing management and educational efforts with private landowners. Additional cavefish populations have been discovered in recent years, but there is still some concern about the size, delineation, and quality of water in the recharge areas. During the next five years the Department plans to

- monitor at least 2 active sites alternately every two years
- continue with cavefish protection efforts on private land within known recharge areas with assistance from FWS and the MDC Landowner Incentive Program, and implement appropriate Best Management Practices
- determine habitat needs and water quality threats to cavefish populations
- Begin water quality monitoring at 6 highest priority active sites
- coordinate the efforts of the state working group and determine the need to initiate formal cooperative efforts with appropriate partners to focus on cavefish recovery activities
- work with and private land conservationists to promote Best Management Practices (BMPs) and secure additional funding for habitat restoration on private lands

Common name: **Pallid sturgeon**	Scientific Name: *Scaphirynchus alba*
State Status: Endangered	Federal Status: Endangered
Goals: Monitor, Research, Protection, Education	Recovery Leader: David Herzog

The federal Recovery Plan was completed in 1993, and the Department has been an active participant on the recovery team. Department efforts are led by a state management plan completed in 1995, but until the issues surrounding the Corps of Engineers Master Manual dictating the flow of the Missouri River are resolved, the Department is restricted in implementation of the plan. During the next five years the Department plans to

- participate on state and federal Recovery Team (Dave Herzog)
- track reports of tagged fish and monitor sport and commercial fishing to evaluate impacts of current regulations on the Missouri River
- identify and document the habitat requirements of pallid sturgeons
- continue to work with the COE on the Master Manual and other proposed changes to big river management that could benefit fish and wildlife resources
- produce and stock (if possible, from local broodstock) 3,000 pallid sturgeon annually in the lower Missouri and Mississippi Rivers
- develop a standardized monitoring program throughout both Missouri and Mississippi Rivers
- conduct a study on critical spawning, nursery areas and habitat needs
- provide additional educational materials about pallid sturgeon and threats to their survival
- continue to work with other state and federal agencies on riverine habitat protection, restoration and enhancement

Common name: **Sicklefin chub** **Sturgeon chub**	Scientific Name: *Macrhybopsis meeki* *Macrhybopsis gelida*
State Status: Species of Concern	Federal Status: Recently Removed as Candidate
Goals: Monitor and Restoration	Recovery Leader: Vince Travnichek

Although known from the shallower edges of the Missouri River, both species have recently been collected in the deeper channels of the Missouri and Mississippi rivers by using trawls. Sturgeon chubs have not declined significantly in the Missouri River in recent times, and data collected from 1997 suggest this species may be slightly increasing in number, although the data set is too short-term to be sure. Sicklefin chubs appear to be more abundant than the sturgeon chub and the species is probably stable at this time in Missouri, although there is some concern that this trend may be a sampling artifact. During the next five years the Department plans to

- continue to monitor the status of these species and develop a standardized monitoring program throughout both Missouri and Mississippi River
- formulate a 10-year species plan in conjunction with the COE, USGS, and the Service
- cooperate with COE to promote and assist in restoration of suitable habitat in Mississippi and Missouri River side channels
- continue to work with the COE on the Master Manual and other proposed changes to big river management that could benefit fish and wildlife resources
- review recent sicklefin data, revise state rank accordingly, and determine whether they should be removed from the Action Plan

Common name: **Spring cavefish**	Scientific Name: *Forbesichthys agassizi*
State Status: Endangered	Federal Status: Region 3 Species of Concern
Goals: Survey, Monitor, Research, Protection	Recovery Leader: Bob Gillespie

Only two populations at a single locality are known for spring cavefish (*Forbesichthys agassizi*) in Missouri This population id found on private property in Scott County is the only population known from west of the Mississippi River. In 1992, a management plan was drafted for this population. Because of threats from water contamination from surface water, this species is listed as state endangered. In the next five years the Department plans to

- determine the feasibility of purchasing the area below the bluffs at the population site or protecting it through a conservation easement with the landowners
- restore hydrology of the site
- continue population biology studies to determine local distribution, size, and viability of population
- monitor ambient and long-term water quality conditions using data loggers
- conduct survey in the Benton Hills area to locate new populations or identify feasibility of locating alternative sites for introduction
- encourage Southeast Missouri Port Authority to develop an emergency response plan in the event of a significant spill or leak
- contact adjacent landowners to discuss management options to protect recharge zone surrounded by row crop agriculture

Common name: **Topeka shiner**	Scientific Name: *Notropis topeka*
State Status: Endangered	Federal Status: Endangered
Goals: Monitor, Research and Management	Recovery Leader: Harold Kerns

Recognizing the decline of this species, MDC formed a state working group and listed the species as state Endangered in 1996. In 1999, this species was federally listed endangered and the Topeka Shiner State Action Plan was approved by MDC. This plan was utilized extensively in forming the draft Federal Recovery Plan (currently under review). Harold Kerns represents MDC on the federal Recovery Team. MDC staff are working with private landowners in Topeka shiner inhabited watersheds to implement practices benefitting the Topeka shiner. In the next five years the Department plans to

- annually monitor the status of this species in Moniteau Creek and Sugar Creek watersheds
- work with private landowners to encourage the use of forestry and stream Best Management Practices in Topeka shiner watersheds
- actively participate in the state working group and federal recovery team
- revise Topeka Shiner State Action Plan and continue to assist in the revision of the Federal Recovery Plan
- continue public education efforts that demonstrate the connection between the Topeka shiner and good water quality
- refine captive propagation methodologies in accordance with the recovery plan/team, identify potential propagation sites, and survey potential suitable habitat for reintroduction that was not previously surveyed
- begin efforts to establish Topeka shiner populations in accordance with the propagation plan, state action plan and federal recovery plan

REPTILES AND AMPHIBIANS

Common name: **Eastern massasauga**	Scientific Name: *Sistrurus catenatus catenatus*
State Status: Endangered	Federal Status: Candidate
Goals: Survey, Research and Management	Recovery Leader: Jeff Briggler

This species is only known from only three north Missouri sites, all on public lands. A rangewide management handbook was prepared and completed by the Eastern Massasauga Management Working Group in 2000. In the next five years the Department plans to

- continue collaboration with Squaw Creek NWR, Swan Lake NWR, FWS, and Towson University, Maryland to monitor existing populations
- coordinate and conduct surveys on suitable habitat on selected MDC lands and other areas
- protect land adjacent to existing populations by purchase, conservation easements, or voluntary conservation agreements with landowners
- participate in an interstate working group

Common name: **Ozark hellbender**	Scientific Name: *Cryptobranchus alleganiensis*
State Status: Endangered	Federal Status: Candidate
Goals: Survey, Monitor, and Research	Recovery Leader: Jeff Briggler

The Ozark hellbender is a subspecies of the eastern hellbender. Although not federally listed, this species is declining at the species level throughout its range in the US, and more rapidly declining at the subspecific level in Missouri. In the next five years the Department plans to

- survey river tributaries with existing populations, then resurvey every 5 years
- participate in working group to draft a plan of action to reduce threats
- develop and implement a monitoring plan
- work with local giggers (gigging for suckers and bullfrogs) to report hellbender sightings
- collaborate with St. Louis Zoo and MDC fish hatcheries to develop captive propagation techniques
- collaborate with specialists to determine causes of mortality on larvae and lack of reproduction in adults
- develop educational material for the general public

BIRDS

Common name: **Bald Eagle**	Scientific Name: *Haliaeetus leucocephalus*
State Status: Endangered	Federal Status: Threatened
Goals: Monitor and Education	Recovery Leader: Andy Forbes

Consistent with the national trend, both summer nesting populations and wintering eagle populations are increasing in Missouri. During the next five years the Department plans to

- conduct the 5-year statewide bald eagle nest survey in 2006 and update nesting records in the Natural Heritage Database when information is provided in other years
- establish refuges when necessary to protect nests
- continue to count eagle numbers during the January winter waterfowl counts
- participate in a series of bald eagle interpretive events each winter

Common name: **Cerulean Warbler**	Scientific Name: *Dendroica cerulea*
State Status: Endangered	Federal Status: Region 3 Species of Concern
Goals: Survey and Monitoring	Recovery Leader: Brad Jacobs

This is a riparian forest species in Missouri that has been experiencing a long term population decline, averaging 2.7% annually through the last 30 years as indicated by the Breeding Bird Survey. During the next five years the Department plans to

- summarize historical and recent information from surveys, atlases, and literature on the status of cerulean warblers in Missouri
- in coordination with FWS, other agencies and universities, design, test, and implement a riparian breeding bird survey throughout Missouri and a cerulean warbler survey in northeast Missouri
- develop Best Management Practices for land managers

Common name: **Greater Prairie Chicken**	Scientific Name: *Tympanuchus cupido*

State Status: Endangered	Federal Status: None
Goals: Monitoring and Management	Recovery Leader: Max Alleger

The greater prairie chicken was added to the state endangered species list in March 1999. This species continues on a precipitous decline that began in the early 1970's. An effort to reverse this trend began in 1984 with the acceptance of the first species management plan, updated in 1991. More recently, the Grasslands Coalition, a progressive action-oriented coalition of natural resource agencies, NGOs and private citizens, began a focused effort to add and improve on grassland habitats in nine key focus areas within prairie chicken breeding range.

In the next five years the Department, as part of the Grasslands Coalition, plans to

- continue to monitor the species population trend in Missouri
- implement prairie management and restoration guidelines to improve prairie grassland habitat
- evaluate additional translocation of birds to previously occupied habitat
- continue habitat assessment and conduct research to resolve management issues
- when and where appropriate, acquire land to protect and manage prairie chickens
- continue a broad-scale landowner education program on prairie management in all Grasslands Coalition Focus Areas.

Common name: **Interior Least Tern**	Scientific Name: *Sterna antillarum athalassos*
State Status: Endangered	Federal Status: Endangered
Goals: Monitor	Recovery Leader: Rochelle Renken

The success of nesting colonies on the Mississippi River varies from year to year, affected largely by water levels in the big rivers. During the next five years the Department plans to

- annually monitor least tern colonies on the Mississippi River
- continue to work with the Army Corps of Engineers on the Master Manual and other proposed changes to big river management that could benefit fish and wildlife resources
- actively participate on the Natural Resource Committee's Missouri River subcommittee on Least Terns and Piping Plovers

Common name: **Peregrine falcon**	Scientific Name: *Falco peregrinus*
State Status: Endangered	Federal Status: Species of Concern
Goals: Monitor	Recovery Leader: Brad Jacobs

There is optimism in Missouri following many years of falcon hacking by the World Bird Sanctuary in the St. Louis area and four years of hacking by the MDC in the Kansas City and Springfield areas. During the next five years the Department plans to

- monitor the nesting population and band young when convenient

MAMMALS

Common name: **Gray bat**	Scientific Name: *Myotis grisescens*
State Status: Endangered	Federal Status: Endangered
Goals: Monitor, Protect, Reclassification	Recovery Leader: Rick Clawson

The federal Recovery Plan was completed in 1982 and the Department has been a leader in its recovery. Department efforts are led by a state management plan completed in 1992. This species is secure and increasing in Missouri, which appears consistent with the national trend. During the next five years, the Department plans to

- continue to monitor the species population trend in Missouri by surveying Priority 1 maternity caves every 2-3 years and Priority 2 maternity caves very 5-10 years
- train regional staff in appropriate techniques for monitoring and managing gray bats (including bat gate instruction)
- continue to make landowner contacts and provide management assistance to private landowners
- build bat gates and other protective structures at endangered bat cave entrances on both public and private land, providing cost share incentives when possible
- coordinate with the FWS to reconstitute the gray bat recovery team to reevaluate the rangewide status of the gray bat and determine the need to reclassify its federal status

Common name: **Indiana bat**	Scientific Name: *Myotis sodalis*
State Status: Endangered	Federal Status: Endangered
Goals: Survey, Monitor, Research, Management	Recovery Leader: Rick Clawson

Despite successful protection of wintering caves and a better understanding of summer habitat requirements, this species continues to decline in Missouri. The Department has been a leader in endangered bat recovery for the Indiana bat. The federal Recovery Plan was revised and completed in 1999 but has not yet been finalized. Department efforts are led by the state Management Plan completed in 1992. The Department is adding emphasis on this species through regional coordination teams. During the next five years the Department plans to

- monitor the species population trend in Missouri by surveying Priority 1 hibernacula every 2 years and Priority 2 hibernacula every 5-10 years
- initiate surveys and monitoring in abandoned mines that may be used as additional hibernacula
- conduct surveys on MDC lands for summer maternity roosts in northern Missouri
- create opportunities for landowner contact and provide management recommendations to private landowners
- train interested regional staff in appropriate techniques for monitoring and managing Indiana bats (including bat gate instruction)
- continue to be a leader in Indiana bat recovery through meetings of the Recovery Team (Rick Clawson, federal Recovery Team Leader) and coordination with the FWS and USFS

- coordinate with FWS, Bat Conservation International, and other agencies in conducting research on changes in microclimates of hibernacula, life history, and summer habitat use
- implement Indiana Bat Habitat Guidelines on MDC lands
- coordinate with FWS, other agencies, and universities to further develop Anabat technology to establish presence, habitat use, and movements of Indiana bats
- coordinate forestry research projects that examine impacts of timber management activities on summer roosting and foraging habitat and migrating Indiana bats

Common name: **Plains spotted skunk**	Scientific Name: *Spilogale putorius interrupta*
State Status: Endangered	Federal Status: NONE
Goals: Survey, Monitor, Research, Management	Recovery Leader: Jackie DeSanty-Combes

The plains spotted skunk is a subspecies of the eastern spotted skunk. Since 1950, the plains spotted skunk has declined throughout much of range in the Great Plains. The Ozarks are believed to be the stronghold of the remaining population. A statewide survey was initially conducted by MDC in 1992, and a more effort intensive survey is being conducted 2002 through 2003 to determine the species' current distribution in Missouri. During the next five years, the Department plans to

- collaborate with University of Missouri-Columbia conducting statewide field surveys on suitable habitat on private lands and selected MDC lands to verify sightings reported in 2002-2003; and determine habitat use and preferences
- develop reliable survey/monitoring methodology(s), and initiate long-term (5-10 year) monitoring
- develop statewide predictive model based on habitat data
- develop specific management actions for Missouri land managers

Common name: **Black-tailed jackrabbit**	Scientific Name: *Lepus californicus*
State Status: Endangered	Federal Status: NONE
Goals: Survey, Monitor, Management	Recovery Leader: Jackie DeSanty-Combes

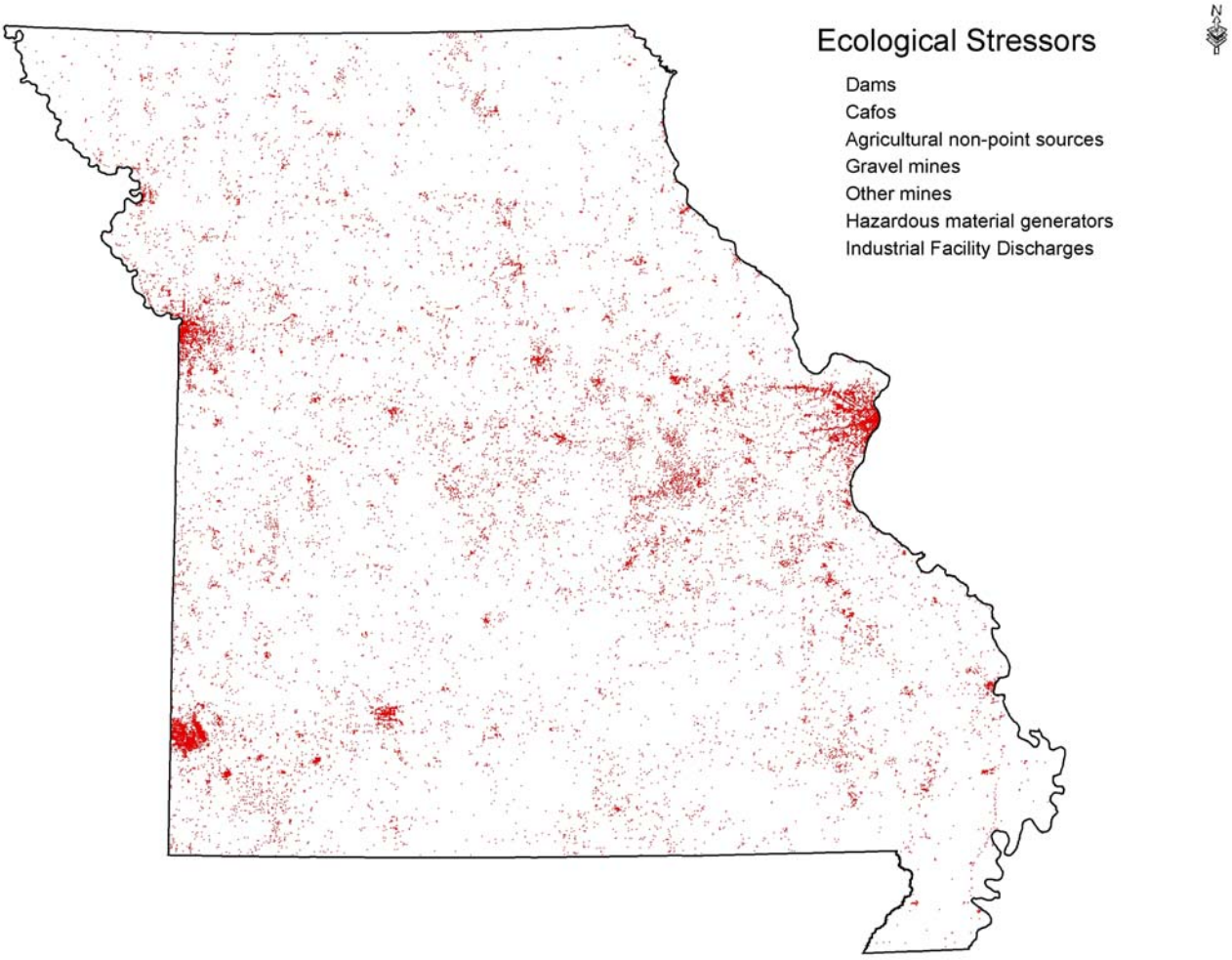
Historically, the western and southern one-third to one-half of Missouri was the extreme eastern edge of the species range in North America. Populations peaked in the 1920's and 1930's during habitat disturbances, and studies in 1979, 1987, and 1990 indicate a steady decline in range and numbers. The last reported sighting of a black-tailed jackrabbit in 1995, and this species may be extirpated from Missouri. During the next five years, the Department plans to

- identify existing populations via a mail survey soliciting sighting information from landowners in the vicinity of the 99 sighting locations in the Heritage database
- conduct field visit to locations reported from the mail survey to assess habitat availability
- form a recovery committee to determine where, if any, large tracts of suitable habitat still exists in Missouri

- initiate a long-term (5-10 year) monitoring program
- develop specific management actions for Missouri land managers, possibly including reintroduction

Appendix L. Ecological Stressors

Point data sources used to identify potential ecological stressors. Used in determining MDC Aquatic Conservation Opportunity Areas.



Appendix M. Missouri Department of Conservation Surveys

SURVEY	TYPE	Collector
Bowhunter Observation Survey	Trend	Bowhunters
Otter Winter Aerial Surveys	Presence/Absence	
Otter Scat Surveys (18 streams, 10 mile segments)	Trend	
Scent Post Furbearer Survey	Trend	
Bear Bait Station Surveys	Presence/Absence	Resource Science
Dove Call Count Survey	Trend	Agents
Quail Count Surveys	Trend	Agents
Pheasant Mail Carrier Survey	Trend	Mail Carriers
Turkey Brood Observation Survey	Production	Volunteers
Ruffed Grouse Drumming Census	Population	Resource Science
Rabbit Roadside Survey	Trend	Agents
Fall Waterfowl Migration Aerial Surveys	Status	
Breeding Goose Aerial Survey	Status	
Mid-Winter Waterfowl Aerial Survey (all waterfowl)	Status	
Prairie Chicken Booming Ground Survey	Trend	Agency personnel
Hellbender Surveys	Trend	
Local Surveys to assess status of plants of interest	Status	
Anuran Call Count Survey	Status	
CWD Monitoring Stations	Presence/Absence	
Locker Plant Deer Data Collection	Harvest	
Deer Check Stations (replaced by data collection via Phone/email – Telecheck)	Harvest	
Acorn Ocular Estimate survey	Trend	Forestry
RAM (Resource Assessment and Monitoring Program in conjunction with Feds)	Status	
Mussel Status Survey	Trend	
Gypsy month monitoring survey	Presence/Absence	Resource Science
Small Game Harvest Survey	Harvest	Resource Science
Firearms Deer Harvest Survey	Harvest	Resource Science
Waterfowl Harvest Survey	Harvest	Resource Science
Spring Turkey	Harvest	Resource Science
Snow goose Survey	Harvest	Resource Science
Fall Turkey	Harvest	Resource Science
Deer Hunter Attitude Survey	Attitudes re: regs/current conditions	Resource Science

SURVEY	**TYPE**	**Collector**
Deer Landowner Attitude Survey	Attitudes re: regs/current conditions	Resource Science
Timber Products Output Survey	Trend	
Timber Price Trends Survey	Trend	
Citizen Urban Forest Survey	Attitudes re regs/current conditions	
Missouri River Public Use Survey	Public Use	
CRP Participant Attitude Survey	Attitudes re regs/current conditions	
Fish Consumption Survey	Status	
EEP Breeding Ground Survey		
Heritage		Agency personnel
Creel Surveys (Various)		Fisheries
Breeding Bird Survey	Trend	Wildlife

Appendix N. Existing Monitoring in Conservation Opportunity Areas

COA	County	COA Area Monitoring (and other) Projects	Location	Frequency	Agency	Contact Person
Multiple COAs	Ozarks	Delineation of Spring Recharge Areas		FY05 Wildlife Diversity Fund Proposal	MDC - FISH	Paul Blanchard (MDC - FISH)
	Potentially all	Resource Assessment and Monitoring - fish, mussel, macroinvertebrate, habitat, water quality	Headwater streams	the state will be sampled completely every 5 years from 1 June to 15 October	MDC - RS	Matt Combes, Mike Kaminski; (MDC - RS)
	Potentially all	purple loosestrife control project	mostly north Missouri	annual June-August	MDC - PLS	Bob DeWitt (MDC - PLS)
	Statewide	Gypsy Moth	statewide	annual May - August	several state and federal agencies	Rob Lawrence (MDC - RS)
	Statewide	Forest Inventory	all MDC Conservation Areas with significant forest resources	10-15 year re-entry schedule	MDC - FOR	Lynn Barnickol (MDC - FOR)
	Statewide	Bowhunters survey of furbearers	statewide	annual during bowhunting season	cooperating bowhunters; MDC - RS	Dave Hamilton (MDC - RS)
Bonne Femme Karst	Boone	MO Stream Team water quality monitoring and "other activity"	74 WQ sites and 28 "other" within 10 mile radius		MDC, DNR, CFM	Sherry Fischer (MDC - FISH)
Bryant Creek	Ozark	Ozark and Eastern Hellbender	Bryant Creek	rotational basis from June-November	MDC, Universities, St. Louis Zoo	Jeff Briggler (MDC RS)
		Woodland Glade	Caney Mt. CA	winter /summer 2004-	MDC - RS	Jeremy Kolaks

COA	County	COA Area Monitoring (and other) Projects	Location	Frequency	Agency	Contact Person
		complex - prescribed fire/vegetation		2006		(MDC - RS)
		MO Stream Team water quality monitoring and "other activity"	14 WQ sites and 7 "other" within 10 mile radius		MDC, DNR, CFM	Sherry Fischer (MDC - FISH)
		Furbearers - scent station route	north-central Ozark county	annual in fall	MDC - RS	Dave Hamilton (MDC - RS)
Cape Hills	Cape Girardeau	Fish community; water quality	Mississippi River bordering Cape Girardeau Co. and beyond	long-term/ongoing/continuous	MDC - RS	Bob Hrabik (MDC - RS)
		MO Stream Team water quality monitoring and "other activity"	8 WQ sites and 3 "other" within 10 mile radius		MDC, DNR, CFM	Sherry Fischer (MDC - FISH)
Cole Camp/Hi Lonesome	Morgan	Birds	near Hi Lonesome	annual Breeding Bird Survey	Audubon	Andy Forbes (MDC - WILD)
		Sericea Lespedeza control/herbicides, fire	several CAs	annual	MDC - RS	Brent Jamison (MDC - RS)
		vegetation, birds, Prairie Mole Cricket; grazing/fire	several CAs	annual	MDC - RS	Sherry Leis (MDC - RS)
		MO Stream Team water quality monitoring and "other activity"	5 WQ sites and 3 "other" within 10 mile radius		MDC, DNR, CFM	Sherry Fischer (MDC - FISH)
		Furbearers - scent station route	southwest Morgan county	annual in fall	MDC - RS	Dave Hamilton (MDC - RS)
Cuivre River Hills	Lincoln	Herps	Cuivre River SP	yearly for toad and frog breeding route and sporadic surveys of ponds	Cuivre River SP biologists	Bruce Schuette (Cuivre River SP), Jeff Briggler (MDC RS)

COA	County	COA Area Monitoring (and other) Projects	Location	Frequency	Agency	Contact Person
		Vegetation	Cuivre River SP	2005	MO Native Plant Society	Bruce Schuette (Cuivre River SP), George Yatskievych (MDC - RS)
		fish community and stream habitat survey	2 sites on Sugar Ck (Lincoln Co.); 1 site on Cuivre River SP; may add more sites	first survey in 2004; repeat every 5 years; sampling May-September	MDC - FISH	Sarah Oakes (MDC - FISH)
		MO Stream Team water quality monitoring and "other activity"	16 WQ sites and 5 "other "within 10 mile radius		MDC, DNR, CFM	Sherry Fischer (MDC - FISH)
Current River Hills	Shannon	MO Ozark Forest Ecosystem Project; timber harvest effects	Shannon/Reynolds/ Carter counties	annual, with breaks between treatments	MDC - RS, FOR	David Gwaze, Randy Jensen
		Pine-Oak Woodland Restoration	Peck Ranch CA, Midco Pine Flats Restoration Unit	every 3 years, next round in 2005	MDC - WILD, FOR	Rhonda Rimer (MDC - WILD); John Tuttle (MDC - FOR)
		Ozark and Eastern Hellbender	Current River watershed	annual June-November	MDC, Universities, St. Louis Zoo	Jeff Briggler (MDC RS)
		Red Bat, Evening Bat	Peck Ranch CA	current MDC proposal to study winter ecology	SMSU, MDC	Dr. Lynn Robbins (SMSU), Rick COAawson (MDC - RS)
		timber harvest/fire vegetation monitoring	Rocky Creek CA	project to begin 2006	MDC	Gary Gognat (MDC - FOR), Jeremy Kolaks (MDC - RS)

COA	County	COA Area Monitoring (and other) Projects	Location	Frequency	Agency	Contact Person
		vegetation; oak/pine, pine oak impacted by oak deCOAine	Peck Ranch CA	Project being developed	MDC - RS	Tom Nichols (MDC - RS)
		Black Bear	Blair Creek, Little Blair Creek areas	annual in August	MDC - RS	Dave Hamilton (MDC - RS)
		MO Stream Team water quality monitoring and "other activity"	15 WQ sites and 10 "other" within 10 mile radius		MDC, DNR, CFM	Sherry Fischer (MDC - FISH)
Eleven Point Hills	Shannon	Ozark and Eastern Hellbender	Eleven Point watershed	annual June-November	MDC, Universities, St. Louis Zoo	Jeff Briggler (MDC RS)
Golden Grassland	Dade	Sericea Lespedeza control/herbicides, fire	several CAs	annual	MDC - RS	Brent Jamison (MDC - RS)
		vegetation, birds, Prairie Mole Cricket; grazing/fire	several CAs	annual	MDC - RS	Sherry Leis (MDC - RS)
		MO Stream Team water quality monitoring	2 WQ sites within 10 mile radius		MDC, DNR, CFM	Sherry Fischer (MDC - FISH)
Grand River Grasslands	Harrison					
Iatan/ Weston Missouri River Corridor	Platte	Shovelnose, Pallid and Lake Sturgeon	Missouri River - St. Joseph to Washington	annually in winter (usually December)	MDC - FISH, RS	Vince Travnichek (MDC - RS); Craig Gemming, Scott Ryan (MDC - FISH)
		Pallid Sturgeon and other bottom-dwelling fishes	Missouri River from Kansas City to Glasgow		MDC, USACOE	Vince Travnichek (MDC - RS)
		MO Stream Team water quality monitoring	1 WQ site within 10 mile radius		MDC, DNR, CFM	Sherry Fischer (MDC - FISH)

COA	County	COA Area Monitoring (and other) Projects	Location	Frequency	Agency	Contact Person
LaBarque Creek	Jefferson	fish community and stream habitat survey	7 sites on Labarque Ck. (northern Jefferson county; 2 on Hilda J. Young CA)	first survey 2001; repeat every 5 years; May-September	MDC - FISH	Kevin Meneau (MDC - FISH)
		MO Stream Team water quality monitoring and "other activity"	45 WQ sites and 31 "other" within 10 mile radius		MDC, DNR, CFM	Sherry Fischer (MDC - FISH)
Loess Hills	Atchison/ Holt					
Lower Grand River	Carroll/ Chariton	Catfish	lower Grand River	annually in late fall/winter	MDC - FISH	Greg Pitchford (MDC - FISH)
		Eastern Massasauga Rattlesnakes	Pershing SP, Swan Lake NWR, Fountain Grove CA, private land	March - October (survey, monitor, telemetry)	MDC - RS, researchers, NWR biologists	Jeff Briggler, Paul Mckenzie (USFWS), Dr. Richard Seigel (Towson University-Maryland)
		MO Stream Team water quality monitoring	2 WQ sites within 10 mile radius		MDC, DNR, CFM	Sherry Fischer (MDC - FISH)
		River Otter - telemetry	Big Piney watershed	annual	MDC - RS	Dave Hamilton (MDC - RS)
Manitou Bluffs	Cooper	MO Stream Team water quality monitoring and "other activity"	1 WQ sites and 7 "other" within 10 mile radius		MDC, DNR, CFM	Sherry Fischer (MDC - FISH)
Marmaton/ Wah'Kon-tah	Bates/ Vernon	Sericea Lespedeza control/herbicides, fire	several CAs	annual	MDC - RS	Brent Jamison (MDC - RS)
		vegetation, birds, Prairie Mole Cricket; grazing/fire	several CAs	annual	MDC - RS	Sherry Leis (MDC - RS)

COA	County	COA Area Monitoring (and other) Projects	Location	Frequency	Agency	Contact Person
		woody vegetation & annual waterfowl food plants; fire	Schell-Osage CA (Vernon & St. COAair Co.)	annually for 2 years each cyCOAe in June and September	MDC - RS, WILD	Norman Murray (MDC - RS)
		MO Stream Team water quality monitoring and "other activity"	1 WQ sites and 2 "other" within 10 mile radius		MDC, DNR, CFM	Sherry Fischer (MDC - FISH)
		Furbearers - scent station route	east-central Vernon county	annual in fall	MDC - RS	Dave Hamilton (MDC - RS)
Middle Meramec	Crawford/ Washington	Black Bass; Rock Bass	Meramec River (Franklin and Crawford counties)	annually in September and October	MDC - FISH	Andy Austin (MDC - FISH)
		MO Stream Team water quality monitoring and "other activity"	9 WQ sites and 8 "other" within 10 mile radius		MDC, DNR, CFM	Sherry Fischer (MDC - FISH)
		Furbearers - scent station route	southwest Crawford county	annual in fall	MDC - RS	Dave Hamilton (MDC - RS)
Mingo Basin	Stoddard	Fish community	Mingo NWR; Duck Creek CA Pool 1	Mingo (ongoing); Duck Creek (annual in spring)	MDC - RS, FISH	Bob Hrabik (MDC - RS)
		Alligator Gar Reintroduction and monitoring	Mingo NWR	Grant has been submitted	MDC - FISH	Chris Kennedy (MDC - FISH)
		MO Stream Team "other activity"	2 "other" sites within 10 mile radius		MDC, DNR, CFM	Sherry Fischer (MDC - FISH)
		Furbearers - scent station route	southwestern Stoddard county and Mingo NWR	annual in fall	MDC - RS	Dave Hamilton (MDC - RS)
Missouri/ Mississippi River Confluence	St. Charles/ St. Louis	MO Stream Team water quality monitoring and "other activity"	8 WQ sites and 12 "other" within 10 mile radius		MDC, DNR, CFM	Sherry Fischer (MDC - FISH)

COA	County	COA Area Monitoring (and other) Projects	Location	Frequency	Agency	Contact Person
Niangua Basin	Dallas	Ozark and Eastern Hellbender	Niangua watershed	rotational basis from June-November	MDC, Universities, St. Louis Zoo	Jeff Briggler (MDC RS)
		Niangua Darter	Niangua and Little Niangua Rivers and some tributaries	annual July through September (tributary in spring)	MDC - RS	Doug Novinger (MDC - RS)
		Smallmouth Bass; Rock Bass	Niangua River (Dallas and LaCOAede counties)	annual in early June	MDC - FISH	Craig Fuller (MDC - FISH)
		Rainbow Trout; Brown Trout	Niangua River (Dallas and LaCOAede counties)	annual in early October	MDC - FISH	Craig Fuller (MDC - FISH)
		Forest inventory	Lead Mine CA; Berry Bluff CA	15-year rotation	MDC - FOR	Steve Laval (MDC - FOR)
		MO Stream Team water quality monitoring and "other activity"	14 WQ sites and 11 "other" within 10 mile radius		MDC, DNR, CFM	Sherry Fischer (MDC - FISH)
North Fork	Douglas	Ozark and Eastern Hellbender	North Fork watershed	annual June-November	MDC, Universities, St. Louis Zoo	Jeff Briggler (MDC RS)
		MO Stream Team water quality monitoring and "other activity"	5 WQ sites and 5 "other" within 10 mile radius		MDC, DNR, CFM	Sherry Fischer (MDC - FISH)
		Furbearers - scent station route	western Howell county	annual in fall	MDC - RS	Dave Hamilton (MDC - RS)
River Bends	New Madrid	Fish Community	Donaldson Point CA	recently completed	MDC - RS	Bob Hrabik (MDC - RS)

COA	County	COA Area Monitoring (and other) Projects	Location	Frequency	Agency	Contact Person
		Turtles	Donaldson Point CA	2004	MDC - RS	Bob Hrabik (MDC - RS)
		Aquatic and Water Quality	Donaldson Point CA	2003	MDC - RS	Bob Hrabik (MDC - RS)
Roaring River	Barry	Birds	near Roaring River	annual Breeding Bird Survey	Audubon	Andy Forbes (MDC - WILD)
		MO Stream Team water quality monitoring and "other activity"	7 WQ sites and 5 "other" within 10 mile radius		MDC, DNR, CFM	Sherry Fischer (MDC - FISH)
		Furbearers - scent station route	northeast Boone county	annual in fall	MDC - RS	Dave Hamilton (MDC - RS)
Shoal Creek	Newton	MO Stream Team water quality monitoring and "other activity"	14 WQ sites and 8 "other" within 10 mile radius		MDC, DNR, CFM	Sherry Fischer (MDC - FISH)
Spring River	Jasper	Neosho Madtom	Spring River between Hwy 43 and stateline	annual October	MDC - RS	Doug Novinger (MDC - RS)
		MO Stream Team water quality monitoring	11 WQ sites within 10 mile radius		MDC, DNR, CFM	Sherry Fischer (MDC - FISH)
St. Francois Knobs	Iron	Riparian Reforestation	St. Francis River	annual; trees in winter, ground flora in summer	MDC - WILD, RS	David Rowold (MDC - WILD), Randy Jensen (MDC - RS)
		Birds / vegetation (woodland glade restoration)	public/private		MDC, PIF, Stephen F. Austin University	David Hasenbeck (MDC - PLS), Jan Fitzgerald (PIF), Andrea Bell (SFAU)
		Fish community / Water Quality	E. Fork Black River and Lower Taum Sauk Lake	spring/summer (fish); continuous (water quality)	MDC - FISH, RS	Paul Cieslewicz (MDC - FISH)

COA	County	COA Area Monitoring (and other) Projects	Location	Frequency	Agency	Contact Person
		MO Stream Team water quality monitoring and "other activity"	7 WQ sites and 1 "other" within 10 mile radius		MDC, DNR, CFM	Sherry Fischer (MDC - FISH)
Thousand Hills Woodland	Adair	Birds	in proximity of Thousand Hills	annual Breeding Bird Survey	Audubon	Andy Forbes (MDC - WILD)
		Sericea Lespedeza control/herbicides, fire	several CAs	annual	MDC - RS	Brent Jamison (MDC - RS)
		MO Stream Team water quality monitoring and "other activity"	8 WQ sites and 11 "other" within 10 mile radius		MDC, DNR, CFM	Sherry Fischer (MDC - FISH)
		Furbearers - scent station route	western Adair county	annual in fall	MDC - RS	Dave Hamilton (MDC - RS)
Tumbling Creek Cave	Taney	MO Stream Team water quality monitoring and "other activity"	4 WQ sites and 1 "other" within 10 mile radius		MDC, DNR, CFM	Sherry Fischer (MDC - FISH)
Union Ridge	Sullivan	MO Stream Team water quality monitoring and "other activity"	3 WQ sites and 2 "other" within 10 mile radius		MDC, DNR, CFM	Sherry Fischer (MDC - FISH)
Upper Gasconade	Laclede	Smallmouth Bass; Rock Bass	Gasconade River and Osage Fork of Gasconade River (Laclede Co.)	annual in September	MDC - FISH	Craig Fuller (MDC - FISH)
		MO Stream Team water quality monitoring and "other activity"	5 WQ sites and 1 "other" within 10 mile radius		MDC, DNR, CFM	Sherry Fischer (MDC - FISH)
		Furbearers - scent station route	southeastern Laclede county	annual in fall	MDC - RS	Dave Hamilton (MDC - RS)

COA	County	COA Area Monitoring (and other) Projects	Location	Frequency	Agency	Contact Person
Wakenda Bottoms	Lafayette	MO Stream Team water quality monitoring	4 WQ sites within 10 mile radius		MDC, DNR, CFM	Sherry Fischer (MDC - FISH)
Western Cherokee Grasslands	Barton	Herps	Prairie SP	yearly for toad and frog breeding route and sporadic surveys of ponds	Prairie SP biologists	Cyndi Evans (Prairie SP), Jeff Briggler (MDC - RS)
		MO Stream Team water quality monitoring	3 WQ sites within 10 mile radius		MDC, DNR, CFM	Sherry Fischer (MDC - FISH)
White River Glades and Woodlands	Taney	Collared Lizards	Graveyard Point	every three years from July-September	MDC - RS	Jeff Briggler (MDC - RS)
		Birds	near Bull Shoal glades	annual Breeding Bird Survey	Audubon	Andy Forbes (MDC - WILD)
		Red Bat, Evening Bat	Drury-Mincy CA	current MDC proposal to study winter ecology	SMSU, MDC	Dr. Lynn Robbins (SMSU), Rick COAawson (MDC - RS)
		Woodland Restoration - Prescribed Fire	Drury-Mincy CA	current MDC proposal to study several aspects	SMSU, MDC	Dr. Alexander Wait (SMSU), Jeremy Kolaks (MDC - RS)
		MO Stream Team water quality monitoring and "other activity"	2 WQ sites and 4 "other" within 10 mile radius		MDC, DNR, CFM	Sherry Fischer (MDC - FISH)

Appendix O. Public Involvement and the Comprehensive Wildlife Strategy in Missouri

Public Involvement and the Comprehensive Wildlife Strategy in Missouri

The Department of Conservation believes that all Missouri citizens are important and we listen and generate conservation action to earn their trust.

> **"Missouri is unique – unique in its history, unique in the way in which the Conservation Commission derives its authority from the people, unique in its funding, and unique in the passion and commitment that is exhibited every day by those who work for the Department of Conservation. Conservation has inherited a great legacy in Missouri because it was created by and for its people"**
>
> - John Hoskins, Director
> Missouri Department of Conservation

The development of a Comprehensive Wildlife Strategy (CWS) for Missouri is an important opportunity to grow and expand Department funding for all wildlife resources.
The Department of Conservation is committed to the development of a strategy that will identify and focus conservation action on the "species in greatest need of conservation."

The Departments commitment to conserving wildlife diversity ….. all wildlife … is not new and it is clearly demonstrated in the Mission, Vision, and Strategic Plan that guides the agency.

The Department Mission: To protect and manage the fish, forest, and wildlife resources of the state; to serve the public and facilitate their participation in resource management activities; and to provide opportunity for all citizens to use, enjoy, and learn about fish, forest, and wildlife resources.

The Department Vision: To have healthy, sustainable plant and animal communities throughout the state of Missouri for future generations to use and enjoy, and that fish, forest, and wildlife resources are in appreciably better condition tomorrow than they are today. That all Missourians understand the relationship and value of plant and animal communities to our social well being. That citizens and government agencies work together to protect, sustain, enhance, restore, or create sustainable plant and animal communities of local, state and national significance.

The Strategic Plan: Goal 1 is to **Preserve and Restore the State's Biodiversity**. Missouri is home to a diverse array of plants, animals, and natural communities. More that 5000 species of plants and at least 20,000 animal species occur in almost 200 recognized natural communities. The state's biota includes species from adjacent biomes as well as species and communities found only in Missouri. Key to conserving the state's

biodiversity is the need for an ecosystem approach which includes resources planning at regional or landscape scale, and restoration and management of native plants, animals, and natural communities. Special emphasis on expanding the Missouri Natural Areas System and protecting unique lands and waters, critical habitats for state and federally listed species and natural features of special interest are also critical to achieving this goal.

We believe Missourians will continue to support conservation of wildlife diversity.
The conservation sales tax that Missourians passed in 1976 continued to build on a commitment to "all wildlife" and made possible the funding for a more comprehensive forest, fish and wildlife program. "Design for Conservation" became a promise to Missourians to work for the conservation of all wildlife. Design clearly included protection of endangered species and their habitats. These funds greatly expanded funding for all wildlife resources and their enjoyment.

Department leaders listened to Missourians in the development of Design and we continue to listen and respond to Missourians today. For example, we know from the 2000 Conservation Monitor Survey – a telephone survey conducted by The Gallup Organization for the Missouri Department of Conservation:

- Missourians are out-door oriented, with most households having one or more participants that enjoy watching television or outdoor programs (92%), read about nature and wildlife (84%), feed birds and wildlife at home (77%), garden (75%), use Conservation Areas (67%), fish (57%), canoe and boat (48%), hunt (35%), target shoot (34%), or volunteer in environmental or conservation groups (16%).

- Almost all Missourians (91%) agree that the Department of Conservation should help private landowners who want to restore native communities of plants and animals.

- Most Missourians (85%) agree that the Department of Conservation should make an effort to restore animals that once lived or are currently very rare in the state.

The Department will continue to talk to Missourians, to survey and monitor their interest and commitment to all Department programs and activities. The kinds of work identified by the Comprehensive Wildlife Strategy have support from Missourians and we will continue to engage Missourians on the merits of this kind of work on a regular basis.

Public involvement relating to the Comprehensive Wildlife Strategy will be achieved by:
1) Department-wide surveys and monitoring with the Missouri public in general,
2) By regular communication and invited participation with conservation partners, and
3) by public notice and comment during Conservation Commission Meetings.

1. The Department will listen to Missourians on a regular basis by conducting statewide surveys and monitoring.

The Department will use the Conservation Monitor and conduct a Conservation Opinion Survey to get regional/statewide perspective on public attitudes and understanding of the first, fish and wildlife in Missouri.

The Conservation Monitor was last conducted in 1994 by the Gallup Organization for the Missouri Department of Conservation (MDC). The objectives of this telephone survey were to assess Missourians' opinions on the state's environment, MDC's performance, and conservation issues. Previous results revealed high satisfaction among Missourians with the care given their state's fish, forests, and wildlife, and more generally with the care given Missouri's natural environment. The Conservation Monitor will be repeated again in 2003 using the same questions to track citizen expectations and satisfactions with MDC programming.

The Conservation Opinion Survey is an evolution of the 7-city survey, a statistically based sampling of Missourians and their awareness and interest in fish, forest, and wildlife resources. It will be conducted in 2003 with results available in 2004. It will specifically ask questions about how Missourians relate to comprehensive wildlife conservation: native plants and animals, restoring natural communities, protecting endangered species, and controlling exotic plants and animals.

Specifically:

- The results of the Conservation Monitor and the Conservation Opinion Survey will used during the development of the CWS and comprehensive wildlife issues will be reported on in the final CWS.

2. Conservation partners, both sister agencies and not-for-profit organizations, will be integral to public involvement through regular communication and invited participation.

The Department will listen to conservation-minded Missourians and the organizations they represent directly through Conservation Forums. We will welcome participation in the development of conservation assessments, the selection of CWS geographies, and the writing and preparation of the final product.

Specifically:

- The Department will conduct Conservation Forums in the 8 administrative regions of Missouri in the Fall of 2003. These Conservation Forums will build upon previous regional forums conducted in 2002 and statewide conservation forums in years previous.
- The CWS Plan Coordinator and Oversight Team members will make presentations to conservation partners so that they fully appreciate the opportunity afforded by the CWS.

•The Conservation actions of conservation partners will be readily integrated into the Conservation Opportunity Area (COA) layers of the assessment framework, especially if provided in a spatial format.

• Conservation partners will be invited to participate in the development of the criteria used to evaluate COAs and identify Conservation Landscapes (CLs), and will be encouraged to review and participate in the selection of CLs in a facilitated meeting in the Fall 2004.

• Conservation partners will have the opportunity to review and comment on the CWS draft(s) March-May, 2004. The Conservation Federation of Missouri will provide a forum for review and comment at their annual Spring (2005) meeting where representatives from all of the CFM affiliates are expected to attend.

• The Department will encourage the development of Strategic Plans by conservation partners and will review and represent wildlife diversity goals and objectives to the degree possible.

3. Public Notice and participation through the Conservation Commission

The Conservation Commission meets regularly and anyone may contact the Conservation Commission with comments or request to appear at a Commission meeting.

Specifically:

• The Departments' commitment to the CWS will be presented to the Conservation Commission in the Fall 2003.

• A progress report on the content of the draft CWS will be presented to the Conservation Commission in the Spring 2005.

• A Summary of the final CWS and the conservation action it represents will be presented to the Conservation Commission in the Fall 2005.

• The Conservation Commission will receive annual updates on State Wildlife Grants spending and the wildlife diversity projects and programs funded by SWG.

Appendix P. 'Your Ideas Count!': Report of Results of the 2003 Conservation Opinion Survey for the Missouri Department of Conservation

'YOUR IDEAS COUNT!': REPORT OF RESULTS OF THE 2003 CONSERVATION OPINION SURVEY FOR THE MISSOURI DEPARTMENT OF CONSERVATION

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July, 2004

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Forward and Acknowledgements

This report presents the results of a survey, "'Your Ideas Count!' Conservation Opinion Survey," conducted in 2003 by the University of Missouri-Columbia (UMC) for the Missouri Department of Conservation (MDC). In 2002, MDC contracted with UMC to conduct a statewide survey to assess Missourians' awareness of MDC, opinions on conservation issues, and participation in outdoor and recreational activities. MDC desired to combine previously-used instruments into a comprehensive survey and to add new questions to address current agency interests and programs. In terms of previous studies, the goal was to replicate portions of the 1989 Seven City and Outstate Survey, completed by MDC with the assistance of Fleishman-Hillard Research (St. Louis). We also incorporated MDC's annual Conservation Monitor Survey into the survey in order to allow the agency and other readers to gauge changes in citizen attitudes over time.

Project investigators worked with MDC staff in 2002 to prepare the survey instrument and to work out final details on the sampling method and overall research design. The project methodology is described in detail in the first section (pp. iii-ix) of this report. In brief, we conducted the survey in the Spring of 2003, using a geographically stratified sample of more than 16,000 citizens. We received more than 7,000 returns, for a response rate of 43 percent. This report includes the compiled data from all survey questions, with results presented for the statewide sample as well as for a variety of regional, demographic, social and other sub-groupings. The second introductory section of this report, "Introduction to the Data Tables" (pp. xi-xv), instructs readers on the presentation of the data and the subgroups represented in the results tables.

This research report would not have been possible without the support, advice, and participation of other individuals and agencies. At the University of Missouri-Columbia, we benefited greatly from the work and advice of the Assessment Resource Center, particularly Robin Albee and Jim Cole. This Center handled all of the tasks related to the printing, mailings, and scanning of the surveys. We also appreciated the assistance of the Office of Social and Economic Data Analysis (OSEDA) for providing the weighting factors. At the Missouri Department of Conservation, our major partner was David Thorne, who contributed to all phases of this project with significant advice and insights. We also benefited from the suggestions and leadership of Dan Witter of MDC, as well as other personnel. The Missouri Department of Conservation provided the funding that allowed the research to proceed in a timely fashion. Additional support came from the Department of Rural Sociology in the Social Sciences Unit, College of Agriculture, Food and Natural Resources (UMC).

We owe an especial debt of gratitude to the individuals who took the time to complete the survey. At a time when citizens are often bombarded by surveys and opinion polling, the number of citizens who participated in our project demonstrates the general interest of Missourians in the issues addressed in this survey and the mandate of MDC. It is our hope that these survey results aid the agency and the citizens of the state in furthering the goals of both groups and provide assistance to the valuable task of maintaining and protecting the significant physical and biological resources of the state.

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Survey Methodology

Survey sample selection

The project team utilized the Assessment Resource Center (ARC) at the University of Missouri to implement the survey sample selection. ARC contracted with USADATA, a national marketing firm, to provide randomly selected households used in the study. USADATA provided a sample of 20,500 Missouri households based on the stratification system described below. USADATA also crosschecked the sample list to ensure that the same household did not receive more than one survey.

ARC gave USADATA an Excel spreadsheet file with a total of 1,016 Missouri zip codes. These zip codes were divided along a plan requested by MDC for the following geographical study units: 7 cities, 8 regions, and 2 black (as defined by US Census returns) oversample regions. The Kansas City and St. Louis city units shared some zip codes with the black oversample areas.

The following sampling frame was used to generate the total of 20,500 households:

1. 1,500 households were selected from each of seven cities (Cape Girardeau-Urban, Columbia-Urban, Kansas City-Urban, Saint Joseph-Urban, Saint Louis-Urban, Springfield-Urban, Joplin-Urban) by zip codes. The seven city subtotal thus comprised 10,500 households

2. 1,000 households were selected from each of the eight region zip code groups (Central-Outstate, Kansas City-Outstate, Northeast-Outstate, Northwest-Outstate, Ozark-Outstate, Saint Louis-Outstate, Southeast-Outstate, Southwest-Outstate) as designated by MDC. The eight region subtotal thus comprised 8,000 households.

3. 1,000 households were selected each from census blocks in Kansas City and St. Louis in which the US Census returns reveal at least 50 percent of the population self-identified as "black/African-American" for race/ethnicity. The subtotal of these two groups (Kansas City-black and St. Louis-black) thus comprised 2,000 households.

From this master list of 20,500 households, ARC drew random samples from each city/region and created a Group 1 sample as follows:

Random sample of 1,200 households from each city (7 cities)	8,400
Random sample of 800 households from St. Louis zips with black pop.>50%	800
Random sample of 800 households from Kansas City zips with black pop.>50%	800
Random sample of 800 households from each outstate MDC regions (8 regions)	6,400
TOTAL HOUSEHOLDS IN GROUP 1 SAMPLE	16,400

Approximately 12% of the initial mailings to the 16,400 households (designated as "Group 1") were retuned by the USPS as "undeliverable" (990) or "forwardable" (1,026). We established a ***Group 2*** mailing to replace or resend these returns. Replacement names were selected in proportion from the regions from which we received "undeliverable" mail; for those households for which the USPS indicated a forwardable address, we simply used the newly-provided listing. Group 2 consisted of 2,314 households, including 2,016 from the two groups mentioned above and an additional 298 names selected from regions with high percentages of mail as undeliverable. Additional details on the composition of this group, the process of implementation, and return rates are discussed later in this section.

Response rates

Table A: Group 1 Survey Waves and Response Rates

Group	Number Mailed	Returned – usable	Returned – undeliverable	Response rate
G1W1	16,400	3,743	2,064	3,743/14,336 = 26%
G1W2	10, 593	2,581	---	2,581/10,593 = 24%
G1Total	14,336	6,324	2,064	6,324/14,336 = 44%

Group 1 mailings and timeline:

Heads-up letters, February 19, 2003
Letters signed by the Director of MDC were sent out to all households in original sample (16,400) explaining the purpose of the research study and informing recipients that a survey packet would be delivered to them within a week.

Wave 1 Survey Packets, February 26, 2003
Mailing of 16,400 survey packets. 3,743 people in the sample responded to this first wave. 2,064 people in this first wave didn't receive packets because they had undeliverable addresses or they had moved to a new address.

Wave 1 Reminder postcards, March 4, 2003
Postcards reminding people to fill out survey (if they haven't already done so) sent out to entire sample.

Wave 2 Replacement surveys, March 20, 2003
Replacement survey packets mailed out to those households that received surveys but did not respond (n=10,593). 2,581 households subsequently responded by sending in completed surveys by the end of this wave.

Last-chance postcard, March 28, 2003
Postcards telling Group 1 households of their last chance to respond to the survey were sent to non-respondents. Postcards were sent out to the entire set of 10,593 Wave 2 households.

Table B: Group 2 survey waves and response rates

Group	Number Mailed	Returned – usable	Returned – undeliverable	Response rate
G2W1	2,314	344	331	344/1,983 = 17%
G2W2	1,639	418	----	418/1,639 = 26%
G2 Total	1,983	762	331	762/1,983 = 38%

Another complete mailing was prepared and sent out to a second group. As noted, Group 2 included households from Group 1 that didn't receive any mailings because of mail forwarding issues, replacement households for Group 1 households that did not receive any mailings because of undelilverable addresses, replacement households for Group 1 households with mailing addresses outside the state of Missouri, and extra households in the urban oversample group. Specifically, these groups were comprised as follows:

1. Forwardables: This group includes households from original Group 1 mailing that didn't receive any survey related mailings because they had moved. With the Group 2 mailing, the new correct addresses for these households were updated in database, and packets etc. were re-stuffed and sent (**n=1,026**).

2. Undeliverables: In the Group 1 mailing, there were 990 "undeliverable" households i.e. households that did not receive any survey related mailings because their addresses were not valid. These undeliverable addresses (**n=990**) were replaced on a 1-for-1 (1:1) basis by zip code (i.e. the same zip code) and replaced with extra randomly selected households from the USADATA list.

3. In anticipation of receiving further undeliverables and forwardable mail from Group 2, and due to the higher percentage of returned mail from the Kansas City and St. Louis black oversample regions, we added 298 households to Group 2. This included 250 households from the Kansas City and St. Louis black oversample regions as well as 48 households to regions where the Group 1 mailing included out-of-state addresses. Additional households were added as needed through random selection of the USADATA list (**n=298**).

Group 2 mailings and timeline:

Heads-up letters, March 24, 2003
Letters signed by the Director of MDC were sent out to all households in Group 2 (**n=2,314**) explaining the purpose of the research study and informing recipients that a survey packet would be delivered to them within a week.

Wave 1 Survey Packets, March 28, 2003
Mailing of 2,314 survey packets. 344 people in the sample responded to this first wave. 331 people in this first wave did not receive any packet because they no longer had a valid address or they had moved to a new address.

Wave 1 Reminder postcards, April 4, 2003
Postcards reminding people to fill out survey if they had not already done so were sent out to entire sample (n=2,314).

Wave 2 Replacement surveys, April 11, 2003
Replacement survey packets mailed out to those households that received surveys, but did not respond (n=1,639) to the Wave 1 mailing. 418 households subsequently responded by sending in completed surveys.

Last-chance postcard, April 30, 2003
Postcards telling Group 2 households of their last chance to respond to the survey were sent to non-respondents. Postcards were sent out to all 1,639 households in Wave 2 survey.

Summary:

A simple way to look at the survey response rates is two combine the Wave 1 and Wave 2 mailings from Groups 1 and 2. This provides a somewhat clearer picture of the overall sample and response rate(s). The "bottom-line" figure for response rate is 43% overall, which is typically considered a viable response rate for mail surveys.

Table C: Combined Group 1 and Group 2 survey waves and response rates

Wave	Number Mailed	Returned – usable	Returned – undeliverable	Response rate
Wave 1	16,650	4,089	331	4,089/16,319 = 25%
Wave 2	12,232	2,999	--	2,999/12,232 = 25%
W1 + W2	16,319	7,088	331	7,088/16,319 = 43%

Sample Used in Analysis and Sample Attrition

As is normal for survey projects, not every returned questionnaire could be used in the analysis. The figures in the tables above include all returned surveys with at least some responses to our questions. But some respondents returned questionnaires only partially complete due to lack of interest, fatigue, and other reasons. Further, some respondents choose not to supply answers to key demographic variables that researchers identified as critical independent variables for the analysis. In this study, the variables of age, sex, and zip code were central to our analysis, and thus we could not use the returns, no matter how complete, of any individual that did not identify any of these three variables.

We had to delete 736 surveys from the final analysis, or 10.4% of the total returns, due to our inability to determine age, sex, or zip code. This dropped our response rate from a total return value of 43 percent to a usable return rate of 39 percent. In looking at the

"loss" of surveys from particular regions, there appears to be no particular urban or outstate region for which a disproportionate amount of surveys could not be utilized. The table below shows the final tally of usable returns, as well as response rates, from every urban and outstate region.

Table D: Response rate of surveys used in analysis

	Households Contacted	Usable Surveys	Response Rate (%)	Region % of Total
Cape Girardeau	1,179	391	33.2	6.2
Columbia	1,182	489	41.4	7.7
Joplin	1,184	463	39.1	7.3
Kansas City Urban	1,158	410	35.4	6.5
Springfield	1,152	479	41.6	7.5
St Joseph	1,184	445	37.7	7.0
St Louis Urban	1,163	457	38.6	7.2
Central Outstate	787	387	49.2	6.1
Kansas City Outstate	788	357	45.3	5.6
Northeast Outstate	786	356	45.3	5.6
Northwest Outstate	787	396	50.3	6.2
Ozark Outstate	782	357	45.6	5.6
St Louis Outstate	773	397	51.4	6.3
Southeast Outstate	781	326	41.7	5.1
Southwest Outstate	783	383	48.9	6.0
KC Black Oversample	918	130	14.2	2.0
STL Black Oversample	932	129	13.8	2.0
Total	16,319	6,352	38.9	100.0

The return rates are very satisfactory for all regions except for the two oversampled urban regions in St. Louis and Kansas City. While the number of returns makes it possible to examine these regions statistically, readers must remember that response rates of 14 percent in these cases are low. The reason for the low response rates is impossible to specify as we did not re-contact non-respondents. However, the results of the data analysis may provide important clues. For example, knowledge about MDC in urban areas in general is lower than in the outstate regions, and the overall trends in response rates confirm generally higher response rates from outstate versus city regions. We might suggest that as the data shows generally lower engagement with MDC (both in terms of knowledge and interaction) as one move from rural to urban that the oversampled regions tend to incorporate core areas of urban regions and thus may include the highest percentages of potential respondents with little contact or familiarity with MDC. Further, our results, as well as those of other studies, reveal lower participation rates among blacks than whites in the kinds of outdoor recreation experiences addressed on this survey. Thus, the oversampled regions include highest percentages of potential respondents who would have found this survey's topics less interesting and relevant.

On surveys such as this one, we may expect that individuals more familiar with, and perhaps favorable towards, the focused agency are more likely to respond to the survey. (On controversial issues, we might expect high returns on both ends of a support/opposition continuum, but in this case we believe that the percentage of people responding to the survey due to intense dislike of MDC is likely small.) In general we ought to be cautious about the generalizability of survey results to entire populations based on the self-selected nature of respondents; in the case of the over-sampled urban area, particular care is warranted in extrapolating from the analyses.

Table E: Demographic Profile of Respondents and Comparisons with Statewide Population

Variable	Survey Sample %	2000 Census %
Location: Outstate Region	(N=2,836)	(N=1,621,715)
Central	13.1	14.7
Kansas City	12.2	13.1
Northeast	11.7	7.6
Northwest	13.4	8.4
Ozark	12.1	9.7
St. Louis	13.5	12.3
Southeast	11.0	15.4
Southwest	12.8	18.8
Location: City	(N=3,241)	(N=2,114,134)
Cape Girardeau	11.6	1.3
Columbia	14.4	3.6
Joplin	13.7	2.6
Kansas City	16.0	28.2
Springfield	14.2	7.1
St. Joseph	13.1	2.7
St. Louis	17.0	54.5
Sex		
Female	31.3	51.4
Male	68.7	48.6
Race/ethnicity		
White	92.2	83.8
Black	3.8	11.1
Hispanic	1.8	2.1
Household Income		
24,999 or less	28.0	31.7
25,000 – 44,999	29.5	31.8
45,000 – 74,999	27.3	19.6
75,000 or more	15.2	16.9
Education		(individuals 25 and older)
H.S. graduate or less	38.2	51.4
Some college	29.5	27.0
College graduate	32.3	21.6
Age		
21-34 years	15.5	28.5

Variable	Survey Sample %	2000 Census %
35-54 years	44.0	41.7
55-69 years	25.8	18.7
70 years or older	14.7	9.1
Currently married	66.9	55.5
Have children in household	35.1	30.1

Any survey of a sub-sample of a large population is not likely to perfectly represent that population, particularly if the sampling design includes stratifications. In our case, our population study was stratified by region and thus included varying selection probabilities for different geographic areas. The relative equality of representation from each of the outstate regions is a by-product of our sampling design, as is the higher number of returns from the urban areas. In the analyses, however, we have weighted our survey respondents by age, sex, and region (see p. xv) to compensate for biases created both by our sampling methodology and the patterns of returns. Table E shows some dimensions of respondent characteristics of our sample versus statewide totals revealed by the 2000 Census of Population.

Our survey population differs in some important respects from the general population. Our weighting scheme (see "Introduction to Data Tables") compensates for age and sex variances. However, we should note that our population also tends to be generally more educated, include fewer minority respondents, and has a higher percentage of married persons than the statewide total. The demographic discontinuities may be an impact of the survey topic itself (e.g., more men may identify with "MDC" in households with both sexes and elect to be the one to return the survey). In our cases, for example, more than 80 percent of returns from "currently married" households were completed by men. The survey process itself may also have an impact. As we sampled by household, the pool of potential respondents is greater in "currently married" households than "non currently married" households. Further, there is on average higher income in households with "currently married" adults than in "not currently married" households and it is generally true that survey return rates are positively correlated with income. While it is always preferable that a survey sample to exactly mirror the study population on all dimensions, we do not believe that these differences have significant impacts on the generalizability of our results.

Appendix Q. Comprehensive Wildlife Conservation Strategy Partners

Audubon Missouri
www.audubon.org/states/mo/mo
As the Missouri state office of the National Audubon Society, Missouri Audubon works to conserve and restore natural ecosystems, focusing on birds and other wildlife. In addition, Missouri Audubon is taking part in the Important Bird Area (IBA) program – a global effort to identify and conserve the areas most important for maintaining bird populations.

Conservation Federation of Missouri
The Conservation Federation of Missouri strives to educate, inspire, and empower individuals and organizations to take action to conserve and to support the sustainable harvest and wise use of fish, wildlife, forest and other natural resources. CFM serves as the Missouri affiliate of the National Wildlife Federation.

Ducks Unlimited
www.ducks.org
Ducks Unlimited works to fulfill the annual life cycle needs of North American waterfowl by protecting, enhancing, restoring, and managing important wetlands and associated uplands. In doing so, DU not only helps conserve waterfowl, but also many other wetland species, as well as helping to preserve the important ecological functioning of intact wetlands.

Grasslands Coalition
www.moprairie.org/gcdescript.htm
The Grasslands Coalition (GC) is a public-private partnership for grassland wildlife conservation, using the prairie chicken as a key indicator of grassland health. In 1998, the Coalition identified nine specific Focus Areas in Missouri in which to concentrate their resources to benefit grassland restoration and wildlife habitat.

Missouri Conservation Heritage Foundation
www.conservation.mo.gov/news/2000/MCHF/MCHF.html
The Missouri Conservation Heritage Foundation's sole purpose is to promote awareness and public support of Missouri Conservation programs. The Foundation offers an opportunity to support natural resources and conservation through tax-deductible donations.

Missouri Department of Natural Resources (DNR)
www.dnr.state.mo.us
The Missouri Department of Natural Resources preserves, protects, restores and enhances Missouri's natural, cultural and energy resources and inspires their enjoyment and responsible use for present and future generations.

Missouri Natural Areas Committee
mdc.mo.gov/nathis/naturalareas
The Missouri Natural Areas Committee (MoNAC) coordinates the statewide system of Natural Areas. The Department of Natural Resources and the Missouri Department of Conservation co-

administer the system, and representatives from the National Park Service and the U.S. Forest Service also serve. MoNAC strives to include the best examples of every remaining type of natural community and geologic feature in the natural areas system.

Missouri Prairie Foundation
www.moprairie.org
Founded in 1966, the Missouri Prairie Foundation works to protect and restore prairie and other native grassland communities through acquisition, management, education, and research.

Missouri Resource Assessment Partnership
www.cerc.cr.usgs.gov/morap
Missouri Resource Assessment Partnership (MoRAP) envisions a Missouri where environmental quality is maintained and human needs are met to ensure the highest quality of life for our citizens. MoRAP's role is to help develop, analyze, and deliver high quality information at the lowest possible cost so partner agencies can efficiently accomplish natural resource inventory, monitoring, and management.

National Park Service
www.nps.gov/ozar
The Ozark National Scenic Riverways protects 134 miles of the Current and Jacks Fork Rivers in the Ozark Highlands of southeastern Missouri.

National Wild Turkey Federation
www.nwtf.org
The National Wild Turkey Federation supports scientific wildlife management on public, private and corporate lands as well as wild turkey hunting as a traditional North American sport.

Natural Resources Conservation Service (NRCS)
www.mo.nrcs.usda.gov
The Natural Resources Conservation Service provides leadership in a partnership effort to help people conserve, maintain, and improve our natural resources and environment.

The Nature Conservancy
www.nature.org/wherewework/northamerica/states/missouri
The Nature Conservancy's mission is to preserve the plants, animals and natural communities that represent the diversity of life on Earth by protecting the lands and waters they need to survive. Using a science-based planning process called Conservation by Design, TNC works to identify the highest-priority places that, if conserved, promise to ensure biodiversity over the long term. TNC's vision is to conserve a set of places that will help ensure the long-term survival of all their native life and natural communities—not just those that are threatened.

Central Hardwoods Joint Venture
http://www.abcbirds.org/nabci/centralhardwoods.htm
Members of the Central Hardwoods Joint Venture (CHJV) formed a partnership, beginning in 2000, with the primary purpose of elevating emphasis on all-bird conservation within the Central Hardwoods Bird Conservation Region (CHBCR). This new partnership seeks to take a lead role

in implementing "all-bird" conservation objectives as set forth by the various national and international bird conservation initiatives operating within the North American Bird Conservation Initiative (NABCI).

Ozark Regional Land Trust
www.orlt.org
ORLT has over two dozen projects protecting more than 3,300 acres of land throughout the Ozark region. It has been instrumental in protecting many natural and geological features such as waterfalls, caves, significant springs, bluffs, forests, prairies, glades, rivers and wetlands. ORLT also preserves urban open space, agriculture lands, historic places and sensitive ecological sites protecting wildlife and endangered species.

Quail Unlimited, Inc.
www.qu.org
Quail Unlimited works to preserve and improve quail habitat.

United States Fish & Wildlife Service
www.fws.gov
The U.S. Fish and Wildlife Service works with others to conserve, protect, and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people.

U. S. Forest Service
www.fs.fed.us/r9/marktwain
The USDA Forest Service manages public lands, including Missouri's Mark Twain National Forest. They strive to sustain the health, diversity, and productivity of our nation's forests and grasslands to meet the needs of present and future generations.

American Fisheries Society
www.fisheries.org
The mission of the American Fisheries Society is to improve the conservation and sustainability of fishery resources and aquatic ecosystems by advancing fisheries and aquatic science and promoting the development of fisheries professionals.

Missouri Department of Conservation
www.mdc.state.mo.us
The Missouri Department of Conservation protects and manages the fish, forest, and wildlife resources of the state. MDC also provides an opportunity for all citizens to use, enjoy, and learn about fish, forest, and wildlife resources.

Appendix R. Conservation Landscapes Meeting Agenda

AGENDA - Conservation Planning Workshop

Conservation Employees Credit Union, Jefferson City, Missouri
November 3, 2004, 9:00 am through 4:00 pm November 4, 2004

Selecting Conservation Landscapes in Missouri

November 3

9 am	**Welcome** **Introductions**	**Rick Thom**
	Goals of the Workshop	**Dennis Figg**
	Comments from the Department	**John Smith**
9:30	**Conservation Opportunity**	**Dennis Figg**
9:45	**Conservation Opportunity Areas (COAs)**	**Various Representatives fac by Amy Linsenbardt**
	Building the combined COA layer demonstration	**Chris Wieberg**
11:00	**BREAK**	
11:15	**Criteria for Conservation Landscapes (CL)** (Examples and Discussion)	**Dennis Figg**
	COA Layer Discussion	**All**
11:45	**Select Conservation Opportunity Areas for discussion ("dot" exercise)**	**facilitated group exercise**
Noon	**LUNCH** (provided)	
1:00 pm	**Review Selection Criteria/Process**	**Rick Thom**
1:15	**CL Candidates – The Next Step** **Discussion, Teams, Leaders**	**Dennis Figg**
2:15	**Evaluate Conservation Landscapes**	**All**
3:15	**BREAK**	
3:30	**Evaluate Conservation Landscapes**	**All**
4:30	**Day 1 review, plan for Day 2, Questions**	**Amy Linsenbardt**

November 4

8:00 am	**Conservation Partnerships** Presentation and Discussion	**David Urich**
9:00	**Assessment of Process**	**Amy Linsenbardt**
	Evaluation of Conservation Landscapes (continued)	**All**
10:15	**BREAK**	
10:30	**Evaluation of Conservation Landscapes** (continued)	**All**
Noon	**LUNCH (provided)**	
1:00 pm	**Evaluation of Conservation Landscapes** (continued)	**All**
3:15	**BREAK**	
3:30	**Questions, Review and Discussion** **Challenges** **Meeting Wrap-Up** **Close Meeting**	**Dennis Figg**

<u>Meeting Outcomes</u>:

- Conservation partners introduce respective Conservation Opportunity Areas
- Participants understand/evaluate criteria for selecting Conservation Landscapes (CLs)
- Participants use a facilitated process to identify the most promising CLs (candidates)
- CL candidates assigned lead person
- Participants understand the “next step” and agree to help develop CL descriptions

Appendix S. Guidance for Conservation Opportunity Area Stakeholder Teams

Nov 23, 2004

Thanks for agreeing to lead the development of a project profile for the Conservation Wildlife Strategy (CWS). Conservation opportunity is all around us, but there are not enough of us to conserve all of the opportunity we identify. While the task of conserving "all wildlife" opens the door for just about everything we could ever want to do to conserve wildlife and their habitats, we have identified the most promising opportunity areas to conserve "all wildlife" in Missouri.

The Comprehensive Wildlife Strategy (CWS) is not simply a plan to get additional State Wildlife Grants, but a way to set priorities for conservation action and generate new and different partnerships for conservation action. You've volunteered (or been recruited) to complete the development of a conservation profile for one of the project areas that will be included in the CWS Conservation Landscapes of Missouri.

Think of the CWS Landscape document as a directory of the best places in Missouri to conserve representative ecosystems and the plants and animals that depend on them.
Your task is to bring together a diverse group of stakeholders, fully describe a specific project area (= conservation landscape), and complete a profile that will be included in that directory. Our job is to offer technical assistance, facilitation, and guidance so that the profile (developed by a team of local stakeholders), will be ready to include in the CWS Landscape document.

Much of the advance work has already been done. We will provide you with the instructions, data layers, technical assistance, and even the facilitator if you like. In short, if you set up the stakeholder meeting we believe the decision-making can be done in a facilitated one-day meeting with stakeholders. After that meeting you will complete a 3-4 page profile based on the team decisions.

Please have your completed profile(s) submitted to me by Monday, January 24, 2005.

Thanks,

Dennis Figg
CWS Plan Coordinator
Wildlife Division, Missouri Department of Conservation
P.O. Box 180
Jefferson City, MO 65102

573-522-4115 ext. 3309
Dennis.Figg@mdc.mo.gov

Developing a project area profile for the CWS

You may feel that laying out strategic goals for ecosystem management is a big assignment. And it is. But you are NOT writing a wildlife diversity plan for the state, or even for a small part of the state. You are being asked to gather a team of stakeholders and define a project area that will further conserve all wildlife in that geography.

"To think, plan and act in terms of ecosystems is seemingly a logical route, but it is equally extremely tasking. Having a spatial element in an ecosystem approach was essential……..", from Developing and Applying a National Ecosystem Concept in Canada, by E. B. Wiken, in North American Workshop on Monitoring for Ecological Assessment of Terrestrial and Aquatic Ecosystems. The spatial element in our conservation planning framework is the conservation opportunity area, and the next step is to describe project area(s) from with the help of local stakeholders.

We have provided the conservation opportunity areas in a spatial database, and recorded the reasons why various conservation interests want to go to work in this geography. This information is available to you …… and to your team ……so that you can take the next step, which is describing one or more project areas from the conservation opportunity area. Your assignment is to guide a group of stakeholders as they understand and describe a cohesive vision for conservation in a specific place where successful conservation is promising.

"Ecosystem management treats Protected Areas [conservation landscapes] not as individual ecosystems, but as part of a larger ecosystem that should be managed by numerous stakeholders with a long-term perspective". From "Islands in a Waterless Sea: The Need for Collaboration between Protected Areas and Their Neighbors". Stacy James, Division of Biological Sciences, University of Missouri.

The project profile you prepare is a brief strategic vision document that will be used to support locally led conservation. Your task is to guide the stakeholders in the development of strategic goals and plans for monitoring success, and then report their decisions and recommendations. The profile is only 3-5 pages of information, but it is the first step (or perhaps the next step) in our conservation planning for all wildlife.

Six steps to profile development:

Step 1 – Gather the team of stakeholders
Step 2 - Review reasons for CL selection. Evaluate GIS products and spatial layers.
Step 3 – Seek guidance on the scale of the project area(s).
Step 4 – Use spatial technology to evaluate the Conservation Opportunity Areas and generate 1 or more project areas by primary habitat category.
Step 5 – Select 1 (or more) project areas to profile.
Step 6 – Prepare a profile for each project area. Project areas will be called Conservation Landscapes when they are incorporated into the final CWS.

We will help you and your team by providing technical assistance as well as meeting facilitation to the degree that you need it.

Step 1 – Gather the Team of Stakeholders

Bring in as many stakeholders as possible to discuss the conservation opportunity. The first draft of the project profile lists the conservation partners that want to go to work with you, "Partners Identified at the Conservation Planning Workshop". Their contact information is available on the CWS Partners list. These people represent the agencies and organizations that are already committing time and money in this project area, or would invest in the conservation opportunity if they had the opportunity to become partners.

The Conservation Planning Workshop was the first pass at identifying potential participation. It probably isn't everyone. You know the conservation opportunity and existing initiatives. You are familiar with the local communities and community leaders, so be thinking about who else might be important to include. **Bring together a diverse group of stakeholders who will contribute positively to build a vision for conservation in your conservation landscape.**

Set a meeting time and date that meets the needs of as many stakeholders as possible. Advise us on your schedule and your team needs so that we can coordinate the time and date with the technical team and facilitator.

Step 2- Review reasons for COA selection. Evaluate GIS products and spatial layers.

Discuss the Conservation Opportunity Areas from your specific geography (spatial data will be provided to your team) and the potential project areas that could be identified for the CWS. **Build understanding about the conservation initiative with all of the stakeholders**. What conservation action is happening now? What could happen in the future? Each partner/participant should be given an opportunity to speak to their conservation interest. Local/regional biologists and managers could also talk about existing priorities and funding related to the conservation initiative. Use the spatial layers to answer questions about current land use, historic context of matrix natural communities, and other questions from team.

Group discussion: Is the conservation interest consistent/complimentary among partners and relevant to the ecological framework? For example, does everyone agree this is a forest wildlife initiative? If we are building landscapes for forest interior birds are the conservation needs of all partners consistent with that habitat based initiative? Also, would the habitat based initiative be relevant in the ecological framework described in The Atlas of Missouri Ecoregions? If the answer is "no" on either topic, the team should consider how to proceed, or if to proceed. Every project area should be described within the context of the primary habitat category (Forests, Woodlands, Savannas, Prairies, Glades and Cliffs, Wetlands, Caves, Rivers and Streams). There must be consensus on the conservation initiative.

If "yes", there is agreement on the ecological framework as well as consensus on the primary habitat initiative, then general agreement among the stakeholders on the development of conservation project area(s) is the next step.

What happens if not all stakeholders want to participate when they understand the conservation initiative fully? That's alright. One important reason for the stakeholders meeting is to get clarity on the conservation opportunity. When there is clarity in the conservation initiative some

participants will decide this is not where they want to go to work, or perhaps not the best place to go to work with limited resources. Other participants will get confirmation that this is still the place to go work. Still others may realize that they can accomplish more if they work with this team in this geography and not work as much in other places. All three are good outcomes. Build understanding about the conservation opportunity and decide which stakeholders are best connected to this specific initiative.

Step 3 – Seek guidance on the scale of the project area (s) = conservation landscapes.

There are tremendous ecological unknowns on the necessary scale of your work. Do the best you can do with the expert resources available to you.

How big is big enough? Some initiatives can be small and others will need to be large enough to capture the primary natural system and representative components. Think at a landscape level…….. But also appreciate that the realities of the current landscape are often constraining. A good message from a recent article in Conservation Biology in Practice**, "Make reserves too large and spillover to fisheries [all fish and wildlife diversity] will be staunched. Make them too small and nothing will benefit".**

Seek out the best guidance you can get for the appropriate scale of the conservation initiative. Partners in Flight offers guidance for guilds of birds with scales of action based on healthy reproducing populations of certain species. For example, if one of your wildlife targets is the cerulean warbler, PIF guidance is that forest blocks of >20,000 acres are necessary to sustain 500 pairs of birds. It may be useful to use this information as a starting place and contrast the other "conservation interests" to expand or contract the size of the initiative. **Find consensus on the scale of conservation action and contrast that with the reality of the present landscape within the boundaries of the conservation opportunity area.**

Step 4 – Use spatial technology to evaluate the conservation opportunity area and generate 1 or more project areas by primary habitat category.

If the Conservation Opportunity Area can only support one project area, then the team refines the boundaries that best captures this specific conservation initiative. It is important that you record the criteria used in your boundary delineation.

If the Conservation Opportunity Area can support more than one project area at the agreed upon scale, map as many options as the team recommends**. Discuss the "existing conservation network" and build on it. Generate 2, 3 or 4 options and discuss the strengths and weaknesses of each.** Prioritize them from highest to lowest. Find consensus on how many of these options should be elevated to project areas. Again, it is important to record the criteria used in your boundary delineation.

We have provided the spatial layers that will help you take the next step in defining project areas. We can provide additional guidance if you need it, but there is no wrong or right approach. Consistency can be a good thing, but the same approach will not fit every landscape. Don't "get lost" in the delineation of the project area boundary, it does not have to be perfect, but it should represent the conservation interests on the team.

Step 5 – Select 1 (or more) project areas.
Select a name for each project area, preferably a geographic name that has relevant history, or a name that is recognizable because of existing conservation opportunity.

If there is no consensus on the name then the team leader has to (gets to) decide.

Step 6 – Prepare a profile for each project area. These project areas will be called Conservation Landscapes when they are incorporated into the final CWS.
The first draft of the project area profile is provided for you. Your task is to "fill in the blanks" after hosting the stakeholder meeting. As the profiles are completed we will share them with all team leaders so you can compare notes and review the products of other teams.

All profiles will follow the same format. Key elements of the format are Description of the Conservation Landscape, Existing Conservation Lands, Conservation Partners (Existing and Future), Strategic Conservation Goals, Plans for Monitoring, Priority Research and Inventory Needs, Funding Sources (Existing and Future), Obstacles to Success…… and photos suitable for publication.

The team leader can develop the profile as necessary, but the best approach is to facilitate team discussion and compile the input. Whenever possible, we will be happy to facilitate the discussions ……or we can provide guidance on how to use facilitated discussion to achieve consensus on the conservation actions and plans for monitoring.

The completed profile is probably 3-5 pages. The profile is the framework for generating conservation action. It clearly describes the conservation initiative, the stakeholders that want to participate in conservation action, the strategic conservation goals and monitoring needs. It also includes a list of the funding mechanisms that could be directed to this conservation landscape so that everyone is successful.

Submit the profile as soon as it is ready so that we can compile the CWS Landscapes document. **Please have your profile submitted by Monday, January 24, 2005**.

CWS Project Area Profile – Specific Guidance on Content

Landscape Name
The name of the project area. Keep it simple and relevant to the geography and the people who live and work there. A local conservation initiative should be named to be recognizable by local stakeholders.

Brief Description of the Conservation Landscape
This is a half page description of the project area. It necessarily focuses on the primary habitat category (Forests, Woodlands, Savannas, Prairies, Glades and Cliffs, Wetlands, Caves, Rivers and Streams). There need not be a lot of ecological background or agency terminology.

You will not be able to list/describe all of the wildlife that will be conserved in the project area, but this is a good place to identify the characteristic natural communities and "banner species" that are obvious conservation targets. For example, the Little Niangua Basin is an Ozark stream initiative and the Niangua darter would seem an obvious species to highlight. You should consider highlighting the other conservation targets that represent the project area. If you participated in the aquatic and terrestrial assessments of MDC we list the targets for the EDU or the LTA. Otherwise, when each stakeholder identifies their conservation needs they will identify their conservation targets. For example, if Quail Unlimited is present their target species is bobwhite quail, and their habitat target will be grasslands and shrublands.

If this profile represents a conservation initiative, then you would want to share the description with a new community leader or resident. These people should easily understand why this area is important for all wildlife when they read the project area profile.

Existing Conservation Lands
The draft project area description has a list of conservation lands, but this will change as soon as you delineate the boundaries of the project area(s**). The list of conservation lands will be generated from the spatial data layer** and not a group exercise. However, the group needs to review the conservation lands list for correctness, and to add conservation lands not mapped (local nature areas, green space, etc.). Maps produced for this specific project area will need to include all conservation lands.

Conservation Partners
Existing conservation partners are the individuals, agencies, NGOs and public lands that are already delivering conservation for all wildlife. Public agency lands fit here, but only if the land is being managed for conservation objectives.
Future conservation partners are the individuals, agencies, NGOs and others who want to deliver conservation for all wildlife. Planning entities are probably not partners, but valuable sources of expert guidance.

Conservation partners can be any individual, community, group, agency or organization. They don't necessarily reside in the project area but are active in conservation delivery in the project area. They knowingly deliver conservation action. The stakeholder may support the conservation action, but not be a conservation partner in this specific project area. For example,

the Missouri Prairie Foundation supports prairie wildlife conservation statewide, but with little staff they cannot be active partners in every project area.

Strategic Conservation Goals
Everyone who wants to deliver conservation action in the project area has specific objectives. Most of them are operational. Your task is to discuss desirable conservation actions and roll them up into 4-5 strategic goals. The best approach is to ask give every partner to make/bring a list of their strategic goals ….. they may need your guidance here. After listing all of them, the team revises the goals to 4-5 that capture the conservation actions of every participating conservation interest present.

Example of a strategic goal: Double the acres of ephemeral wetlands in the grassland restoration areas to create habitat for tiger salamanders. OR Double the population of tiger salamanders in the grassland restoration areas. Exactly where, when, with what tools, within what time frame, are operational goals and objectives. The specifics of how to accomplish implementation are not described here. These are team planning decisions in the future.

Develop as many strategic goals as needed, but revise them or consolidate them into the highest 4-5 for your project area profile.

Plans for Monitoring
Monitoring is necessary …….. and necessarily related to the strategic objectives. For every strategic objective the team submits, they should consider how to monitor success. Management actions require performance monitoring. In the example of the ephemeral pool habitat, performance monitoring is reporting on the acres constructed.

Since your strategic goals describe conservation outcomes (at the landscape, habitats/natural community or species level) effectiveness monitoring will need to be identified. In this example, effectiveness monitoring is tracking the population trend of the salamanders to determine if the habitat objectives are producing the target wildlife, or tracking the habitat gain in relation to changes in the salamander population.

Identify as many monitoring needs as needed, but only list the top 5-10 in your profile.

Do the best you can to describe your monitoring needs, and relate them specifically to your strategic goals. This is a good facilitated exercise for the team. We will review and help revise monitoring needs (Dennis Figg, Debby Fantz, Courtney Kerns) as you develop your profile, and after you submit your profile as needed.

Priority Research and Inventory Needs
Refer to your strategic goals and monitoring needs, and identify research and inventory needs. This is a good facilitated exercise for the team. For example, perhaps one of the strategic goals is to reduce tree canopy cover on 30% of the remnant limestone glade communities in the project area. You may need a complete inventory of glade habitats so that you can prioritize which

glades are the highest natural quality. This is a priority inventory need if it will prevent your team from targeting conservation action without it.

Identify as many research and inventory needs, but only list the top 5-10 in your profile.

Funding Sources (Existing and Future)
This is a good facilitated exercise for the team. Make a list of all of the funding that is presently being used for conservation action in the project area. Also make a list of the funding opportunities that the team would like to explore for future conservation action.

Obstacles to Success
This is a good facilitated exercise for the team. Generate a list of threats to success. Perhaps review each strategic goal and find out what is preventing successful conservation of all wildlife in the project area. The team should prioritize them. For example, exotic invasive plants may be the primary threat to restoration of a grassland ecosystem.

Photographs
The final Conservation Landscapes report will include 3 – 5 photographs of every project area. Please submit 5-10 high quality digital photographs of the landscape, best natural communities/habitats, and/or key species targets. Not everyone has the tools and skills for this so recruit help from the team, or let us know and we will assist as necessary.

Do not integrate your photos into the CWS profile. It is fine…… necessary ……. that they remain separate. Coordinate your photograph needs with Amy Linsenbardt.

Appendix T. Conservation Federation of Missouri Affiliates

Archery Big Bucks of Missouri
Big Game Hunters
Bridlespur Hunt Club
Capital City Fly Fishers
Central Missouri Chapter Safari Club
Coldwater Outing & Game Preserve
Deer Creek Sportsman Club
Festus/Crystal City Conservation Club
Forest Releaf of Missouri
Franklin County Wildlife Club
Friends of Lake Taneycomo
Greenway Network
Heaven's Anglers
Jefferson County Coonhunters
Kansas City Woodcarvers
Lambert Field Rod & Gun Club
Mark Twain Area Quail Unlimited
Mid Missouri Ruffed Grouse Society
Mid Missouri Trout Unlimited
Midwest Diving Council
Mississippi County Conservation Association
Mississippi Valley Duck Hunters
Mississippi Valley Gun Club
Missouri Association of Meat Processors
Missouri Bass Federation
Missouri Bow Hunters
Missouri Conservation Agents Association
Missouri Consulting Foresters Association
Missouri Equine Council
Missouri Falconers Association
Missouri Federation of Animal Owners
Missouri Forest Products Association
Missouri Mountain Maids
Missouri Park & Recreation Association
Missouri Parks Association
Missouri Prairie Foundation
Missouri Sport Shooting Association
Missouri State Campers Association
Missouri State Council Quail Unlimited
Missouri Taxidermist Association
Missouri Trappers Association
Missouri Trout Fishermen's Association
Missouri Waterfowl Association
Missouri Wild Turkey Federation
Missourians Outdoors
MO Chapter Soil & Water Conservation
MO Hunter Education Instructor's Association
Monett Sportsman League
Noodler's Anonymous
Northeast Missouri Coonhunters
Northside Conservation Federation
Ozark Fly Fishers
Ozark Mountain Paddlers
Ozark Wilderness Waterways
Perry County Sportsman Club
Pomme De Terre Chapter Muskies
St. James Civic Club
Show-Me Clean Streams
Shoe-Me Missouri Back Country Horsemen
South Side Division
Southwest Missouri Fly Fishers
Sporting Dog Association of Missouri
Table Rock Bassmasters
Tipton Farms & Sportsman Club
Triple "F" Sportsman Club
United Bow Hunters of Missouri
Wecomo Sportsman Club
Wild Elk Institute of Missouri
Windsor Lake Rod and Gun Club

Appendix U. Conservation Federation of Missouri Resolution

Committee: Natural History & Wildlands

#26

Author: MO Natural Areas Assoc.

Comprehensive Wildlife Strategy

WHEREAS the Missouri Department of Conservation is producing a Comprehensive Wildlife Strategy (CWS) to guide the conservation of all wildlife, plants and natural communities important to all of Missouri's wildlife;

AND WHEREAS, an important component of the CWS is to work with partner agencies, organizations and other entities in achieving its conservation goals;

AND WHEREAS, the members of the Missouri Natural Committee are also partners in the production of the CWS;

AND WHEREAS, the objective of the Missouri Natural Areas System is to identify, protect and manage the best examples of Missouri's terrestrial and aquatic natural communities and geological features within a system of designated Missouri Natural Areas;

AND WHEREAS, this objective is compatible with and, in fact, advances the objectives of CWS;

AND WHEREAS, the solicitations of recommendations and opinions from conservation partners is part of the CWS planning process;

NOW, THEREFORE, BE IT RESOLVED that the Conservation Federation of Missouri assembled at the Lodge of Four Seasons, this 13th day of February, 2005. endorse the efforts of the MDC to create a Comprehensive Wildlife Strategy and ask that the growth and maintenance of the Missouri Natural Areas System be recognized within the CWS as important to comprehensive wildlife conservation and that designated Missouri Natural Areas and potential candidate natural areas be represented in the CWS products.