Ecoregions of Iowa and Missouri

Ecoregions denote areas of general similarity in ecosystems and in the type, quality, and quantity of environmental resources; they are designed to serve as a spatial framework for the research, assessment, management, and monitoring of ecosystems and ecosystem components. By recognizing the spatial differences in the capacities and potentials of ecosystems, ecoregions stratify the environment by its probable response to disturbance (Bryce et al., 1999). These general purpose regions are critical for structuring and implementing ecosystem management strategies across federal agencies, state agencies, and nongovernment organizations that are responsible for different types of resources within the same geographical areas (Omernik et al., 2000).

The approach used to compile this map is based on the premise that ecological regions can be identified through the analysis of the spatial patterns and the composition of biotic and abiotic phenomena that affect or reflect differences in ecosystem quality and integrity (Wiken, 1986; Omernik, 1987, 1995). These phenomena include geology, physiography, vegetation, climate, soils, land use, wildlife, and hydrology. The relative importance of each characteristic varies from one ecological region to another regardless of the hierarchical level. A Roman numeral hierarchical scheme has been adopted for different levels of ecological regions. Level I is the coarsest level, dividing North America into 15 ecological regions. Level II divides the continent into 52 regions (Commission for Environmental Cooperation Working Group, 1997). At level III, the continental United States contains 104 ecoregions and the conterminous United States has 84 ecoregions (United States Environmental Protection Agency [USEPA], 2000). Level IV is a further subdivision of level III ecoregions. Explanations of the methods used to define the USEPA's ecoregions are given in Omernik (1995), Omernik and others (2000), Griffith and others (1994), and Gallant and others (1989).

This level III and IV ecoregion map was compiled at a scale of 1:250,000 and depicts revisions and subdivisions of earlier level III ecoregions that were originally compiled at a smaller scale (USEPA 2000, Omernik 1987). This poster is part of a collaborative effort primarily between the USEPA Region VII, the USEPA National Health and Environmental Effects Laboratory (Corvallis, Oregon), the Iowa Department of Natural Resources - Environmental Protection Division and the Geological Survey, the Missouri Department of Natural Resources - Environmental Services Program, University of Missouri Columbia - Geography Department, Missouri Department of Conservation, the U.S. Department of Agriculture (USDA) - Natural Resources Conservation Service (NRCS), and the U.S. Department of Interior - U.S. Geological Survey (USGS) - Earth Resources Observation Systems (EROS) Data Center. The portion of the work covering Iowa was adapted from Griffith and others (1994) and the part covering Missouri was adapted in part from Schroeder and others (1999).

This project is associated with an interagency effort to develop a common framework of ecological regions (McMahon and others, 2001). Reaching that objective requires recognition of the differences in the conceptual approaches and mapping methodologies applied to develop the most common ecoregion-type frameworks, as well as the different purposes of these frameworks, including those developed by the USFS (Bailey and others, 1994), the USEPA (Omernik 1987, 1995), and the U.S. Department of Agriculture (USDA) - Natural Resources Conservation Service (NRCS) (USDA-Soil Conservation Service, 1981). Regional collaborative projects such as in Missouri and Iowa can be a step toward reaching consensus across the entire nation. However, unlike most of the collaborative state and regional projects to refine and subdivide ecoregions where consensus has been achieved among the major resource management agencies [e.g. Nebraska and Kansas (Chapman and others, 2001) and North and South Dakota (Bryce and others, 1998)], complete agreement on the hierarchical structure of ecoregions in Missouri was not reached among participants from the EPA, NRCS, and USFS. To attain consensus among all participants in these state-level projects while at the same time maintaining consistency in mapping approaches and objectives from one state to another is often difficult and sometimes impossible. This is to be expected given that regional, state, and local experts have different backgrounds and perceptions of the relative importance of particular characteristics for mapping ecological regions, and because of the understandably strong loyalties to existing frameworks that often were developed to serve slightly different objectives. Nonetheless, as each of the federal agency frameworks are refined and subdivided their differences are becoming less discernible.

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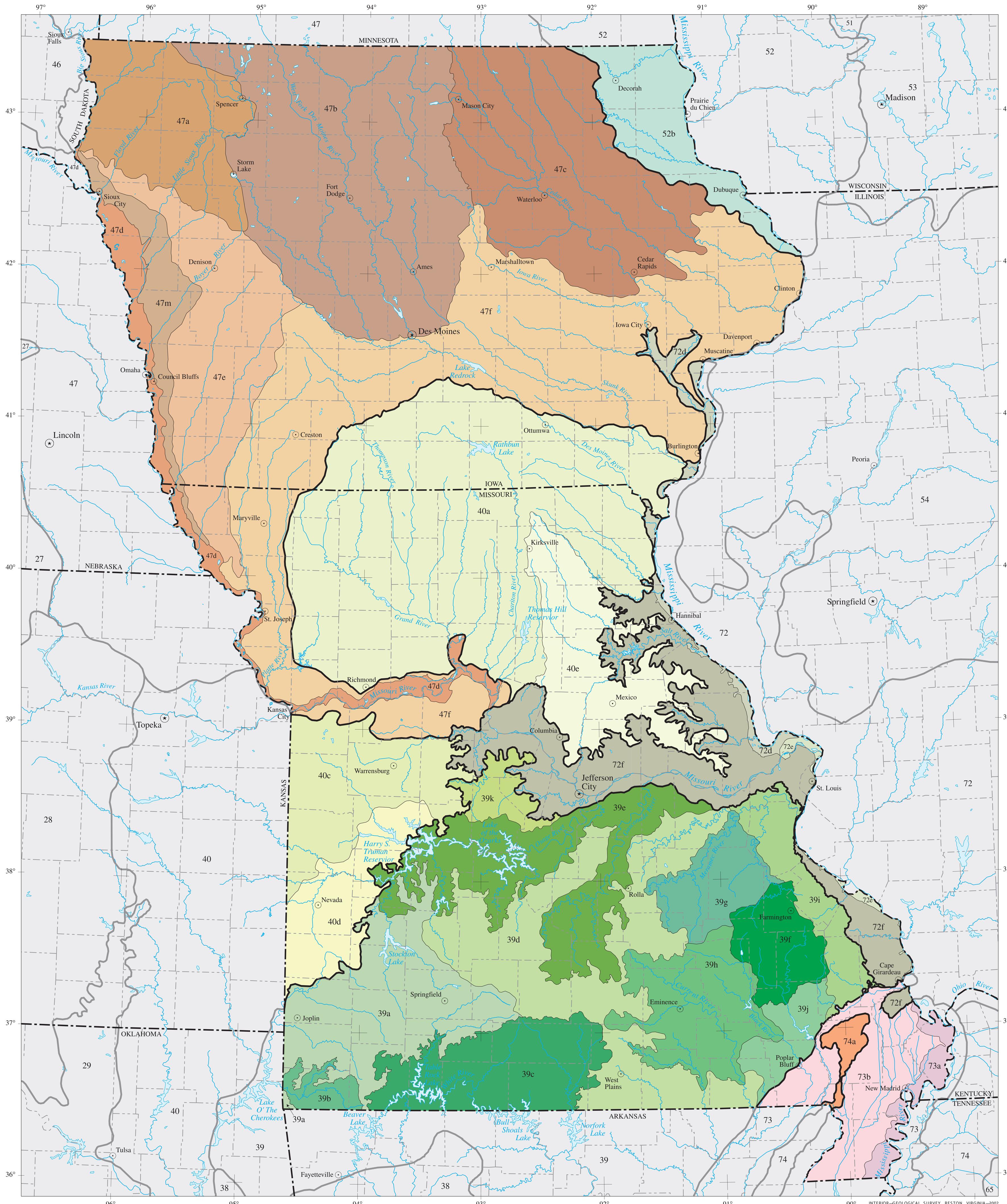


39 Ozark Highlands
- 39a Springfield Plateau
- 39b Elk River Hills
- 39c White River Hills
- 39d Central Plateau
- 39e Osage/Gasconade Hills
- 39f St. Francois Knobs and Basins
- 39g Meramec River Hills
- 39h Current River Hills
- 39i Eastern Ozark Border
- 39j Black River Hills Border
- 39k Prairie Ozark Border

40 Central Irregular Plains
- 40a Loess Flats and Till Plains
- 40c Wooded Osage Plains
- 40d Cherokee Plains
- 40e Claypan Prairie

47 Western Corn Belt Plains
- 47a Northwest Iowa Loess Prairies
- 47b Des Moines Lobe
- 47c Iowan Surface
- 47d Missouri Alluvial Plain
- 47e Steeply Rolling Loess Prairies
- 47f Rolling Loess Prairies
- 47m Western Loess Hills

52 Driftless Area
- 52b Paleozoic Plateau/Coulee Section

72 Interior River Valleys and Hills
- 72d Upper Mississippi Alluvial Plain
- 72e Middle Mississippi Alluvial Plain
- 72f River Hills

73 Mississippi Alluvial Plain
- 73a Holocene Meander Belts
- 73b Pleistocene Valley Trains

74 Mississippi Valley Loess Plains
- 74a Bluff Hills

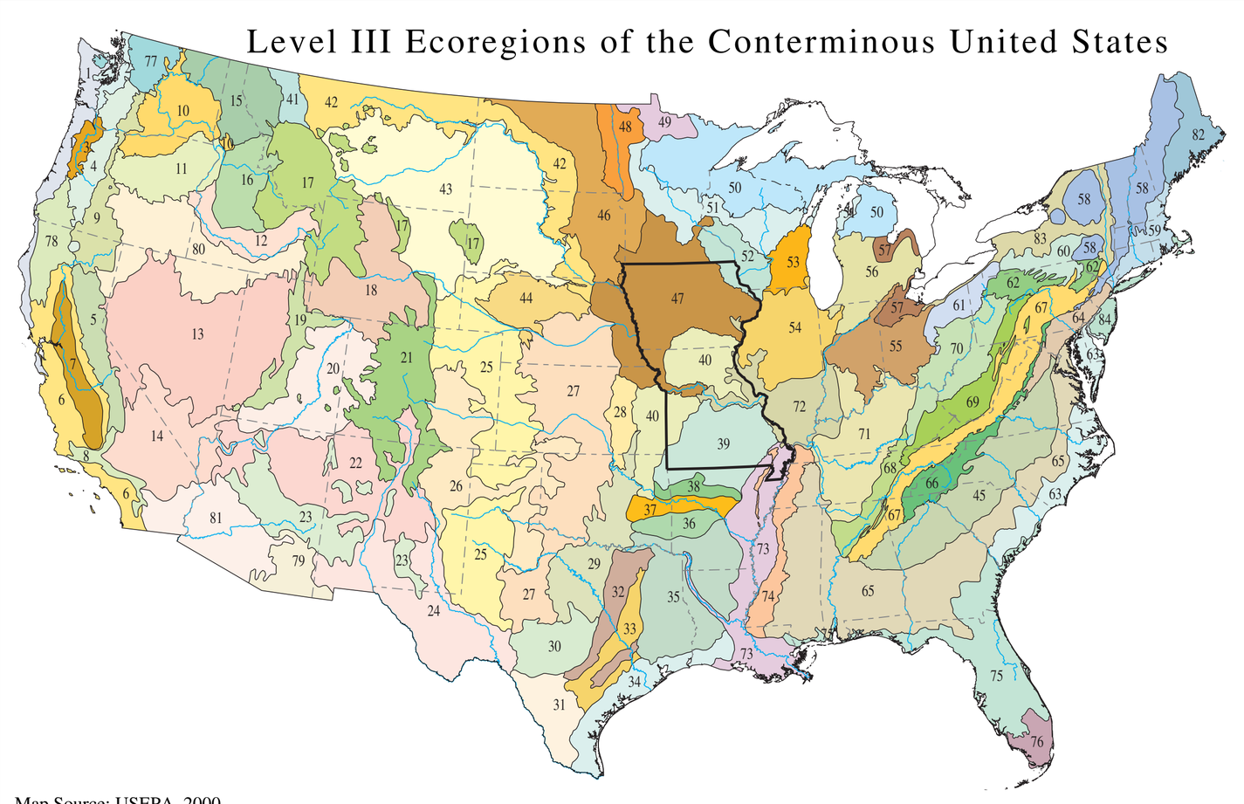
Level III boundary
Level IV boundary
State boundary
County boundary

SCALE 1:1 800 000

20 10 0 30 60 mi
40 30 20 10 0 60 120 km

Albers equal area projection
Standard parallels 37° N and 43° N

Level III Ecoregions of the Conterminous United States



1 Coast Range
2 Puget Lowland
3 Willamette Valley
4 Cascades
5 Sierra Nevada
6 Southern and Central California Chaparral and Oak Woodlands
7 Central California Valley
8 Southern California Mountains
9 Eastern Cascades Slopes and Foothills
10 Columbia Plateau
11 Blue Mountains
12 Snake River Plain
13 Central Basin and Range
14 Mojave Basin and Range
15 Northern Rockies
16 Idaho Batholith
17 Middle Rockies
18 Wyoming Basin
19 Wasatch and Uinta Mountains
20 Colorado Plateaus
21 Southern Rockies
22 Arizona/New Mexico Plateau
23 Arizona/New Mexico Mountains
24 Chihuahuan Deserts
25 Western High Plains
26 Southwestern Tablelands
27 Central Great Plains
28 Flint Hills
29 Central Oklahoma/Texas Plains
30 Edwards Plateau
31 Southern Texas Plains
32 Texas Blackland Prairies
33 East Central Texas Plains
34 Western Gulf Coastal Plain
35 South Central Plains
36 Ouachita Mountains
37 Arkansas Valley
38 Boston Mountains
39 Ozark Highlands
40 Central Irregular Plains
41 Canadian Rockies
42 Northwestern Glaciated Plains
43 Northwestern Great Plains
44 Nebraska Sand Hills
45 Piedmont
46 Northern Glaciated Plains
47 Western Corn Belt Plains
48 Lake Agassiz Plain
49 Northern Minnesota Wetlands
50 Northern Lakes and Forests
51 North Central Hardwood Forests
52 Driftless Area
53 Southeastern Wisconsin Till Plains
54 Central Corn Belt Plains
55 Eastern Corn Belt Plains
56 Southern Michigan/Northern Indiana Drift Plains
57 Huron/Erie Lake Plains
58 Northeastern Highlands
59 Northeastern Coastal Zone
60 Northern Appalachian Plateau and Uplands
61 Erie Drift Plain
62 North Central Appalachians
63 Middle Atlantic Coastal Plain
64 Northern Piedmont
65 Southeastern Plains
66 Blue Ridge
67 Ridge and Valley
68 Southwestern Appalachians
69 Central Appalachians
70 Western Allegheny Plateau
71 Interior Plateau
72 Interior River Valleys and Hills
73 Mississippi Alluvial Plain
74 Mississippi Valley Loess Plains
75 Southern Coastal Plain
76 Southern Florida Coastal Plain
77 North Cascades
78 Klamath Mountains
79 Madrean Archipelago
80 Northern Basin and Range
81 Sonoran Basin and Range
82 Laurentian Plains and Hills
83 Eastern Great Lakes and Hudson Lowlands
84 Atlantic Coastal Pine Barrens

Map Source: USEPA, 2000

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39. Ozark Highlands

The Ozark Highlands ecoregion has a more irregular physiography and is generally more forested than adjacent regions, with the exception of the Boston Mountains (38) to the south. Soils are mostly derived from cherty carbonate rocks, with chert stone comprising about 20% to 60% of the soil mass. Cambrian and Ordovician dolomite and sandstone comprise the dominant bedrock in the interior of the region with Mississippian limestone underlying the western outer regions. Shale, chert, and Precambrian igneous rocks are also present. Topography varies from steep slopes near the large streams to moderate relief hills on the broad plateaus or inter-stream areas. Karst features, including caves, springs, and spring-fed streams are found throughout most of the region. High-gradient, clear-flowing streams in entrenched valley meanders are also common. More than 60% of the total area is open forest or woodland, although in the more rugged sections the forest covers nearly all of the upland. Oak is the predominant forest type, but mixed stands of oak and pine are also common, with pine concentrations greatest to the southeast. Cultivated land is mainly confined to small tracts in the numerous valleys and small creek bottoms. Cleared upland is used for pasture and livestock.

The most dissected regions in the Ozark Highlands (39) have a large area of closed forest with limited areas cleared for pastureland. Forestry and recreation are both important industries in this ecoregion.

Ecoregions 39a, 39d, and 39k generally have more level land cleared for pasture and less closed forest area than the more dissected regions 39b, 39c, 39e, 39f, and 39g.

39a The **Springfield Plateau** ecoregion is a smooth to gently rolling plain underlain by Mississippian-age cherty limestone and is less dissected than most regions in the Ozarks. A moderate topography and a potential natural vegetation of tallgrass prairie, deciduous forest, and savanna characterize this transitional area where the prairies of the Cherokee Plains (40d) grade into the woodlands of the Ozarks. However, unlike the neighboring plains, this region has karst features and rocky soils, especially in wooded areas. Land cover is a mix of woodland and areas of pastureland in the cleared prairies. Lead and zinc were mined in the southwest portion of this region and mining tailings still remain.

39b The **Elk River Hills** ecoregion includes areas of rolling plains and more rugged hills with steep slopes and narrow ridges than the neighboring Springfield Plateau (39a). Soils are rocky and thin over carbonate bedrock and support potential natural vegetation of oak woodland, savanna and some limited glade areas, with prairie comprising only about 7% of the area. This marks a transition from the greater prairie component of the Springfield Plateau (39a), to the mixed oak woodland, scattered pine-oak and glades of the White River Hills (39c) to the east. This region curently has substantial areas in poultry production, especially across the Missouri border into Arkansas, which have impacted water quality.

39c The **White River Hills** ecoregion is one of the more dissected areas in the Ozark region with local relief of 200 to 600 feet. Dissected Ordovician dolomite and some sandstone, with step-like topography of level-crested buttes, lower benches, and bottomlands are common. Potential natural vegetation is a mosaic of oak and oak-pine forest and woodland, interspersed with widespread limestone or dolomite glades. Cliffs, sinkholes, and caves are prevalent, with some of the largest caves in Missouri found in this region. Large springs, high-gradient, sustained-flow streams, as well as many smaller losing streams that are often dry are typical. There are significant water impoundments in this ecoregion with the entire length of the White River in Missouri impounded into three reservoirs (Table Rock Lake, Bull Shoals Lake, and Lake Taneycomo). The dissected topography and the thin, rocky soils provide little arable land. Consequently, land cover is principally woodland and much of the area is in public lands.

39d Surrounded by hill regions, except for the Springfield Plateau (39a) to the west, the **Central Plateau** ecoregion is less dissected than most regions in the interior Ozark Highlands. Streams flowing across the region have divided it into a large number of small plateaus. Pennsylvanian strata underlie low relief areas in the north. Most of the surface, however, is underlain by Ordovician carbonates. Bedrock is mantled by a thick solution residuum and loess, and karst features are extensive with large sinkhole areas. The potential natural vegetation of this region is tallgrass prairie, savanna, and post-oak woodlands, with a larger area of prairie vegetation than neighboring regions. The majority of the land is cleared and used for pasture; farms are found mainly on the uplands. Cherty soils predominate, although they are not as cherty as in surrounding hill regions. Large areas of clay and sandy soils also occur and areas with Pennsylvanian clay-filled sinks are mined for fire clay. The region has less surface water and soils are generally more droughty than in surrounding regions.

39e The **Osage/Gasconade Hills** ecoregion is more densely forested and dissected than the lower relief Central Plateau (39d) to the south. Steep slopes and narrow ridges of carbonate and sandstone underlie soils which are rocky and thin. Outcrops of Gasconade dolomite with some sandstone are found throughout the region along with areas of Roubidoux sandstone, Jefferson City-Cotter dolomites and scattered Mississippian limestone outliers in the western portion. Numerous caves, springs, calcareous wet meadows, losing streams, and streams with entrenched valley meanders are common. Streams flow generally northward and drain into the Missouri River. The potential natural vegetation is predominantly mixed oak forest, with oak-pine forest and some pine forests in the southeast areas of the region and some small limestone and sandstone glades. The northeastern edges of this region are transitional and blend into the Interior River Valleys and Hills (72) ecoregion.

39f The **St. Francois Knobs and Basins** ecoregion contains the oldest geologic formations in the state and has a different landscape than surrounding regions. The igneous bedrock knobs of Precambrian granite, rhyolite, and intermediate rocks rise 200 to 900 feet above the intervening basins which are underlain by Cambrian sedimentary rocks, primarily carbonate with some sandstone. This is the only region within the Ozark Highlands (39) that generally lacks karst topography. Streams are smaller than in neighboring regions but have a greater fall distance because of the steep topography. Sedimentary-derived soils may be stone free, not cherty as in neighboring regions. The soil mantle is generally shallow with low fertility, except in the basins, which have a thicker, more loamy layer. The potential natural vegetation includes scrub-oak, post-oak, and blackjack oak forests and glade areas, along with prairie in the basins and valleys. Most of the region is in forest and woodland, with cleared land limited to the small basin-like valleys used for pasture and limited cropland. Lead mining has been an important activity in this region for over two centuries and significant scarification has occurred. Other mineral resources include granite and, to a limited extent, silver, copper, and cobalt, by-products of lead mining.

39g The **Meramec River Hills** ecoregion is deeply dissected, with steep-sided hills and chert-covered ridges. The hills tend to be more rugged than in the Osage/Gasconade Hills (39e) ecoregion to the northwest. Land use is mainly timber and recreation, with some pastureland for grazing, and barite and iron mining in the southeast. The potential natural vegetation in this region is shortleaf pine-oak forest and woodland, with a greater oak concentration than in forests of the Current River Hills (39h) to the south. Streams in this region drain northeast into the Mississippi River.

39h In many ways, the physiography of the **Current River Hills** ecoregion is similar to that of the Meramec River Hills (39g) to the north. However, this region has many endemic species not found in other Ozark regions and the potential natural vegetation here has a greater pine concentration than in regions to the north and west. The region underwent intensive timber cutting in the early decades of the twentieth century. It now sustains major recreational activities. The stream valleys contain numerous, large, high-quality springs and water quality is generally better than elsewhere in Missouri. Caves and losing streams are common. Streams drain southeast into the Mississippi River.

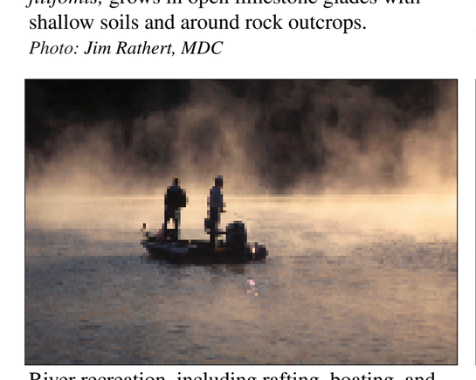
39i The **Eastern Ozark Border** ecoregion is a transitional area between the interior ecoregions of the Ozark Highlands (39) and the Interior River Valleys and Hills (72) ecoregion to the east. Moderately dissected hills and sheer bluffs typify the region. Soils can be rocky and thin on steep slopes, with areas of claypan or loess similar to the Black River Hills Border (39j) to the southwest. Compared to the Central Plateau (39d), however, the loess mantle in this region tends to be deeper and more expansive on the uplands. Potential natural vegetation is a mix of oak forest, savanna, glades, and prairies. Land cover is variable with forests, woodlands, and cleared areas in cropland and pasture. This ecoregion has more cropland agriculture than adjoining Ozark regions (39j, 39f).

39j The **Black River Hills Border** is a transitional region with broad, flat inter-stream divides and moderately dissected hills. There is significantly less relief than in neighboring hill regions in the Ozark Highlands (39) but greater relief than in the southeastern Mississippi Alluvial Plain (73). Soils are thin and rocky on steeper slopes, with claypan and loess in more level areas. More soils are derived from sandstone and loess, in contrast to interior Ozark Highlands (39) regions which have soils mainly derived from dolomite. Potential natural vegetation is a mix between Ozark species on uplands and Mississippi Alluvial Plain species in river bottoms. Land cover is predominantly forest and woodland with a scattering of pastureland and cropland in the cleared valley bottoms. This region has the highest precipitation in the Ozark Highlands (39) with 44-46 inches per year.

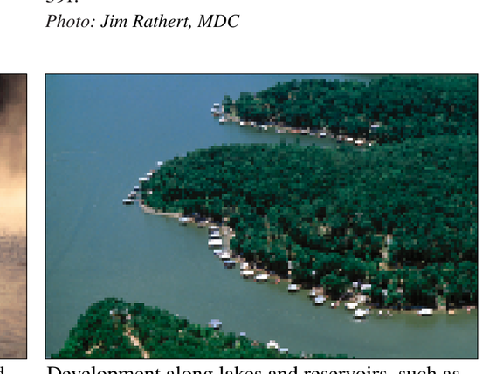
39k The **Prairie Ozark Border** ecoregion shares characteristics with both the Wooded Osage Plains (40c) and adjacent regions within the Ozark Highlands (39). Topography is mostly smooth to gently sloping plains, and soils, derived from loess and cherty limestone, tend to support more cropland than other Ozark regions. The area shares the same bedrock, Mississippian to the north, and Ordovician to the south, as nearby Ozark regions. Streambeds are generally rocky and tend to be more Ozarkian in structure than those found in the Wooded Osage Plains (40c) to the west. The biotic composition and potential natural vegetation reflect the transition from a predominantly prairie landscape in the northwest to a more wooded landscape of the interior Ozark Highlands (39).

The endangered Missouri bladder-pod, *Leaquerlla filifomis,* grows in open limestone glades with shallow soils and around rock outcrops. *Photo: Jim Rathert, MDC*

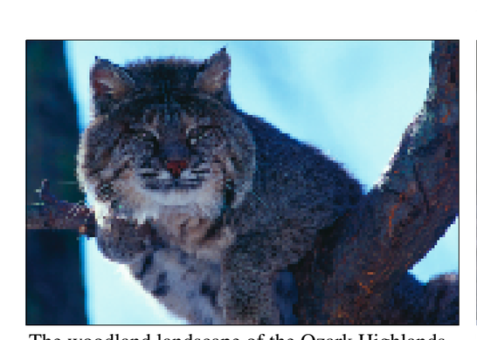
Lead mining has occurred in ecoregions 39a and 39f. *Photo: Jim Rathert, MDC*



River recreation, including rafting, boating, and sport fishing, is an important industry throughout the Ozark Highlands (39). *Photo: Nick Decker, Missouri DNR*



Development along lakes and reservoirs, such as here at the Lake of the Ozarks, has increased with the popularity of recreation within the Ozark Highlands (39). *Photo: Jim Rathert, MDC*



The woodland landscape of the Ozark Highlands (39) makes an ideal habitat for the bobcat, *Lynx rufus*. *Photo: Jim Rathert, MDC*

The brightly colored collared lizard, *Crotaphytus collaris collaris*, is found in the glade habitat of the White River Hills (39c). *Photo: Jim Rathert, MDC*

The endangered gray bat, *Myotis grisescens,* was once a common inhabitant of the caves in Ecoregion 39. Habitat loss and human disturbance have significantly reduced their numbers. *Photo: Merlin D. Tuttle, Bat Conservation International*

The threatened Ozark cavefish, *Amblyopsis rosae,* is closely linked to the endangered gray bat. The largest Ozark cavefish populations occur in caves used by the gray bat, where the bat guano forms the caves' primary energy source. *Photo: Jim Rathert, MDC*

40. Central Irregular Plains

The Central Irregular Plains have a mix of land use and are topographically more irregular than the Western Corn Belt Plains (47) to the north, where most of the land is in crops. The region, however, is less irregular and less tree-covered than the ecoregions to the south and east. The potential natural vegetation is a grassland/woodland mosaic with wider wooded strips along the streams compared to the region to the north. The portion of the region in Iowa and the northern half of Missouri was glaciated in pre-Illinoian time. The drift, largely derived from limestone and shale, is composed of clay with a high percentage of rock fragments. The southern portion of Ecoregion 40 was not glaciated (40c and 40d), but the topography is generally level to rolling, similar to the glaciated area of this region. Soils in the southern parts of Ecoregion 40 are derived from Pennsylvanian shale, sandstone, and limestone residuum or from shallow loess. Groundwater tends to be saline, unlike the freshwater of the Ozark Highlands (39) to the southeast. The mix of land use activities includes mining operations of high-sulfur bituminous coal. Although historically mining was more widespread, a few new mines continue to open. The disturbance of these coal strata in southern Iowa, areas of northern and southwestern Missouri, and southeastern Kansas has degraded water quality and affected aquatic biota.

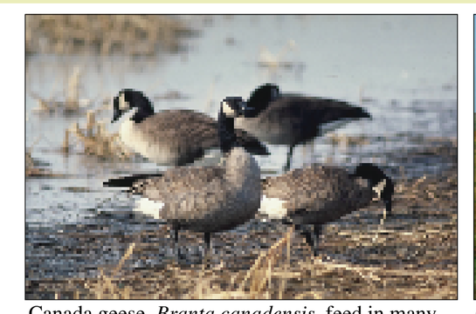
The gently rolling topography of the Central Irregular Plains (40) has a land cover mosaic of cropland, woodland, and grassland.

40a Deep to moderate loess deposits over glacial till and dark shallow soils are characteristic of the **Loess Flats and Till Plains** ecoregion. Loess deposits generally increase to the south, especially near the Missouri River. Several streams have headwaters in this region, and the topography varies from flat to moderately hilly. Valley sides are not steep, with slopes generally less than 10%. The Chariton River area is a more dissected and hilly area within this region. It lacks glacial till in many places and has a greater drainage density and more woody vegetation in stream reaches than in other parts of the ecoregion. Natural wetlands occur along the Grand River and several other rivers in the region. Soils are inherently fertile, but use can be limited due to severe erosion. Land use includes areas of cropland, pasture in the valleys and on upland slopes, and bands of woodland. Corn and soybeans are the major crops.

40c The **Wooded Osage Plains** ecoregion is a non-glaciated undulating plain with smooth, low, limestone escarpments and small areas of exposed bedrock. Pennsylvanian limestone, sandstone, and shale strata with differential erosion has produced a more rolling topography than in the Cherokee Plains (40d) to the south. The upland prairie has a greater proportion of southwestern plants and animals, a lesser proportion of northern species, and a greater diversity in streamside woody vegetation than the Loess Flats and Till Plains (40a) to the north. Topography of this region also tends to be smoother than the till plains of 40a. The potential natural vegetation is a mosaic of oak-hickory woodland and bluestem prairie, with a greater concentration of the woodlands than in regions to the west. Land use is a mosaic of woodland, cropland, and grassland/rangeland.

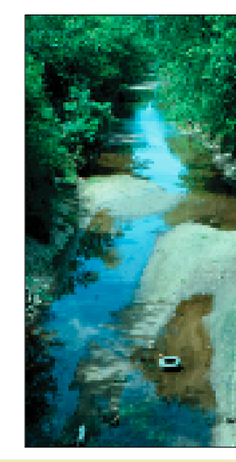
40d The **Cherokee Plains** ecoregion is a non-glaciated, relatively flat, erosional plain with more poorly drained and less fertile soils than the Wooded Osage Plains (40c). Claypan soils distinguish this region from surrounding regions and support potential natural vegetation of tallgrass prairie, oak-hickory woodland, and claypan prairie where soils are less permeable. Sites can be seasonally wet but usually become extremely dry during the summers. Land use includes a mix of cropland and grassland, limited woodland, and areas of coal strip mining extending into southeastern Kansas.

40e Well-developed claypan soils on glacial till typify the **Claypan Prairie** ecoregion. This region has a more level, gently rolling topography than surrounding regions. Expansive cropland and pastureland, with an emphasis on livestock production, is common. The potential natural vegetation is tallgrass prairie with less woodland than surrounding regions. Streams run generally west to east, draining into the Mississippi River, in contrast to the northwest to southeast drainage of the Loess Flats and Till Plains (40a) to the west.

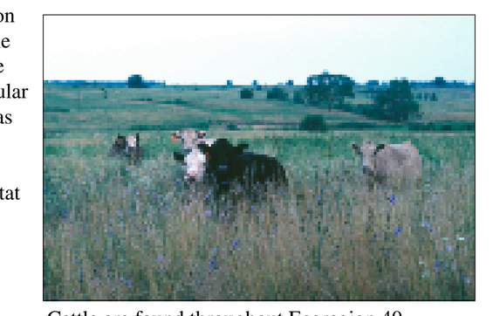


Canada geese, *Branta canadensis*, feed in many of the croplands of Ecoregion 40 during migration.

Contour farming is common on the rolling plains of the Central Irregular Plains (40) of Iowa and northern Missouri.



Channelization of many of the streams in the Central Irregular Plains (40) has reduced the quality of physical habitat for fish.



Cattle are found throughout Ecoregion 40. Grazing in addition to confined feeding operations has contributed to environmental degradation of streams and ground water in the region. *Photo: Jim Rathert, MDC*

47. Western Corn Belt Plains

Once covered with tallgrass prairie, over 75 percent of the Western Corn Belt Plains is now used for cropland agriculture and much of the remainder is in forage for livestock. A combination of nearly level to gently rolling glaciated till plains and hilly loess plains, average annual precipitation of 26–37 inches, which occurs mainly in the growing season, and fertile, warm, moist soils make this one of the most productive areas of corn and soybeans in the world. Major environmental concerns in the region include surface and groundwater contamination from fertilizer and pesticide applications as well as impacts from concentrated livestock production.

The once extensive tallgrass prairie has been replaced by cropland agriculture as the prevailing land cover of the Western Corn Belt Plains (47). Large corporate farms are common and few small family farms remain in the region. Iowa produces more corn and soybeans than any other state.

47a The **Northwest Iowa Loess Prairies** ecoregion is a gently undulating plain with a moderate to thick layer of loess. It is the highest and driest region of the Western Corn Belt Plains, as it rises to meet the Northern Glaciated Plains (46) of the Dakotas. Although loess covers almost all of the the broad upland flats, ridges, and slopes, minor glacial till outcrops occur near the base of some of the side slopes. Silty clay loam soils have developed on the loess. The area is mostly treeless, except for the more moist areas along some stream corridors and on farmstead windbreaks. The dominant land use is cropland agriculture with some pasture and cattle feedlots.

47b One of the youngest and flattest regions in Iowa, the **Des Moines Lobe** ecoregion is a distinctive area of Wisconsinan glacial stage landforms currently under extensive agriculture. In general, the land is level to gently rolling with some areas of the moraines having the most relief. The morainal ridges and hummocky knob and kettle topography contrast with the flat plains of ground moraines, former glacial lakes, and outwash deposits. A distinguishing characteristic from other parts of Ecoregion 47 is the lack of loess over the glacial drift. The stream network is poorly developed and widely spaced. The major rivers have carved valleys that are relatively deep and steep-sided. Almost all of the natural lakes of Iowa are found in the northern part of this region. Most of the region has been converted from wet prairie to agricultural use with substantial surface water drainage. Only a small fraction of the wetlands remain, and many natural lakes have been drained as a result of agricultural drainage projects.

47c The **Iowan Surface** ecoregion is a geologically complex region located between the bedrock-dominated landforms of the Paleozic Plateau/Coulee Section (52b) and the relatively recent glacial drift landforms of the Des Moines Lobe (47b). The southern and southeastern border of this region is irregular and crossed by major northwest- to southeast-trending stream valleys. In the northern portion of the region, the glacial deposits are thin, and shallow limestone bedrock creates karst features such as sinkholes and sags. There are no natural lakes of glacial origin in this region, but overflow areas and backwater ponds occur on some of the larger river channels contributing to some diversity of aquatic habitat and a large number of fish species.

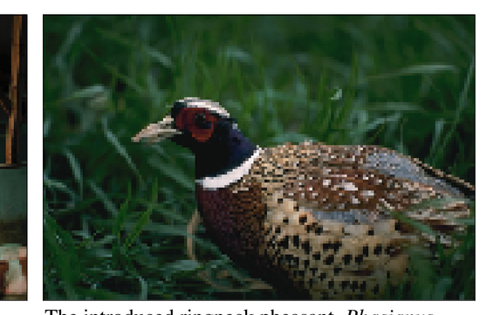
47d The **Missouri Alluvial Plain** is part of the large, wide, flat alluvial plain found in five neighboring states. Surrounded by bluffs capped with deep loess, the historic island-studded meandering river channel has been stabilized and narrowed to manage discharge and to promote navigation and agriculture. The deep silty and clayey alluvial soils support extensive cropland agriculture. Most of the oak-hickory forest, floodplain forest, and tallgrass prairie has been removed due to conversion to cropland, although some wetlands are being restored.

47e Rolling hills with thick loess deposits and underlying glacial till distinguish the **Steeply Rolling Loess Prairies** ecoregion from the flat Missouri Alluvial Plain (47d) to the west. Land clearing has promoted vast sheet erosion and gullying and consequent re-deposition of loess in the valley bottoms. Potential natural vegetation is tallgrass prairie with woodland in narrow valleys and stream reaches. Most of the region is prime farmland and cropland is extensive.

47f Loess deposits on well drained plains and open low hills characterize the **Rolling Loess Prairies** ecoregion. Loess deposits tend to be thinner than those found in 47e to the west, generally less than 25 feet in depth except along the Missouri River where deposits are thicker. Potential natural vegetation is a mosaic of mostly tallgrass prairie and areas of oak-hickory forest. Although cropland agriculture is widespread, this region has more areas of woodland and pasture than neighboring 47e.

47m The **Western Loess Hills** ecoregion extends south from Iowa and covers only a small area in northwestern Missouri. The deep loess-dominated hills have greater relief and a higher drainage density than the Steeply Rolling Loess Prairies (47e) to the east. The more irregular topography and erosive, silty soils contribute to a mixed land use with less cropland and more pasture and woodland than neighboring regions. The flora of this region is mixed, with shortgrass and mixed-grass prairie and rare xeric species on south and west-facing slopes, and bur-oak woodland and tallgrass prairie on cooler, moister slopes.

Confined animal feeding operations, including hog farms, are common in many areas of the Corn Belt Plains (47). Iowa is one of the top hog-producing states in the nation.



The introduced ringneck pheasant, *Phasianus colchicus*, is a popular game bird in Ecoregion 47.

Tallgrass prairie has a dense and vast root mass that holds the soil and helps minimize erosion. Loss of this natural vegetation has contributed to erosion and water quality problems.

Stream ditching and drain tiling is a common land use practice associated with the widespread cropland agriculture in the Western Corn Belt Plains (47).

52. Driftless Area

The hilly uplands of the Driftless Area (52) ecoregion easily distinguish it from surrounding ecoregions. Much of the area consists of a deeply dissected, loess-capped, bedrock-dominated plateau. The ecoregion is also called the Paleozoic Plateau because the landscape's appearance is a result of erosion through rock strata of Paleozoic age. Although evidence of glacial drift has been found in the ecoregion, its influence has been minor compared to surrounding regions. Livestock and dairy farming are major land uses and can impact stream quality. In contrast to the adjacent glaciated ecoregions, the Driftless Area (52) has few lakes, most of which are reservoirs with generally high trophic states, and a stream density and flow that is generally greater than regions to the east.

Woodlands and pasture dominate numerous hillsides on the bedrock influenced terrain of the Driftless Area (52) ecoregion. Cropland is confined to scattered level areas and dairy farming is common throughout the region.

52b The bedrock-dominated terrain of the **Paleozoic Plateau/Coulee Section** ecoregion is strikingly different from the rest of Iowa. Steep slopes and bluffs, higher relief, sedimentary rock outcrops, dense forests, and unique boreal microhabitats differentiate this ecoregion from the Western Corn Belt Plains (47) to the west. The Silurian Escarpment, a prominent physiographic feature that helps define the southern and western boundary of this ecoregion, separates the mostly cropland area of the Western Corn Belt Plains (47) from the mixed land use of the Driftless Area (52). Dissolution of the limestone and dolomite rocks results in karst features such as sinkholes, caves, and springs, and makes groundwater vulnerable to contamination. The streams in the Iowa portion of this region occupy entrenched valleys, and have cool waters with high gradients flowing over rocky substrates. The fish communities found here reflect this preference for cool clear water with relative constancy of flow.

74. Mississippi Valley Loess Plains

This ecoregion stretches from near the Ohio River in western Kentucky to Louisiana. It consists primarily of irregular plains, along with some disjoined low hills found within the Mississippi Alluvial Plain (73). Oak–hickory and oak-hickory-pine forests are the natural vegetation cover. With flatter topography than the Southeastern Plains ecoregion (65) to the east, streams tend to have less gradient and more silty substrates. Thick loess is a distinguishing characteristic of the region.

74a The portion of the **Bluff Hills** ecoregion, locally known as Crowley's Ridge, is a disjunct series of loess-capped low hills with greater relief than the surrounding Mississippi Alluvial Plain (73). These hills, possibly the result of movement on the New Madrid seismic zone, are geologically diverse, containing sands, gravel, clays, and bedrock of several geologic formations. Spring-fed streams and seep areas occur on the lower slopes in the sandy and gravelly soils. Soils are generally well drained, more loamy and eroded than those found in the surrounding Mississippi Alluvial Plain (73). Land cover in the Missouri portion is mainly pasture and woodland with only limited areas of row crop agriculture.

Crowley's Ridge, viewed from the Mississippi Alluvial Plain (73), is a disjunct remnant of the Bluff Hills (74a) ecoregion. *Photo: David Hoffman, Missouri DNR - Geologic Survey Program*

72. Interior River Valleys and Hills

The Interior River Valleys and Hills ecoregion is made up of many wide, flat-bottomed, terraced valleys, forested valley slopes, and dissected glacial-till plains. In contrast to the generally rolling to slightly irregular plains in adjacent ecological regions to the north, east, and west (northwest only in Missouri), where most of the land is cultivated for corn and soybeans, less than half of this area is in cropland, about 30 percent is in pasture, and the remainder is in forest. This region is generally a transitional area between the more forested areas in the Ozarks, and the flatter plains and more extensive cropland of regions to the north.

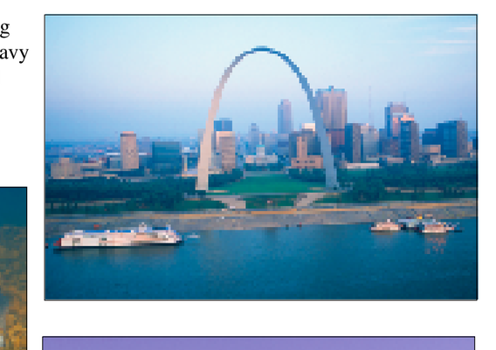
A mix of hills, river bluffs, valleys and more level areas used for agriculture is characteristic of Ecoregion 72. *Photo: Nick Decker, Missouri DNR*

72d A small portion of the **Upper Mississippi Alluvial Plain** is found in Missouri, with most of the ecoregion occurring in Illinois and Iowa. The smooth to irregular alluvial plain and the river channel have undergone drastic changes in the last 100 years. Large reaches of the river have been channelized and numerous low dams with locks have been constructed upstream from St. Louis. The potential natural vegetation of oak-hickory forest, northern floodplain forest, and tallgrass prairie has all but been replaced by agriculture. Soils are deep, silty and clayey alluvium and support extensive cropland. The Mississippi River is generally less turbid than in the neighboring Middle Mississippi Alluvial Plain (72e).

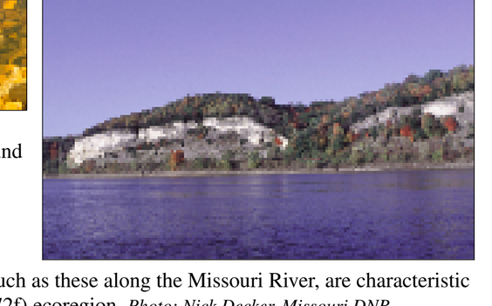
72e The **Middle Mississippi Alluvial Plain** in Missouri is narrow, comprising the Mississippi River alluvial plain between the Missouri and Ohio Rivers. Similar to 72d to the north, this region is a smooth alluvial plain with widespread cropland agriculture and stream channelization. Increased turbidity, current, and volume from the Missouri River contribute to a change in the aquatic biota. In addition, storm water runoff from the St. Louis urban area contributes significant non-point source pollutants to the river.

72f Smooth to moderately dissected, forested river side-slopes and bluffs, some loess-covered hills, and areas with karst features are characteristic of the **River Hills** ecoregion. This region, which lies along the Missouri River as well as the Mississippi River, is a transition zone between the loess-covered and till-covered plains to the north (Ecoregion 40) and the lighter colored, rocky soils of the more dissected interior Ozark Highlands (39) regions. The River Hills are less forested than interior areas in the Ozarks. Ridges and valleys have a deep soil mantle but the steep slopes are stony with frequent rock outcrops. Loess, which can be thick in some areas, mantles the ridges and uplands. Deep, sandy and silty, moderately to poorly drained alluvium covers the river valleys. Paleozoic bedrock is relatively resistant to erosion along the Missouri River, and consequently the Missouri River alluvial valley is relatively narrow in this region, a contrast to the wide plain of neighboring 47d. Land cover throughout this region is varied, with row crops, improved pasture, woodland, and oak and mesic mixed hardwood forests.

Urbanization and increasing development along the Mississippi and Missouri Rivers place a heavy burden on water quality and the environmental health of the river systems. *Photo: Jim Rathert, MDC*



Paddlefish, *Polydon spathula,* also known as "spoonbill catfish", are a popular game fish found in the Mississippi River. *Photo: Jim Rathert, MDC*



Limestone bluffs, such as these along the Missouri River, are characteristic of the River Hills (72f) ecoregion. *Photo: Nick Decker, Missouri DNR*

73. Mississippi Alluvial Plain

This riverine ecoregion extends from southern Illinois, at the confluence of the Ohio River with the Mississippi River, south to the Gulf of Mexico. It is mostly a broad, flat, alluvial plain with river terraces and levees providing the main elements of relief. Soils tend to be poorly drained, except for selected areas of sandy soils. In Missouri, this region is the northern biotic limit for many coastal plain species. Extensive clearing and drainage for agriculture began in the early 20th century and removed most of the natural bottomland deciduous forest. Winters are mild and summers are hot, with temperatures and average annual precipitation increasing from the north to south. Presently, most of the northern and central parts of the region are in cropland and receive heavy treatments of insecticides and herbicides. Rice, cotton, and soybeans are the major crops.

Widespread cropland agriculture with a few small blocks of forested woodlots is a common land cover throughout the Mississippi Alluvial Plain (73). *Photo: Nick Decker, Missouri DNR*

73a The Holocene floodplain of the Mississippi alluvial valley contains the meander belt of the present course of the Mississippi River. Point bars, oxbows, natural levees, and abandoned channels are all characteristic of the **Holocene Meander Belts** ecoregion. Soils are silty and clayey loams derived from alluvium, are not as sandy as neighboring 73b, and are generally poorly drained. The Mississippi River and its associated tributaries have been heavily channelized and leveed throughout the region. Widespread draining of wetlands and removal of bottomland forest has also occurred and cropland agriculture is extensive.

73b A broad, flat, alluvial plain, the **Pleistocene Valley Trains** ecoregion is distinct from the dissected topography of the neighboring Ozark Highlands (39). The region was formed from Pleistocene glacial outwash deposits from the Mississippi and Ohio Rivers and subsequently covered with fertile, thick, alluvial and eolian deposits. Sand dune fields and eolian deposits also occur in the plain between the Bluff Hills (Crowley's Ridge) (74a) and the Ozark Highlands (39) to the west, and along the eastern border of Sikeston Ridge, center of the New Madrid Seismic zone. Most of the area was historically covered with bald cypress, tupelo swamp forest, and mixed deciduous bottomland forest. Natural grasslands occupied sandy terraces. Today, row crop agriculture dominates the landscape with primary production in soybeans, cotton, and rice.

Aerial pesticide applications are part of the intensive agricultural practices of Ecoregion 73. *Photo: Barb Kleiss*

Cotton is a major crop in the Mississippi Alluvial Plain (73). *Photo: Jim Rathert, MDC*

The venomous cottonmouth water moccasin, *Agikistrodon piscivorus,* prefers wetland habitats and can be found in the marshes and rice fields of Ecoregion 73. *Photo: Jim Rathert, MDC*

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