13140

North-Central Interior Maple-Basswood Forest

BpS Model/Description Version: Aug. 2020

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| --- | --- | --- | --- |
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Vegetation Type

Forest and Woodland

Map Zones

38, 39, 40, 41, 42, 43, 44, 50

Geographic Range

This forest type extends from northern MN and WI southward into IA and IL, and from the forest-prairie margin eastward to Lake Michigan. This forest type is fringed by northern hardwoods to the north and prairies to the west. The western range of beech forms the eastern boundary, whereas its southern margin roughly parallels the maximum extent of past glaciation. The Big Woods of southeastern MN is representative of this forest type (Grimm 1984). In MZ41 this BpS would have occurred in ECOMAP subsections 212 Kb, 212 Nb, and 222 Ma, Mb, Mc, and Md. In MZ 50 the BpS would have occurred in subsections 222 Kb, Kc, Kd, Ke, Kf, Kg, Kh, 222 Md and 222 La, Lc, Ld, and Le. In MZ42 this BpS would have been concentrated in subsections 222Lc, Lf, 222Mb, and Me but would have had scattered occurrences in mesic, fire-protected sites in 251Ba, Be, 251Cf, Ch, and 251Ga. This BpS is of limited extent in MZ38. It occurs in scattered, fire-protected areas in 251Ha, 251Hd, and 251Gc in eastern NE and northeastern KS.

In MZs 39 and 40, this might have occurred as outliers within ECOMAP subsections 251Ba and 251Bb.

Biophysical Site Description

The North-Central Interior Maple-Basswood forest occurred on rich, mesic sites that were protected from fire by the oak-aspen buffer lying between this community and the prairie and or by natural fuel breaks. They also occurred on upland sites with moist soils, usually in settings protected from fire. In MN, these fire-protected sites supporting maple-basswood forest occur on the rolling topography of end moraines, the north facing-slopes of till plains, and the middle and lower north-facing slopes of loess-or drift-covered bedrock bluffs (MNDNR 2005). Soils are well-drained loam derived from calcareous till or wind-deposited silt over bedrock (MNDNR 2005).

For LANDFIRE mapping, soils are generally Alfisols, with low percentages of sand (<15%) and moderate percentages of silt (>30%). SSURGO taxonomic particle sizes of “fine,” “fine-silty,” “fine-loamy,” “loamy” are associated with the distribution of this system.

Plants in these communities have access to predictable supplies of water and nutrients, but they are often limited by light because of the dense forest canopy. Typical sites are buffered from seasonal drought by fine-textured moisture-retaining soils or dense subsoil layers. Essential nutrients are mineralized from decaying organic matter at twice the rate of that in fire-dependent forest or wet forest communities.

Following retreat of the glaciers, most of the present Big Woods became prairie between 9,000 and 6,000yrs before present (Webb et al. 1993). Oak woodland began invading the prairie about 5,000yrs ago, becoming fully established 2,400yrs ago (Grimm 1981). Oak woodland persisted until 300yrs ago, when elm, basswood, and sugar maple rapidly expanded and became dominant. The changes from prairie to oak woodland, and from oak woodland to maple-basswood 'bigwoods' must have resulted from reductions in fire frequency, which were probably caused by increased precipitation and possibly decreased temperatures (ibid).

Vegetation Description

Sites are characterized by continuous, often dense, canopies of deciduous trees and understories of shade-adapted shrubs and herbs. Dominant trees species in the canopy and subcanopy include sugar maple, basswood, northern red oak, red elm, American elm, ironwood, bitternut hickory, and muscle wood. Canopy associates may include white ash, yellow birch, black walnut, white oak, hackberry, butternut, black cherry, and Kentucky coffee-tree. In WI, beech may also be a component of the tree canopy (Curtis 1959). The sparse shrub layer is dominated by sugar maple and other young tree species in addition to prickly gooseberry, chokecherry, alternate leaved dogwood, prickly ash, and red-berried elder (MNDNR 2005).

The ground flora is dominated by spring ephemerals which complete their life cycle in the spring before the canopy trees have leafed out and cast a dense shade on the understory. Common ground cover species include Dutchman's breeches (Dicentra cucullaria), cut-leaved toothwort (Cardamine concatenata), bloodroot (Sanguinaria canadensis), Virginia waterleaf (Hydrophyllum virginianum), violet (Viola pubescens), wild leek (Allium tricoccum), blue cohosh (Caulophyllum thalictroides), early meadow-rue (Thalictrum dioicum), bedstraw (Galium aparine), sweet cicely (Osmorhiza claytonii), jack-in-the-pulpit (Arisaema triphyllum), trilliums (Trillium spp.), and wood anemone (Anemone quinquefolia). (MNDNR 2005, Curtis 1959)

BpS Dominant and Indicator Species

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| ACSA3 | *Acer saccharum* | Sugar maple |
| TILIA | *Tilia* | Basswood |
| POTR5 | *Populus tremuloides* | Quaking aspen |
| ULRU | *Ulmus rubra* | Slippery elm |
| QURU | *Quercus rubra* | Northern red oak |
| CACA18 | *Carpinus caroliniana* | American hornbeam |
| ULAM | *Ulmus americana* | American elm |
| FRPE | *Fraxinus pennsylvanica* | Green ash |

Species names are from the NRCS PLANTS database. Check species codes at http://plants.usda.gov.

Disturbance Description

Fire Regime V characterizes this system, dominated by high-intensity, low-frequency fires that occur in greater than 1,000yr intervals. Low-intensity fires surface fires may have been more frequent in the mid-seral stages of this BpS when more fire-prone species (such as oak) comprise a larger component of the tree canopy. Light surface fires would result in the partial loss of trees and are estimated at a rotation of about 50yrs (MNDNR 2005).

Historically, this forest type, composed of fire-sensitive species, was not disturbed by fire except during periods following catastrophic wind events or extreme drought. Grimm (1984) states “The fire regimes of deciduous forests, such as bigwoods, are much different from the commonly perceived model of fire regime, in which fuels and fire danger increase with time and in which intense crown fires cause great destruction of the forest.” In maple-basswood forests, decomposition of potential fuels is rapid, and is particularly rapid on base-rich soils (Bormann and Likens 1979), such as those of the Big Woods. Because of the dense shade, the cover of herbs and shrubs is sparse. Thus little fuel exists at the ground level, tree trunks are not very flammable, and the open tree crowns do not carry fire very well. Moreover, low solar radiation, high humidity, and low wind speeds prolong the moisture retention of ground-level fuels (Kucera 1952), thereby inhibiting the ignition and spread of fire. These forests are sometimes referred to as the “asbestos forests” because of their fireproof character (Vogl 1967). Ordinarily, only the leaf litter ever reaches a flammable state, and only patchy creeping ground fires occur (Niering et al. 1970, Barden and Woods 1973).

Two primary disturbance factors are used to model this system. Catastrophic windthrow affects mature stands and occurs on an approximately 600-700yr rotation (MNDNR 2005). Replacement fire occurs primarily in young and windthrown stands and occurs on a rotation of approximately 1,000yrs. In addition, surface fires occur in young stands < 100yrs of age which contain a significant component of oak. The disturbance probabilities by class applied in the model are contained in the VDDT documentation section.

Per the IL Fire Needs Assessment survey, Fire Return Intervals for this system (currently) are on average 7 years to maintain good quality habitat in this system and 2 years to restore degraded habitats back to this system. No information on burn severity was provided.

Fire Frequency

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Severity** | **Avg FI** | **Percent of All Fires** | **Min FI** | **Max FI** |
| Replacement | 1038 | 46 |  |  |
| Moderate (Mixed) |  |  |  |  |
| Low (Surface) | 866 | 54 |  |  |
| All Fires | 472 | 100 |  |  |

Fire interval is expressed in years for each fire severity class and for all types of fire combined (All Fires). Average FI is the central tendency modeled. Percent of all fires is the percent of all fires modeled in that severity class. Minimum and Maximum FIs show the relative range of fire intervals as estimated by model contributors, if known.

Scale Description

The most common disturbance extent could best be characterized as a single-tree or small-group gap-phase dynamic. Replacement events would have encompassed hundreds to thousands of acres. Patch sizes would generally conform to landforms on which they are found.

Adjacency or Identification Concerns

Historically, elm was a canopy component within the maple-beech forest (Grimm 1981). However, this species has been largely eliminated from this system due to Dutch elm disease. American elm (Ulmus americana) is now generally only present in the understory and midstory in contemporary forests, whereas historically it would have been the occasional canopy dominant.

Uncharacteristic conditions in this setting include infestation by exotic earthworms of European species that have affected or begun to affect soil conditions, herb/forb species representation, and tree regeneration (Hale et al. 1999). Habitat for the rare Great Lakes endemic fern, Botrychium mormo, is largely eliminated after worm invasion.

Invasive species, including buckthorn and honeysuckle, are increasing in contemporary forests – generally in the southern extent of this BpS.

In many areas, the original distribution of this type has largely been replaced by agriculture except on unsuitable landforms. However, this type has expanded into areas formerly occupied by less mesic forest types (North-Central Interior Dry-Mesic Oak Forest and Woodland, and North-Central Interior Dry Oak Forest and Woodland) due to fire suppression and high-grading of the oaks. This type can be partially distinguished during mapping using a combination of aspect and soil information, with this type being limited to the more loamy soils on fire-protected sites and north-facing slopes.

Issues or Problems

Native Uncharacteristic Conditions

Comments

Succession Classes

**Mapping Rules**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Upper Layer Lifeform** | **Height (m)** | **Canopy Cover (%)** | | | | | | | | | |
| **0-10** | **11-20** | **21-30** | **31-40** | **41 - 50** | **51-60** | **61-70** | **71-80** | **81-90** | **91-100** |
| Herb | 0-0.5 | UN | UN | UN | UN | UN | UN | UN | UN | UN | UN |
| Herb | 0.5-1.0 | UN | UN | UN | UN | UN | UN | UN | UN | UN | UN |
| Herb | >1.0 | UN | UN | UN | UN | UN | UN | UN | UN | UN | UN |
| Shrub | 0-0.5 | UN | UN | UN | UN | UN | UN | UN | UN | UN | UN |
| Shrub | 0.5-1.0 | UN | UN | UN | UN | UN | UN | UN | UN | UN | UN |
| Shrub | 1.0-3.0 | UN | UN | UN | UN | UN | UN | UN | UN | UN | UN |
| Shrub | >3.0 | UN | UN | UN | UN | UN | UN | UN | UN | UN | UN |
| Tree | 0-5 | A | A | A | A | A | A | A | A | A | A |
| Tree | 5-10 | B | B | B | B | B | B | B | B | B | B |
| Tree | 10-25 | UN | UN | UN | UN | UN | UN | C | C | C | C |
| Tree | 25-50 | UN | UN | UN | UN | UN | UN | D | D | D | D |
| Tree | >50 | UN | UN | UN | UN | UN | UN | D | D | D | D |

Succession class letters A-E are described in the Succession Class Description section. Some classes use a leafform distinction where a qualifier is added to the class letter: Brdl (broadleaf), Con (conifer), or Mix (mixed conifer and broadleaf). UN refers to uncharacteristic native or a combination of height and cover that would not be expected under the reference condition. NP refers to not possible or a combination of height and cover which is not physiologically possible for the species in the BpS.

**Description**

Class A 8 Early Development 1 - All Structures

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| POTR5 | Populus tremuloides | Quaking aspen | Upper |
| TILIA | Tilia | Basswood | Upper |
| QURU | Quercus rubra | Northern red oak | Upper |
| ACSA3 | Acer saccharum | Sugar maple | Upper |

Description

Characterized by early-seral young forest following a catastrophic wind or fire event. Young forest dominated by aspen, birch, northern red oak, basswood, American elm < 35yrs.

*Maximum Tree Size Class*  
Pole 5-9" DBH

Class B 9 Mid Development 1 - All Structures

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| ACSA3 | Acer saccharum | Sugar maple | Upper |
| TILIA | Tilia | Basswood | Upper |
| QURU | Quercus rubra | Northern red oak | Upper |
| ULAM | Ulmus americana | American elm | Upper |

Description

Characterized by mid-succession maturing forests. In this stage there is the gradual decline of northern red oak and it is replaced by sugar maple. American elm and ironwood increase while aspen senesces and is eliminated from the system.

*Maximum Tree Size Class*  
Medium 9-21"DBH

Class C 14 Mid Development 2 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| ACSA3 | Acer saccharum | Sugar maple | Upper |
| TILIA | Tilia | Basswood | Upper |
| QURU | Quercus rubra | Northern red oak | Upper |
| ULAM | Ulmus americana | American elm | Upper |

Description

Characterized by late-successional maturing forests. Forest dominated by sugar maple, basswood, American elm, ironwood, northern red oak.

*Maximum Tree Size Class*  
Large 21-33"DBH

Class D 69 Late Development 1 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| ACSA3 | Acer saccharum | Sugar maple | Upper |
| TILIA | Tilia | Basswood | Upper |
| QURU | Quercus rubra | Northern red oak | Upper |
| ULAM | Ulmus americana | American elm | Upper |

Description

These old late-seral forests (> 150yrs) are the end point of succession. Forest dominated by sugar maple, basswood, American elm, ironwood, northern red oak. Small gap disturbances predominate to maintain a high proportion of the acreage in this class.

Upper Layer Lifeform is not the dominant lifeform. In this late seral stage there would be a multi-layer canopy and sub-canopy (created through small-scale windthrow). Therefore, although the min tree height is set at 25m in order to make this class exclusive from Class C tree height would range from 10-50 m.

*Maximum Tree Size Class*  
Very Large >33"DBH

Model Parameters

Deterministic Transitions

|  |  |  |  |
| --- | --- | --- | --- |
| **From Class** | **Begins at (yr)** | **Succeeds to** | **After (years)** |
| Early1:ALL | 0 | Mid1:ALL | 35 |
| Mid1:ALL | 36 | Mid2:CLS | 75 |
| Mid2:CLS | 76 | Late1:CLS | 150 |
| Late1:CLS | 151 | Late1:CLS | 999 |

Probabilistic Transitions

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Disturbance Type** | **Disturbance occurs In** | **Moves vegetation to** | **Disturbance Probability** | **Return Interval (yrs)** | **Reset Age to New Class Start Age After Disturbance?** | **Years Since Last Disturbance** |
| Replacement Fire | Early1:ALL | Early1:ALL | 0.001 | 1000 | Yes | 0 |
| Replacement Fire | Mid1:ALL | Early1:ALL | 0.001 | 1000 | Yes | 0 |
| Surface Fire | Mid1:ALL | Mid1:ALL | 0.014 | 71 | No | 0 |
| Replacement Fire | Mid2:CLS | Early1:ALL | 0.001 | 1000 | Yes | 0 |
| Wind or Weather or Stress | Mid2:CLS | Early1:ALL | 0.0015 | 667 | Yes | 0 |
| Replacement Fire | Late1:CLS | Early1:ALL | 0.001 | 1000 | Yes | 0 |
| Wind or Weather or Stress | Late1:CLS | Early1:ALL | 0.0015 | 667 | Yes | 0 |
| Wind or Weather or Stress | Late1:CLS | Late1:CLS | 0.2 | 5 | No | 0 |

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