USDA Natural Resources Conservation Service

Ecological site R098XA002MI
Inland Salt Marshes

Last updated: 1/12/2024
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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.

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 Inland Salt Marshes is a range of organic (or mineral) soils with high electrical conductivity, indicating a high amount of dissolved salts, particularly sodium chloride.

Associated sites

F098XA006MI	**Mucky Depressions**

Similar sites

F098XA006MI	**Mucky Depressions**

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Schoenoplectus americanus* (2) *Eleocharis parvula*

Physiographic features

Extant occurrences are in floodplains, presumably below the elevation of Paleozoic salt deposits.

Table 2. Representative physiographic features

Landforms	(1) Valley floor
Runoff class	Low
Elevation	531–919 ft
Water table depth	0 in
Aspect	Aspect is not a significant factor

Climatic features

This ecological site experiences a humid continental climate with mild summers and cold winters. Precipitation is moderately well distributed through the year with higher amounts during the growing season than the winter. Temperature extremes are moderated by the Great Lakes compared to other inland continental locations, though not as much as MLRAs directly bordering the Great Lakes. Mean annual extreme minimum temperatures range from -26.6 to -20.8°C (-16 to -5°F), which falls within hardiness zones 5a to 6a. Annual snowfall is enhanced by the Great Lakes, mainly on the western half of the MLRA.

Table 3. Representative climatic features

Frost-free period (average)	140 days
Freeze-free period (average)	167 days
Precipitation total (average)	35 in

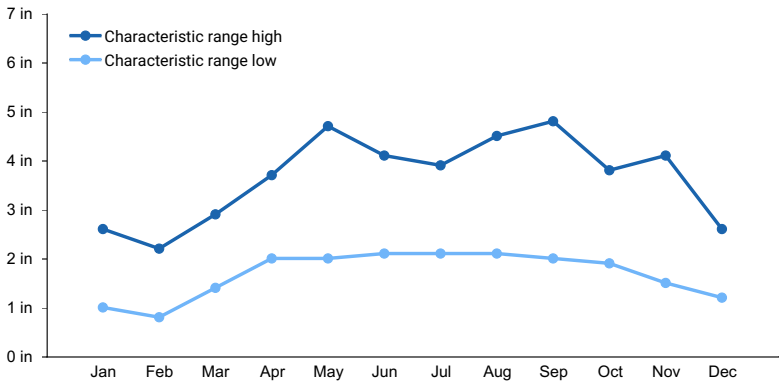


Figure 1. Monthly precipitation range

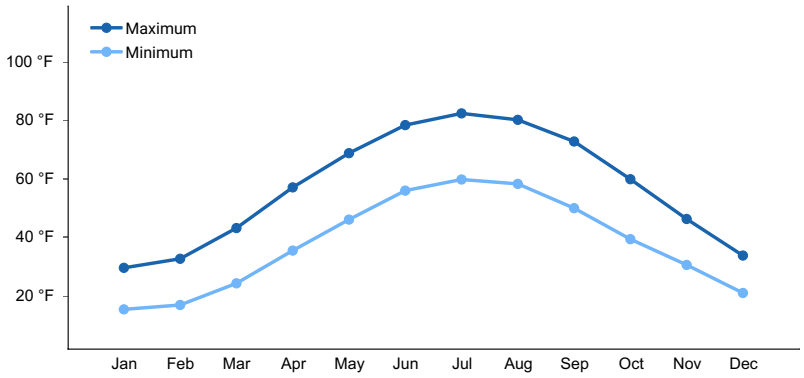


Figure 2. Monthly average minimum and maximum temperature

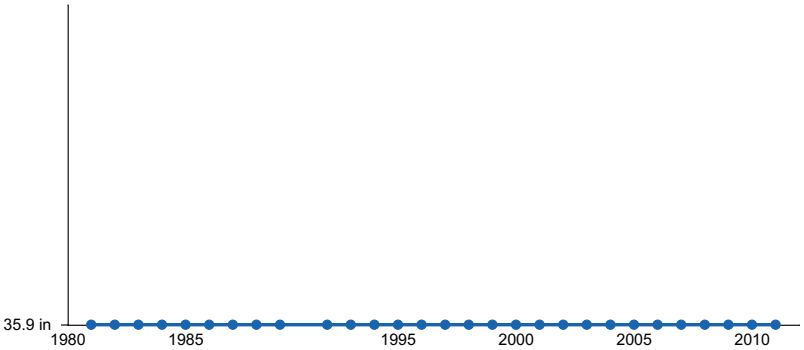


Figure 3. Annual precipitation pattern

Climate stations used

- (1) IONIA 2SSW [USC00204078], Ionia, MI
- (2) ALMA [USC00200146], Alma, MI
- (3) SAINT JOHNS [USC00207280], Saint Johns, MI

Influencing water features

Site remains saturated from groundwater flow.

Soil features

Soils are very poorly drained mucks or mineral soils. Extant occurrences are included in mollic floodplain mapunits (Ceresco and Sloan) and a Houghton muck map unit. A provisional classification of these sites is Fluvaquentic Endoaquepts and Typic Sulfisaprists. If the sulfur content proves to be too low to make Sulfisaprists, classification it is likely to be the catch-all Typic Haplosaprists. The only soil taxonomic grouping available to recognize the higher salinity is Halic Haplosaprists. However, documented electrical conductivity readings failed reach the necessary 30 dS/m to be identified as a Halic subgroup, despite a unique response in floristic composition to the otherwise

elevated salinity. Recent field data across one saltmarsh shows pHs ranging from 5.4 to 7, and electrical conductivity ranging from 2.05 to 13.55 dS/m. Vegetation composition turnover from *Typha angustifolia* to saltmarsh specialist *Schoenoplectus americanus* occurred at 3 dS/m. The relatively low Typha cover present in this higher salinity zone was 1.8 m tall compared to 3 m outside this zone. An area of exclusively the very short *Eleocharis parvula* had readings greater than 10 dS/m. The site was probably overlooked by Clinton County surveys due to its extremely limited occurrences (3 sites < 5 ha total) restricted to the Maple River floodplain.

Table 4. Representative soil features

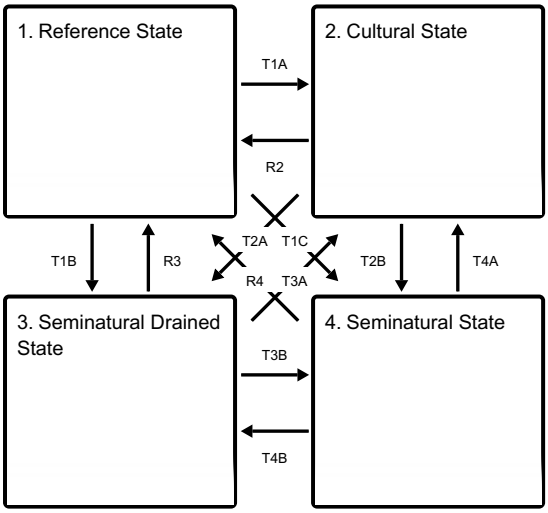
Parent material	(1) Organic material
Surface texture	(1) Muck
Drainage class	Very poorly drained
Permeability class	Moderately slow to moderately rapid
Soil depth	79 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-39.4in)	13.78–21.65 in
Electrical conductivity (0-19.7in)	2–15 mmhos/cm
Soil reaction (1:1 water) (0-19.7in)	5.5–8
Subsurface fragment volume <=3" (0-59.1in)	0%
Subsurface fragment volume >3" (0-59.1in)	0%

Ecological dynamics

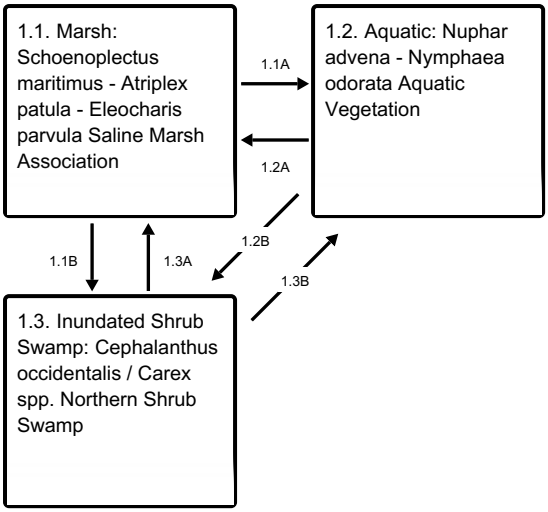
Site remains saturated year round with saline groundwater, though the salinity may vary spatially and seasonally. Relatively few species of halophytes (salt tolerant plants) dominate the vegetation. Site remains relatively clear of woody species due a lack of salt tolerant native trees and shrubs. The reference community is dominated by obligate halophytic (salt tolerant) sedges like *Schoenoplectus americanus* and *Eleocharis parvula*.

State and transition model

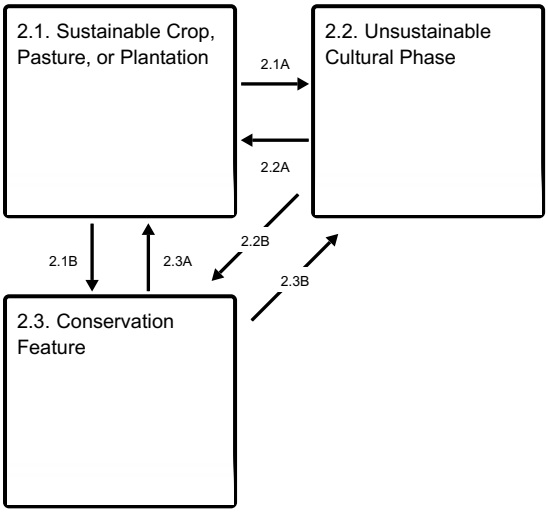
Ecosystem states



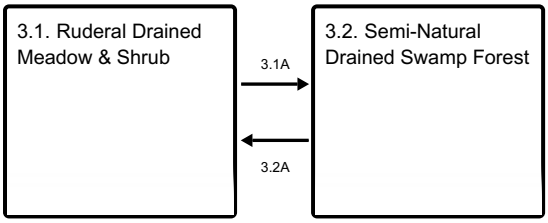
State 1 submodel, plant communities



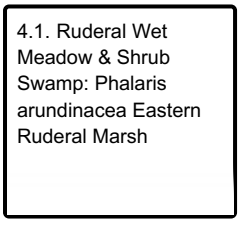
State 2 submodel, plant communities



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 to shrub swamps. Dominant natural processes and disturbance regimes include fire, wind, and beaver activities.

Dominant plant species

- chairmaker's bulrush (*Schoenoplectus americanus*), grass
- dwarf spikerush (*Eleocharis parvula*), grass

Community 1.1
Marsh: Schoenoplectus maritimus - Atriplex patula - Eleocharis parvula Saline Marsh Association

Community 1.2
Aquatic: Nuphar advena - Nymphaea odorata Aquatic Vegetation

Community 1.3
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.

Pathway 1.1A
Community 1.1 to 1.2

Inundation

Pathway 1.1B
Community 1.1 to 1.3

Temporary exposure and reduced salinity; shrub establishment

Conservation practices

Tree/Shrub Site Preparation
Tree/Shrub Establishment

Pathway 1.2A
Community 1.2 to 1.1

Lower water table, seasonal exposure; emergent vegetation established

Pathway 1.2B
Community 1.2 to 1.3

Temporary exposure and lower salinity; shrub establishment

Pathway 1.3A
Community 1.3 to 1.1

Disturbance (fire, deep inundation) or higher salinities leading to shrub mortality

Conservation practices

Brush Management

Prescribed Burning

Pathway 1.3B
Community 1.3 to 1.2

Disturbance (fire, deep inundation) or higher salinities leading to shrub mortality

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 5. 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 6. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	0-3%	1-25%	0-15%	5-75%
>0.5 <= 1	0-3%	1-25%	0-15%	5-75%
>1 <= 2	0-3%	10-50%	0-15%	10-90%
>2 <= 4.5	0-5%	5-30%	0-3%	1-40%
>4.5 <= 13	20-75%	5-35%	–	0-20%
>13 <= 40	55-95%	0-5%	–	–
>40 <= 80	20-80%	0-1%	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

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

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 7. Community 3.2 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (Ft)	Canopy Cover (%)	Diameter (In)	Basal Area (Square Ft/Acre)
Tree							
American elm	ULAM	*Ulmus americana*	Native	16.4–49.2	5–50	–	–
common hackberry	CEOC	*Celtis occidentalis*	Native	16.4–49.2	1.5–40	–	–
red maple	ACRU	*Acer rubrum*	Native	32.8–82	0–30	–	–
pin oak	QUPA2	*Quercus palustris*	Native	32.8–82	3–30	–	–
silver maple	ACSA2	*Acer saccharinum*	Native	32.8–82	1–25	–	–
boxelder	ACNE2	*Acer negundo*	Native	16.4–49.2	1.5–15	–	–
American basswood	TIAM	*Tilia americana*	Native	32.8–82	0–15	–	–
American basswood	TIAM	*Tilia americana*	Native	16.4–49.2	0–10	–	–
swamp white oak	QUBI	*Quercus bicolor*	Native	32.8–82	0–10	–	–
swamp white oak	QUBI	*Quercus bicolor*	Native	16.4–49.2	1.5–10	–	–
red maple	ACRU	*Acer rubrum*	Native	16.4–49.2	0–10	–	–
American elm	ULAM	*Ulmus americana*	Native	32.8–82	0–10	–	–
eastern cottonwood	PODE3	*Populus deltoides*	Native	32.8–82	0–5	–	–
white mulberry	MOAL	*Morus alba*	Introduced	16.4–49.2	0–5	–	–
black cherry	PRSE2	*Prunus serotina*	Native	32.8–82	0–4	–	–
tuliptree	LITU	*Liriodendron tulipifera*	Native	32.8–82	0–3	–	–
sassafras	SAAL5	*Sassafras albidum*	Native	32.8–82	0–3	–	–
black cherry	PRSE2	*Prunus serotina*	Native	16.4–49.2	0–2	–	–
silver maple	ACSA2	*Acer saccharinum*	Native	16.4–49.2	0–2	–	–
bigtooth aspen	POGR4	*Populus grandidentata*	Native	32.8–82	0–1.5	–	–
black oak	QUVE	*Quercus velutina*	Native	32.8–82	0–1.5	–	–
Vine/Liana							
riverbank grape	VIRI	*Vitis riparia*	Native	6.6–49.2	0.1–2	–	–
summer grape	VIAE	*Vitis aestivalis*	Native	16.4–65.6	0–1.5	–	–
Virginia creeper	PAQU2	*Parthenocissus quinquefolia*	Native	6.6–49.2	0–0.2	–	–

Table 8. Community 3.2 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (Ft)	Canopy Cover (%)
Grass/grass-like (Graminoids)					
eastern bottlebrush grass	ELHY	*Elymus hystrix*	Native	0.3–1.6	0.2–10
rosy sedge	CARO22	*Carex rosea*	Native	0.3–1.6	0–5
awlfruit sedge	CAST5	*Carex stipata*	Native	1.6–3.3	0–1
sweet woodreed	CIAR3	*Cinna arundinacea*	Native	3.3–4.9	0–1

sweet woodreed	CIAR2	*Cinna arundinacea*	Native	3.3–4.9	0–1
broadleaf rosette grass	DILA8	*Dichanthelium latifolium*	Native	1.6–3.3	0–0.4
whitegrass	LEVI2	*Leersia virginica*	Native	1.6–3.3	0–0.4
Forb/Herb					
Canadian clearweed	PIPU2	*Pilea pumila*	Native	0.3–1.6	25–65
great ragweed	AMTR	*Ambrosia trifida*	Native	0.3–1.6	0–35
American pokeweed	PHAM4	*Phytolacca americana*	Native	3.3–6.6	2–20
threelobe beggarticks	BITR	*Bidens tripartita*	Native	1.6–3.3	0–15
white snakeroot	AGAL5	*Ageratina altissima*	Native	0.3–1.6	0–5
stinging nettle	URDI	*Urtica dioica*	Native	0.3–1.6	0.4–5
white avens	GECA7	*Geum canadense*	Native	1.6–3.3	0.5–5
lesser burdock	ARMI2	*Arctium minus*	Introduced	0.3–1.6	0.1–5
devil's beggartick	BIFR	*Bidens frondosa*	Native	1.6–3.3	0–4
clustered blacksnakeroot	SAOD	*Sanicula odorata*	Native	0.3–1.6	0–4
Canadian woodnettle	LACA3	*Laportea canadensis*	Native	0.3–1.6	0–4
American hogpeanut	AMBR2	*Amphicarpaea bracteata*	Native	0.3–1.6	0–2
stickywilly	GAAP2	*Galium aparine*	Native	0.3–1	0–1
American bellflower	CAAM18	*Campanulastrum americanum*	Native	3.3–6.6	0–1
beggarslice	HAVI2	*Hackelia virginiana*	Native	0.3–1.6	0–0.5
bristly buttercup	RAHI	*Ranunculus hispidus*	Native	1.3–3.3	0–0.5
garlic mustard	ALPE4	*Alliaria petiolata*	Introduced	0.3–1.6	0–0.5
Asiatic dayflower	COCO3	*Commelina communis*	Introduced	0.3–1.6	0–0.4
Canadian honewort	CRCA9	*Cryptotaenia canadensis*	Native	0.3–1.6	0–0.4
common yellow oxalis	OXST	*Oxalis stricta*	Native	0.3–1.6	0–0.2
feathery false lily of the valley	MARA7	*Maianthemum racemosum*	Native	0.3–1.6	0–0.1
mayapple	POPE	*Podophyllum peltatum*	Native	0.3–1.6	0–0.1
common cinquefoil	POSI2	*Potentilla simplex*	Native	0.3–1.6	0–0.1
calico aster	SYLA4	*Symphyotrichum lateriflorum*	Native	0.3–1.6	0–0.1
Canadian white violet	VICA4	*Viola canadensis*	Native	0.3–1.6	0–0.1
Fern/fern ally					
spinulose woodfern	DRCA11	*Dryopteris carthusiana*	Native	0.3–1.6	0–0.3
western brackenfern	PTAQ	*Pteridium aquilinum*	Native	3.3–6.6	0–0.1
Shrub/Subshrub					
multiflora rose	ROMU	*Rosa multiflora*	Introduced	1.6–6.6	0.5–20
northern spicebush	LIBE3	*Lindera benzoin*	Native	1.6–6.6	1–15
Morrow's honeysuckle	LOMO2	*Lonicera morrowii*	Introduced	1.6–6.6	0–5
black raspberry	RUOC	*Rubus occidentalis*	Native	1.6–6.6	0–4
Amur honeysuckle	LOMA6	*Lonicera maackii*	Introduced	1.6–6.6	0–2
autumn olive	ELUM	*Elaeagnus umbellata*	Introduced	1.6–6.6	0–0.4
eastern prickly gooseberry	RICY	*Ribes cynosbati*	Native	1.6–6.6	0–0.1
Allegheny blackberry	RUAL	*Rubus allegheniensis*	Native	1.6–6.6	0–0.1
European cranberrybush	VIOP	*Viburnum opulus*	Native	0–1	0–0.1
multiflora rose	ROMU	*Rosa multiflora*	Introduced	0–1	0–0.1
Tree					

green ash	FRPE	*Fraxinus pennsylvanica*	Native	3.3–16.4	0–3
green ash	FRPE	*Fraxinus pennsylvanica*	Native	0.3–1.6	0–2
sassafras	SAAL5	*Sassafras albidum*	Native	3.3–16.4	0–2
common hackberry	CEOC	*Celtis occidentalis*	Native	3.3–16.4	0.1–1.5
black cherry	PRSE2	*Prunus serotina*	Native	0.3–1.6	0–1
swamp white oak	QUBI	*Quercus bicolor*	Native	3.3–16.4	0–1
swamp white oak	QUBI	*Quercus bicolor*	Native	0.3–1.6	0–1
bitternut hickory	CACO15	*Carya cordiformis*	Native	0.3–1.6	0–0.1
hawthorn	CRATA	*Crataegus*	Native	3.3–16.4	0–0.1
Vine/Liana					
Virginia creeper	PAQU2	*Parthenocissus quinquefolia*	Native	0.3–1.6	3–25
eastern poison ivy	TORA2	*Toxicodendron radicans*	Native	0.3–1.6	0.2–1.5
eastern poison ivy	TORA2	*Toxicodendron radicans*	Native	3.3–16.4	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.

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Approval

Nels Barrett, 1/12/2024

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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	05/11/2025
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:

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17. **Perennial plant reproductive capability:**
