USDA Natural Resources Conservation Service

Ecological site F094DY011WI
Loamy-Mantled Uplands

Accessed: 04/29/2024

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): 094D–Northern Highland Sandy Pitted Outwash

The Loamy-Mantled Uplands ecological site occupies about 160,000 acres in MLRA 94D.

Classification relationships

The Loamy-Mantled Uplands ecological site correlates to two habitat types—ATM and ATD; both were developed by Kotar and Burger (2002). ATM habitat type is named after Acer saccharum (sugar maple)-Tsuga canadensis (eastern hemlock)/Maianthemum canadense (Canada mayflower); in the ATD habitat type the D stands for Dryopteris spinulosa (spinulose wood fern). These species have very high constancy value relative to this site, i.e. they are present on a higher percentage of these sites than other species. The ATD habitat type is a slighty richer site, it produces a denser canopy which casts a deep shade to which the ferns are better adapted. This ecological site has dry-mesic to mesic moisture regime—due to the variable thickness of the loamy mantle--and is medium in nutrients. With both hemlock and sugar maple on this on this site, sunlight is a limiting resource for understory vegetation.

Ecological site concept

ATTENTION: This ecological site meets the NESH 2014 requirements for PROVISIONAL. A provisional ecological site is established after broad ecological site concepts are identified and an initial state-and-transition model is

drafted. Following quality control and quality assurance reviews of the ecological site concepts, an identification number and name for the provisional ecological site are entered into ESIS. A provisional ecological site may include literature reviews, land use history information, some soils data, legacy data, ocular estimates for canopy and/or species composition by weight, and even some line-point intercept information. A provisional ecological site does not meet the NESH 2014 standards for an Approved ESD, but does provide the conceptual framework of soil-site correlation for the development of the ESD. For more information about this ecological site, please contact your local NRCS office.

The Loamy-Mantled Uplands ecological site has both mesic and dry-mesic sites depending on the thickness of the loamy mantle. The loamy-mantle ranges from 10 to 40 inches of sandy loam or loam; these texture have between 10 and 20 percent clay, between 20 to 40 percent silt and between 40 and 70 percent sand. have These sites have both well-drained and somewhat excessively drained soils, generally both soil types contain enough nutrients to grow highly productive mixed hardwood-conifer forests, with more conifers on the drier sites.

Associated sites

F094DY011WI	**Loamy-Mantled Uplands** Small areas of Steep Loamy-Mantled Ridges often occur within areas of Loamy-Mantled Uplands.

Table 1. Dominant plant species

Tree	(1) *Acer saccharum* (2) *Tilia americana*
Shrub	(1) *Corylus cornuta* (2) *Lonicera canadensis*
Herbaceous	(1) *Aralia nudicaulis* (2) *Dryopteris intermedia*

Physiographic features

The Loamy-Mantled Uplands ecological site is found on undulating to hilly glacio-fluvial deposits, and they are located on backslopes, shoulders and summits of those hilly deposits. Slopes are less than 16%. The loamy mantles that occur on this site were deposited either by slow-velocity glacial meltwater as alluvium, or as wind-blown sediments deposited as the landscape was beginning dry out after the glaciers melted. These landforms typically contain more cobbles (3 to 10 inches in diameter) and stones (10 to 24 inches in diameter) than the sandy group of ecological sites in this area. This is mainly because these sediments were deposited closer to the source of the melting glacier.

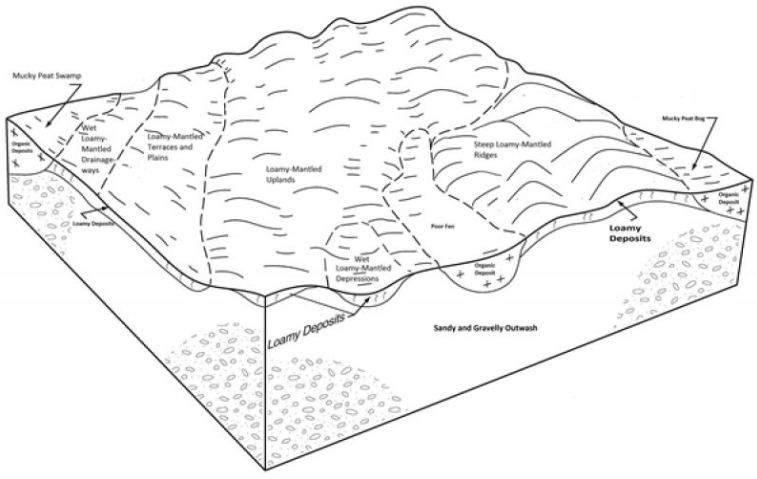


Figure 2. Loamy-mantled ecological sites

Table 2. Representative physiographic features

Landforms	(1) Disintegration moraine (2) Outwash fan (3) Kame
Flooding frequency	None
Ponding frequency	None
Elevation	408–555 m
Slope	2–15%
Ponding depth	0 cm
Water table depth	203 cm
Aspect	Aspect is not a significant factor

Climatic features

The climate is humid continental with very cold winters and warm summers. As is common across northern Wisconsin, two-thirds of the precipitation falls as rain during the relatively short growing season of late May to early September. Most of the rainfall is transpired by plants. Snow cover is likely in the months of November through April. Snow cover prevents deep frost penetration which promotes groundwater recharge.

Table 3. Representative climatic features

Frost-free period (average)	96 days
Freeze-free period (average)	123 days
Precipitation total (average)	864 mm

Climate stations used

- (1) NORTH PELICAN [USC00476122], Rhinelander, WI
- (2) REST LAKE [USC00477092], Manitowish Waters, WI
- (3) WILLOW RSVR [USC00479236], Hazelhurst, WI
- (4) LONG LAKE DAM [USC00474829], Eagle River, WI

Influencing water features

This ecological site is not a wetland. This site does contribute to groundwater recharge. Runoff from this low to medium, this increases the potential for non-transpired infiltration during spring melt and after the growing season in autumn.

Soil features

The soils on this ecological site are characterized by a sandy loam or finer surface layer of highly variable thickness (typically between 10 to 40 inches). These soils are the well drained Padus and somewhat excessively drained Pence map unit components; they frequently occur in an intricately mixed map unit complex. The underlying soil layers are mainly stratified sand and gravel. The range of thickness of the loamy mantle for this site starts at 10 inches, but soils with thinner loamy mantles produce sites that are transitional to this site. Soils with a significant loamy mantle (>10 inches) have a higher water holding capacity and a higher nutrient content than soils that entirely formed in sand and gravel, thus they produce richer ecological sites.

Table 4. Representative soil features

Surface texture	(1) Sandy loam (2) Fine sandy loam (3) Loam
Family particle size	(1) Sandy

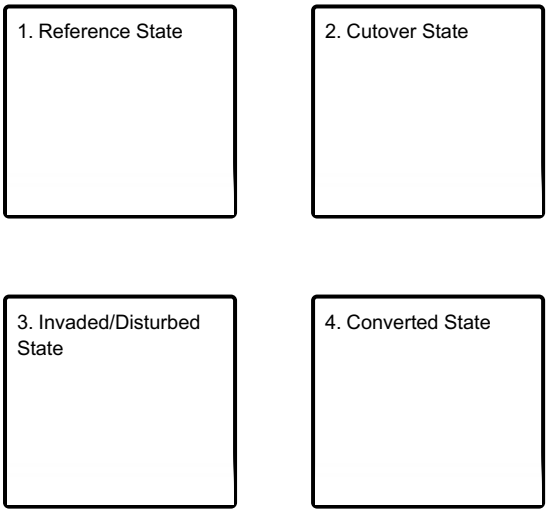
Drainage class	Well drained to somewhat excessively drained
Permeability class	Moderately rapid to very rapid
Soil depth	203 cm
Surface fragment cover <=3"	2–10%
Surface fragment cover >3"	0–1%
Available water capacity (0-101.6cm)	12.7–20.32 cm
Calcium carbonate equivalent (0-101.6cm)	0%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	5.1–6.4
Subsurface fragment volume <=3" (Depth not specified)	5–30%
Subsurface fragment volume >3" (Depth not specified)	0–10%

Ecological dynamics

This ecological site supports a mesic northern hardwood and conifer forest with an understory of ferns, spring ephemeral wildflowers, sedges and grasses, and shrubs. The understory can be species rich or sparse depending successional stage. Later seral stages have a closed multi-layered canopy, with a high leaf area index. This condition restricts light penetration, which in turn, limits understory productivity. Early seral stage forests, mainly aspen and birch, allow more light to the forest floor and this results in a denser understory, often with a well developed shrub-sapling layer. Small-scale disturbances, such as windthrow, insect damage and plant diseases play a major role in creating a diverse and patchy plant community on this site. Windthrow is common on sites that have a lithologic discontinuity in the soil; which on this site is the loamy soil over sand and gravel. However, some sites are more exposed to wind than others, so location plays a major role as well. A site that is subject to high windthrow hazard typically displays a profound pit and mound micro-topography over most of the forest floor. This is especially true where the loamy mantles contains a high silt content. Silty material has a high natural angle of repose and produces very stable and long-lasting "cradle-knolls".

State and transition model

Ecosystem states



State 1 submodel, plant communities

1.1. Early-Seral Phase

1.2. Mid-Seral Phase

1.3. Climax Phase

State 2 submodel, plant communities

2.1. Aspen-Birch Phase

2.2. Red Oak-White Pine Phase

2.3. Sugar Maple-Hemlock Phase

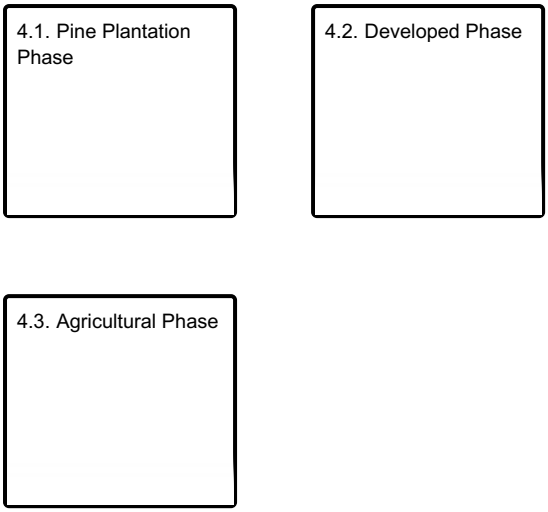
State 3 submodel, plant communities

3.1. Earthworm Phase

3.2. Invasive Weeds Phase

3.3. Recent Logging Phase

State 4 submodel, plant communities



State 1
Reference State

An undisturbed Reference State is hard to find these days. The floristic representation of early-seral, mid-seral and climax phases are mostly assumed from remnant populations. The early and mid-seral phases were the result of disturbances; the long-term trend toward the climax phase was the most common trajectory in the past. Now many sites fail to reach a climax phase before disturbance sets them back. Nearly all of the Reference State sites were harvested during logging era and these sites were often converted to farmland because they had the most productive soils with the fewest restrictions (i.e. wetness, stoniness, or droughtiness). However agricultural was still problematic and thus abandoned, promulgating old-field succession to the forested condition.

Community 1.1
Early-Seral Phase

This phase consisted of mainly aspen and birch but conifers such as balsam fir and red pine were common associates. Small trees such as ironwood (Ostrya viginiana), black cherry and pin cherry (Prunus spp.) were are also common in the re-generating forest. Shrubs were abundant on sites that received sunlight; these included beaked hazel, maple-leaf viburnum and several dogwood species.

Community 1.2
Mid-Seral Phase

This phase consisted of mainly red oak and white pine with more shade tolerant trees such as sugar maple, yellow birch and basswood dominating the seedling and sapling layers. Shade tolerant conifers like hemlock and white spruce are appearing in the understory in specialized habitats, mainly the cooler, shadier sites.

Community 1.3
Climax Phase

The climax phase has a dense canopy of sugar maple and hemlock with very little understory vegetation. The understory is mainly ferns and small, spring-ephemeral wildflowers. This phase persisted for many centuries as the canopy were able to reproduce under the overstory. When gaps appeared through the death of individual trees, advance regeneration of the overstory species filled them. The sugar maple-hemlock cover type is largely credited with producing strongly podzolized soils. These soils are highly acidic, however they are typically nutrient rich and very productive.

State 2
Cutover State

The Cutover State has largely replaced the Reference State. These sites often have a mix of early- and late-successional species due to frequent natural disturbances and selective logging practices. Then again, mono-

cultures of aspen or maple can develop in patches on these site due to same disturbance factors. The reality is that this site has many possible combinations of species, and those species must compete intensely for the available resources.

Community 2.1
Aspen-Birch Phase

This phase has become more common over time as man-made disturbance increases in forested areas and cleared land reverts to forest. Markets exist for aspen and birch pulpwood, so that increases that likelihood of even-aged management. Clear-cutting stands of aspen before they start to deteriorate is one the most economically sound forms of forest management. Not only does it provide a useful forest product, it also encourages aspen regeneration. It also benefits a number of popular wildlife species (namely whitetail deer, ruffed grouse, and golden-winged warblers) to have stands of different age class aspen on the landscape.

Community 2.2
Red Oak-White Pine Phase

This phase was a common replacement stand to the Aspen-Birch Phase because of the abundance of this phase as the edaphic climax phase on nearby sandy ecological sites. This phase is very popular with landowners and forest managers for its scenic value on one hand and timber value on the other. This value puts a premium on management for these species. While there is no particular shortage, there is high demand for this phase.

Community 2.3
Sugar Maple-Hemlock Phase

This phase is long-lived but in the modern forest it is subject to numerous disturbances. It is now relegated to areas protected from natural and man-made disturbances.

State 3
Invaded/Disturbed State

This very common state will over time closely resemble the Cutover State except for the addition of invasive species. However, in some extreme cases the post-logging condition of the site precludes timely forest regeneration. This may be due soil compaction, excessive rutting or introduction of particularly aggressive weeds. Soil compaction and rutting result from vehicle traffic when the soil too wet to bear the load. The loamy-mantled soils on these sites have a higher water-holding capacity and slower permeability than nearby sandy soils, so it may appear that vehicle traffic won't be problem when in fact it is. The Earthworm Phase is common in areas near lakes, roads, trails, farm fields, and dwellings. Weeds also follow these invasion routes.

Community 3.1
Earthworm Phase

This is probably now the most common phase on this ecological site. Non-native earthworms have successfully colonized all suitable habitat in this area in the last 150 years and Loamy-Mantled Uplands are the most favorable of sites. The plant community can be anything from closed canopy maple-basswood forest to agricultural crops. The effects of earthworm colonization include loss of organic surface layers, increased weeds, increased erosion potential and decreases in some native wildflowers such as twisted-stalk and bellflower. It must also be noted that some native wildflower species have increased due to earthworms; these include trilliums and jack-in-the-pulpit.

Community 3.2
Invasive Weeds Phase

Invasive weeds have encroached on many sites where the canopy has removed, especially along roads, trails, and near building sites. One of the most problematic species on this garlic mustard, which has dramatically spread in southern Wisconsin and is moving north. Fortunately, many of the common post-logging invasive weeds, such as sweet clover and mare's tail, are shaded out when the site is reforested.

Community 3.3
Recent Logging Phase

Logging introduces many changes to a site besides canopy removal. More sunlight reaches the forest floor, thus surface temperatures increase which in turn, and causes increased organic matter decomposition. Ground flora becomes taller and denser, and native pioneer species are favored. The negative aspects of these changes are the increases in non-native species and loss of habitat for desirable species. However, well planned logging operations can have little or no negative consequences, especially when they leave a site that resembles the aftermath of natural disturbances, mainly in the form of woody debris and non-compacted soils.

State 4
Converted State

The Converted State involves removal of existing vegetation (i.e. land clearing) and transforming the site into completely different land use. This can advantageous if the site was previously disturbed and is currently infested with problematic species. Otherwise this practice causes loss of native forest habitat. Ideally, redevelopment of disturbed sites will be encouraged and undisturbed sites will be left in forested sites.

Community 4.1
Pine Plantation Phase

Planting conifers was a widespread practice back in the days of cheap labor. Today, smaller commercial or private land plantations are more commonly created, rather than the large pine plantation on public land of earlier years. After 50 years or so of sound management, older pine plantations begin to resemble natural stands with multiple layers and a diverse understory.

Community 4.2
Developed Phase

The creation of this phase reached a high point years ago and has since cooled off. The developed sites are beginning to blend in to landscape in a visual sense but they are still sources of invasive species and plant diseases brought into the area.

Community 4.3
Agricultural Phase

The Agricultural Phase acreage peaked many years ago and is now a mere remnant of its former extent. Many old fields are succeeding to trees and shrubs. There is still some cropland but most agricultural land is now hayland or pasture.

Additional community tables

Other references

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Contributors

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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	
Approved by	
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:**

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

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

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

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

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

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

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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:

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

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

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

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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:**
