

13653

Boreal White Spruce-Fir-Hardwood Forest - Aspen-Birch

BpS Model/Description Version: Aug. 2020

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Vegetation Type

Forest and Woodland

Map Zones

41

Geographic Range

The sub-boreal aspen birch forest described here is documented throughout northern and northeastern Minnesota. It is found in sections 212M and 212L and subsection 212Nd (Aaseng et al. 2003).

In map zones (MZ)s 50 and 51, the aspen and birch component of this system is considered seral to other upland Biophysical Setting (BpS) units, including 1302, 1362, 1366 and 1407. The conifer component of this system is also indicative of lowland systems such as 1481.

Biophysical Site Description

This type occurs on a variety of soil types within its range. It is common on scoured bedrock terrain, stagnation moraines and till plains, and outwash plains (Aaseng et al. 2003). Within bedrock terrain it occurs on deeper soils 36-40in (Ohmann and Ream 1971).

Vegetation Description

Major deciduous species are trembling and bigtooth aspen, paper birch and red maple. Trembling aspen is often the most abundant species in early successional stages while bigtooth aspen, paper birch and red maple are common minor associates. Species considered late successional such as balsam fir, northern white-cedar and black and white spruce are usually present though not abundant during the early successional stages. By the later successional stage stands consist mainly of balsam fir with lesser components of aspen, birch, spruce and sometimes cedar. Historically, white and red pine were more common on the landscape prior to significant logging events in the late 1800s and early 1900s, and substantial areas were converted to this vegetation type. Isolated red and jack pine are likely remnants of previously logged sites, and may indicate a pine BpS (1362-1 or 1362-2) rather than this type. Shrub cover is often dense especially on rich sites, with beaked hazel being the most abundant tall shrub followed by mountain maple, round-leaf dogwood (*Cornus rugosa*) and green alder. Low shrubs are not always abundant and consist of bush honeysuckle, blueberry and dewberry. Depending on shading and site physiography the ground layer varies in abundance and diversity. Moist and more-open sites are more abundant, containing numerous herbs. Large-leaved aster is normally most abundant with wild sarsaparilla, bluebead-lily, star flower (*Trientalis borealis*), twisted stalk, lily-of-the-valley, ground pine (*Lycopodium dendroideum*) and club moss (*Lycopodium* spp.). As conditions become drier and

more nutrient-poor, blueberry, bracken fern, veiny pea (*Latyrus venous*) and bunchberry become common. In later successional stands the herb layer becomes sparse, though still having many of the same species, and coverage of Dicranium and Schreber's mosses increases (Heinselman 1996, Ohmann and Ream 1971).

BpS Dominant and Indicator Species

Symbol	Scientific Name	Common Name
POTR5	<i>Populus tremuloides</i>	Quaking aspen
BEPA	<i>Betula papyrifera</i>	Paper birch
ABBA	<i>Abies balsamea</i>	Balsam fir
ACRU	<i>Acer rubrum</i>	Red maple
DILO	<i>Diervilla lonicera</i>	Northern bush honeysuckle

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

Disturbance Description

The natural fire regime is one of stand replacement fires every 70-110yrs (Frelich 2002). Beginning with an aspen-birch early successional stage, spruce and fir present in the stand will increase in abundance over time. After 70-80yrs, the overstory aspen and birch trees begin to break apart due to insects, disease and windthrow. The conifers are usually well established in the understory at this point and will soon assume dominance in the overstory. The stand becomes more susceptible to fire and spruce budworm attacks as conifers increase in abundance. Periodic outbreaks of spruce budworm will kill much of the conifer overstory increasing the susceptibility to fire even more. It is only a matter of time before the stand burns. The post-fire stand composition typically retains the composition of the former parent stand however with a greatly shifted dominance. Assume birch, aspen and maple are still relatively abundant in the pre-fire stand, the post-fire stand will consist of a dense thicket of birch, aspen and maple sprouts with scattered spruce, fir and pine. The abundance of the latter species depends greatly on the availability of nearby seed sources typically in unburned patches.

Fire Frequency

Severity	Avg FI	Percent of All Fires	Min FI	Max FI
Replacement	114	68		
Moderate (Mixed)	247	32		
Low (Surface)				
All Fires	78	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

Historical fire size ranged from small acreages (<1000ac) to extremely large events (>100,000ac or 40,000ha) (Heinselman 1978).

Adjacency or Identification Concerns

This type encompasses a variety of communities described by other authors (Frelich 2002, Hop et al. 2001, Heinselman 1996, Ohmann and Ream 1971), namely, aspen-birch, aspen-birch-boreal conifer, birch-fir, maple-aspen-birch, spruce-fir-aspen and spruce-fir-birch-cedar. Each of these can be considered a different successional stage of the same community with some variation. This type is commonly referred to as mixedwood in Canada and refers to all successional stages.

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	A	A	A	A	A	A	A	A	A	A
Tree	10-25	UN	UN	UN	UN	UN	B	B	B	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	24	Early Development 1 - All Structures
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Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
POTR5	Populus tremuloides	Quaking aspen	Upper
BEPA	Betula papyrifera	Paper birch	Upper
ABBA	Abies balsamea	Balsam fir	Lower

Description

This is the regeneration phase often characterized by dense thickets of aspen, birch and maple sprouts and suckers. Conifers such as balsam fir, white and black spruce, white cedar and pine

are scattered throughout the stand (Aaseng et al. 2003). This is an even-aged cohort with sporadic inclusions of unburned patches.

Maximum Tree Size Class

Sapling >4.5ft; <5"DBH

Class B	27	Mid Development 1 - Closed
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Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
POTR5	Populus tremuloides	Quaking aspen	Upper
BEPA	Betula papyrifera	Paper birch	Upper
ABBA	Abies balsamea	Balsam fir	Low-Mid

Description

The stand moves through the stem exclusion phase and approaches "maturity." Most of the tree species that will occur in this type are now present. Aspen and birch dominate the overstory. Pines occasionally occur in the upper canopy as well. Balsam fir and spruce become abundant. White cedar occurs in some stands.

Maximum Tree Size Class

Pole 5-9" DBH

Class C	22	Late Development 1 - Closed
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Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
POTR5	Populus tremuloides	Quaking aspen	Upper
BEPA	Betula papyrifera	Paper birch	Upper
ABBA	Abies balsamea	Balsam fir	Mid-Upper
PIGL	Picea glauca	White spruce	Middle

Description

The overstory reaches "maturity," aspen and birch near their maximum height. These species still dominate the canopy but begin to succumb to disease and windthrow. The pines begin to overtop the upper canopy. Spruce and fir increase in density to the extent that a stand replacement fire is possible. These species begin to fill gaps in the canopy. Upper and middle canopies are apparent. Spruce budworm outbreaks are possible.

Maximum Tree Size Class

Medium 9-21"DBH

Class D	20	Late Development 2 - Closed
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Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
ABBA	Abies balsamea	Balsam fir	Upper
PIGL	Picea glauca	White spruce	Upper
BEPA	Betula papyrifera	Paper birch	Mid-Upper
PIST	Pinus strobus	Eastern white pine	Upper

Description

These stands are beyond the natural fire return interval. The overstory of aspen and birch breaks up due to windthrow and disease. The gaps are quickly filled with spruce, fir, cedar, and birch. Occasional red and white pine are present as super canopy trees. Spruce budworm outbreaks likely have or will occur. The stand is highly susceptible to fire. If fire does not occur, gap phase dynamics drive the system.

Maximum Tree Size Class

Medium 9-21"DBH

Class E	7	Late Development 3 - Closed
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Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
ABBA	Abies balsamea	Balsam fir	Upper
PIGL	Picea glauca	White spruce	Upper
THOC	Thalictrum occidentale	Western meadow-rue	Mid-Upper
PIMA	Picea mariana	Black spruce	Mid-Upper

Description

The stand succeeds to spruce/fir/birch/cedar. These species dominate the canopy. The original cohort of aspen and birch are all but gone. The supercanopy pine succumb to windthrow. Cedar and black spruce are common in the mid to upper canopy. Periodic spruce budworm outbreaks continue to occur (approximately every 31-37yrs (Frelich 2002)).

Maximum Tree Size Class

Medium 9-21"DBH

Model Parameters

Deterministic Transitions

From Class	Begins at (yr)	Succeeds to	After (years)
Early1:ALL	0	Mid1:CLS	30
Mid1:CLS	31	Late1:CLS	70
Late1:CLS	71	Late2:CLS	110

Late2:CLS	111	Late3:CLS	200
Late3:CLS	201	Late3: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	0.009	111	Yes	0
Mixed Fire	Mid1:CLS	Mid1:CLS	0.015	67	No	0
Replacement Fire	Late1:CLS	Early1:ALL	0.013	77	Yes	0
Insects or Disease	Late1:CLS	Late1:CLS	0.03	33	No	0
Replacement Fire	Late2:CLS	Early1:ALL	0.015	67	Yes	0
Insects or Disease	Late2:CLS	Late2:CLS	0.03	33	No	0
Replacement Fire	Late3:CLS	Early1:ALL	0.015	67	Yes	0
Insects or Disease	Late3:CLS	Late3:CLS	0.03	33	No	0

References

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