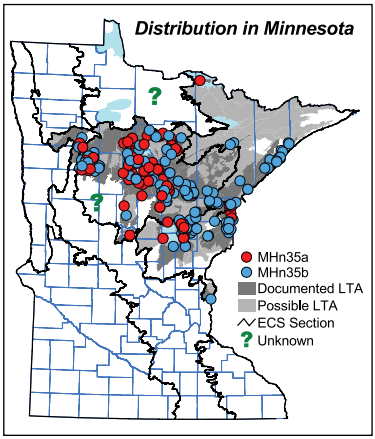
Northern Mesic Hardwood Forest

Mesic to dry-mesic hardwood forests on well-drained to moderately well-drained loamy soils, most often on stagnation moraines and till plains and less frequently on bedrock hills.

Vegetation Structure & Composition



Description is based on summary of vegetation data from 322 plots (relevés).

- **Ground-layer** cover is variable, ranging from sparse (5–25%) to continuous (> 75%). Wild sarsaparilla *(Aralia nudicaulis),* large-leaved aster *(Aster macrophyllus),* mountain rice grass *(Oryzopsis asperifolia),* rose twistedstalk *(Streptopus roseus)*, Canada mayflower *(Maianthemum canadense)*, and Pennsylvania sedge *(Carex pensylvanica)* are present in more than 85% of the sites, with Pennsylvania sedge often the most abundant ground-layer species present. Other common plants include wood anemone *(Anemone quinquefolia)*, sweet-scented bedstraw *(Galium triflorum),* large-flowered bellwort *(Uvularia grandiflora),* and bluebead lily *(Clintonia borealis).*
- **Shrub-layer** cover typically varies from patchy (25–50%) to continuous. Sugar maple is the most important species; other frequent species are beaked hazelnut *(Corylus cornuta),* chokecherry *(Prunus virginiana),* pagoda dogwood *(Cornus alternifolia)*, fly honeysuckle *(Lonicera canadensis),* and balsam fir.
- **Subcanopy** is often present, but cover is variable, with sugar maple and ironwood the most important species.
- **Tree canop**y is usually continuous (> 75% cover) and dominated by sugar maple or northern red oak with lesser amounts of basswood, or by variable mixtures of paper birch, sugar maple, basswood, and quaking aspen.

Landscape Setting & Soils

- **Stagnation moraines**—Common. Present on level areas within otherwise hummocky terrain. Parent material is fine-textured till with loamy or sandy-loam surface layers. The till is noncalcareous or calcareous only at depths greater than 40in (100cm). Firm, clayey subsoil horizons that perch snowmelt and rainfall are present, but there is no indication of prolonged soil saturation. Soils are well drained. Soil-moisture regime is fresh. (Chippewa Plains, Pine Moraines & Outwash Plains, and St. Louis Moraines in MDL; WSU; North Shore Highlands in NSU; Hardwood Hills in MIM)
- **Till plains**—Occasional. Landscape is level to rolling with long, gentle slopes. Parent material is noncalcareous sandy-loam till or finer-textured till that is weakly calcareous below 40in (100cm). Subsoil horizons that can perch snowmelt or rainfall are present. In coarser drift, these subsoil horizons are firm because of partial cementation of soil particles. In finer-textured drift, subsoil horizons are firm because of accumulation of clay particles. In rolling topography, soils are well drained, and the soil-moisture regime is fresh. In level terrain and on lower slopes, soils are moderately well drained, and the soil-moisture regime is moderately moist. (Chippewa Plains, Pine Moraines & Outwash Plains, and St. Louis Moraines in MDL; WSU; North Shore Highlands in NSU; Hardwood Hills in MIM)
- **Scoured bedrock terrain**—Occasional. Landscape is rugged with steep slopes. Parent material is a discontinuous mantle of noncalcareous till and bouldery colluvium, about 20–50in (50–125cm) thick, over bedrock. In some places wind- or water-deposited silt is present on the surface. There is no indication of prolonged soil saturation, but the underlying bedrock may serve to perch snowmelt and rainfall. Soils are well drained,

and because they are very shallow, the soil-moisture regime is dry. (North Shore Highlands in NSU)

- **Dissected glacial lake sediments**—Rare. Present on moderate to steep slopes in rugged terrain. Parent material is stratified fine sand, silt, and, less often, clay. The soil surface is loamy and leached of carbonates to at least 20in (50cm). Soil drainage depends mostly on slope, with steep slopes well drained, and flatter slopes somewhat poorly drained. Soil moisture regime is moderately moist to moist because of the tendency of groundwater to flow to the soil surface through coarser strata in the lake sediments. (SSU)

Natural History

In the past, catastrophic disturbances were rare in MHn35. An analysis of Public Land Survey records indicates that the rotation of catastrophic fires was about 970 years, and the rotation of catastrophic windthrow was in excess of 1,000 years. Events that result in partial loss of trees, such as light surface fires and patchy windthrow, were more common, with an estimated rotation of about 130 years. Based on the historic composition and age structure of these forests, MHn35 had three growth stages separated by two periods of transition.

- **0–55 years**—Young forests recovering from fire or wind, dominated by paper birch and quaking aspen with less sugar maple, northern red oak, and basswood.
- **55–95 years**—A transition period marked by a gradual decline in paper birch, aspen, and northern red oak and their replacement by sugar maple, white spruce, and basswood. Some white pine seedlings become established in the understory during this transition.
- **95–205 years**—Mature forests characterized by mixed canopies of paper birch, sugar maple, and white spruce, with less basswood and white pine. Some old aspen and northern red oak persist in this stage. Sugar maple and basswood seedlings and saplings are present in the understory.
- **205–295 years**—A transition period marked by a significant increase in white spruce and white pine, and a corresponding decline in paper birch.
- **> 295 years**—Very old forests dominated by white pine and sugar maple with modest amounts of paper birch. Sugar maple seedlings and saplings dominate the understory. (The apparent succession of the community to white pine may be due to the fact that white pine is the only tree in these settings that regularly lives for more than 200 years. These old forests were uncommon and probably occurred as scattered groves of very large white pine mixed with younger white spruce and paper birch.)

Similar Native Plant Community Classes

- **MHn47 Northern Rich Mesic Hardwood Forest**

MHn47 is similar to sugar maple–dominated stands of MHn35 (MHn35b) but occurs on moister and richer sites (often the difference in soil moisture and richness is due to the presence of a wind-deposited silt cap in MHn47 and its general absence in MHn35). MHn47 is more likely to have species characteristic of WFn communities, while MHn35 often has species indicative of the occurrence of light surface fires in the past.

MHn35 Indicator Species	(freq%) *MHn35*	MHn47
Hairy honeysuckle *(Lonicera hirsuta)*	**25**	2
Veiny pea *(Lathyrus venosus)*	**21**	2
Bracken *(Pteridium aquilinum)*	**39**	5
Pale vetchling *(Lathyrus ochroleucus)*	**36**	7
Juneberries *(Amelanchier* spp.)	**53**	14
Northern red oak (C)	**60**	17
Bush honeysuckle *(Diervilla lonicera)*	**30**	9
Red maple (C,U)	**60**	20

MHn47 Indicator Species	(freq%) MHn35	*MHn47*
Wild leek *(Allium tricoccum)*	1	**22**
Alpine enchanter's nightshade *(Circaea alpina)*	1	**30**
Ostrich fern *(Matteuccia struthiopteris)*	1	**21**
Jack-in-the-pulpit *(Arisaema triphyllum)*	10	**69**
Blue cohosh *(Caulophyllum thalictroides)*	6	**40**
Nodding trillium *(Trillium cernuum)*	9	**43**
Wild ginger *(Asarum canadense)*	12	**49**
Yellow birch (C)	15	**48**

- **MHn45 Northern Mesic Hardwood (Cedar) Forest**

The ranges of MHn45 and MHn35 overlap in northeastern Minnesota, mainly in the North Shore Highlands Subsection in NSU.

MHn35 Indicator Species	(freq%) MHn35	MHn45
Early meadow-rue *(Thalictrum dioicum)*	**47**	-
Leatherwood *(Dirca palustris)*	**42**	-
Pale vetchling *(Lathyrus ochroleucus)*	**40**	-
Ironwood (U)	**83**	2
Northern red oak (C,U)	**81**	2
Zigzag goldenrod (Solidago flexicaulis)	**38**	1
Round-lobed hepatica *(Anemone americana)*	**60**	2
Basswood (C,U)	**80**	8

MHn45 Indicator Species	(freq%) MHn35	MHn45
Carolina spring beauty *(Claytonia caroliniana)*	-	**34**
Red-berried elder *(Sambucus racemosa)*	1	**34**
Mountain ashes (U)	3	**49**
Alpine enchanter's nightshade *(Circaea alpina)*	3	**34**
Thimbleberry *(Rubus parviflorus)*	4	**43**
Shining firmoss *(Huperzia lucidula)*	6	**44**
Common oak fern *(Gymnocarpium dryopteris)*	9	**44**
Spinulose shield fern or Glandular wood fern*	16	**76**

*Spinulose shield fern or Glandular wood fern *(Dryopteris carthusiana* or *D. intermedia)*

- **MHc26 Central Dry-Mesic Oak-Aspen Forest**

MHc26 can have similar tree canopy composition to MHn35 (although MHc26 is more likely to be dominated by northern red oak, while MHn35 is more likely to be strongly dominated by sugar maple), and the two communities have broadly overlapping ranges in the WSU, MDL, and northern MIM. MHc26 is more likely to have some plants indicative of occasional burning or soil disturbance, while MHn35 is more likely to have species with affinity for WFn communities.

MHn35 Indicator Species	(freq%) MHn35	MHc26
Groundpine*	**36**	4
White spruce (U)	**18**	2
Balsam fir (C,U)	**51**	8
Wild ginger *(Asarum canadense)*	**23**	4
Long-stalked sedge *(Carex pedunculata)*	**38**	12
Bunchberry *(Cornus canadensis)*	**15**	5
Sugar maple (C)	**82**	29
Bluebead lily *(Clintonia borealis)*	**71**	27

MHc26 Indicator Species	(freq%) MHn35	MHc26
Gray dogwood *(Cornus racemosa)*	2	**21**
Black cherry (U)	6	**54**
Pointed-leaved tick trefoil *(Desmodium glutinosum)*	7	**48**
Blue beech (U)	4	**20**
Poison ivy *(Toxicodendron rydbergii)*	11	**46**
Lowbush blueberry *(Vaccinium angustifolium)*	12	**43**
Wild honeysuckle *(Lonicera dioica)*	7	**24**
Large-flowered trillium *(Trillium grandiflorum)*	8	**29**

*Groundpine *(Lycopodium dendroideum* or *L. hickeyi)*

- **MHn44 Northern Wet-Mesic Boreal Hardwood-Conifer Forest**

MHn44 can be similar to stands of MHn35 in which quaking aspen is abundant in the canopy (MHn35a). MHn44 is more likely to have species with affinity for WFn communities, indicating moister soil conditions and the common presence of wet depressions. MHn35 is more likely to have species with affinity for well-drained soils and less likely to have wet depressions.

MHn35 Indicator Species	(freq%) MHn35	MHn44
Leatherwood *(Dirca palustris)*	**44**	3
Ironwood (C)	**22**	2
Ironwood (U)	**74**	15
Big-toothed aspen (C)	**16**	3
Northern red oak (C)	**31**	8
Common false Solomon's seal *(Smilacina racemosa)*	**17**	5
Sugar maple (C,U)	**90**	32
Basswood (C)	**55**	20

MHn44 Indicator Species	(freq%) MHn35	MHn44
Balsam poplar (U)	2	**24**
Bladder sedge *(Carex intumescens)*	2	**20**
White spruce (C)	5	**31**
Swamp red currant *(Ribes triste)*	6	**27**
Naked miterwort *(Mitella nuda)*	14	**55**
Balsam fir (C)	11	**41**
Palmate sweet coltsfoot *(Petasites frigidus)*	14	**49**
Black ash (U)	22	**68**

- **MHc37 Central Mesic Hardwood Forest (Western)**

MHc37 is similar to MHn35, although the two classes overlap geographically only in the extreme western MDL and in the northern part of the Hardwood Hills Subsection in the MIM.

MHn35 Indicator Species	(freq%) MHn35	MHc37
Starflower *(Trientalis borealis)*	**61**	-
Groundpine*	**36**	-
Red maple (C)	**31**	-
Bluebead lily *(Clintonia borealis)*	**71**	1
Fly honeysuckle *(Lonicera canadensis)*	**62**	3
Red maple (U)	**64**	7
Bearded shorthusk *(Brachyelytrum erectum)*	**35**	5
Balsam fir (U)	**51**	8

MHc37 Indicator Species	(freq%) MHn35	MHc37
Lopseed *(Phryma leptostachya)*	1	**50**
Common enchanter's nightshade *(Circaea lutetiana)*	1	**25**
Bloodroot *(Sanguinaria canadensis)*	4	**48**
American elm (C)	3	**30**
Blue cohosh *(Caulophyllum thalictroides)*	4	**37**
American hazelnut *(Corylus americana)*	6	**37**
Pointed-leaved tick trefoil *(Desmodium glutinosum)*	7	**30**
American elm (U)	17	**73**

*Groundpine *(Lycopodium dendroideum* or *L. hickeyi)*

Native Plant Community Types in Class

(Note: The community types described below have considerable overlap in species composition; in the field, many sites may appear intermediate between the two.)

• **MHn35a Aspen - Birch - Basswood Forest**

Canopy is composed of variable mixtures of paper birch, sugar maple, basswood, quaking aspen, and red maple, with northern red oak, bur oak, big-toothed aspen, and white pine sometimes important. Sugar maple is often abundant in the subcanopy. Beaked hazelnut, mountain maple *(Acer spicatum)*, bush honeysuckle *(Diervilla lonicera),* and round-leaved dogwood *(Cornus rugosa)* tend to be more abundant in the shrub layer in MHn35a than in MHn35b. Likewise, wild sarsaparilla, large-leaved aster, and Canada mayflower are considerably more abundant in the ground layer in MHn35a, together usually providing more than half of the ground-layer cover. When present, prickly or smooth wild rose *(Rosa acicularis* or *R. blanda)*, trailing blackberries *(Rubus flagellaris* and similar *Rubus* species), bunchberry *(Cornus canadensis)*, and wild ginger *(Asarum canadense)* help to distinguish MHn35a from MHn35b. The range of MHn35a is centered in the MDL, but MHn35a also occurs in the WSU, SSU, and northern MIM. Description is based on summary of vegetation data from 125 plots.

• **MHn35b Red Oak - Sugar Maple - Basswood - (Bluebead Lily) Forest**

Canopy typically has sugar maple, basswood, and northern red oak as important components, along with smaller amounts of paper birch and red maple and occasionally some yellow birch or quaking aspen. Sugar maple and ironwood are common and sometimes abundant in the subcanopy. MHn35b includes northern red oak–dominated forests on bedrock ridges and south- to east-facing slopes in the North Shore Highlands Subsection in the NSU. These forests may be relatively open, especially on bedrock ridges. Balsam fir and juneberries *(Amelanchier* spp.) are common in the understory in these settings. MHn35b is also represented by forests in the St. Croix River valley in which white pine forms a supercanopy over mesic hardwood species such as sugar maple, northern red oak, and yellow birch. These forests are now extremely limited in extent, although they may have been more common before white pine logging began in the valley in the mid-1800s. Species that help somewhat in distinguishing MHn35b from MHn35a include common false Solomon's seal *(Smilacina racemosa),* American spikenard *(Aralia racemosa),* and groundpines *(Lycopodium dendroideum* or *L. hickeyi)*. MHn35b has been documented in the MDL, the northern half of WSU, the southern half of NSU, and in the northern MIM. Description is based on summary of vegetation data from 196 plots.

photo by K.A. Rusterholz MN DNR

Tettegouche State Park, Lake County, MN

MHn35 Northern Mesic Hardwood Forest – Species Frequency & Cover

	freq%	cover
Forbs, Ferns & Fern Allies		
Wild sarsaparilla *(Aralia nudicaulis)*	94	●●●
Large-leaved aster *(Aster macrophyllus)*	93	●●
Rose twistedstalk *(Streptopus roseus)*	87	●
Canada mayflower *(Maianthemum canadense)*	86	●●
Wood anemone *(Anemone quinquefolia)*	74	●
Large-flowered bellwort *(Uvularia grandiflora)*	73	●●
Sweet-scented bedstraw *(Galium triflorum)*	73	●
Bluebead lily *(Clintonia borealis)*	71	●
Clayton's sweet cicely *(Osmorhiza claytonii)*	67	●
Hairy Solomon's seal *(Polygonatum pubescens)*	61	●
Starflower *(Trientalis borealis)*	61	●
Round-lobed hepatica *(Anemone americana)*	60	●
Lady fern *(Athyrium filix-femina)*	59	●●
Pale bellwort *(Uvularia sessilifolia)*	54	●
Bracken *(Pteridium aquilinum)*	51	●●
Rugulose or Yellow violet *(Viola canadensis* or *V. pubescens)*	50	●
Dwarf raspberry *(Rubus pubescens)*	48	●
Early meadow-rue *(Thalictrum dioicum)*	47	●
Rattlesnake fern *(Botrychium virginianum)*	46	●
Pale vetchling *(Lathyrus ochroleucus)*	40	●
Maryland black snakeroot *(Sanicula marilandica)*	39	●
Common strawberry *(Fragaria virginiana)*	39	●
Red baneberry *(Actaea rubra)*	39	●
Zigzag goldenrod *(Solidago flexicaulis)*	38	●
Groundpine *(Lycopodium dendroideum* or *L. hickeyi)*	36	●
American spikenard *(Aralia racemosa)*	35	●
Common false Solomon's seal *(Smilacina racemosa)*	32	●
Wild ginger *(Asarum canadense)*	23	●
Veiny pea *(Lathyrus venosus)*	22	●
Elliptic shinleaf *(Pyrola elliptica)*	22	●
Lindley's aster *(Aster ciliolatus)*	21	●
Interrupted fern *(Osmunda claytoniana)*	16	●●
Grasses & Sedges		
Mountain rice grass *(Oryzopsis asperifolia)*	91	●●
Pennsylvania sedge *(Carex pensylvanica)*	85	●●●
Long-stalked sedge *(Carex pedunculata)*	38	●
Bearded shorthusk *(Brachyelytrum erectum)*	35	●
Drooping wood sedge *(Carex arctata)*	17	●
Low Shrubs		
Trailing blackberries *(Rubus flagellaris* and similar *Rubus* spp.)	14	●●
Lowbush blueberry *(Vaccinium angustifolium)*	12	●
Shrubs		
Beaked hazelnut *(Corylus cornuta)*	86	●●●
Chokecherry *(Prunus virginiana)*	72	●
Fly honeysuckle *(Lonicera canadensis)*	62	●
Pagoda dogwood *(Cornus alternifolia)*	62	●
Juneberries *(Amelanchier* spp.)	52	●
Mountain maple *(Acer spicatum)*	49	●●
Bush honeysuckle *(Diervilla lonicera)*	45	●
Leatherwood *(Dirca palustris)*	42	●●
Downy arrowwood *(Viburnum rafinesquianum)*	41	●
Prickly gooseberry *(Ribes cynosbati)*	34	●
Hairy honeysuckle *(Lonicera hirsuta)*	24	●
Round-leaved dogwood *(Cornus rugosa)*	18	●

Trees	Canopy		Subcanopy		Shrub Layer	
	freq%	cover	freq%	cover	freq%	cover
Sugar maple	82	●●●●	88	●●●●	93	●●●●
Basswood	65	●●●	52	●●●	67	●
Paper birch	61	●●●	31	●●●	12	●
Northern red oak	49	●●●	25	●●	77	●
Quaking aspen	31	●●●	13	●●	44	●
Red maple	31	●●●	37	●●	60	●
Ironwood	24	●●	68	●●●	72	●●
Big-toothed aspen	13	●●●	-	-	9	●
Bur oak	11	●●	9	●●	12	●
Yellow birch	10	●●	8	●●	-	-
Balsam fir	8	●●	18	●●	48	●
White spruce	-	-	8	●	14	●