Ecological Site Description

Ponded Sinkhole Wetland R116BY040MO

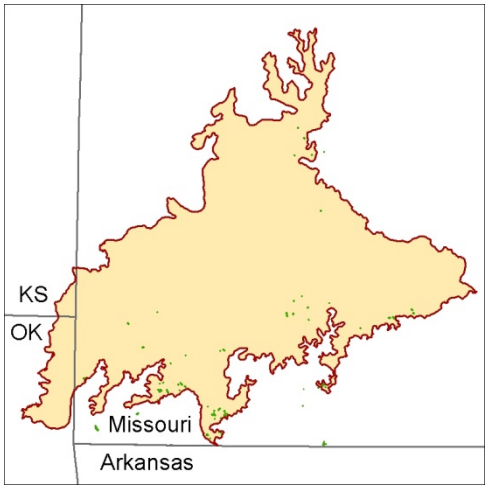
- *(Acer rubrum/ Cephalanthus occidentalis/ Carex)*
- (red maple/buttonbush /sedge)

An Ecological Site Description (ESD) is a reference document of ecological knowledge regarding a particular land area (ecological site). An ESD describes ecological potential and ecosystem dynamics of land areas and their potential management. Ecological sites are linked to soil survey map unit components, which allows for mapping of ecological sites. (***NOTE:*** *This is a "provisional" ESD, and is subject to change. It contains basic ecological information sufficient for conservation planning and land management in Missouri. After additional information is developed and reviewed, a "Correlated" ESD will be published and will be available via the Web Soil Survey* http://websoilsurvey.nrcs.usda.gov .)

Major Land Resource Area: 116B – Springfield Plain

Introduction

The Springfield Plain (area outlined in red on the map) is in the western part of the Ozark Uplift. It is primarily a smooth plateau with some dissection along streams. Elevation is about 1,000 feet in the north to over 1,700 feet in the east along the Burlington Escarpment adjacent to the Ozark Highlands. The underlying bedrock is mainly Mississippian-aged limestone, with areas of shale on lower slopes and structural benches, and intermittent Pennsylvanian-aged sandstone deposits on the plateau surface.

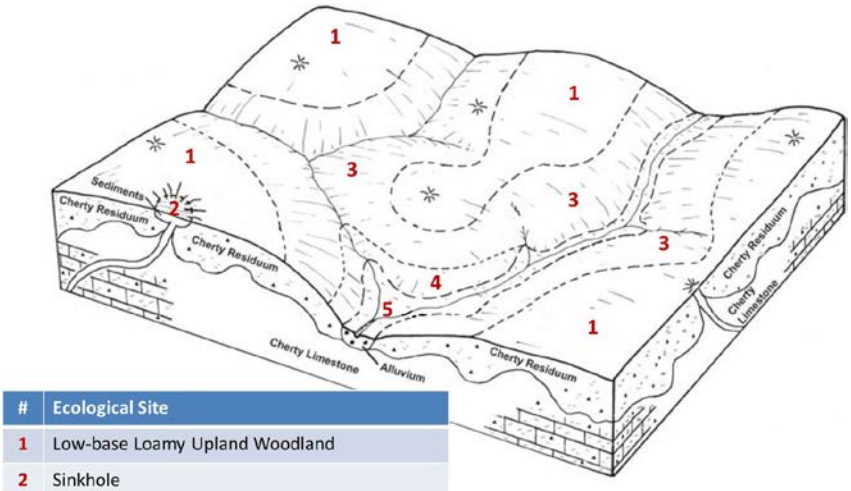


Ponded Sinkhole Wetlands (green areas on the map) occur in karst areas, primarily in the southern Springfield Plain. Soils are very deep and loamy throughout, with periodic ponding and high water tables.

Physiographic Features

This site is on sinkholes with slopes of 0 to 3 percent. The site receives runoff from the adjacent uplands, and is subject to frequent ponding in the winter months.

The following figure (adapted from Gregg & Woodward, 2006) shows the typical landscape position of this ecological site, and landscape relationships with other ecological sites. It is within the area labeled "2", as well as in smaller sinkholes as shown on the figure. Sinkhole sites are associated with limestone, so adjacent ecological sites are typically underlain by limestone such as the sites shown in the figure.



#	Ecological Site
1	Low-base Loamy Upland Woodland
2	Sinkhole
3	Low-base Chert Upland Woodland
4	Chert Upland Woodland
5	Gravelly/Loamy Upland Drainageway Woodland

Soil Features

These soils have no rooting restriction. The soils were formed under woodland vegetation, and have thin, light-colored surface horizons. Parent material is colluvium. They have silt loam surface horizons, and loamy subsoils. They are affected by a seasonal high water table during the spring months. Soil series associated with this site include Sowcoon.

Ecological Dynamics

Information contained in this section was developed using historical data, professional experience, field reviews, and scientific studies. The information presented is representative of very complex vegetation communities. Key indicator plants, animals and ecological processes are described to help inform land management decisions. Plant communities will differ across the MLRA because of the naturally occurring variability in weather, soils, and aspect. The Reference Plant Community is not necessarily the management goal. The species lists are representative and are not botanical descriptions of all species occurring, or potentially occurring, on this site. They are not intended to cover every situation or the full range of conditions, species, and responses for the site.

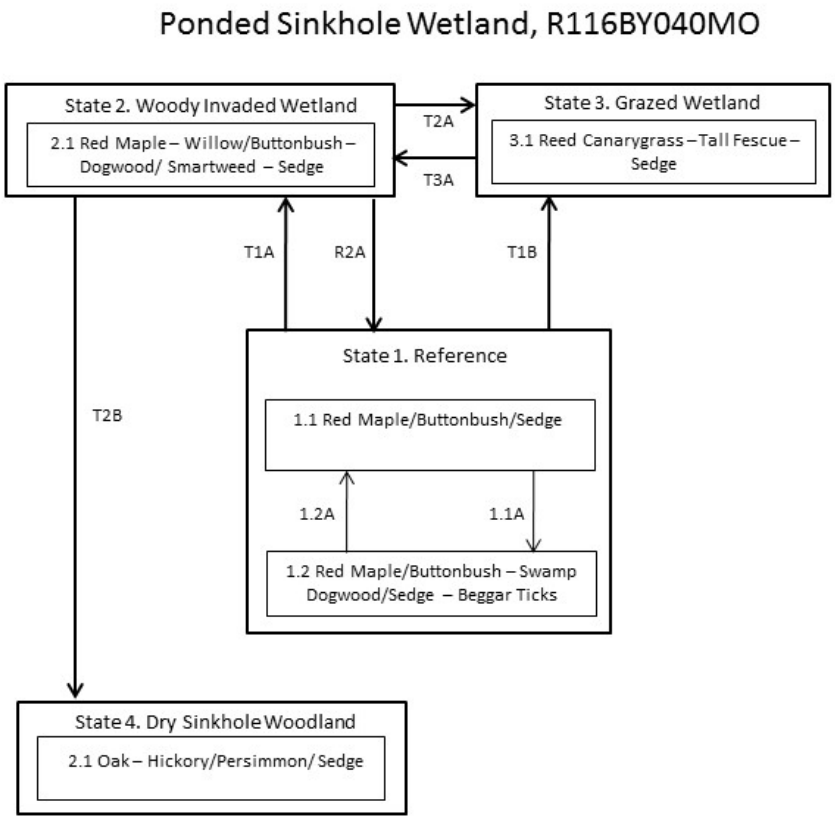
The reference plant community is a wetland with scattered pin oak, red maple and green ash as overstory species associated with sinkhole basins. The tree canopy, when present, is medium in height (60 to 70 feet) and open. The understory is poorly developed and the ground cover is mixed herbaceous. Grasses and sedges can dominate in open ephemeral wet areas. In contrast to more abundant Loamy Sinkhole Woodlands, these units hold surface water for at least some period each year. These sites are unique and valuable communities within the more common and widespread woodland-forest complex.

The driving ecological dynamic of Ponded Sinkhole Wetlands is the hydrology. This is governed by the size of the catchment, as well as the depth and configuration of the sink. Each one is unique in these respects. Over time, these wetlands can accumulate organic matter and silt and decrease in water depth and duration, consequently, slowly succeeding from swamp, to marsh and shrub swamp, to periodically wet woodlands.

Similar to the surrounding woodlands, fire, wind and ice played an occasional role. But fire would have been retarded by the wet conditions. Wind and ice would have influenced canopy structure of the treed sinks. Many wet sinks have been cleared, drained or altered by humans. Some have had berms put up to make the water deeper and more permanent for livestock. Most have had some influence of livestock.

A State and Transition Diagram is depicted in Figure 1. Detailed descriptions of each state, transition, plant community, and pathway follow the model. This model is based on available experimental research, field observations, professional consensus, and interpretations. It may change as knowledge increases.

Figure 1: State and transition diagram



Code	Event/Activity/Process
T1A	Woody invasion; reduced ponding
T1B	Woody removal; drainage activities; grazing;
T3A	Grazing cessation; woody invasion
T2A	Woody removal; grazing
T2B	Excessive silting; no ponding; open sinkhole
1.1A	Decreased ponding
1.2A	Increased ponding
R2A	Woody reduction; restore natural hydrology and ponding

Ecological States

State 1: Reference

This state is typical of wet sinkhole wetlands that experience full horizon saturation (endosaturation) for extended periods during the growing season. Long duration ponding regimes are common during many years.

Two phases can occur that will transition back and forth depending on ponding water levels. Shorter ponding intervals with periods of open water will increase woody species such willow, dogwoods and other woody species. When ponding and flooding intervals lengthen woody species will decrease.

State 2: Woody Invaded Wetland
During extended dry periods or excessive silting in from upland sites, the reference state may become drier and may transition to a woody invaded wetland state. The drier site conditions allow woody seed germination to occur and over time allow a denser canopy to form. Many hydric species may also decrease. If wetter condition return this state can be restored to a reference state by reducing woody cover. Sites that have transitioned to this state through excessive silting may be very difficult to restore to a reference state.

State 3: Grazed Wetland
Many wet sinks have been cleared, drained or otherwise altered by humans. Some have had berms put up to make the water deeper and more permanent for livestock activity and use. Most have had some influence of livestock during some period of recent time.

State 4: Dry Sinkhole Woodland
Some wet sinkholes will transition to this state through excessive siltation and or removal of the sinkhole plug that drains the previously wet sinkhole. This transition to a woodland community can take many years (>25 - 50 years) to complete.

Reference State Plant Community
(Note: This site may include wetter inclusions and associated communities, that are highly variable, ranging from pond marshes and shrub swamps with floating mats of vegetation, to swamps with an overstory of red maple and green ash and other wetland trees. There are numerous plants whose occurrence in Missouri is confined to these sinkhole ponds, and many others whose next nearest locality is in the wetlands of the Mississippi Lowlands.)

Canopy Trees

Common Name	Botanical Name	Cover % (low-high)	Canopy Height (ft)
PIN OAK	*Quercus palustris*	0-20	70
RED MAPLE	*Acer rubrum*	0-20	70
GREEN ASH	*Fraxinus pennsylvanica*	0-20	60
PERSIMMON	*Diospyros virginiana*	0-20	50
BLACK WILLOW	*Salix nigra*	0-20	50

Shrubs

Common Name	Botanical Name	Cover % (low-high)	Canopy Height (ft)
BUTTONBUSH	*Cephalanthus occidentalis*	5-20	5
SWAMP DOGWOOD	*Cornus obliqua*	5-20	8

Forbs

Common Name	Botanical Name	Cover % (low-high)
BEGGAR TICKS	*Bidens discoidea.*	5-20
SWAMP LOOSESTRIFE	*Decodon verticillatus*	5-20
ROSE MALLOW	*Hibiscus lasiocarpos*	5-20
LEAST DUCKWEED	*Lemna minuta*	5-20

Grasses and sedges

Common Name	Botanical Name	Cover % (low-high)
SWEET WOODREED	*Cinna arundinacea*	5-20
INLAND RUSH	*Juncus interior*	5-20
SLENDER SPIKE RUSH	*Eleocharis verrucosa*	5-20
LONGHAIR SEDGE	*Carex comosa*	5-20
BROADWING SEDGE	*Carex alata*	5-20
COMMON CATTAIL	*Typha latifolia*	5-20

Site Interpretations

*Wildlife**

- Fishless sinkhole ponds provide critical breeding habitat for numerous species of salamanders, toads and frogs. This is especially important if the sinkholes are in dry upland woodlands where the closest standing water may be many miles away.

- Sinkhole ponds also provide excellent foraging sites for woodland and forest bats because aquatic flying insects are abundant there.

- Bird species associated with this ecological site's reference state condition: Wood Duck, Prothonotary Warbler, Green Heron and Yellow Warbler.

- Amphibians that often use sinkhole wetlands for breeding sites include the Ringed Salamander (*Ambystoma annulatum*), Spotted Salamander (*A. maculatum*), Marbled Salamander (*A. opacum*), Central Newt (*Notophthalmus viridescens louisianensis*), Dwarf American Toad (*Bufo americanus charlesmithi*), Cope's Gray Treefrog (*Hyla cinerea*), Eastern Gray Treefrog (*H. versicolor*), Northern Spring Peeper (*Pseudacris crucifer crucifer*), Pickerel Frog (*Rana palustris*), Wood Frog (*Rana sylvatica*) and Southern Leopard Frog (*R. sphenocephala*).

- Small mammals associated with this ecological site's reference state condition: Muskrat (*Ondatra zibethicus*), Southern Bog Lemming (*Synaptomys cooperi*), and Mink (*Mustela vison).*

- Sinkhole ponds are very valuable for odonates (dragonflies and damselflies), some examples include the Azure Bluet (*Enallagma aspersum*), Amber-winged Spreadwing (*Lestes eurinus*), Spatterdock Darner (*Aeshna mutata*) and Comet Darner (*Anax longipes*).

*This section prepared by Mike Leahy, Natural Areas Coordinator, Missouri Department of Conservation, 2013

Forestry

- Management: **This ecological site is not recommended for traditional timber management activity**.

Glossary

Backslope – a hillslope profile position that forms the steepest and generally linear, middle portion of the slope.

Backswamp – marshy or swampy, depressed areas of flood plains between natural levees and valley sides or terraces

Calcareous – the presence of calcium carbonate in the soil parent material within the rooting zone; relatively alkaline

Claypan – a dense, compact, slowly permeable layer in the subsoil having much higher clay content than the overlying material

Chert – hard, extremely dense or compact crystalline sedimentary rock, consisting dominantly of interlocking crystals of quartz

Cliff – a significant vertical, or near vertical, rock exposure

Dolomite – a type of sedimentary rock that is a carbonate mineral composed of calcium magnesium carbonate

Drainageway – the upper most reach of a stream channel system characterized by little meandering

Dry – a site where soil moisture is limiting during the growing season; low available water capacity

Dune – a low mound, ridge, bank or hill of loose, wind-blown sand

Exposed – steep, south and west-facing slopes, which are warmer and drier than other slope aspects

Flatwoods – a type of woodland that occurs on soils with a root restricting subsoil layer within 20 to 30 inches, resulting in very slow runoff and ponding that remains saturated for most of the winter and early spring months but dries out and becomes very dry in the summer months; plants that grow there must be adapted to both conditions

Floodplain – the nearly level plain that borders a stream and is subject to inundation under flood-stage conditions

Footslope – a hillslope position at the base of a slope where hillslope sediment (colluvium) accumulates

Forest – a vegetative community dominated by trees forming a closed canopy and interspersed with shade-tolerant understory species

Fragipan – a dense, brittle subsoil horizon that is extremely hard and compact when dry

Glade – open, rocky, barren vegetative community dominated by drought-adapted forbs and grasses, typically with scattered, stunted woody plants

Igneous –bedrock formed by cooling and solidification of magma. Granite and rhyolite are typical igneous bedrocks in Missouri

Limestone – a type of sedimentary rock composed largely of calcium carbonate

Loess – material transported and deposited by wind and consisting predominantly of silt-size particles

Loamy – soil material containing a relatively equal mixture of sand and silt and a somewhat smaller proportion of clay

Marsh – a type of wetland that is dominated by herbaceous rather than woody plant species

Moist – a site that is moderately well to well drained and has high available water capacity, resulting in a well-balanced supply of moisture (neither too dry nor too wet).

Mudstone – blocky or massive, fine-grained sedimentary rock in which the proportions of clay and silt are approximately equal

Natric – a soil horizon that displays a blocky, columnar, or prismatic structure and has a subhorizon with an exchangeable-sodium saturation of over 15%

Outwash – stratified sediments of sand and gravel removed or "washed out" from a glacier by melt-water streams

Prairie – a vegetative community dominated by perennial grasses and forbs with scattered shrubs and very few trees

Protected – steep, north- and east-facing slopes, which are cooler and moister than other slope aspects

Residuum - unconsolidated, weathered, or partly weathered mineral material that accumulates by disintegration of bedrock in place

Riser – a component of terraces and flood-plain steps consisting of the steep side slope; the escarpment

Riverfront – a vegetative community in the floodplain immediately adjacent and generally parallel to a river or stream channel

River hills – a geographic area characterized by thick, dissected loess deposits, formed immediately adjacent to the edges of the Missouri and Mississippi River floodplains

Sandy – a coarse-sized soil containing a large mixture of sand and gravels and a somewhat smaller proportion of silts and clays with excessive drainage

Sandstone – a sedimentary rock containing dominantly sand-size particles

Savanna – grasslands interspersed with open-grown scattered trees, groupings of trees, and shrubs

Shale – a sedimentary rock formed from clay, silty clay, or silty clay loam deposits and having the tendency to split into thin layers

Shallow – a site with bedrock within 20 inches of the surface

Shoulder – the slope profile position that forms the convex surface near the top of a hill slope; it comprises the transition zone from summit to backslope

Sinkhole – a closed, circular or elliptical depression, commonly funnel-shaped, characterized by subsurface drainage and formed either by dissolution of the surface of underlying bedrock or by collapse of underlying caves within bedrock

Summit – the top or highest area of a hillslope

Swale –shallow, closed depressions irregularly spaced across a floodplain or terrace with an irregularly undulating surface.

Swamp – an area of low, saturated ground, intermittently or permanently covered with water, and predominantly vegetated by shrubs and trees.

Talus – rock fragments of any size or shape (usually coarse and angular) derived from and lying at the base of a cliff or very steep rock slope.

Terrace – a step-like surface, bordering a valley floor that represents the former position of a flood plain

Till – dominantly unsorted and unstratified soil material deposited directly by a glacier

Upland – a general term for the higher ground of a region, in contrast with a low-lying, adjacent land such as a valley or floodplain

Wet – a somewhat poorly, poorly or very poorly drained site that has an oversupply of moisture during the growing season

Woodland – a highly variable vegetative community with a canopy of trees ranging from 30 to 100 percent closure with a sparse midstory and a dense ground flora of grasses, sedges and forbs

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