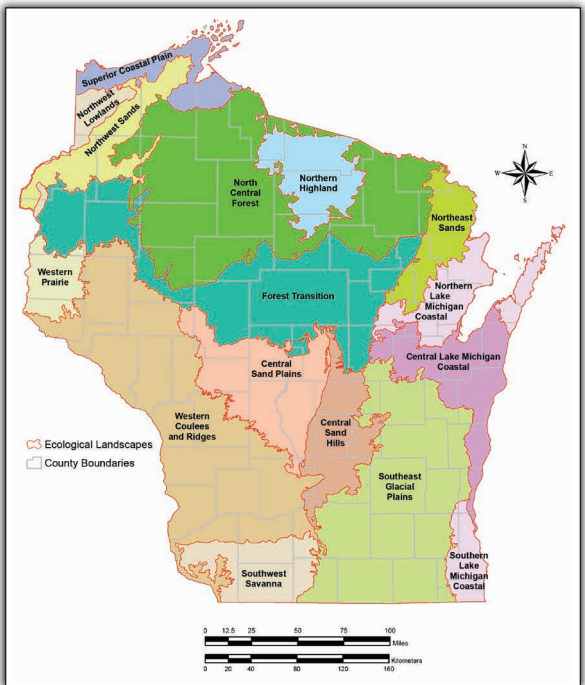




(Photo from Kemp Natural Resources Station Archives)

Appendix 1: Ecological Landscapes of Wisconsin



Ecological Landscapes of Wisconsin Map

*(©2011 Wisconsin Department of Natural Resources,
Ecological Landscapes of Wisconsin Handbook - 1805.1)*

Scale: 1:2,750,000 Wisconsin Transverse Mercator NAD83(91) Map S1-ams

Wisconsin was divided into 16 ecoregions with similar ecology and management opportunities. Each of these ecoregions is called an Ecological Landscape. The Ecological Landscapes are based on the National Hierarchical Framework of Ecological Units (NHFEU; Cleland et. al 1997). There were too many NHFEU Subsections and too few NHFEU Sections to be useful for management purposes. Ecological Landscapes use the same boundaries as NHFEU Sections or Subsections. However, some NHFEU Subsections were combined to reduce the number of geographical units in the state to a manageable number. Therefore, Ecological Landscapes are at a size (scale) between NHFEU Sections and Subsections.

Appendix 2: WDNR Natural Heritage Inventory Forested Wetland Types

The following are forested wetland types that are described by the Wisconsin Department of Natural Resources Natural Heritage Inventory (which crosswalks to Northern Lowland forest cover types) and characteristics of each.

BLACK SPRUCE SWAMPS

An acidic conifer swamp forest characterized by a relatively closed canopy of black spruce (*Picea mariana*) and an open understory in which Labrador Tea (*Ledum groenlandicum*) and Sphagnum Mosses (*Sphagnum* spp.) are often prominent, along with Three-leaved Solomon's Seal (*Smilacina trifolia*), Creeping Snowberry (*Gaultheria hispidula*), and Three-seeded Sedge (*Carex trisperma*). The herbaceous understory is otherwise relatively depauperate. These forests are found in flat depressions on outwash or moraine. A "moat" (or "lagg") may occur at the upland-wetland interface. This wetland type receives water mainly from precipitation and runoff. Natural disturbance factors include windthrow, insect outbreak, and rarely, flooding and fire.

TAMARACK SWAMPS

These weakly to moderately minerotrophic conifer swamps are dominated by a broken to closed canopy of tamarack (*Larix laricina*) and a frequently dense understory of speckled alder (*Alnus rugosa*). The understory is more diverse than in black spruce (*Picea mariana*) swamps and may include more nutrient demanding species such as Winterberry (*Ilex verticillata*) and black ash (*Fraxinus nigra*). Stands with spring seepage with more nutrients sometimes have Marsh Marigold (*Caltha palustris*) and Skunk Cabbage (*Symplocarpus foetidus*). As with black spruce swamp, they receive water mainly from precipitation and runoff. Natural disturbance factors include windthrow, insect outbreak, and rarely flooding and fire.

NORTHERN WET FORESTS

This type encompasses a group of weakly minerotrophic, conifer-dominated, acid peatlands located mostly north of the Tension Zone. It is sometimes broken out into subgroups that are influenced by nutrient levels. The dominant trees are black spruce (*Picea mariana*) and tamarack (*Larix laricina*). Jack pine (*Pinus banksiana*) is a significant component in parts of the type's range. This community is found primarily in kettle depressions or partially filled basins, on glacial outwash landforms, moraines, and till plains, where the water table is near the surface or where drainage is somewhat impeded. The community also occurs along the margins of lakes and low-gradient streams.

On the drier end of the spectrum, the spruce-tamarack swamps may grade into "rich" swamp forests of northern white cedar (*Thuja occidentalis*) or black ash (*Fraxinus nigra*), if a source of nutrient enriched groundwater is present. They are associated with headwater streams or shallow kettles depressions. Tamarack swamp is a less acid, wet conifer forest community that can support nutrient demanding understory plants that are also tolerant of relatively high pH levels. Tamarack (*Larix laricina*) is the dominant tree, sometimes to the virtual exclusion of other tree species. In some stands, hardwoods such as paper birch (*Betula papyrifera*), red maple (*Acer rubrum*), black ash (*Fraxinus nigra*), and (formerly) elm (*Ulmus* spp.) occur as canopy associates, subcanopy trees, or saplings. The understory may be more diverse and structurally complex than in the more acid spruce-dominated swamps, and sometimes features a well developed tall shrub layer composed of plants with relatively high nutrient demands such as speckled alder (*Alnus rugosa*), Alder-leaved Buckthorn (*Rhamnus alnifolia*), Mountain Holly (*Nemopanthus mucronata*), and Winterberry (*Ilex verticillata*). Natural disturbance factors include windthrow, and in drier years, fire.

CEDAR SWAMPS

This is a rare upland forest community of mesic sites in northern Wisconsin, characterized by northern white cedar (*Thuja occidentalis*) and various associates including eastern hemlock (*Tsuga canadensis*), balsam fir (*Abies balsamea*), yellow birch (*Betula alleghaniensis*), and white pine (*Pinus strobus*). The herb layer may contain Wild Lily-of-the-Valley (*Maianthemum canadense*), Clubmosses (*Lycopodium* spp.), Goldthread (*Coptis groenlandica*), Fringed Polygala (*Polygala paucifolia*), and Naked Miterwort (*Mitella nuda*), and trailing sub-shrubs such as Twinflower (*Linnaea borealis*) and Creeping Snowberry (*Gaultheria hispidula*) and others. This forested minerotrophic wetland, maintained by mineral rich groundwater, occurs on rich, neutral to alkaline peats and mucks throughout much of northern Wisconsin. Natural disturbance is mainly wind events that create gaps in the stand for new regeneration. A number of rare plants occur more frequently in cedar swamps than any other habitat.

HARDWOOD SWAMPS

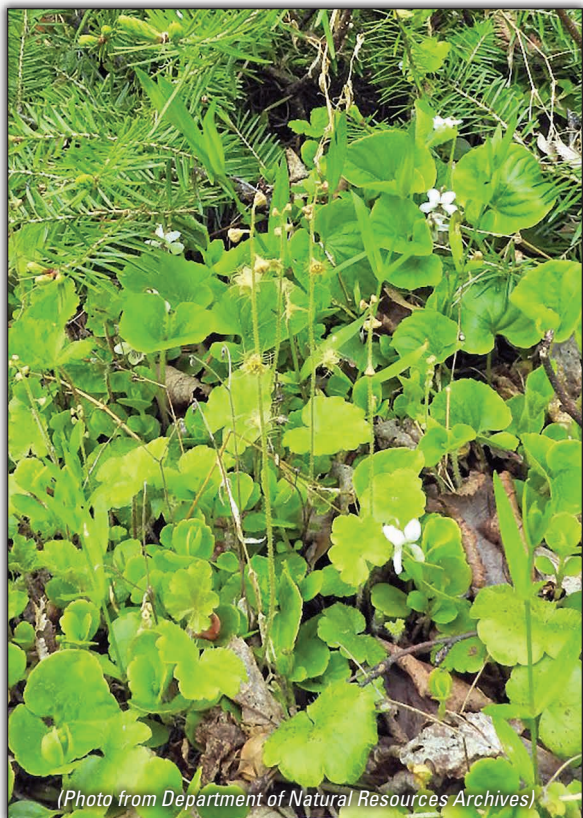
The northern hardwood swamp is a deciduous forested wetland that occurs along lakes or streams, or in insular basins in poorly drained morainal landscapes. This community occurs across the state, but is most common in northern Wisconsin. The dominant tree species are black ash (*Fraxinus nigra*) and green ash (*Fraxinus pennsylvanica*), but in some stands red maple, yellow birch, and (formerly) American elm (*Ulmus americana*) are also important. The diversity of tree species is usually dictated by timing, extent and duration of flooding, and windthrow which are common disturbance events. More stagnant swamps favor black ash (*Fraxinus nigra*), where as oxygenated, moving water favors more green ash (*Fraxinus pennsylvanica*). Speckled alder (*Alnus rugosa*) is common in the shrub layer while herbaceous flora is often Marsh Marigold (*Caltha palustris*), Swamp Dewberry (*Rubus hispidus*), Skullcaps (*Scutellaria* spp.), Spotted Touch-me-not (*Impatiens capensis*), and many sedges. Soils may be mucks or mucky sands.

FLOODPLAIN FORESTS

This lowland hardwood forest community type occurs on alluvial plains of larger rivers. Canopy dominants vary, but may include silver maple (*Acer saccharum*), river birch (*Betula nigra*), green ash (*Fraxinus pennsylvanica*), black ash (*Fraxinus nigra*), hackberries (*Celtis* spp.), swamp white oak (*Quercus bicolor*), (formerly) Elms (*Ulmus* spp.), and eastern cottonwood (*Populus deltoides*). Historically, the elms were a significant component of the floodplain forests, but Dutch elm disease has eliminated most large elm trees that formerly provided supercanopy structure, snag and den sites, and large woody debris. Northern occurrences of this type tend to be less extensive, are often discontinuous, and are relatively less diverse compared to those in the south. Silver maple (*Acer saccharinum*) and green ash (*Fraxinus pennsylvanica*) remain among the dominant species, but oak (*Quercus macrocarpa*), and boxelder maple (*Acer negundo*) replacing some of the many missing southern trees. Buttonbush (*Cephalanthus occidentalis*) is a locally dominant shrub that may form dense thickets on the margins of oxbow lakes, sloughs and ponds, which are often important aquatic habitats within these forests. Understory plants include Nettles (*Urtica* spp.), sedges, tall ferns, and a wide variety of other plants. Flooding (channel migration) is the main disturbance event while sedimentation and tree fall can shape the occurrence and diversity of species.



(Photo from Department of Natural Resources Archives)



(Photo from Department of Natural Resources Archives)



(Photo from Kemp Natural Resources Station Archives)

APPENDIX 3: SPECIES CHECKLIST FOR FIELD USE (Scientific Name)

Date: _____ / _____ / _____ Stand ID#: _____ Collected By: _____

Location: _____

COVER CLASS VALUES: ① Present-trace (<1%) ② Common (1-5%) ③ Well Represented (5-25%) ④ Abundant (>25%)

Herbs & Small Shrubs

- _____ *Arisaema triphyllum*
- _____ *Aralia racemosa*
- _____ *Athyrium filix-femina*
- _____ *Calla palustris*
- _____ *Cicuta maculata*
- _____ *Clintonia borealis*
- _____ *Coptis groenlandica*
- _____ *Cornus canadensis*
- _____ *Dryopteris cristata*
- _____ *Dryopteris disjuncta*
- _____ *Dryopteris phegopteris*
- _____ *Dryopteris spinulosa*
- _____ *Equisetum spp.*
- _____ *Eupatorium maculatum*
- _____ *Impatiens capensis*
- _____ *Iris versicolor*
- _____ *Linnaea borealis*
- _____ *Lycopus uniflorus*

- _____ *Maianthemum canadense*
- _____ *Matteuccia struthiopteris*
- _____ *Mitchella repens*
- _____ *Mitella nuda*
- _____ *Onoclea sensibilis*
- _____ *Osmunda cinnamomea*
- _____ *Osmunda claytoniana*
- _____ *Oxalis montana*
- _____ *Polygonatum pubescens*
- _____ *Prunella vulgaris*
- _____ *Pteridium aquilinum*
- _____ *Scutellaria lateriflora*
- _____ *Smilax herbacea*
- _____ *Smilax tamnoides*
- _____ *Trientalis borealis*
- _____ *Trillium cernuum*
- _____ *Urtica dioica*

Shrubs

- _____ *Acer spicatum*
- _____ *Alnus rugosa*
- _____ *Cornus stolonifera*
- _____ *Corylus cornuta*
- _____ *Lonicera spp.*
- _____ *Nemopanthus mucronata*
- _____ *Rhamnus alnifolia*
- _____ *Ribes spp.*
- _____ *Rubus hispidus*
- _____ *Rubus pubescens*
- _____ *Rubus spp.*
- _____ *Spiraea alba*
- _____ *Vaccinium angustifolium*
- _____ *Vaccinium myrtilloides*

Trees

- _____ *Abies balsamea*
- _____ *Acer rubrum*
- _____ *Betula alleghaniensis*
- _____ *Betula papyrifera*
- _____ *Fraxinus nigra*
- _____ *Fraxinus pennsylvanica*
- _____ *Larix laricina*
- _____ *Picea glauca*
- _____ *Picea mariana*
- _____ *Quercus rubra*
- _____ *Sorbus americana*
- _____ *Thuja occidentalis*
- _____ *Tilia americana*
- _____ *Tsuga canadensis*
- _____ *Ulmus americana*
- _____ *Ulmus spp.*

Other Species

APPENDIX 4: SPECIES CHECKLIST FOR FIELD USE (Common Name)

Date: ____ / ____ / ____ Stand ID#: _____ Collected By: _____

Location: _____

COVER CLASS VALUES: ❶ Present-trace (<1%) ❷ Common (1-5%) ❸ Well Represented (5-25%) ❹ Abundant (>25%)

Herbs & Small Shrubs

- | | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>_____ Beech Fern</p> <p>_____ Bracken Fern</p> <p>_____ Bristly Greenbrier</p> <p>_____ Bugleweed</p> <p>_____ Bunchberry</p> <p>_____ Carrion Flower</p> <p>_____ Cinnamon Fern</p> <p>_____ Common Wood Sorrel</p> <p>_____ Crested Wood Fern</p> <p>_____ Goldthread</p> <p>_____ Hairy Solomon's Seal</p> <p>_____ Heal-all</p> <p>_____ Horsetails</p> <p>_____ Interrupted Fern</p> <p>_____ Lady Fern</p> <p>_____ Larger Blue Flag</p> <p>_____ Mad-dog Skullcap</p> <p>_____ Naked Miterwort</p> | <p>_____ Nodding Trillium</p> <p>_____ Oak Fern</p> <p>_____ Ostrich Fern</p> <p>_____ Partridgeberry</p> <p>_____ Sensitive Fern</p> <p>_____ Small Jack-in-the-pulpit</p> <p>_____ Spikenard</p> <p>_____ Spinulose Shield Fern</p> <p>_____ Spotted Joe-Pye Weed</p> <p>_____ Spotted Touch-me-not</p> <p>_____ Starflower</p> <p>_____ Stinging Nettle</p> <p>_____ Twinflower</p> <p>_____ Water Arum</p> <p>_____ Water Hemlock</p> <p>_____ Wild Lily-of-the-valley</p> <p>_____ Yellow Beadlily</p> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Other Species

Shrubs

- _____ Alder-leaved Buckthorn
- _____ Beaked Hazel
- _____ Canada Blueberry
- _____ Currants/Gooseberries
- _____ Dwarf Raspberry
- _____ Fly Honeysuckles
- _____ Low-sweet Blueberry
- _____ Mountain Holly
- _____ Mountain Maple
- _____ Narrow-leaved Meadowsweet
- _____ Raspberries/Blackberries
- _____ Red-osier Dogwood
- _____ Speckled Alder
- _____ Swamp Dewberry

Trees

- _____ American Basswood
- _____ American Elm
- _____ American Mountain Ash
- _____ Balsam Fir
- _____ Black Ash
- _____ Black Spruce
- _____ Eastern Hemlock
- _____ Elm
- _____ Green Ash
- _____ Northern Red Oak
- _____ Northern White Cedar
- _____ Paper Birch
- _____ Red Maple
- _____ Tamarack
- _____ White Spruce
- _____ Yellow Birch