

Ecological site R098XB028IN Kankakee Mucky Depressions

Last updated: 1/12/2024
Accessed: 05/07/2024

General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.



Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

MLRA notes

Major Land Resource Area (MLRA): 098X–Southern Michigan and Northern Indiana Drift Plains

This area is in the Eastern Lake Section of the Central Lowland Province of the Interior Plains. It is a broad glaciated plain that is deeply mantled by till in the north and outwash to the south. Much of the area is nearly level to gently rolling. Elevation ranges from 183 to 391 m (600 to 1285 ft). Local topographic relief averages 9 m and ranges up to 74 m (30 to 245 ft). Highest relief occurs adjacent to river valleys eroded through moraines.

Topography is more subdued south of the Atlantic/Gulf drainage divide near the Michigan/Indiana state line, elevations ranging from 185 to 280 m (605 to 920 ft). Local topographic relief in the south averages 4 m and ranges up to 49 m (10 to 160 ft).

The surface of this area is covered by 30 to 150 m (100 to 500 ft) of glacial drift in most areas. At the northern edge of the area, the drift is more than 100 meters (300 ft) thick. From the Grand River basin northward, most of the drift consists of till from the Saginaw Lobe of the Wisconsin Ice Sheet. From the Kalamazoo River basin southward, there are significant deposits of unconsolidated sand and gravel outwash formed between major lobes of the receding Wisconsin Ice Sheet. The outwash deposits are reworked as sand dunes in the Kankakee River basin.

The bedrock beneath the glacial deposits in this area is deformed in the shape of a basin. The center of this basin is in the north-central part of the area. Pennsylvanian-age sandstone are in the center of the basin, and Mississippian-age sandstone and shale beds form the outer rings of the basin. In a few areas the drift deposits are

less than 2 m (6 ft) thick, where glacial outwash channels have eroded to limestone bedrock in Grand Rapids, and where sandstone bedrock cuestas peak in elevation in near Hillsdale, Michigan. A sandstone cliff < 15 m high (<50 ft) occurs along a short stretch of the Grand River in Grand Ledge, Michigan.

Most of the rivers in this area are short because of their proximity to the Great Lakes east and west of the area. The largest watersheds, the St. Joseph River, Grand River, and Kalamazoo River drain into Lake Michigan. The southern extent of the MLRA is drained by the Kankakee River of the Mississippi River watershed.

Classification relationships

Among the USFS ecoregional framework (Cleland et al., 2007), most of MLRA 98 is represented by the Humid Temperate Domain (200), Hot Continental Division (220), Midwest Broadleaf Forest Province (222), South Central Great Lakes Section (222J), subsections 222Jc, 222Jg, 222Jh, and 222Jf. Similar sites within the portion of MLRA 98 that overlap the Prairie Division (250) and Prairie Parkland Province (251) are treated as separate ecological sites. MLRA 98 recently was adjusted to exclude portions of Warm Continental Division (210), Laurentian Mixed Forest Province (212) to the north, and subsections 222Ja and 222Jb to the northwest.

Among the EPA ecoregional framework (Omernik and Griffith, 2014), most of MLRA 98 falls within Eastern Temperate Forests (Level I: 8), Mixed Wood Plains (Level II: 8.1), Southern Michigan/Northern Indiana Drift Plains (Level III: 56), and Level IV: 56b, 56g, and 56h. Similar sites within the portion of MLRA 98 that overlap the Central USA Plains (Level II: 8.2) and Central Corn Belt Plains (Level III: 54) are treated as separate ecological sites. MLRA 98 recently was adjusted to exclude portions of Northern Forests (Level I: 5), Mixed Wood Shield (Level II: 5.2), Northern Lakes and Forests (Level III: 50) to the north, and level IV: 56d and 56f to the northwest.

Ecological site concept

The central concept of the Kankakee Mucky Depressions is organic soils (typically muck) of intermediate pHs (5-7). Small delineations occur as base slope seeps. May occur on former lake beds as organic flats with minerotrophic ground water influence, but without marl. A variety of higher or lower fertility marshes and shrub swamps may form, but wetness and fire frequency limits the degree to which swamp forest can form.

Associated sites

R098XB034IN	Kankakee Wet Drift Flats
-------------	---------------------------------

Similar sites

F098XA006MI	Mucky Depressions
-------------	--------------------------

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Cephalanthus occidentalis</i>
Herbaceous	(1) <i>Carex stricta</i>

Physiographic features

Site most frequently occupies old lake beds or base slope seeps.

Table 2. Representative physiographic features

Landforms	(1) Depression
Runoff class	Negligible to low
Ponding duration	Brief (2 to 7 days) to very long (more than 30 days)

Ponding frequency	Occasional to frequent
Elevation	162–280 m
Water table depth	0 cm
Aspect	Aspect is not a significant factor

Climatic features

This ecological site experiences a humid continental climate with warm summers and cold winters. Precipitation is moderately well distributed through the year with higher amounts during the growing season than the winter. This ecological site is distributed only along the southern portion of the MLRA, and consequently is outside the moderating envelope of the Great Lakes. This area does have slightly greater annual rainfall due to being slightly closer to the main source of moisture (the Gulf of Mexico) than the rest of the MLRA, but this trend is canceled out by higher potential evapotranspiration rates. More significantly, this area has lower snowfall, warmer summer temperatures, and more frequent lightning, all of which contribute to higher fire frequencies than northern portions of the MLRA.

Table 3. Representative climatic features

Frost-free period (characteristic range)	141-149 days
Freeze-free period (characteristic range)	176-182 days
Precipitation total (characteristic range)	991-1,041 mm
Frost-free period (actual range)	139-150 days
Freeze-free period (actual range)	175-182 days
Precipitation total (actual range)	965-1,041 mm
Frost-free period (average)	145 days
Freeze-free period (average)	179 days
Precipitation total (average)	1,016 mm

Climate stations used

- (1) ROCHESTER [USC00127482], Rochester, IN
- (2) SOUTH BEND MICHIANA RGNL AP [USW00014848], South Bend, IN
- (3) WHEATFIELD [USC00129511], Wheatfield, IN
- (4) FRANCESVILLE [USC00123078], Francesville, IN
- (5) KANKAKEE WASTEWATER [USC00114603], Kankakee, IL
- (6) KNOX WWTP [USC00124657], Knox, IN

Influencing water features

Site remains saturated for most of the year, and may be seasonally ponded to shallow depths.

Soil features

Soils are very poorly drained organics with moderate pH. They are commonly classified as Typic Haplosaprists and Terric Haplosaprists and commonly mapped as Houghton, Adrian, and Palms series.

Table 4. Representative soil features

Parent material	(1) Organic material (2) Marl (3) Coprogenic material
-----------------	---

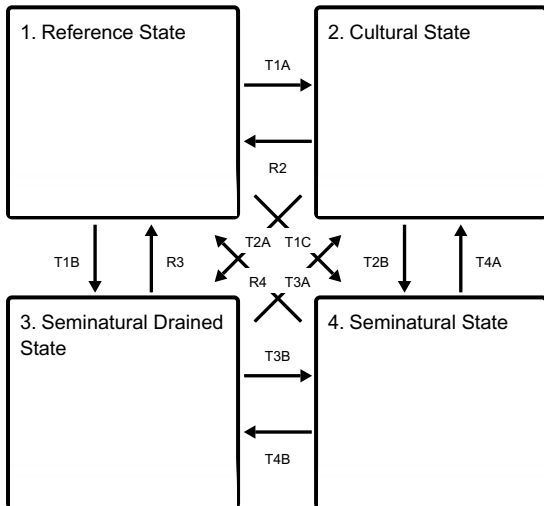
Surface texture	(1) Muck (2) Marl (3) Coprogenous earth
Drainage class	Very poorly drained
Permeability class	Slow to moderately rapid
Soil depth	201 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-100.1cm)	35–54.99 cm
Soil reaction (1:1 water) (0-50cm)	5.5–8
Subsurface fragment volume <=3" (0-150.1cm)	0%
Subsurface fragment volume >3" (0-150.1cm)	0%

Ecological dynamics

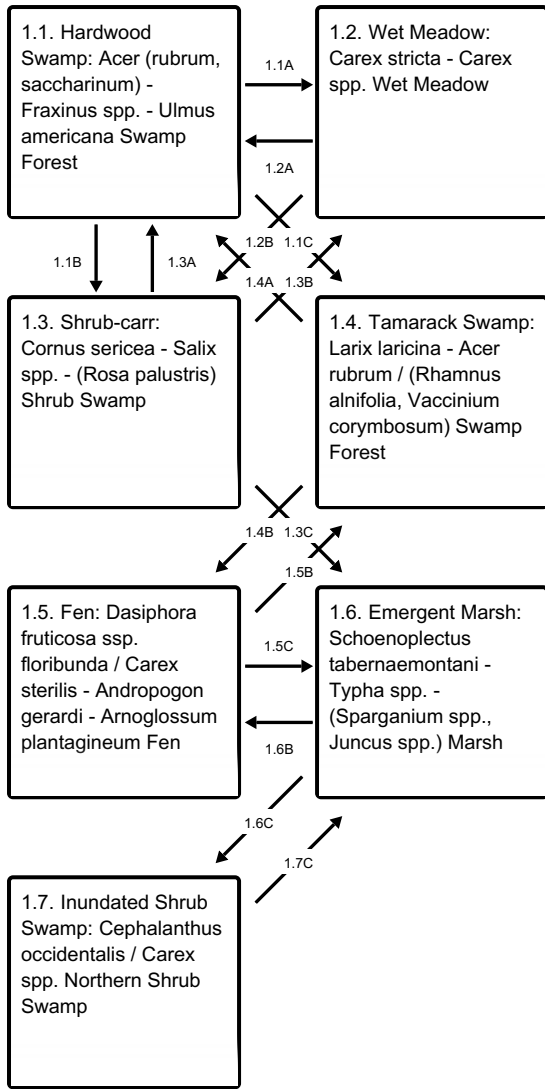
Fire was frequent in context with adjacent prairie and oak savanna, and supported a wet meadow community. Wetter sites supported buttonbush swamps. Wet anoxic soils favor facultative and obligate wetland species. The reference community is dominated by buttonbush (*Cephalanthus occidentalis*) and upright sedge (*Carex stricta*).

State and transition model

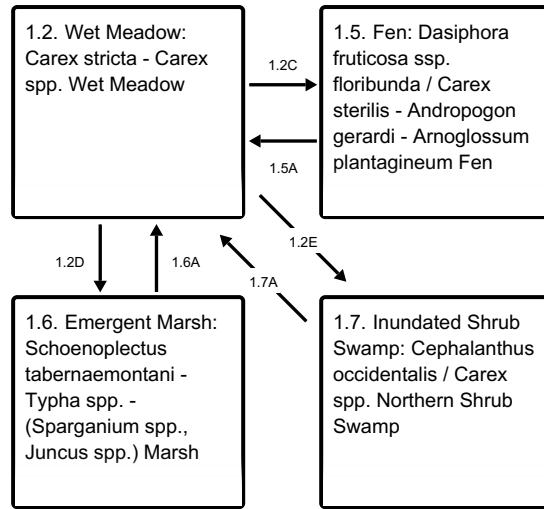
Ecosystem states



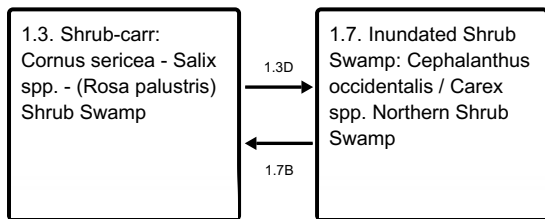
State 1 submodel, plant communities



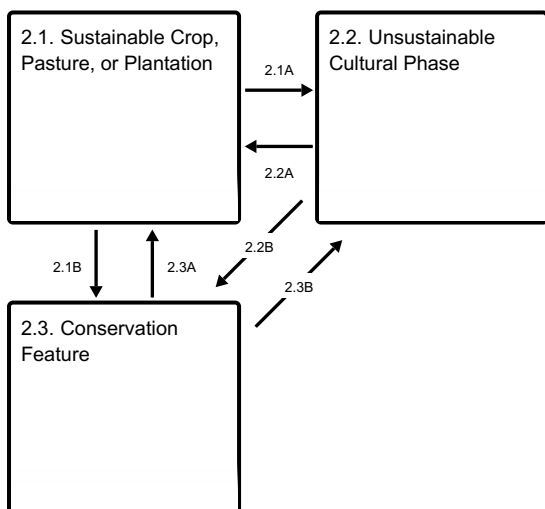
Communities 2, 5, 6 and 7 (additional pathways)



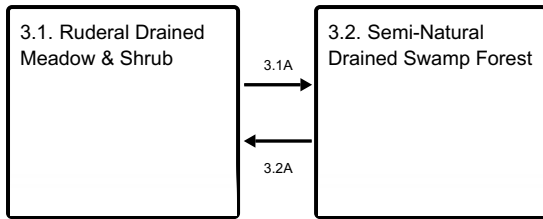
Communities 3 and 7 (additional pathways)



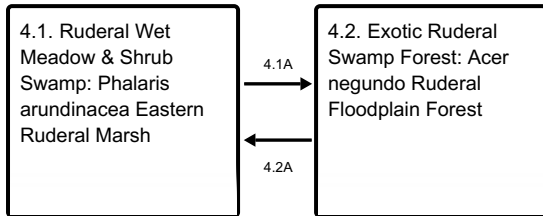
State 2 submodel, plant communities



State 3 submodel, plant communities



State 4 submodel, plant communities



State 1 Reference State

The Reference State consists of a spontaneous wild condition wherein non-native species are of low abundance and all native species retain viable populations. Structure and function of communities vary according to natural processes and disturbance regimes, with human influences limited to drivers that have the similar outcomes as natural processes. Communities range from marshes and fens to hardwood swamps. Dominant natural processes and disturbance regimes include fire, wind, and beaver activities.

Dominant plant species

- common buttonbush (*Cephalanthus occidentalis*), shrub
- upright sedge (*Carex stricta*), grass

Community 1.1

Hardwood Swamp: Acer (rubrum, saccharinum) - Fraxinus spp. - Ulmus americana Swamp Forest

This phase can be relatively fertile, sometimes occurring on sites with a more variable hydrology.

Forest overstory. The overstory is dominated by silver maple (*Acer saccharinum*) and green ash (*Fraxinus pennsylvanica*) with a broad assortment of other hardwoods.

Forest understory. Understory vegetation ranges from sparse in ponded areas to dense where the overstory canopy opens up. The species composition is variable, yet in some cases can form monocultures.

Dominant plant species

- silver maple (*Acer saccharinum*), tree
- green ash (*Fraxinus pennsylvanica*), tree
- common buttonbush (*Cephalanthus occidentalis*), shrub
- smallspike false nettle (*Boehmeria cylindrica*), other herbaceous
- lizard's tail (*Saururus cernuus*), other herbaceous
- jewelweed (*Impatiens capensis*), other herbaceous

Table 5. Ground cover

Tree foliar cover	40-95%
Shrub/vine/liana foliar cover	1.5-60.0%
Grass/grasslike foliar cover	1-75%
Forb foliar cover	5-45%
Non-vascular plants	0-10%

Biological crusts	0%
Litter	0.2-90.0%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0%

Table 6. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	0-15%	0-5%	0-1%	1-30%
>0.15 <= 0.3	0-15%	0-5%	0-1%	1-30%
>0.3 <= 0.6	0-15%	1-60%	0-2%	4-45%
>0.6 <= 1.4	0-5%	1-55%	0-70%	1-20%
>1.4 <= 4	2-15%	1-55%	0-65%	0%
>4 <= 12	40-95%	–	–	–
>12 <= 24	30-95%	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Community 1.2

Wet Meadow: *Carex stricta* - *Carex* spp. Wet Meadow

This phase represents open vegetation that is moderately fertile and has a high diversity of species. It is created through tree and shrub mortality due to beaver activity and is maintained by fire. Fire every ten years or so is required to maintain this phase without tree and shrub encroachment. Larger patches with interiors more distant from potential tree seed sources may persist for greater periods. After about 60 years after disturbance, vegetation succeeds to shrub swamp.

Forest overstory. The overstory has less than 5 percent tree cover.

Forest understory. Understory vegetation is dense and graminoid dominated with various species of grasses, sedges, and forbs.

Dominant plant species

- upright sedge (*Carex stricta*), grass
- bluejoint (*Calamagrostis canadensis*), grass
- sensitive fern (*Onoclea sensibilis*), other herbaceous
- spotted joe pye weed (*Eutrochium maculatum*), other herbaceous

Table 7. Ground cover

Tree foliar cover	0-5%
Shrub/vine/liana foliar cover	0-15%
Grass/grasslike foliar cover	70-85%
Forb foliar cover	5-20%
Non-vascular plants	0%

Biological crusts	0%
Litter	0%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0%

Table 8. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	0-1%	0-5%	0-3%	4-25%
>0.15 <= 0.3	0-1%	0-5%	0-3%	4-30%
>0.3 <= 0.6	0-1%	5-45%	3-20%	4-45%
>0.6 <= 1.4	0%	5-55%	70-90%	1-30%
>1.4 <= 4	0%	5-55%	0-1%	0-15%
>4 <= 12	0-5%	–	–	–
>12 <= 24	0-5%	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Community 1.3

Shrub-carr: *Cornus sericea* - *Salix* spp. - (*Rosa palustris*) Shrub Swamp

This phase is dominated by a range of large shrub species that tolerate saturated conditions, but is not frequently inundated. This phase may be intermediate in succession between swamp forest and wet meadow.

Forest overstory. The overstory has less than 5 percent tree cover. Occasionally, speckled alder (*Alnus rugosa*) may approach tree size, forming thick groves.

Forest understory. Understory vegetation is dense and dominated by shrubs of several species, including redosier dogwood (*Cornus sericea*), winterberry (*Ilex verticillata*), and swamp rose (*Rosa palustris*).

Dominant plant species

- redosier dogwood (*Cornus sericea*), shrub
- swamp rose (*Rosa palustris*), shrub
- common winterberry (*Ilex verticillata*), shrub
- speckled alder (*Alnus incana* ssp. *rugosa*), shrub

Table 9. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	–	–	–
>0.15 <= 0.3	–	–	–	–
>0.3 <= 0.6	–	–	0-50%	0-50%
>0.6 <= 1.4	–	10-95%	–	–
>1.4 <= 4	–	10-95%	–	–
>4 <= 12	0-5%	–	–	–
>12 <= 24	0-5%	–	–	–
>24 <= 37	0-5%	–	–	–
>37	–	–	–	–

Community 1.4

Tamarack Swamp: *Larix laricina* - *Acer rubrum* / (*Rhamnus alnifolia*, *Vaccinium corymbosum*) Swamp Forest

This phase represents a later successional (forested) outcome of a stable saturated hydrology and low fertility.

Forest overstory. The overstory cover can vary from open tamarack (*Larix laricina*) woodland to red maple (*Acer rubrum*) forest. Areas to the north may have large patches dominated by relict northern white cedar (*Thuja occidentalis*).

Forest understory. Understory vegetation is variable and can consist of shade-tolerant species like skunk cabbage (*Symplocarpus foetidus*) similar to the hardwood swamp phase or some species components of the shrub-carr (e.g., winterberry) and fen phases.

Dominant plant species

- red maple (*Acer rubrum*), tree
- tamarack (*Larix laricina*), tree
- common winterberry (*Ilex verticillata*), shrub
- highbush blueberry (*Vaccinium corymbosum*), shrub
- poison sumac (*Toxicodendron vernix*), shrub
- skunk cabbage (*Symplocarpus foetidus*), other herbaceous
- cinnamon fern (*Osmunda cinnamomea*), other herbaceous

Table 10. Ground cover

Tree foliar cover	15-60%
Shrub/vine/liana foliar cover	10-45%
Grass/grasslike foliar cover	3-30%
Forb foliar cover	25-55%
Non-vascular plants	5-40%
Biological crusts	0%
Litter	0-30%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0-60%
Bare ground	0%

Table 11. Woody ground cover

Downed wood, fine-small (<0.40" diameter; 1-hour fuels)	–
Downed wood, fine-medium (0.40-0.99" diameter; 10-hour fuels)	–
Downed wood, fine-large (1.00-2.99" diameter; 100-hour fuels)	0-1%
Downed wood, coarse-small (3.00-8.99" diameter; 1,000-hour fuels)	0-0%
Downed wood, coarse-large (>9.00" diameter; 10,000-hour fuels)	0-1%
Tree snags** (hard***)	–
Tree snags** (soft***)	–
Tree snag count** (hard***)	0 per hectare
Tree snag count** (soft***)	0 per hectare

* **Decomposition Classes:** N - no or little integration with the soil surface; I - partial to nearly full integration with the soil surface.

** >10.16cm diameter at 1.3716m above ground and >1.8288m height--if less diameter OR height use applicable down wood type; for pinyon and juniper, use 0.3048m above ground.

*** **Hard** - tree is dead with most or all of bark intact; **Soft** - most of bark has sloughed off.

Table 12. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	0-2%	2-5%	0-2%	15-45%
>0.15 <= 0.3	0-2%	1-4%	0-2%	15-45%
>0.3 <= 0.6	0-2%	10-45%	2-5%	25-50%
>0.6 <= 1.4	2-20%	10-45%	1-30%	4-10%
>1.4 <= 4	20-45%	10-40%	0-4%	–
>4 <= 12	15-60%	–	–	–
>12 <= 24	1-20%	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Community 1.5

Fen: *Dasiphora fruticosa* ssp. *floribunda* / *Carex sterilis* - *Andropogon gerardi* - *Arnoglossum plantagineum* Fen

This phase represents open conditions with a stable calcareous hydrology or exposed marl. Species composition and low stature strongly reflect the low nutrient availability.

Forest overstory. Overstory is mostly treeless, but scattered tamarack (*Larix laricina*) may approach 5 percent cover. Poison sumac (*Toxicodendron vernix*) occasionally approaches tree size.

Forest understory. Understory consists of dwarf shrubs like shrubby cinquefoil (*Dasiphora fruticosa*) and Kalm's St. Johnswort (*Hypericum kalmianum*), and graminoids like twigrush (*Cladium mariscoides*), woolly sedge (*Carex pellita*), and yellow sedge (*Carex flava*). Many of the species are calciphiles (calcium indicators). The wax-myrtle (*Morella pensylvanica*) is a locally rare nitrogen-fixing shrub found in the margins of large fens.

Dominant plant species

- shrubby cinquefoil (*Dasiphora fruticosa*), shrub
- woollyfruit sedge (*Carex lasiocarpa*), grass
- smooth sawgrass (*Cladium mariscoides*), grass

Table 13. Ground cover

Tree foliar cover	0%
-------------------	----

Shrub/vine/liana foliar cover	5-55%
Grass/grasslike foliar cover	30-80%
Forb foliar cover	10-50%
Non-vascular plants	35-45%
Biological crusts	0%
Litter	0%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0-15%
Bare ground	0%

Table 14. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	0-1%	2-40%	4-10%	0-35%
>0.15 <= 0.3	0-1%	2-40%	5-30%	1-3%
>0.3 <= 0.6	0-1%	5-55%	25-80%	2-10%
>0.6 <= 1.4	0-2%	1-3%	5-80%	3-45%
>1.4 <= 4	0-2%	1-3%	0-3%	0-2%
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Community 1.6

Emergent Marsh: *Schoenoplectus tabernaemontani* - *Typha* spp. - (*Sparganium* spp., *Juncus* spp.) Marsh

This phase represents the open condition with shallow (approximately 15 cm) standing water.

Forest overstory. There is no tree cover in this phase.

Forest understory. Understory consists of emergent graminoids like cattails (*Typha latifolia*) and bulrushes (*Schoenoplectus* spp.), and a mix of marsh forbs. There is often a submergent substratum of aquatic plants and algae (e.g., *Chara* sp.).

Dominant plant species

- broadleaf cattail (*Typha latifolia*), grass
- softstem bulrush (*Schoenoplectus tabernaemontani*), grass
- swamp milkweed (*Asclepias incarnata*), other herbaceous
- eastern marsh fern (*Thelypteris palustris*), other herbaceous

Table 15. Ground cover

Tree foliar cover	0-10%
Shrub/vine/liana foliar cover	0-25%
Grass/grasslike foliar cover	45-95%
Forb foliar cover	1.5-15.0%

Non-vascular plants	0-4%
Biological crusts	0%
Litter	0%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	50-100%
Bare ground	0%

Table 16. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	0%	0-5%	1-45%	2-15%
>0.15 <= 0.3	0%	0-5%	1-45%	2-15%
>0.3 <= 0.6	0%	0-20%	1-45%	2-15%
>0.6 <= 1.4	0-1%	0-15%	4-95%	0%
>1.4 <= 4	0-1%	0-15%	1-2%	–
>4 <= 12	0-5%	–	–	–
>12 <= 24	0-5%	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Community 1.7

Inundated Shrub Swamp: *Cephalanthus occidentalis* / *Carex* spp. Northern Shrub Swamp

This phase represents the shrubby phase with shallow standing water. This shrubby often occurs on the nutrient rich edges of a wetland where the muck is more decomposed, and the substrate becomes submerged (no hummocks to stand on).

Forest overstory. Less than 5 percent tree cover associated with this phase, related to transitions from adjacent vegetation phases or is shaded from adjacent upland vegetation. Trees rooted within this zone most likely are willows (*Salix* spp.) that can tolerate longer hydroperiods.

Forest understory. Understory consists of emergent shrubs, mainly buttonbush (*Cephalanthus occidentalis*).

Dominant plant species

- common buttonbush (*Cephalanthus occidentalis*), shrub

Table 17. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	–	–	–
>0.15 <= 0.3	–	–	–	–
>0.3 <= 0.6	–	–	–	–
>0.6 <= 1.4	–	10-80%	–	–
>1.4 <= 4	–	10-80%	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Pathway 1.1A
Community 1.1 to 1.2

Temporary prolonged inundation or fire

Conservation practices

Prescribed Burning

Pathway 1.1B
Community 1.1 to 1.3

Clearcut, blowdown, or fire

Conservation practices

Prescribed Burning
Early Successional Habitat Development/Management
Forest Stand Improvement

Pathway 1.1C
Community 1.1 to 1.4

Increased peat or marl thickness, and decreased nitrogen or phosphorus availability

Pathway 1.2A
Community 1.2 to 1.1

Succession

Conservation practices

Tree/Shrub Site Preparation
Tree/Shrub Establishment

Pathway 1.2B
Community 1.2 to 1.3

Succession

Conservation practices

Tree/Shrub Site Preparation

Tree/Shrub Establishment

Pathway 1.2C

Community 1.2 to 1.5

Increased peat or marl thickness, and decreased nitrogen or phosphorus availability

Pathway 1.2D

Community 1.2 to 1.6

Permanent inundation

Pathway 1.2E

Community 1.2 to 1.7

Permanent inundation

Pathway 1.3A

Community 1.3 to 1.1

Succession

Conservation practices

Tree/Shrub Site Preparation

Tree/Shrub Establishment

Pathway 1.3B

Community 1.3 to 1.2

Temporary prolonged inundation or fire

Conservation practices

Prescribed Burning

Pathway 1.3C

Community 1.3 to 1.6

Permanent inundation

Pathway 1.3D

Community 1.3 to 1.7

Permanent inundation

Pathway 1.4A

Community 1.4 to 1.1

Decreased peat or marl thickness, and increased nitrogen or phosphorus availability

Pathway 1.4B

Community 1.4 to 1.5

Clearcut, blowdown, or fire

Conservation practices

Prescribed Burning
Early Successional Habitat Development/Management
Forest Stand Improvement

Pathway 1.5A

Community 1.5 to 1.2

Decreased peat or marl thickness, and increased nitrogen or phosphorus availability

Pathway 1.5B

Community 1.5 to 1.4

Succession

Conservation practices

Tree/Shrub Site Preparation
Tree/Shrub Establishment

Pathway 1.5C

Community 1.5 to 1.6

Permanent inundation

Pathway 1.6A

Community 1.6 to 1.2

Lower water table

Pathway 1.6B

Community 1.6 to 1.5

Lower water table

Pathway 1.6C

Community 1.6 to 1.7

Temporary drop in water table with shrub establishment

Conservation practices

Tree/Shrub Site Preparation
Tree/Shrub Establishment

Pathway 1.7A

Community 1.7 to 1.2

Lower water table, and fire

Conservation practices

Prescribed Burning

Pathway 1.7B
Community 1.7 to 1.3

Lower water table

Pathway 1.7C
Community 1.7 to 1.6

Temporary drought and fire with shrub mortality

Conservation practices

Brush Management
Prescribed Burning

State 2
Cultural State

The cultural state is actively managed. The structure and composition of cultural vegetation is not self-sustaining without human inputs.

Community 2.1
Sustainable Crop, Pasture, or Plantation

The community phase is an undifferentiated placeholder representing any of a number of possible crops or other intensive land uses in which best available management practices are employed to ensure that a minimum amount of soil erosion and water pollution occurs.

Community 2.2
Unsustainable Cultural Phase

The community phase is an undifferentiated placeholder representing any of a number of possible crops or other intensive land uses in which poor management practices are employed, resulting in an unacceptable amount of soil erosion and water pollution.

Community 2.3
Conservation Feature

The community phase represents non-crop vegetation that is managed in association with cropland or other intensive land uses to reduce environmental impacts of the land use. The managed vegetation can be a grassed waterway, conservation reserve, a small patch pollinator garden, or other land taken out of crop production. The small size and adjacency to an intensive land uses limits the degree to which native biological community and associated ecosystem services can be restored, but in a landscape context it may provide buffers or connectivity with nearby wild ecosystems.

Pathway 2.1A
Community 2.1 to 2.2

Revert to unsustainable cultural practices

Pathway 2.1B
Community 2.1 to 2.3

Establish conservation feature

Conservation practices

Conservation Cover
Grassed Waterway

**Pathway 2.2A
Community 2.2 to 2.1**

Implement sustainable cultural practices

Conservation practices

Conservation Crop Rotation
Cover Crop
Nutrient Management
Integrated Pest Management (IPM)

**Pathway 2.2B
Community 2.2 to 2.3**

Establish conservation feature

Conservation practices

Conservation Cover
Grassed Waterway

**Pathway 2.3A
Community 2.3 to 2.1**

Implement sustainable cultural practices

Conservation practices

Conservation Crop Rotation
Cover Crop
Nutrient Management
Integrated Pest Management (IPM)

**Pathway 2.3B
Community 2.3 to 2.2**

Revert to unsustainable cultural practices

**State 3
Seminatural Drained State**

The Seminatural Drained State is modified from reference conditions by draining the site, often followed by temporary cultivation of the site. The vegetation is spontaneously self-generated or self-sustaining in response to both human and natural drivers. However, species composition may no longer indicate wetland definitions, and may consist of a mix of native and introduced species. The degree of isolation from intact habitat and the degree of disturbance will dictate the species composition as vegetation recovers.

Community 3.1

Ruderal Drained Meadow & Shrub

This phase represents an undifferentiated open community with few trees, with a variable native and non-native species composition.

Dominant plant species

- multiflora rose (*Rosa multiflora*), shrub
- reed canarygrass (*Phalaris arundinacea*), grass
- eastern woodland sedge (*Carex blanda*), grass
- rice cutgrass (*Leersia oryzoides*), grass

Community 3.2

Semi-Natural Drained Swamp Forest

This phase represents an undifferentiated forested community, with a variable native and non-native species composition.

Dominant plant species

- American elm (*Ulmus americana*), tree
- red maple (*Acer rubrum*), tree
- American basswood (*Tilia americana*), tree
- Virginia creeper (*Parthenocissus quinquefolia*), shrub
- multiflora rose (*Rosa multiflora*), shrub
- northern spicebush (*Lindera benzoin*), shrub
- eastern bottlebrush grass (*Elymus hystrix*), grass
- Canadian clearweed (*Pilea pumila*), other herbaceous
- great ragweed (*Ambrosia trifida*), other herbaceous
- jumpseed (*Polygonum virginianum*), other herbaceous

Table 18. Ground cover

Tree foliar cover	55-95%
Shrub/vine/liana foliar cover	10-55%
Grass/grasslike foliar cover	2-25%
Forb foliar cover	10-80%
Non-vascular plants	0-2%
Biological crusts	0%
Litter	25-50%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0%

Table 19. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	0-3%	1-25%	0-15%	5-75%
>0.15 <= 0.3	0-3%	1-25%	0-15%	5-75%
>0.3 <= 0.6	0-3%	10-50%	0-15%	10-90%
>0.6 <= 1.4	0-5%	5-30%	0-3%	1-40%
>1.4 <= 4	20-75%	5-35%	–	0-20%
>4 <= 12	55-95%	0-5%	–	–
>12 <= 24	20-80%	0-1%	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Pathway 3.1A Community 3.1 to 3.2

Succession

Pathway 3.2A Community 3.2 to 3.1

Blowdown or clearcut

Conservation practices

Early Successional Habitat Development/Management
Forest Stand Improvement

State 4 Seminatural State

The Seminatural State is modified from reference conditions mainly in species composition due to some type of disturbance, but retains a wetland hydrology. The state might have been drained and under cultivation for a time, but subsequently, hydrology is at least partially restored. The vegetation is spontaneously self-generated or self-sustaining in response to both human and natural drivers. However, species composition consists of a mix of native and introduced species. The degree of isolation from intact habitat and the degree of disturbance will dictate the species composition as vegetation recovers.

Community 4.1 Ruderal Wet Meadow & Shrub Swamp: *Phalaris arundinacea* Eastern Ruderal Marsh

This phase represents an undifferentiated open community with few trees, with a variable native and non-native species composition.

Dominant plant species

- reed canarygrass (*Phalaris arundinacea*), grass
- rice cutgrass (*Leersia oryzoides*), grass

Table 20. Ground cover

Tree foliar cover	0-3%
Shrub/vine/liana foliar cover	0.1-10.0%
Grass/grasslike foliar cover	40-100%

Forb foliar cover	1-50%
Non-vascular plants	0%
Biological crusts	0%
Litter	35-45%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0-5%
Bare ground	0%

Table 21. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	0%	0%	0%	0-40%
>0.15 <= 0.3	0%	0%	0-1%	0-35%
>0.3 <= 0.6	0%	0-5%	0-4%	1-40%
>0.6 <= 1.4	0%	0-5%	40-100%	0-10%
>1.4 <= 4	0-1%	0-5%	5-100%	0-4%
>4 <= 12	–	0-5%	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Community 4.2

Exotic Ruderal Swamp Forest: *Acer negundo* Ruderal Floodplain Forest

This phase represents an undifferentiated forested community, with a variable native and non-native species composition.

Dominant plant species

- boxelder (*Acer negundo*), tree
- eastern cottonwood (*Populus deltoides*), tree

Pathway 4.1A

Community 4.1 to 4.2

Succession

Pathway 4.2A

Community 4.2 to 4.1

Blowdown or clearcut

Conservation practices

Early Successional Habitat Development/Management
Forest Stand Improvement

Transition T1A

State 1 to 2

Drained, cleared vegetation, then cultivated domesticated species

Transition T1B

State 1 to 3

Drained, cleared vegetation, then invasive species introduced

Transition T1C

State 1 to 4

Cleared vegetation, then invasive species introduced

Restoration pathway R2

State 2 to 1

Restored hydrology, removed domesticated species, and restored native species

Conservation practices

Brush Management
Restoration and Management of Rare and Declining Habitats
Wetland Wildlife Habitat Management
Wetland Restoration
Herbaceous Weed Control

Transition T2A

State 2 to 3

Abandoned, then succession

Transition T2B

State 2 to 4

Restored hydrology, controlled invasive species, then restored native species

Conservation practices

Wetland Restoration

Restoration pathway R3

State 3 to 1

Restored hydrology, controlled invasive species, then restored native species

Conservation practices

Brush Management
Restoration and Management of Rare and Declining Habitats
Wetland Wildlife Habitat Management
Wetland Restoration
Herbaceous Weed Control

Transition T3A
State 3 to 2

Cleared vegetation, then cultivated domesticated species

Transition T3B
State 3 to 4

Restored hydrology

Conservation practices

Wetland Restoration

Restoration pathway R4
State 4 to 1

Controlled invasive species, then restored native species

Conservation practices

Brush Management
Restoration and Management of Rare and Declining Habitats
Wetland Wildlife Habitat Management
Herbaceous Weed Control

Transition T4A
State 4 to 2

Drained, cleared vegetation, then cultivated domesticated species

Transition T4B
State 4 to 3

Drained

Additional community tables

Table 22. Community 3.2 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)	Diameter (Cm)	Basal Area (Square M/Hectare)
Tree							
American elm	ULAM	<i>Ulmus americana</i>	Native	5–15	5–50	–	–
common hackberry	CEOC	<i>Celtis occidentalis</i>	Native	5–15	1.5–40	–	–
red maple	ACRU	<i>Acer rubrum</i>	Native	10–25	0–30	–	–
pin oak	QUPA2	<i>Quercus palustris</i>	Native	10–25	3–30	–	–
silver maple	ACSA2	<i>Acer saccharinum</i>	Native	10–25	1–25	–	–
boxelder	ACNE2	<i>Acer negundo</i>	Native	5–15	1.5–15	–	–
American basswood	TIAM	<i>Tilia americana</i>	Native	10–25	0–15	–	–
American basswood	TIAM	<i>Tilia americana</i>	Native	5–15	0–10	–	–
swamp white oak	QUBI	<i>Quercus bicolor</i>	Native	10–25	0–10	–	–
swamp white oak	QUBI	<i>Quercus bicolor</i>	Native	5–15	1.5–10	–	–
red maple	ACRU	<i>Acer rubrum</i>	Native	5–15	0–10	–	–
American elm	ULAM	<i>Ulmus americana</i>	Native	10–25	0–10	–	–
eastern cottonwood	PODE3	<i>Populus deltoides</i>	Native	10–25	0–5	–	–
white mulberry	MOAL	<i>Morus alba</i>	Introduced	5–15	0–5	–	–
black cherry	PRSE2	<i>Prunus serotina</i>	Native	10–25	0–4	–	–
tuliptree	LITU	<i>Liriodendron tulipifera</i>	Native	10–25	0–3	–	–
sassafras	SAAL5	<i>Sassafras albidum</i>	Native	10–25	0–3	–	–
black cherry	PRSE2	<i>Prunus serotina</i>	Native	5–15	0–2	–	–
silver maple	ACSA2	<i>Acer saccharinum</i>	Native	5–15	0–2	–	–
bigtooth aspen	POGR4	<i>Populus grandidentata</i>	Native	10–25	0–1.5	–	–
black oak	QUVE	<i>Quercus velutina</i>	Native	10–25	0–1.5	–	–
Vine/Liana							
riverbank grape	VIRI	<i>Vitis riparia</i>	Native	2–15	0.1–2	–	–
summer grape	VIAE	<i>Vitis aestivalis</i>	Native	5–20	0–1.5	–	–
Virginia creeper	PAQU2	<i>Parthenocissus quinquefolia</i>	Native	2–15	0–0.2	–	–

Table 23. Community 3.2 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)
Grass/grass-like (Graminoids)					
eastern bottlebrush grass	ELHY	<i>Elymus hystrix</i>	Native	0.1–0.5	0.2–10
rosy sedge	CARO22	<i>Carex rosea</i>	Native	0.1–0.5	0–5
awlfruit sedge	CAST5	<i>Carex stipata</i>	Native	0.5–1	0–1
sweet woodreed	CIAR2	<i>Cinna arundinacea</i>	Native	1–1.5	0–1
broadleaf rosette grass	DILA8	<i>Dichanthelium latifolium</i>	Native	0.5–1	0–0.4
whitegrass	LEVI2	<i>Leersia virginica</i>	Native	0.5–1	0–0.4
Forb/Herb					
Canadian clearweed	PIPU2	<i>Pilea pumila</i>	Native	0.1–0.5	25–65

great ragweed	AMTR	<i>Ambrosia trifida</i>	Native	0.1–0.5	0–35
American pokeweed	PHAM4	<i>Phytolacca americana</i>	Native	1–2	2–20
threelobe beggarticks	BITR	<i>Bidens tripartita</i>	Native	0.5–1	0–15
white snakeroot	AGAL5	<i>Ageratina altissima</i>	Native	0.1–0.5	0–5
stinging nettle	URDI	<i>Urtica dioica</i>	Native	0.1–0.5	0.4–5
white avens	GECA7	<i>Geum canadense</i>	Native	0.5–1	0.5–5
lesser burdock	ARMI2	<i>Arctium minus</i>	Introduced	0.1–0.5	0.1–5
devil's beggartick	BIFR	<i>Bidens frondosa</i>	Native	0.5–1	0–4
clustered blacksnakeroot	SAOD	<i>Sanicula odorata</i>	Native	0.1–0.5	0–4
Canadian woodnettle	LACA3	<i>Laportea canadensis</i>	Native	0.1–0.5	0–4
American hogpeanut	AMBR2	<i>Amphicarpaea bracteata</i>	Native	0.1–0.5	0–2
stickywilly	GAAP2	<i>Galium aparine</i>	Native	0.1–0.3	0–1
American bellflower	CAAM18	<i>Campanulastrum americanum</i>	Native	1–2	0–1
beggarslice	HAVI2	<i>Hackelia virginiana</i>	Native	0.1–0.5	0–0.5
bristly buttercup	RAHI	<i>Ranunculus hispidus</i>	Native	0.4–1	0–0.5
garlic mustard	ALPE4	<i>Alliaria petiolata</i>	Introduced	0.1–0.5	0–0.5
Asiatic dayflower	COCO3	<i>Commelina communis</i>	Introduced	0.1–0.5	0–0.4
Canadian honewort	CRCA9	<i>Cryptotaenia canadensis</i>	Native	0.1–0.5	0–0.4
common yellow oxalis	OXST	<i>Oxalis stricta</i>	Native	0.1–0.5	0–0.2
feathery false lily of the valley	MARA7	<i>Maianthemum racemosum</i>	Native	0.1–0.5	0–0.1
mayapple	POPE	<i>Podophyllum peltatum</i>	Native	0.1–0.5	0–0.1
common cinquefoil	POSI2	<i>Potentilla simplex</i>	Native	0.1–0.5	0–0.1
calico aster	SYLA4	<i>Symphotrichum lateriflorum</i>	Native	0.1–0.5	0–0.1
Canadian white violet	VICA4	<i>Viola canadensis</i>	Native	0.1–0.5	0–0.1
Fern/fern ally					
spinulose woodfern	DRCA11	<i>Dryopteris carthusiana</i>	Native	0.1–0.5	0–0.3
western brackenfern	PTAQ	<i>Pteridium aquilinum</i>	Native	1–2	0–0.1
Shrub/Subshrub					
multiflora rose	ROMU	<i>Rosa multiflora</i>	Introduced	0.5–2	0.5–20
northern spicebush	LIBE3	<i>Lindera benzoin</i>	Native	0.5–2	1–15
Morrow's honeysuckle	LOMO2	<i>Lonicera morrowii</i>	Introduced	0.5–2	0–5
black raspberry	RUOC	<i>Rubus occidentalis</i>	Native	0.5–2	0–4
Amur honeysuckle	LOMA6	<i>Lonicera maackii</i>	Introduced	0.5–2	0–2
autumn olive	ELUM	<i>Elaeagnus umbellata</i>	Introduced	0.5–2	0–0.4
eastern prickly gooseberry	RICY	<i>Ribes cynosbati</i>	Native	0.5–2	0–0.1
Allegheny blackberry	RUAL	<i>Rubus allegheniensis</i>	Native	0.5–2	0–0.1
European cranberrybush	VIOP	<i>Viburnum opulus</i>	Native	0–0.3	0–0.1
multiflora rose	ROMU	<i>Rosa multiflora</i>	Introduced	0–0.3	0–0.1
Tree					
green ash	FRPE	<i>Fraxinus pennsylvanica</i>	Native	1–5	0–3
green ash	FRPE	<i>Fraxinus pennsylvanica</i>	Native	0.1–0.5	0–2
sassafras	SAAL5	<i>Sassafras albidum</i>	Native	1–5	0–2
common hackberry	CEOC	<i>Celtis occidentalis</i>	Native	1–5	0.1–1.5
black cherry	DRPE3	<i>Prunus serotina</i>	Native	0.1–0.5	0–4

black cherry	FRSEZ	<i>Prunus serotina</i>	Native	0.1–0.5	0–1
swamp white oak	QUBI	<i>Quercus bicolor</i>	Native	1–5	0–1
swamp white oak	QUBI	<i>Quercus bicolor</i>	Native	0.1–0.5	0–1
bitternut hickory	CACO15	<i>Carya cordiformis</i>	Native	0.1–0.5	0–0.1
hawthorn	CRATA	<i>Crataegus</i>	Native	1–5	0–0.1
Vine/Liana					
Virginia creeper	PAQU2	<i>Parthenocissus quinquefolia</i>	Native	0.1–0.5	3–25
eastern poison ivy	TORA2	<i>Toxicodendron radicans</i>	Native	0.1–0.5	0.2–1.5
eastern poison ivy	TORA2	<i>Toxicodendron radicans</i>	Native	1–5	0–1

Table 24. Community 4.1 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)	Diameter (Cm)	Basal Area (Square M/Hectare)
Tree							
green ash	FRPE	<i>Fraxinus pennsylvanica</i>	Native	5–15	0–0.5	–	–

Table 25. Community 4.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)
Grass/grass-like (Graminoids)					
reed canarygrass	PHAR3	<i>Phalaris arundinacea</i>	Unknown	1–2	5–100
rice cutgrass	LEOR	<i>Leersia oryzoides</i>	Native	1–1.5	2–45
narrowleaf cattail	TYAN	<i>Typha angustifolia</i>	Introduced	1–1.5	0–15
broadleaf cattail	TYLA	<i>Typha latifolia</i>	Native	1–1.5	0.1–5
upright sedge	CAST8	<i>Carex stricta</i>	Native	1–1.5	0–4
hairy sedge	CALA16	<i>Carex lacustris</i>	Native	1–1.5	0–2
common spikerush	ELPA3	<i>Eleocharis palustris</i>	Native	0.2–0.4	0–2
fowl bluegrass	POPA2	<i>Poa palustris</i>	Native	0.5–1	0–1
woolgrass	SCCY	<i>Scirpus cyperinus</i>	Native	1–1.5	0–0.5
crested sedge	CACR7	<i>Carex cristatella</i>	Native	0.5–1	0–0.4
prairie cordgrass	SPPE	<i>Spartina pectinata</i>	Native	1.5–3	0–0.3
Bebb's sedge	CABE2	<i>Carex bebbii</i>	Native	0.5–1	0–0.2
green bulrush	SCAT2	<i>Scirpus atrovirens</i>	Native	1–1.5	0–0.2
bluejoint	CACA4	<i>Calamagrostis canadensis</i>	Native	1–1.5	0–0.2
Virginia wildrye	ELVI3	<i>Elymus virginicus</i>	Native	0.5–1	0–0.1
cockspur grass	ECHIN4	<i>Echinochloa</i>	Unknown	0.1–0.5	0–0.1
Forb/Herb					
purplestem aster	SYPU	<i>Symphotrichum puniceum</i>	Native	0.1–0.5	0.5–45
flat-top goldentop	EUGR5	<i>Euthamia graminifolia</i>	Native	0.1–0.5	0–5
white panicle aster	SYLA6	<i>Symphotrichum lanceolatum</i>	Native	0.1–0.5	0–4
marsh seedbox	LUPA	<i>Ludwigia palustris</i>	Native	0–0.1	0–4
spotted joe pye weed	EUMA9	<i>Eutrochium maculatum</i>	Native	1–2	0.1–3
swamp verbena	VEHA2	<i>Verbena hastata</i>	Native	0.1–0.5	0.3–2
common boneset	EUPE3	<i>Eupatorium perfoliatum</i>	Native	0.1–0.5	0.2–2
ditch stonecrop	PESE6	<i>Penthorum sedoides</i>	Native	0.4–1	0–1.5

devil's beggartick	BIFR	<i>Bidens frondosa</i>	Native	0.5–1	0–1
giant goldenrod	SOGL	<i>Solidago gigantea</i>	Native	1.5–3	0.1–1
stinging nettle	URDI	<i>Urtica dioica</i>	Native	0.1–0.5	0–1
Canada thistle	CIAR4	<i>Cirsium arvense</i>	Introduced	0.1–0.5	0–1
giant sunflower	HEGI	<i>Helianthus giganteus</i>	Native	0.1–0.5	0–0.5
jewelweed	IMCA	<i>Impatiens capensis</i>	Native	1–1.5	0–0.5
purpleleaf willowherb	EPCO	<i>Epilobium coloratum</i>	Native	0.5–1	0–0.5
swamp milkweed	ASIN	<i>Asclepias incarnata</i>	Native	1–1.5	0–0.5
wild mint	MEAR4	<i>Mentha arvensis</i>	Native	0.4–1	0–0.4
smallspike false nettle	BOCY	<i>Boehmeria cylindrica</i>	Native	0.3–0.5	0–0.4
American water horehound	LYAM	<i>Lycopus americanus</i>	Native	0.3–0.5	0–0.4
Allegheny monkeyflower	MIRI	<i>Mimulus ringens</i>	Native	0.1–0.5	0–0.3
Virginia iris	IRVI	<i>Iris virginica</i>	Native	0.5–1	0–0.2
yellow avens	GEAL3	<i>Geum aleppicum</i>	Native	0.4–1	0–0.2
Canada goldenrod	SOAL6	<i>Solidago altissima</i>	Native	0.5–1	0–0.2
great ragweed	AMTR	<i>Ambrosia trifida</i>	Native	0.1–0.5	0–0.1
sweet white violet	VIBL	<i>Viola blanda</i>	Native	0.1–0.3	0–0.1
clearweed	PILEA	<i>Pilea</i>	Native	0.1–0.3	0–0.1
Virginia mountainmint	PYVI	<i>Pycnanthemum virginianum</i>	Native	0.1–0.5	0–0.1
stiff marsh bedstraw	GATI	<i>Galium tinctorium</i>	Native	0.3–0.5	0–0.1
blue skullcap	SCLA2	<i>Scutellaria lateriflora</i>	Native	0.1–0.5	0–0.1
Fern/fern ally					
sensitive fern	ONSE	<i>Onoclea sensibilis</i>	Native	0.1–0.5	0–2
Shrub/Subshrub					
black elderberry	SANI4	<i>Sambucus nigra</i>	Native	0.5–2	0–4
American red raspberry	RUID	<i>Rubus idaeus</i>	Native	1–2	0–2
sandbar willow	SAIN3	<i>Salix interior</i>	Native	0.5–2	0–1.5
black elderberry	SANI4	<i>Sambucus nigra</i>	Native	0–0.3	0–0.2
Tree					
silver maple	ACSA2	<i>Acer saccharinum</i>	Native	0.1–0.5	0–3
peachleaf willow	SAAM2	<i>Salix amygdaloides</i>	Native	1–5	0–0.2
eastern cottonwood	PODE3	<i>Populus deltoides</i>	Native	0.1–0.5	0–0.1
Vine/Liana					
devil's darning needles	CLVI5	<i>Clematis virginiana</i>	Native	1–3	0–0.5
climbing nightshade	SODU	<i>Solanum dulcamara</i>	Introduced	0.1–0.5	0–0.1
riverbank grape	VIRI	<i>Vitis riparia</i>	Native	1–1.5	0–0.1

Inventory data references

Site Development and Testing Plan

Future work is needed, as described in a future project plan, to validate the information presented in this provisional ecological site description. Future work includes field sampling, data collection and analysis by qualified vegetation ecologists and soil scientists. As warranted, annual reviews of the project plan can be conducted by the Ecological Site Technical Team. A final field review, peer review, quality control, and quality assurance reviews of the ESD are necessary to approve a final document.

Other references

Albert, D. A. et al., 1995. Vegetation circa 1800 of Michigan. Michigan's native landscape as interpreted from the General Land Office Surveys 1816-1856 (digital map), Lansing: Michigan Natural Features Inventory.

Barnes, B. V. and Wagner, W. H., 2004. Michigan trees: a guide to the trees of the Great Lakes region. Ann Arbor (Michigan): University of Michigan Press.

Burger, T. L. and Kotar, J., 2003. A Guide to Forest Communities and Habitat Types of Michigan. Madison, Wisconsin: Department of Forest Ecology and Management, University of Wisconsin.

Cleland, D. T. et al., 1994. Field guide: Ecological classification and inventory system of the Huron-Manistee National Forests, s.l.: USDA Forest Service, North Central Forest Experiment Station.

Cleland, D.T., J.A. Freeouf, J.E. Keys, G.J. Nowacki, C. Carpenter, and W.H. McNab. 2007. Ecological Subregions: Sections and Subsections of the Conterminous United States. USDA Forest Service, General Technical Report WO-76. Washington, DC. 1–92.

Jacquart, E., Homoya, M. and Casebere, L., 2002. Natural Communities of Indiana (Working Draft), Indianapolis: Indiana Department of Natural Resources, Division of Nature Preserves.

Kost, M. A. et al., 2010. Natural Communities of Michigan: Classification and Description, Lansing, MI: Michigan Natural Features Inventory.

Moran, R. C., 1981. Prairie fens in northeastern Illinois: floristic composition and disturbance. Ohio Biol Surv Biol Notes, 15, 164-168.

Omernik, J.M. and G.E. Griffith. 2014. Ecoregions of the Conterminous United States: Evolution of a Hierarchical Spatial Framework. Environmental Management 54:1249–1266.

Swink, F. and Wilhelm, G., 1994. Plants of the Chicago Region. Indianapolis(Indiana): Indiana Academy of Science.

U.S. Department of the Interior, Geological Survey, 2008. LANDFIRE: LANDFIRE 1.1.0 Vegetation Dynamics Models. Accessed August 28, 2012 <http://landfire.cr.usgs.gov/viewer/>.

U.S. Department of the Interior, Geological Survey, 2011. LANDFIRE: LANDFIRE 1.1.0 Existing Vegetation Type layer. <http://landfire.cr.usgs.gov/viewer/>

Contributors

Greg Schmidt

Approval

Nels Barrett, 1/12/2024

Acknowledgments

Matt Bromley and Andy Henriksen reviewed the narratives. Matt Bromley reviewed associated soil map units.

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	
Contact for lead author	
Date	05/07/2024
Approved by	Nels Barrett
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

2. **Presence of water flow patterns:**

3. **Number and height of erosional pedestals or terracettes:**

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

5. **Number of gullies and erosion associated with gullies:**

6. **Extent of wind scoured, blowouts and/or depositional areas:**

7. **Amount of litter movement (describe size and distance expected to travel):**

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

Dominant:

Sub-dominant:

Other:

Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**
-

14. **Average percent litter cover (%) and depth (in):**
-

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**
-

16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**
-

17. **Perennial plant reproductive capability:**
-