Atlas of Missouri Amphibians and Reptiles for 2023

Richard E. Daniel and Brian S. Edmond

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Richard E. Daniel
Division of Biological Sciences
University of Missouri-Columbia
114 LeFevre Hall
Columbia MO 65211
danielr@missouri.edu

Brian S. Edmond
Computer Services
Missouri State University
901 South National Ave
Springfield MO 65897
BrianEdmond@missouristate.edu

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Introduction

Since 1988, members of the Missouri Herpetological Association have compiled new county distribution records for amphibians and reptiles native to the state (Daniel *et al.* 2022 and previous updates). Cumulative accounts of these new records were presented in Powell *et al.*. (1993), Powell and Daniel (1997), and Daniel and Edmond (2002). Johnson (2000) presented revised distribution maps based on a combination of these cumulative accounts and more recent annual compilations. The publication of Johnson (1987, 2000) renewed interest in expanding our knowledge of the distribution of the state's herpetofauna. Briggler and Johnson (2021) published an updated version of the *The Amphibians and Reptiles of Missouri* that incorporated all *Atlas* records up until that time. We follow their taxonomy and nomenclature here. In order to provide herpetologists working in Missouri with current information that is easily taken into the field, we are presenting revised species distribution and county records maps in a format that can be easily updated as new records are documented.

In 1997, with the initiation of the Missouri Herpetological Atlas Project (MOHAP), a database was established to serve as the basis for verifying new distribution records and tracking changes in individual species distributions within the state (Edmond and Daniel 2024). Qualification for inclusion in the database requires a catalogued voucher specimen housed in an institutional collection (Appendix A). However, in order to be valuable in tracking changes in the distribution of individual species, it is important to document historical records. Many of the specimens collected prior to the 1970s, most notably those reported by Hurter (1911) and Anderson (1965), were documented by specimens that have since been lost or destroyed. In order to provide the most accurate picture of the distribution of the state's herpetofauna we have included some literature records (Appendix B).

Some records were not included because the identification could not be determined with certainty. Within Missouri, the *Hyla versicolor* complex consists of two broadly sympatric and morphologically indistinguishable species (*H. chrysoscelis* and *H. versicolor*). Specimens collected for which the species identification was not determined by some non-morphological trait were not included.

Currently, the MOHAP database contains 38,487 entries and 34,349 valid, non-duplicated collections. This represents specimens housed in 37 museum collections and cited from 33 historical literature sources; 5,347 documented county records; 10,816 unique localities; and 18,150 unique species / locality combinations. This new total constitutes 679 new database entries since the 2021 edition of the *Atlas* (Daniel and Edmond 2022). The total number of species contained in the current edition of the atlas is 118, comprised of 116 native species and 2 non-native species.

Previous editions of the atlas are available upon request. Readers may contribute new records and read more about project details online (Edmond and Daniel 2024). Questions, comments, and suggestions should be directed to the senior author.

Amphibians and Reptiles of Possible Occurrence

A number of species found in surrounding states are known to occur in close proximity to the borders of Missouri. While not currently recognized as part of the Missouri herpetofauna, some or all of these species may eventually be found within the state.

A number of primarily eastern species have distributions that reach the Mississippi River along a portion of the Missouri border. These include: Southern Two-lined Salamander (*Eurycea cirrigera*), Three-lined Salamander (*Eurycea guttolineata*), Northern Zigzag Salamander (*Plethodon dorsalis*), Northern Slimy Salamander (*Plethodon glutinosus*), Eastern Cricket Frog (*Acris crepitans*), Western Chorus Frog (*Pseudacris triseriata*), Bird-voiced Treefrog (*Hyla avivoca*), Eastern Fence Lizard (*Sceloporus undulatus*), Gray Ratsnake (*Pantherophis spiloides*), and Eastern Ribbonsnake (*Thamnophis sauritus*).

Rivers, even large ones, change course over time and typically form an imperfect geographic barrier. Shepard and Kuhns (2017) examined the separation between Northern Slimy Salamanders (*Plethodon glutinosus*) and Western Slimy Salamanders (*Plethodon albagula*) along the Illinois-Missouri border. They found that salamanders on Fountain Bluff, an island formed of Missouri uplands cut off by post-glacial changes in the Mississippi River channel, belong to the species found in Illinois.

Spotted Dusky Salamander (*Desmognathus conanti*) and Midwestern Earthsnake (*Carphophis amoenus*) have been reported in the southern portion of Crowley's Ridge of Arkansas. Crowley's Ridge is a thin, sandy upland formed during the Pleistocene, which extends from northeastern Arkansas through southeast Missouri to the Shawnee Hills of Illinois. Populations of one or both of these species may exist in the isolated remnants of Crowley's Ridge in Missouri.

Powell *et al.* (2016) shows the distribution of the Western Milksnake (*Lampropeltis gentilis*) extending into western Missouri along the Kansas border. However, the sparsity of records from this region makes it difficult to accurately define the species boundary. Until additional material is available for evaluation, we have not included this species as part of the state herpetofauna.

Erroneously Reported and Non-Native Species

Anderson (1945) reported two specimens of the Dwarf Salamander (*Eurycea quadridigitata*) from Roaring River State Park in Barry County. With the nearest known naturally occurring populations of *E. quadridigitata* in southern Arkansas, more than 125 miles from the Missouri border, it is likely that this record is based on misidentified, but morphologically similar Oklahoma Salamanders (*E. tynerensis*).

Johnson and Bader (1974) included Lesser Earless Lizard (*Holbrookia maculata*) based on two specimens

collected from Knob Noster State Park in Johnson County. Nickerson and Krager (1972) considered this record problematic because of the close proximity of the park to Whiteman Air Force Base and Central Missouri State University. The nearest record of this species is more than 115 miles away in central Kansas. Further searches failed to produce additional specimens. As a result, this species is not considered to be part of Missouri's herpetofauna.

Anderson (1957) listed the occurrence of the Queensnake (*Regina septemvittata*) in Missouri based on three specimens deposited in the American Museum of Natural History collection. These specimens were ascribed to G.K. Noble and reported to come from Stone County. In further investigation by Roger Conant (1960), Byron C. Marshall, who worked with Noble in the Interior Highlands during this period, reportedly had no recollection of finding this species. The nearest known populations of Queen Snake are in the Boston Mountains of Arkansas, approximately 80 miles south of this locality. The questions about the origin of the specimens and the absence of additional records from Missouri suggest that this species does not occur in the state.

One species of non-native frog and two species of lizards have been reported in Missouri. A population of Greenhouse Frogs (*Eleutherodactylus planirostris*) was established inside a commercial greenhouse in Jefferson City, Missouri (J. Briggler, pers. comm.). The population of these small terrestrial breeding frogs persisted for several years, but has apparently disappeared following renovation of the greenhouse. There are no other reports of this tropical species occurring within the state. Its apparent inability to survive extreme winter weather makes it unlikely for these frogs to exist in Missouri as a free-ranging species outside of sheltered habitats, such as greenhouses.

Mediterranean Gecko (*Hemidactylus turcicus*) is native to the Mediterranean basin and western Asia. This species is easily transported and a highly successful colonizer. Populations of this species have been established worldwide. In the United States, this species is currently established widely throughout the south, especially along the Gulf and East Coasts. Isolated populations are also found around numerous urban centers of the Midwest and central plains (Powell *et al.* 2016). Two populations appear to be established in Missouri. Bufalino (2004) reported this species from St. Louis County. A second population was discovered in Joplin, Missouri by Mr. A. Braun (Daniel *et al.* 2015).

Briggler *et al.* (2015) reported the presence of a robust population of Italian Wall Lizard (*Podarcis siculus*) in a Joplin neighborhood after being contacted by a resident in 2013. This population apparently descended from a series of lizards imported from Topeka, KS, which escaped in 2001. In many states, including Missouri, it is illegal to release non-native species. Despite prohibitions, the majority of introduced populations of this species in North America originated from released animals in the pet trade (Burke and Deichsel 2008).

Thus far, non-native amphibians and reptiles in Missouri have been confined to urban centers and do not appear to constitute a threat to our native herpetofauna. However, this is not the case everywhere and non-native species that have become invasive are considered by many biologists to be a major threat, second only to habitat loss or degradation, to native species. Responsible pet owners should always exercise care to prevent the spread of this and all non-native species into the natural environment.

Distributions

Distribution is one of many characteristics used to describe a species and range maps (such as those found in Conant and Collins (1998)) are used to approximate a species' likely distribution. This atlas uses locality dot maps, with each dot representing a known locality for that species. This conservative method results in an underestimate of a species distribution but is more accurate than a range map. The purpose of the atlas project is to document as closely as possible both current and historical distributions for all native amphibians and reptiles in Missouri.

However, the printed version of the atlas only reflects the best historical approximation of each species' distribution in the state. The most noticeable resulting incongruity is that fact that some species are shown in historical localities in which they are almost certainly no longer found. For example, the Smooth Greensnake (*Opheodrys vernalis*) was once found in scattered populations in the prairie regions of the state. Due to extensive habitat loss and possibly other reasons, they are extremely rare or extirpated in the state.

While natural communities have long been a staple in ecology, formal classification of natural communities has been undertaken relatively recently in Missouri (Nelson 2005). Like individual species, natural communities can be described and characterized with distinct distributions and abundances in different ecoregions (see next section). For example, glades are common in the Ozarks but rare elsewhere in the state. Steyermark (1963), Yatskievych (1999), Pflieger (1989), Hawker (1992), and Unklesbay and Vineyard (1992) all describe and summarize the complex interplay among geology, natural history, ecoregions, natural divisions, and natural communities from slightly different perspectives. Taken together, these ideas form the basis of the biogeography of Missouri and they are essential in understanding why plants and animals have the distributions that we see today.

Terrestrial Ecoregions

An ecoregion classification system attempts to define and describe geographic regions that correspond to broad ecosystem patterns, topography, geology, soils, vegetation patterns, and the distributions of plants and animals. Omernik (1987) described ecoregions (Levels I, II, and III) for the conterminous United States as a hierarchical scheme with Level I corresponding to large regions and Level III representing smaller, more precisely described regions. The Environmental Protection Agency (2003) is coordinating an effort to further subdivide Level III regions into Level IV regions. Nigh and Schroeder (2002) published Level III and Level IV ecoregions for Missouri.

Some amphibian and reptile species follow defined ecoregions closely. For example, the Cave Salamander (*Eurycea lucifuga*) is neatly confined to the Ozark Highlands (Level III) and found throughout the ecoregion, with the exception of most of the Springfield Plateau (Level IV). Several species found in the southeastern alluvial plain are particularly characteristic and also confined to that area (*e.g.*, Three-toed Amphiuma (*Amphiuma tridactylum*) and Southern Watersnake (*Nerodia fasciata*)).

Many species, however, seem to be abundant throughout Missouri, regardless of the region or natural community. The American Bullfrog (*Lithobates catesbeianus*), Snapping Turtle (*Chelydra serpentina*), and Western Ratsnake (*Pantherophis obsoletus*) among several others fall into this category. Finally, many species are more closely associated with a particular natural community or habitat than with a particular ecoregion or natural division. For example, The Flat-headed Snake (*Tantilla gracilis*) can be found in the Ozark Highlands, Osage Prairie, and Interior River Valleys and Hills but it is restricted to rocky glades.

In general, Level IV ecoregions are too granular to be useful in describing the distributions of Missouri amphibians and reptiles, several Ozark salamander species and many of the coastal plains species being notable exceptions. However, this level of detail is useful to understand natural community distributions on which some species are dependent. It also underscores the importance of looking at border states and across artificial political boundaries to understand distributions within Missouri.

Level I (page 8), Level II (page 9), Level III (page 10), and Level IV (page 11) ecoregion maps for Missouri and surrounding states, based on Omernik (1987) and Nigh and Schroeder (2002) are included here. The hierarchy for Levels I, II, and III is included in Table 1 (below), while the Level III and Level IV hierarchy is included in Table 2 (below). Unfortunately, the authors' coding scheme for Level III is inconsistent, though the names do match. Both authors' codes for Level III are included in the tables as a cross-reference. An earlier approach by Thom and Wilson (1980) divided Missouri into natural divisions and sections (page 7), roughly corresponding to Level III and Level IV ecoregions, respectively.

Table 1. List of Level I, II, and III Terrestrial Ecoregions from Omernik (1987). Those regions marked with an asterisk (*) do not occur in Missouri but are sufficiently close to be of interest to Missouri biologists. Level III codes from Nigh and Schroeder (2002) are in parentheses.

- **8.** Eastern Temperate Forests
  - **8.3.** Southeastern USA Plains
    - **8.3.3.** Interior Plateau* (71)
    - **8.3.6.** Mississippi Valley Loess Plains (74)
    - **8.3.2.** Interior River Valleys and Hills (72)
  - **8.4.** Ozark / Ouachita / Appalachian Forests
    - **8.4.5.** Ozark Highlands (39)
    - **8.4.6.** Boston Mountains* (38)
  - **8.5.** Southeast US Coastal Plain
    - **8.5.2.** Mississippi Alluvial Plain (73)
- **9.** Great Plains
  - **9.2.** Temperate Prairies
    - **9.2.3.** Western Corn Belt Plains (47)
    - **9.2.4.** Central Irregular Plains (40)

Table 2. List of Level III and Level IV Terrestrial Ecoregions from Nigh and Schroeder (2002). Those regions marked with an asterisk (*) do not occur in Missouri but are sufficiently close to be of interest to Missouri biologists. Those regions marked with a caret (^) are contained entirely within the state's borders.

- **38.** Boston Mountains* (8.4.6)
  - **38a.** Upper Boston Mountains*
  - **38b.** Lower Boston Mountains*
- **39.** Ozark Highlands (8.4.5)
  - **39a.** Springfield Plateau
  - **39b.** Elk River Hills
  - **39c.** White River Hills
  - **39d.** Central Plateau
  - **39e.** Osage / Gasconade River Hills^
  - **39f.** Saint Francois Knobs / Basins^
  - **39g.** Meramec River Hills^
  - **39h.** Current River Hills^
  - **39i.** Easter Ozark Border^
  - **39j.** Black River Hills Border^
  - **39k.** Prairie Ozark Border^
- **40.** Central Irregular Plains (9.2.4)
  - **40a.** Loess Flats and Till Plains
  - **40b.** Osage Cuestas*
  - **40c.** Wooded Osage Plains
  - **40d.** Cherokee Plains
  - **40e.** Claypan Prairie^
- **47.** Western Corn Belt Plains (9.2.3)
  - **47d.** Missouri Alluvial Plain
  - **47e.** Steeply Rolling Loess Prairies
  - **47f.** Rolling Loess Prairies
  - **47h.** Nebraska / Kansas Loess Hills*
  - **47i.** Loess and Glacial Drift Hills*
  - **47m.** Western Loess Hills
- **71.** Interior Plateau* (8.3.3)
  - **71m.** Northern Shawnee Hills*
  - **71n.** Southern Shawnee Hills*
- **72.** Interior River Valleys and Hills (8.3.2)
  - **72a.** Wabash / Ohio Bottomlands*
  - **72d.** Upper Mississippi Alluvial Plain
  - **72e.** Middle Mississippi Alluvial Plain
  - **72f.** River Hills
  - **72g.** Southern Ozarkian River Bluffs*
  - **72i.** Western Dissected Illinoian Till Plain*
  - **72j.** Southern Illinoian Till Plain*
  - **72k.** Cretaceous Hills*
  - **72l.** Karstic Northern Ozarkian River Bluffs*
- **73.** Mississippi Alluvial Plain (8.5.2)
  - **73a.** Northern Holocene Meander Belts
  - **73b.** Northern Pleistocene Valley Trains*
  - **73c.** Saint Francis Lowlands
  - **73f.** Western Lowlands Holocene Meander Belts

73g. Western Lowlands Pleistocene Valley Trains

74. Valley Loess Plains (8.3.6)
- **74a.** Bluff Hills
- **74b.** Loess Plains

Aquatic Subregions

Like terrestrial ecoregions, aquatic subregions can be classified in discrete units, based on watershed and hydrological characteristics. Subregions are composed of ecological drainage units, which are major watersheds that are consolidated based on similarity and proximity (MSDIS 2009a). Subregions and their component drainage units can be seen in Table 3 (below).

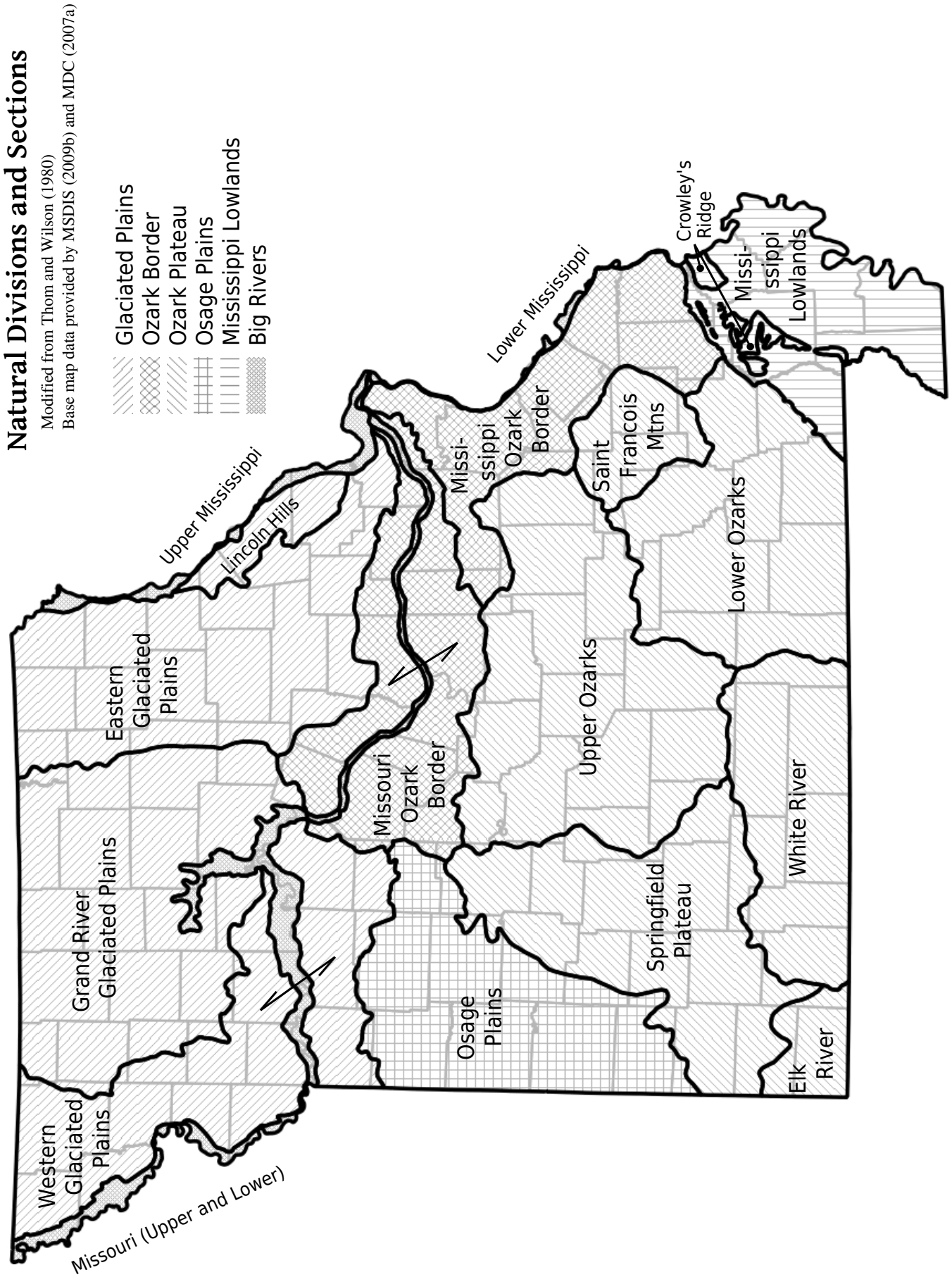
Naturally, many of the same patterns emerge in both terrestrial and aquatic geographic classifications since the two are not independent of one another. However, aquatic subregions and ecological drainage units can differ from their terrestrial counterparts since most aquatic organisms are confined to watersheds as well as specific habitats. Since many species of amphibians and reptiles are partially or wholly dependent on aquatic habitats, distributions can sometimes be best understood and explained by examining aquatic subregions, ecological drainage units, and even individual watersheds.

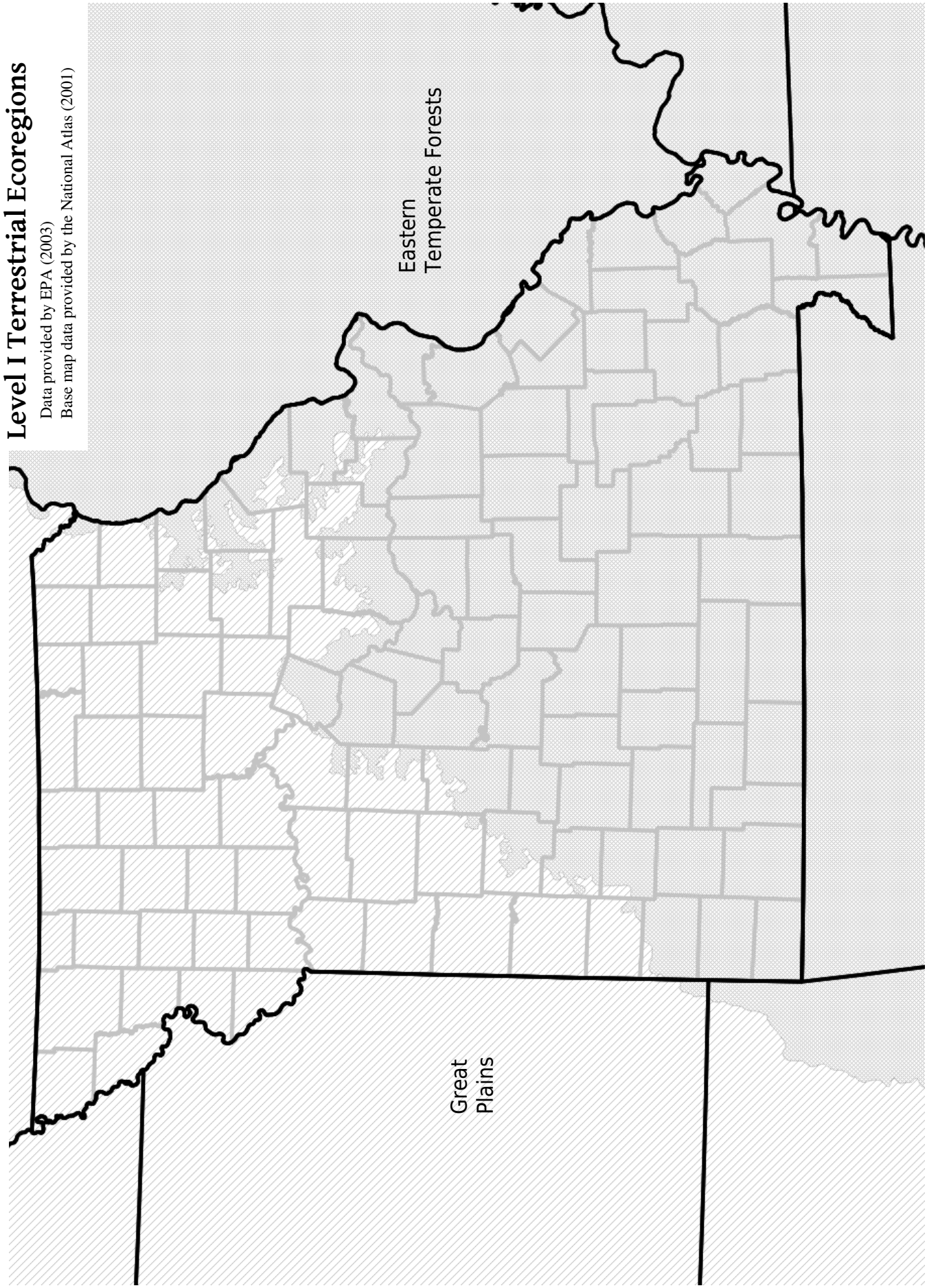
The base map for major rivers and streams (page 12) shows locations of actual rivers and streams inside Missouri and just outside the state's borders where appropriate (USGS 1994; MDC 2007b). The watershed boundaries map (page 13) displays the maximum terrestrial boundary for major watersheds (NRCS 2002). Both of these maps are underlain with unique background colors to display Missouri's primary drainage systems: a) Mississippi River, b) Missouri River, c) Arkansas River, and d) White River.

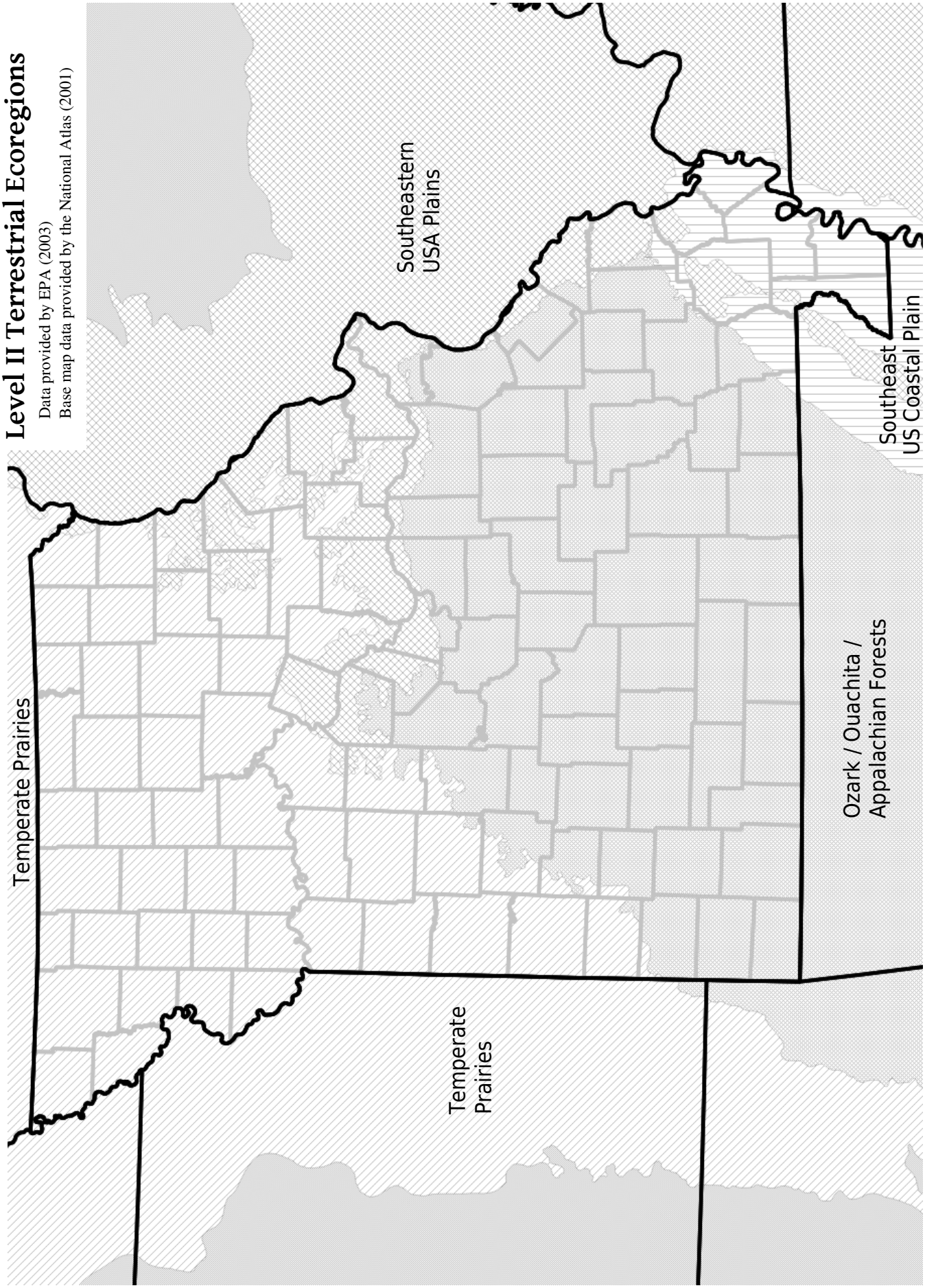
Some species found in the state exhibit distributions that can be better understood by referring to these primary drainage systems. The ecological drainage units map (page 14) shows a somewhat consolidated view of the watersheds map based on those watersheds and other characteristics. It is underlain with unique background colors showing the three broad aquatic subregions in the state. Still more detailed aquatic region classifications are available but often include areas based on very small creeks and their watersheds and are therefore not included here.

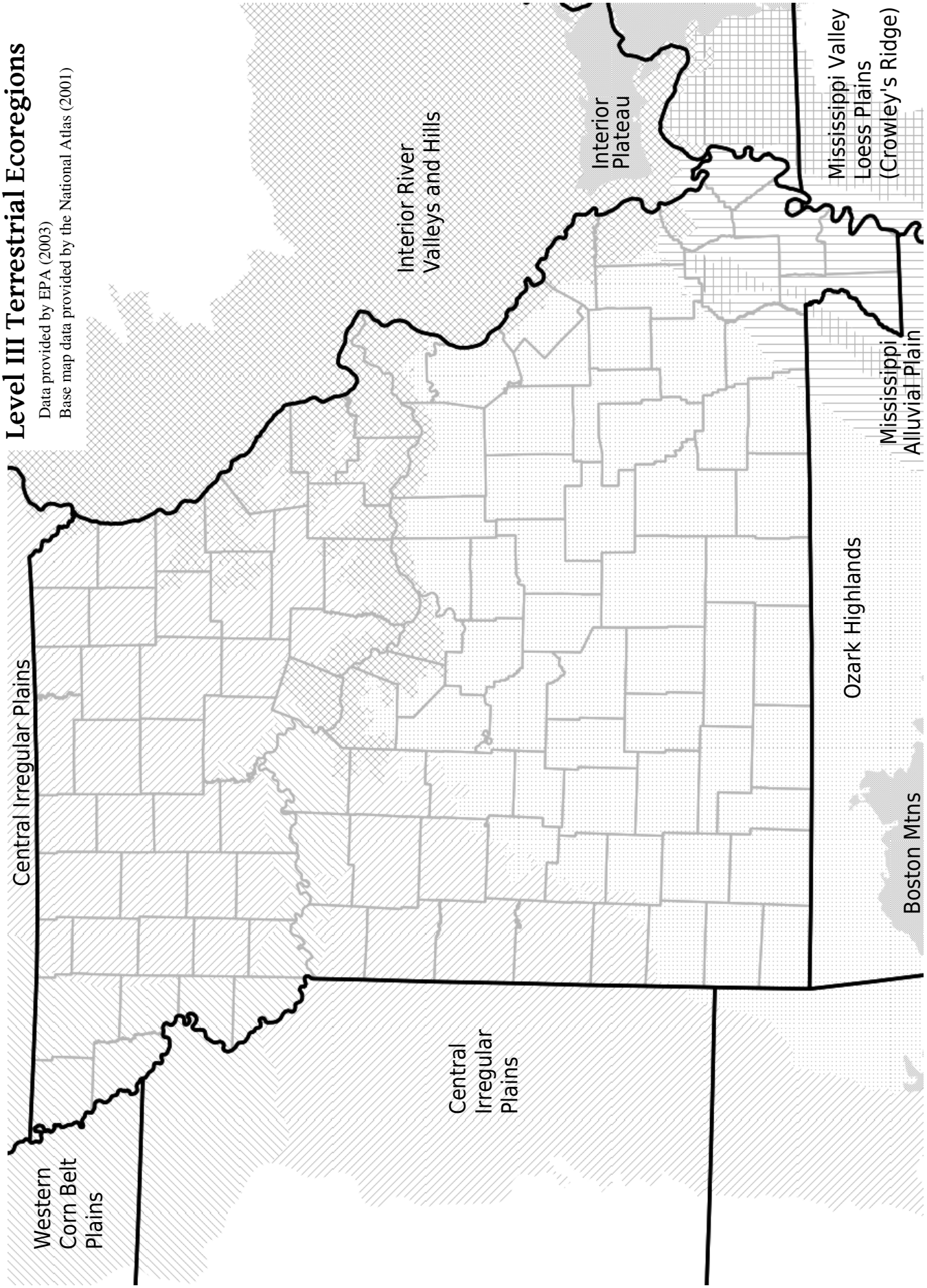
Table 3. List of Aquatic Subregions and Ecological Drainage Units from MSDIS (2009a, 2009c). Each drainage unit is indicated with its primary drainage system: a) Mississippi River, b) Missouri River, c) Arkansas River, d) White River.

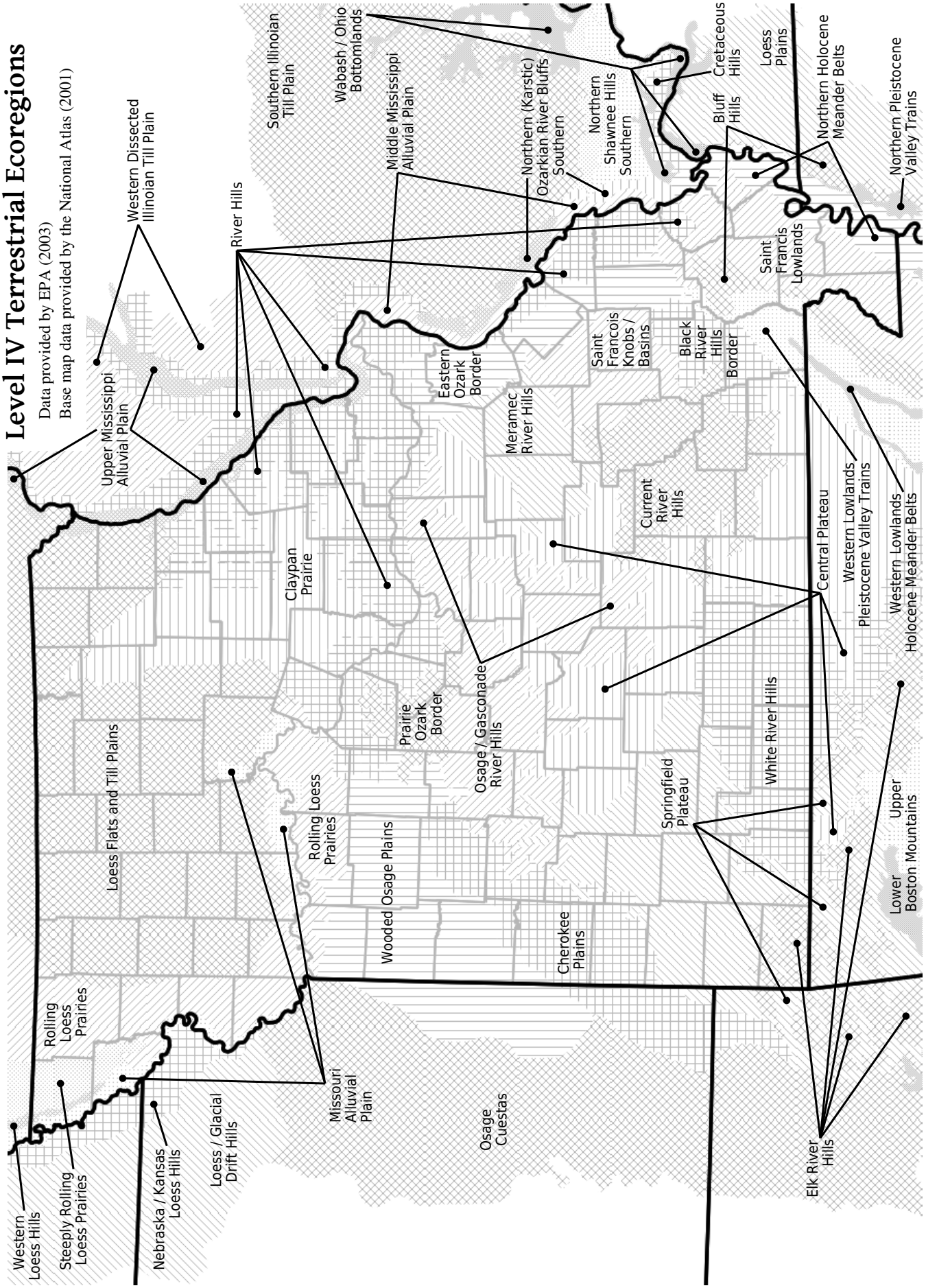
- Central Plains Subregion
  - Blackwater / Lamine (b)
  - Cuivre / Salt (a)
  - Des Moines (a)
  - Grand / Chariton (b)
  - Kansas (b)
  - Nishnabotna / Platte (b)
  - Osage / South Grand (b)
- Ozarks Subregion
  - Apple / Joachim (a)
  - Black / Current (d)
  - Gasconade (b)
  - Meramec (a)
  - Moreau / Loutre (b)
  - Osage (b)
  - Neosho (c)
  - Upper Saint Francis / Castor (a)
  - White (d)
- Mississippi Alluvial Subregion
  - Black / Cache (a)
  - Saint Francis / Little (a)
  - Saint Johns Bayou (a)

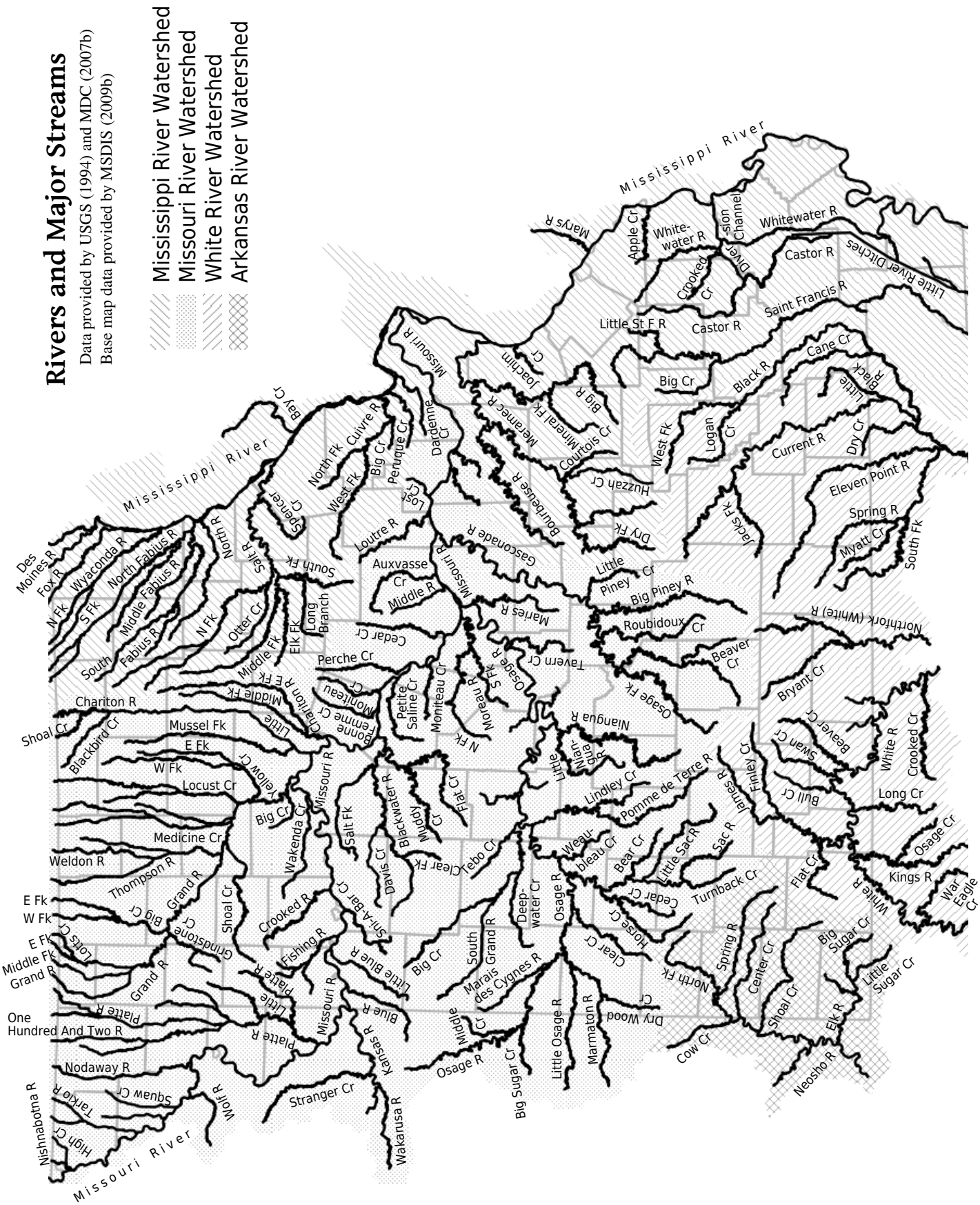

Natural Divisions and Sections
Modified from Thom and Wilson (1980)
Base map data provided by MSDIS (2009b) and MDC (2007a)
Glaciated Plains
Ozark Border
Ozark Plateau
Osage Plains
Mississippi Lowlands
Big Rivers
Western Glaciated Plains
Missouri (Upper and Lower)
Grand River Glaciated Plains
Eastern Glaciated Plains
Upper Mississippi
Lincoln Hills
Missouri Ozark Border
Missi-ssippi Ozark Border
Lower Mississippi
Osage Plains
Springfield Plateau
Upper Ozarks
Saint Francois Mtns
Lower Ozarks
Crowley's Ridge
Missi-ssippi Lowlands
White River
Elk River

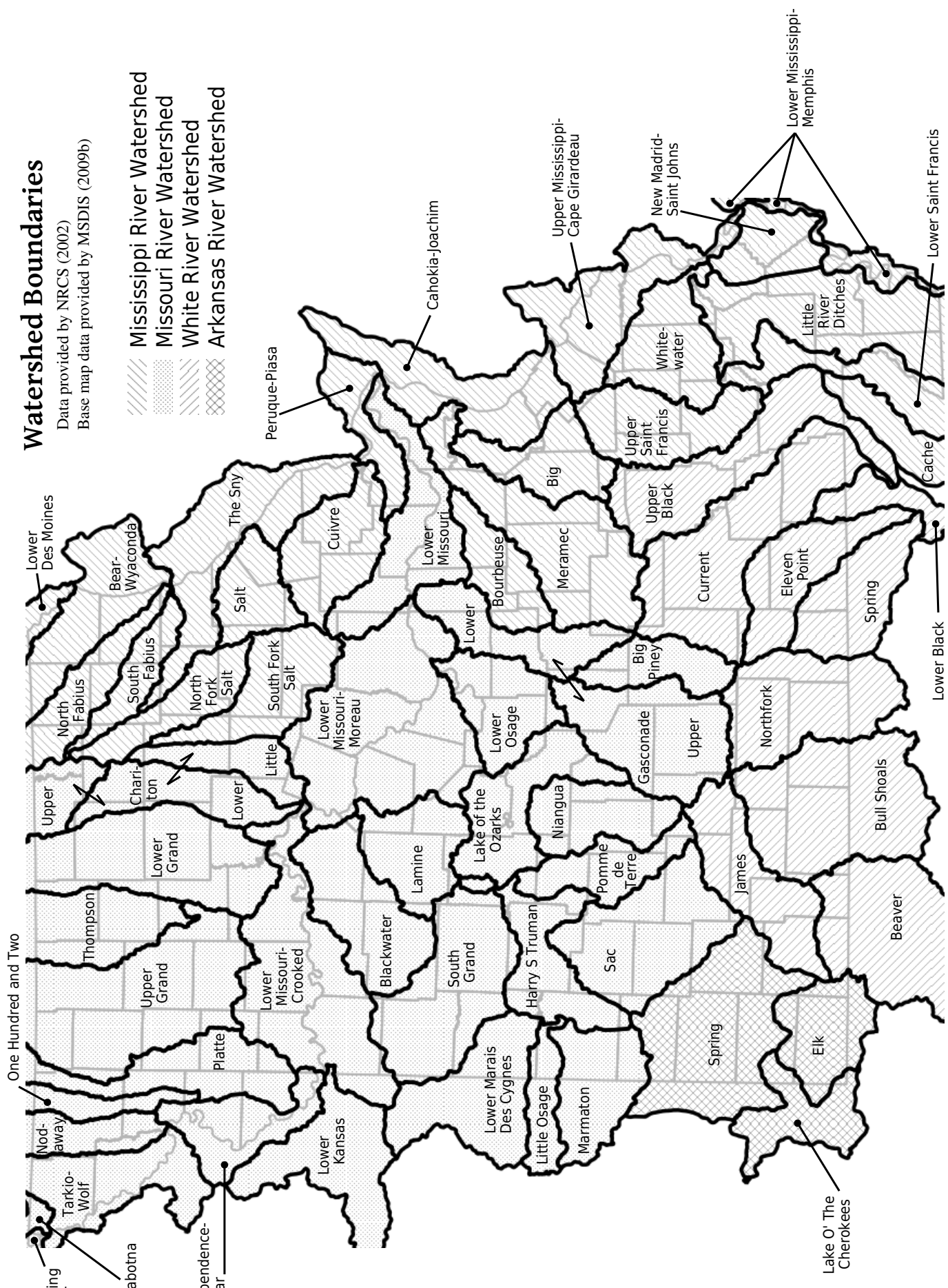

Level I Terrestrial Ecoregions
Data provided by EPA (2003)
Base map data provided by the National Atlas (2001)
Eastern Temperate Forests
Great Plains


Level II Terrestrial Ecoregions
Data provided by EPA (2003)
Base map data provided by the National Atlas (2001)
Southeastern USA Plains
Southeast US Coastal Plain
Temperate Prairies
Ozark / Ouachita / Appalachian Forests
Temperate Prairies


Level III Terrestrial Ecoregions
Data provided by EPA (2003)
Base map data provided by the National Atlas (2001)
Central Irregular Plains
Western Corn Belt Plains
Central Irregular Plains
Interior River Valleys and Hills
Interior Plateau
Mississippi Valley Loess Plains (Crowley's Ridge)
Mississippi Alluvial Plain
Ozark Highlands
Boston Mtns


Level IV Terrestrial Ecoregions
Data provided by EPA (2003)
Base map data provided by the National Atlas (2001)
Western Loess Hills
Steeply Rolling Loess Prairies
Rolling Loess Prairies
Nebraska / Kansas Loess Hills
Loess / Glacial Drift Hills
Loess Flats and Till Plains
Missouri Alluvial Plain
Upper Mississippi Alluvial Plain
Western Dissected Illinoian Till Plain
Claypan Prairie
Rolling Loess Prairies
Wooded Osage Plains
Osage Cuestas
Prairie Ozark Border
Osage / Gasconade River Hills
Cherokee Plains
River Hills
Southern Illinoian Till Plain
Wabash / Ohio Bottomlands
Middle Mississippi Alluvial Plain
Eastern Ozark Border
Meramec River Hills
Northern (Karstic) Ozarkian River Bluffs Southern
Northern Shawnee Hills Southern
Saint Francois Knobs / Basins
Black River Hills Border
Springfield Plateau
Current River Hills
White River Hills
Central Plateau
Cretaceous Hills
Bluff Hills
Loess Plains
Saint Francis Lowlands
Western Lowlands Pleistocene Valley Trains
Western Lowlands Holocene Meander Belts
Northern Holocene Meander Belts
Northern Pleistocene Valley Trains
Upper Boston Mountains
Lower Boston Mountains
Elk River Hills


Rivers and Major Streams
Data provided by USGS (1994) and MDC (2007b)
Base map data provided by MSDIS (2009b)
Mississippi River Watershed
Missouri River Watershed
White River Watershed
Arkansas River Watershed
Mississippi River
Missouri River
Marys R
Apple Cr
White-water R
Diversion Channel
Whitewater R
Castor R
Little River Ditches
Crooked Cr
Saint Francis R
Little St F R
Castor R
Missouri R
Joachim Cr
Big R
Meramec R
Courtois Cr
Big Cr
Black R
Cane Cr
Little Black
West Fk
Logan Cr
Current R
Dry Cr
Huzzah Cr
Dry Fk
Eleven Point R
Spring R
Myatt Cr
South Fk
Bay Cr
North Fk Cuivre R
Big Cr
Perruque Cr
Dardenne Cr
West Fk
Spencer Cr
Lost Cr
Loutre R
Bourbeuse R
Gasconade R
Des Moines R
Fox R
Wyaconda R
North Fabius R
Middle Fabius R
Fabius R
North R
Salt R
South Fk
N Fk
S Fk
South
N Fk
Otter Cr
Auxvasse Cr
Middle R
Missouri R
Little Piney Cr
Big Piney R
Jacks Fk
Maries R
Long Branch
Elk Fk
Cedar Cr
Middle Fk
Roubidoux Cr
Northfork (White) R
Perche Cr
Tavern Cr
Beaver Cr
Middle Fk
Little Chariton R E Fk
Osage R S Fk
Moniteau Cr
Petite Saline Cr
Moreau R
N Fk
Osage Fk
Bryant Cr
Chariton R
Shoal Cr
Mussel Fk
Blackbird Cr
Bonne Femme Cr
Little Moniteau Cr
Niangua R
Beaver Cr
E Fk
W Fk
Yellow Cr
Locust Cr
Missouri R
Little Niangua R
Swan Cr
White R
Crooked Cr
Big Cr
Wakenda Cr
Salt Fk
Blackwater R
Muddy Cr
Flat Cr
Lindley Cr
Pomme de Terre R
Finley Cr
Bull Cr
Long Cr
Medicine Cr
Weldon R
Thompson R
Grand R
Davis Cr
Clear Fk
Tebo Cr
Weau-bleau Cr
Bear Cr
Little Sac R
Sac R
Osage Cr
Kings R
War Eagle Cr
White R
E Fk
W Fk
Big Cr
Shoal Cr
Crooked R
Sni-A-Bar Cr
Grindstone Cr
Deep-water Cr
Osage R
Cedar Cr
Turnback Cr
Flat Cr
Lotts Cr
E Fk
Middle Fk
Grand R
Fishing R
Little Blue R
Big Cr
South Grand R
Marais des Cygnes R
Horse Cr
Clear Cr
Spring R
Big Sugar Cr
Little Sugar Cr
Center Cr
North Fk
Platte R
Little Platte R
Missouri R
Blue R
Kansas R
Middle Cr
Dry Wood Cr
Marmaton R
Little Osage R
Big Sugar Cr
Osage R
Shoal Cr
Elk R
Cow Cr
Neosho R
One Hundred And Two R
Nodaway R
Squaw Cr
Tarkio R
Wolf R
Nishnabotna R
High Cr
Stranger Cr
Wakarusa R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Base map data provided by MSDIS (2009b)
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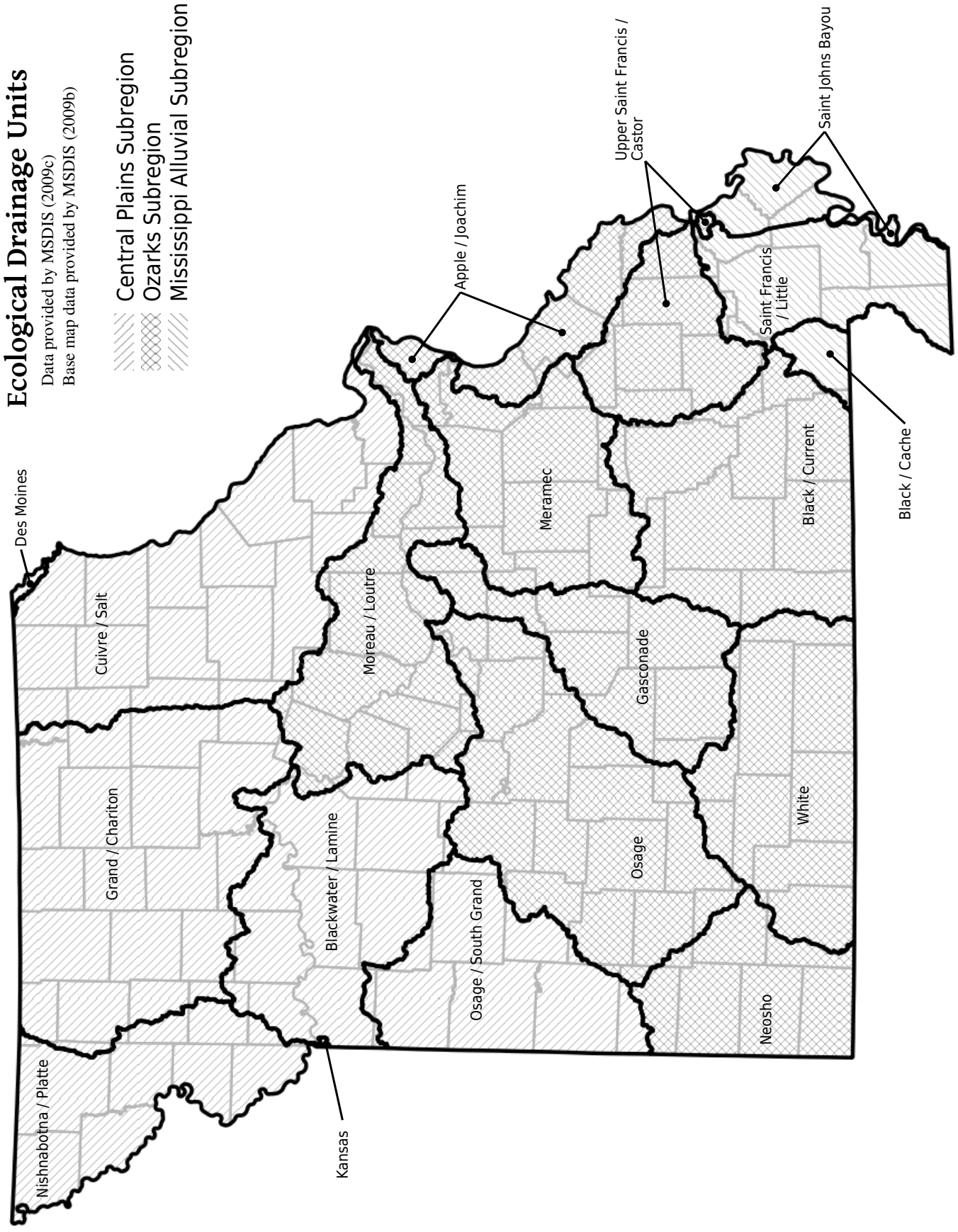
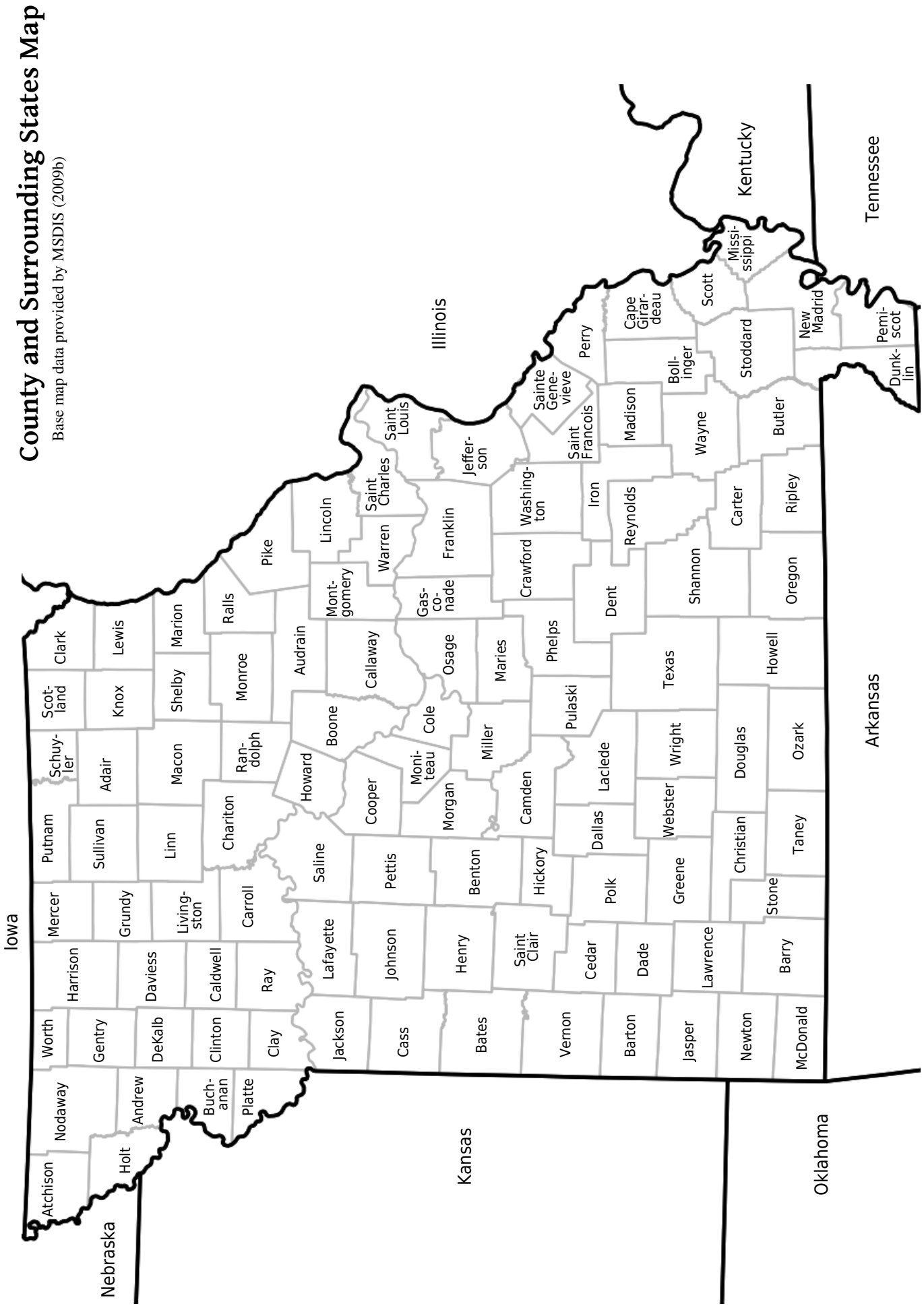
Missouri River Watershed
White River Watershed
Arkansas River Watershed
Keg-Weeping Water
Nishnabotna
Independence-Sugar
Tarkio-Wolf
Nod-away
One Hundred and Two
Lower Kansas
Platte
Upper Grand
Thompson
Lower Grand
Upper Chari-ton
Lower Chari-ton
Lower Missouri-Crooked
Blackwater
Lamine
Lower Des Moines
Bear-Wyaconda
North Fabius
South Fabius
North Fork Salt
Salt
South Fork Salt
Little
Lower Missouri-Moreau
The Sny
Cuivre
Peruque-Piasa
Lower Missouri
Lower Osage
Lake of the Ozarks
South Grand
Harry S Truman
Lower Marais Des Cygnes
Little Osage
Marmaton
Cahokia-Joachim
Bourbeuse
Meramec
Big
Upper Mississippi-Cape Girardeau
Niangua
Pomme de Terre
Sac
Spring
Lake O' The Cherokees
Big Piney
Lower
Gasconade
Upper
Upper Saint Francis
Upper Black
Current
Eleven Point
Spring
Northfork
James
Elk
Beaver
Bull Shoals
New Madrid-Saint Johns
Whitewater
Little River Ditches
Lower Mississippi-Memphis
Lower Saint Francis
Cache
Lower Black


Ecological Drainage Units
Data provided by MSDIS (2009c)
Base map data provided by MSDIS (2009b)
Central Plains Subregion
Ozarks Subregion
Mississippi Alluvial Subregion
Des Moines
Cuivre / Salt
Grand / Chariton
Nishnabotna / Platte
Kansas
Moreau / Loutre
Blackwater / Lamine
Osage / South Grand
Apple / Joachim
Meramec
Gasconade
Osage
Neosho
Upper Saint Francis / Castor
Saint Francis / Little
White
Saint Johns Bayou
Black / Current
Black / Cache


County and Surrounding States Map
Base map data provided by MSDIS (2009b)
Iowa
Nebraska
Kansas
Oklahoma
Arkansas
Illinois
Kentucky
Tennessee
Atchison
Holt
Nodaway
Andrew
Buch-anan
Platte
Clay
Worth
Gentry
DeKalb
Clinton
Harrison
Daviess
Caldwell
Ray
Mercer
Grundy
Living-ston
Carroll
Putnam
Sullivan
Linn
Chariton
Schuy-ler
Adair
Macon
Ran-dolph
Scot-land
Knox
Shelby
Monroe
Clark
Lewis
Marion
Ralls
Pike
Lincoln
Saint Charles
Warren
Montgomery
Audrain
Howard
Boone
Callaway
Cooper
Moni-teau
Cole
Osage
Gas-co-nade
Franklin
Maries
Miller
Morgan
Camden
Saline
Pettis
Benton
Hickory
Lafayette
Johnson
Henry
Saint Clair
Jackson
Cass
Bates
Vernon
Cedar
Dade
Barton
Polk
Dallas
Laclede
Pulaski
Phelps
Crawford
Washing-ton
Jeffer-son
Saint Louis
Sainte Gene-vieve
Saint Francois
Perry
Cape Girar-deau
Bollinger
Scott
Missi-ssippi
Stoddard
New Madrid
Pemi-scot
Dunk-lin
Madison
Wayne
Butler
Iron
Reynolds
Carter
Ripley
Dent
Shannon
Oregon
Texas
Howell
Webster
Wright
Douglas
Ozark
Greene
Christian
Taney
Stone
Lawrence
Barry
Jasper
Newton
McDonald