13130

North-Central Interior Beech-Maple Forest

BpS Model/Description Version: Aug. 2020

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| --- | --- | --- | --- |
| **Modelers** |  | **Reviewers** |  |
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| None | None | None | None |
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Vegetation Type

Forest and Woodland

Map Zones

47, 50, 51

Geographic Range

This mesic forest type extends through MI and eastern WI and is limited by the distribution of beech (Fagus grandifolia). North of the tension zone in WI and MI, this would be replaced by the Laurentian-Acadian Northern Hardwoods Forest system (13020). In MZ51, this system replaces the North-Central Interior Maple-Basswood Forest (13140).

In MZ50, this type is limited to Subsections 222Kc, 222Ke, 222Kf and 222Kg.

Biophysical Site Description

The North-Central Interior Beech-Maple 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.

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.

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, beech, basswood, northern red oak, red elm, American elm, ironwood, bitternut hickory, black ask, green ash and muscle wood. Canopy associates may include white oak, hackberry, butternut, black walnut, black cherry, yellow birch and Kentucky coffee-tree. 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 |
| TIAM | *Tilia americana* | American basswood |
| POTR5 | *Populus tremuloides* | Quaking aspen |
| FAGR | *Fagus grandifolia* | American beech |
| 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 1000yr 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 1000yrs. 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 Illinois 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 3 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 | 987 | 45 |  |  |
| Moderate (Mixed) |  |  |  |  |
| Low (Surface) | 823 | 55 |  |  |
| All Fires | 449 | 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.

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 | A | A | A | A | A | A | A | A | A | A |
| Herb | 0.5-1.0 | A | A | A | A | A | A | A | A | A | A |
| Herb | >1.0 | A | A | A | A | A | A | A | A | A | A |
| Shrub | 0-0.5 | A | A | A | A | A | A | A | A | A | A |
| Shrub | 0.5-1.0 | A | A | A | A | A | A | A | A | A | A |
| Shrub | 1.0-3.0 | A | A | A | A | A | A | A | A | A | A |
| Shrub | >3.0 | A | A | A | A | A | A | A | A | A | A |
| 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 | C | C | C | C | C | C | C | C | C | C |
| Tree | 25-50 | D | D | D | D | D | D | D | D | D | D |
| Tree | >50 | D | D | D | D | D | D | 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 |
| TIAM | Tilia americana | American 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 and American elm <35yrs. Sugar maple is not likely to establish immediately following fire, but regeneration may be heavy following windthrow events.

*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 |
| TIAM | Tilia americana | American basswood | Upper |
| QURU | Quercus rubra | Northern red oak | Upper |
| FAGR | Fagus grandifolia | American beech | Upper |

Description

Characterized by mid-succession maturing forest. In this stage there is the gradual decline of northern red oak and it is replaced by sugar maple and beech. American elm and basswood 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 |
| FAGR | Fagus grandifolia | American beech | Upper |
| TIAM | Tilia americana | American basswood | Upper |
| ULAM | Ulmus americana | American elm | Upper |

Description

Characterized by late-successional maturing forest. Forest dominated by sugar maple, beech, 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 |
| FAGR | Fagus grandifolia | American beech | Upper |
| TIAM | Tilia americana | American basswood | 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, beech, 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).

*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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