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## MINNESOTA

Lee Frelich has calculated that as of 1992 Minnesota had 264,023 ha (652,137 acres) of primary forest. The types in order of decreasing prominence were as follows: Northern White-cedar 66,653 ha, spruce-fir 47,471 ha, Black Spruce-Tamarack 44,516 ha, Jack Pine 39,984 ha; aspen-birch 35,370 ha, Red Pine and White Pine 22,339 ha, northern hardwood 4549 ha, riverbottom 2684 ha, oak-hickory 456 ha. The percentage of primary forest that is composed of long-lived species that are more than 120 years in age, ie old growth according to the definition in Minnesota, was not known. Presettlement forest covered 10,964,800 ha (27,083,056 acres) in Minnesota, Frelich estimated. The state's primary forest in 1992 was therefore 2.4% of the presettlement forest (Frelich 1995).

Minnesota's largest areas of virgin landscape are the Boundary Waters Canoe Area Wilderness (BWCAW) in Superior National Forest in the northeast and the peatlands scattered across the north-central and northeastern portions of the state. The aspen parklands in the northwest are also extensive and are relatively little disturbed.

In 1991 Minnesota protected 146,000 acres of peatland in Peatland Scientific and Natural Areas, comprising the state-owned land in the core areas of 16 ecologically significant peatlands. Not protected by the state in the cores are 6641 acres of county-owned land and 2312 acres of privately owned land. The state wants to acquire the latter. Also left out of the Natural Areas are 323,000 acres of watersheds that surround the cores. Scientists deem protection of these watersheds essential to the survival of the peatlands. Nevertheless, the watersheds were omitted in order to obtain consensus for the protection of the core areas. A state law incorporating a no-net-loss-of-wetlands policy will be used to protect the hydrological systems of the watersheds.

The small amount of commercial timber associated with the peatlands is mostly in the areas characterized as watersheds rather than within the Scientific and Natural Areas. Each core area has some forest (almost all non-commercial), but the dominant cover of most is not forest. Exceptions are spring fens, i.e. fen tracks emanating from forested tracts. The core area of Red Lake Peatland, for example, is 83,000 acres in size, with probably only some 2% forested (Djupstrom 1993). The peatlands are composed of fens, swamps, and bogs. The fens resemble meadows. The swamps are dominated by Black Spruce, Northern White-cedar, or Tamarack. The bogs are usually dominated by mosses, ericaceous shrubs, and some sedges; but they may be either unforested, or forested with Black Spruce or Tamarack.

The core areas of the peatlands are generally little disturbed except for unsuccessful attempts at drainage in certain areas (Rusterholz 1989) and the harvesting of stunted Black Spruce for Christmas decorations. Most of the timber activities in watershed areas involve crossing sensitive lands to reach timber elsewhere. The crossing is done only in winter, when the peatland is frozen, but can cause damage unless done under special guidelines (Djupstrom 1993). Two of the 16 protected peatlands are described below.

The BWCAW contains an estimated 400,154 acres of unlogged forest, according to Lee Frelich (348,644 acres of standing forest and 51,510 acres that were blown down in 1999). Frelich bases the figures largely on data from Heinselman (1996) and on his own work on the Environmental Impact Statement for proposed prescribed burns in the area of the blowdown (Frelich 2001 and 2002). (See below for more details.)

The aspen parklands in Minnesota comprise some 200,000 acres of "more or less natural land" concentrated in about six core areas spread out across eastern Kittson County and northwestern Roseau County. (An additional, adjacent 50,000 acres of "more or less natural" aspen parklands are found in Manitoba, Canada, where they extend 20 miles from the US-Canada border. The 50,000 acres are managed by The Nature Conservancy of Canada.) The parklands are a mosaic of aspen patches, prairie patches, wetlands, and brush prairie with scattered to dense shrubs. Bur Oak appears sparingly amidst the Quaking Aspen groves in the uplands. In the wetlands are Balsam Poplar, Quaking Aspen, and, along the rivers, American Elm, Green Ash, and Peachleaf Willow. Also present are oak brush and dogwood brush. Roads, ditches, and agricultural land separate the core areas. The parklands are subject to episodes of severe drought, and wildfires have been frequent for 5000-8000 years. Fragmentation brought about by agricultural development has decreased the frequency of fires, yet the parklands may still be the most functional of tallgrass prairie and savanna landscapes (Chapman 1993, Reisz 2001).

Three high-quality areas of aspen parkland are in Wildlife Management Areas in Kittson County: Skull Lake, Beaches, and Caribou. Skull Lake Wildlife Management Area (6360 acres) contains savanna and dune prairie; Beaches Lake (18,426 acres), aspen/oak forest and wet prairie; Caribou (7861 acres), open wet prairie with aspen clones. Reisz describes these areas as "some of the best examples of functional landscapes in the Northern Tallgrass Prairie Ecoregion (2001).

Ancient Northern White-cedar are found on bluffs and other rocky sites around the Great Lakes, including the Boundary Waters Canoe Area Wilderness (BWCAW) and the volcanic rocks on the North Shore of Lake Superior. Lee Frelich has discovered Northern White-cedar, possibly as old as 2000 years (2001). Islands in Seagull Lake (Cook County) in the BWCAW support "excellent" examples of ancient cedar. The largest of the 250 islands, Threemile Island, has several stands. One is on a small bay protected by a granite peninsula. The peninsula is only about 50 feet in length; on the outer edge are six cedars, each 500 to 1000 years old. "The head of the bay has a dense, swampy, all-aged cedar forest with trees that blew down hundreds of years ago and are still alive. The branches of the toppled trees have turned up "to become individual trees that are now acquiring ancient characteristics themselves" (Frelich 2002). Other ancient Northern White-cedar grow at Basswood Lake (Becker County) (Frelich 2001).

D. W. Larson et al. have cored ancient white-cedar on bluffs above the Mississippi River in Dakota (Winona County) (2000). Frelich notes that ancient cedars are common in swamps in the BWCAW (Frelich 2001).

Minnesota supports remnant savanna sites that have had little or no logging but that cannot be categorized as old growth, because they have been extensively grazed by livestock and have suffered from fire suppression. Any logging would have been limited to occasional cutting for fuel wood, since the trees are not good-quality timber. Some of

the savannas include land that has been plowed, but the areas were for the most part spared farming, because of their sandy soil. We list five high-quality savannas, all of which are in state-owned Scientific and Natural Areas and are subject to prescribed burning: **Prairie Smoke Dunes**, northwestern Minnesota (Norman County): 1107 acres of Bur Oak-Northern Pin Oak remnant sand savanna and open dune faces on which aspen are encroaching; **Uncas Sand Dunes**, northwest of Minneapolis (Sherburne County): a 745-acre area with primary Bur Oak-Northern Pin Oak savanna on sand dunes, which are interspersed with old pine plantations (MDNR is cutting out the planted pines); **Agassiz Dunes**, northwestern Minnesota (Norman County): a 435-acre tract of sand dune blow outs with Bur Oak-Northern Pin Oak sand savanna (aspen are encroaching on the site); **Saint Croix Savanna**, southeastern Minnesota (Washington County): a 112-acre area, of which approximately 64 acres are hill prairie, here essentially primary sand savanna with Bur Oak-Northern Pin Oak; **Helen Alison Natural Area**, north of Minneapolis (Anoka County): an 86-acre area, of which 60 acres are primary Northern Pin Oak-Bur Oak sand savanna (Djupstrom 1993; MDNR 2002).

The Minnesota Department of Natural Resources (MDNR) is conducting a state-wide old-growth inventory on state land. The department was required to adopt old-growth guidelines by January 1, 1991, as the result of an out-of-court settlement of a lawsuit challenging the environmental review of a proposed forest products plant. As a result, in 1990 MDNR area and regional staff developed a candidate list of old-growth sites. MDNR began evaluating candidate sites in the field in 1993. By the end of 2002, MDNR had designated 38,000 acres of old-growth forest (29,718 acres of actual old growth and 8282 acres of potential future old growth). These were stands of high quality. They had rejected for preservation as old growth 32,000 acres of candidate stands that were of lower quality or that failed to qualify for other reasons. At the end of 2002 one subsection, Hardwood Hills, had yet to be evaluated. In 1994 a goal of 690 acres of designated old growth had been set for Hardwood Hills.

MDNR defines as old-growth forest, communities that are dominated by long-lived tree species and that have not experienced catastrophic man-made or natural disturbance for a long period of time. For MDNR long means 120 years in relation to all old-growth species except White Spruce, for which the time period is 90 years. MDNR eliminates from consideration as old growth aspen-birch communities, White Birch, and Jack Pine.

Sites that MDNR designates as old growth are protected from logging. However, approximately 70% of all designated sites are less than 50 acres in size and thus would be extremely vulnerable to other forms of disruption. To maintain the viability of the old growth, MDNR establishes a buffer, called a "Special Management Zone" (SMZ), around each site. The buffer extends at least 330 feet in every direction from the edge of each old-growth stand. Logging is allowed in the SMZ, but wherever possible only on extended rotation and by methods other than clearcutting.

Minnesota is comprised of four ecological provinces: tallgrass aspen parklands, prairie parkland, Laurentian mixed forest (coniferous forest), and eastern broadleaf forest. Based on the definition of old-growth forest used by the Minnesota Department of Natural Resources, only the latter two of those provinces contain old growth. The

overwhelming majority of the old growth sites are in the Laurentian mixed forest.

The 38,000 acres of designated actual and future old growth are found on four different classifications of land administered by MDNR: Scientific and Natural Areas (SNAs)(1820 acres), Wildlife Management Areas (WMAs) (2191 acres), State Parks (8669 acres), and lands administered by Forestry (25,426 acres--“Forestry lands in the Boundary Waters Canoe Area Wilderness/Shipstead-Nolan Act: no harvest areas” [4050 acres] and “Forestry Timberlands” [21,376 acres]). Given the large number of old-growth sites in Minnesota, we have had to be selective in our listing. Because descriptions of old growth in Scientific and Natural Areas are more readily available than are such descriptions of other types of areas, our chapter pays disproportionate attention to the SNAs.

The following state lands that we do not describe below have 300 or more designated acres of actual old growth: Bowstring State Forest (801 acres), Buena Vista State Forest (608 acres), Cloquet Valley State Forest (311 acres), Finland State Forest (1631 acres), George Washington State Forest (625 acres), Grand Portage State Forest (640 acres), Jay Cooke State Park (312 acres), Koochiching State Forest (1283 acres), Pine Island State Forest (750 acres), Red Lake Wildlife Management Area (702 acres), Savanna Portage State Park (2023 acres), Smoky Hills State Forest (376 acres), White Earth State Forest (400 acres), and Whitewater Wildlife Management Area (491 acres).

In 2003 the Chippewa and Superior National Forests are in the process of revising their respective forest management plans. The US Forest Service (USFS) has compiled a joint Draft Environmental Impact Statement (EIS) and separate management plans for the two forests. In preparing to write the documents, the staff of each forest studied old growth.

In 1993 USFS described for the first edition of our survey four specific stands on the Chippewa, three of which were entirely or mostly in Research Natural Areas (RNAs). Since 1996, USFS has scored forty pine and hardwood stands with an old-growth scoring system developed by Minnesota’s Department of Natural Resources (MDNR). They found only a few, small stands that met the definition of old growth that USFS developed from MDNR’s system.

Also since 1993, USFS teams on the Chippewa have identified “old-growth complexes” and “core areas,” overlapping concepts that became “potential candidate special management complexes” in documents pertaining to the revision of the forest management plan. The teams apparently identified the complexes largely through consultation of databases, supplemented by talking to local people.

Various alternatives in the draft management plan include proposed candidate special management complexes and/or proposed candidate RNAs. The complexes and RNAs may overlap. For instance, a proposed complex may include a proposed RNA. Some of the proposed complexes and RNAs encompass old growth. However, USFS’s main aim is to set aside the best representatives of their respective types of forest. The best representatives are not necessarily old growth. Therefore, a list of the proposed candidates does not indicate the locations of old growth, Al Williamson, Forest Ecologist said. He was unwilling to give us a list or to discuss specific proposed sites. Ten proposed sites are named in the Draft Environmental Impact Statement, but the names (Cutfoot Sioux, Flora Lake, Goche Lake, Mississippi, North Fork, Ottertail, Pimushe

Lake, Sucker Bay, Sunken Lake, and Trout Lake) do not resemble the names of the well-known old-growth sites in the Forest.

The least harvested stands on the Chippewa are lowland stands, most of which have been altered by ditching and draining, Williamson said. The second least harvested stands are northern hardwoods, from which most of the White Pine has been removed. Therefore, whether or not old growth can be found to any extent on the Chippewa depends on how much human disruption one allows, he noted (Williamson 2001).

For the Superior National Forest, Robin Vora drew up a list of “Potential Natural Areas, Including Representative Ecosystems, on the Superior National Forest,” excluding land protected as

Wilderness, State Parks or State Scientific and Natural Areas (SNAs). He concentrated on using existing information, “field knowledge, maps, and high-altitude aerial photographs.” His report, published in January 1997, recommended 93 areas for further field inventory. Using Vora’s report, the staff of the National Forest drew up a list of 45 sites for field work in the summer of 1997. Chel Anderson conducted the field work, and in December 1997 her report “Evaluation of Selected Potential Candidate Research Natural Areas . . .” appeared.

The various alternative forest plans for Superior National Forest include, depending on alternative, up to 41 potential candidate RNAs. Most, but not all of them, appeared in Vora’s and Anderson’s reports. Lula supplied us with a list of the potential candidates, with their acreage. (This list later appeared in the Draft Environmental Impact Statement.) He told us, however, that the document describing the potential RNAs is too lengthy for reproduction. Therefore, for this survey, we have included information on existing RNAs with old growth and on a selection of the potential candidates, based on Vora’s and Anderson’s reports. We are unable to give exact acreage for the old growth, as neither Lula’s list nor Vora’s report contains such figures, and Anderson seldom gives them. Furthermore, certain areas have apparently been partially logged since they were described in the 1997 reports.

#### **SUPERIOR NATIONAL FOREST**, in northeastern Minnesota

--**Boundary Waters Canoe Area Wilderness.** As stated above, an estimated 400,154 acres of never-logged forest, of which 51,510 acres blew down in 1999. Frelich breaks this forest into three types: Red and White Pine (61,675 acres of which 8108 acres have blown down); Jack Pine (301,979 acres of which 39,922 acres have blown down); lowland conifer/ash (36,500 acres, of which 3480 have blown down). He states that in addition the forest has 21,400 acres of primary “lichen” community with scattered dwarf trees (mostly Jack Pine, Red Pine, White Pine, Bur Oak, Northern White-cedar, and Black Spruce); and, scattered along lake shores, small groves of ancient Northern White-cedar. The groves are generally 0.1 acres or less and thus do not show up in inventories; but several hundred of them may exist (Frelich 2002).

Heinselmann’s 1996 book broke the types down into finer categories. We give his figures for ecosystems dominated by trees, though these figures are somewhat out of date, as an additional indication of the character of the area. UPLAND TYPES: Jack Pine-oak (21,400 acres, 4.7% of total area); Red Pine (17,700 acres, 3.9%); Jack Pine-Black Spruce (50,900 acres, 11.2%); Jack Pine-fir (28,700 acres, 6.3%); Black Spruce-feathermoss (28,700 acres, 6.3%); aspen-birch (28,700 acres, 6.3%); aspen-birch-White

Pine (21,400 acres, 4.7%); maple-aspen-birch (32,300 acres, 7.1%); maple-aspen-birch-fir (28,700 acres, 6.3%); fir-birch (72,800 acres, 16.0%); Northern White-cedar (17,700 acres, 3.9%); LOWLAND TYPES: mixed conifer swamp forest (2300 acres, 0.5%); Black Spruce bog forest (33,200 acres, 7.3%); Tamarack bog forest (500 acres, 0.1%); Sphagnum-Black Spruce bog (9500 acres, 2.1%); ash-elm-swamp forest (500 acres, 0.1%); alder-willow wetland (11,400 acres, 2.5%) (Heinselman 1996).

Within the BWCA is the Lac La Croix Research Natural Area (St. Louis County): a 973-acre RNA with a 440-acre virgin, old-growth Great Lakes pine forest. The forest "is dominated by Red Pine on ridges and steep slopes and by White Pine on lower slopes and draws" (Rusterholz 1989, 1993).

--**Candle Lake** (St. Louis County). A potential RNA of 408 acres, including 163 lowland acres that are now classified as suitable for logging. Anderson evaluated 900 acres in the area, including 165 acres of Northern White-cedar with Balsam Fir in the subcanopy. The stand showed "very scattered evidence of previous logging." Known as Lake Leander Cedar, this stand is presumably largely within the proposed candidate RNA. (The stand extends into state land.) The 900 acres also included "a largely undisturbed black ash and cedar wetland complex along the north side."

--**Dragon Lake** (Lake County). A potential RNA of 2085 acres, with old-growth Red and White Pine. The proposed candidate includes 1630 acres of upland and 181 of lowland forest now classified as suitable for logging. Vora gave a 4140-acre Dragon Lake site (including lakes) the highest ranking of any natural area on the Superior National Forest, with 81 out of a possible 93 points overall and 16 out of a possible 20 for lack of disturbance. Anderson characterized the 4140 acres: "red pine forest, old growth, unthinned and thinned; white pine forest, old growth, unthinned and thinned; paper birch and aspen forest; black spruce, white cedar and mixed conifer swamp, including old growth" (Anderson 1997; Vora 1997).

--**Fall River Patterned Fen** (Cook County). A potential RNA of 988 acres, 426 of which are lowlands. The only trees in the fen are Black Spruce on sphagnum hammocks, but the fen is undisturbed (Anderson 1997).

--**Kawishiwi Pines** (Lake County). A 471-acre potential RNA that includes at least 240 acres of old-growth Red and White Pine (Lula 2002; MDNR 2002). Adjacent to the 471 acres is the state-owned 80-acre Kawishiwi Triangle Scientific and Natural Area with 29 acres of old-growth White Pine. The state-owned pines and presumably the USFS-owned pines date from regeneration following fires in 1854 (MDNR 2002).

--**Keeley Lake Research Natural Area** (Lake County). A 640-acre RNA within a 1280-acre tract that is 70% upland forest and 30% bog forest, with rock outcrops, streams, and the 121-acre Harris Lake. The larger area "has not been cut and has not had a significant burn for over 100 years." The upland forest is dominated by Jack Pine, in pure stands and in a mixture with Black Spruce, Quaking Aspen, Red Pine, and White Pine, the last two frequent only near the lake. The scattered lowlands support open meadows edged by alder thickets, and bogs with early to mature Black Spruce bog forest (Williams 1993).

--**Lake Agnes Hardwoods** (Lake County). Three hundred sixty acres of old-growth northern hardwoods: 260 acres in Superior National Forest, 80 acres of which are in the 792-acre candidate Lake Agnes Research Natural Area. The balance is under the control of the Minnesota Department of Natural Resources. Sugar Maple predominates.

Moschatel, Broad-leaved Spring Beauty, and White Baneberry, all associated in Minnesota with old growth, live here, Moschatel in unusual numbers (Williams 1993, Wilson 1993). According to Anderson's report, the area has 360 acres of old growth, but the old growth was "cut in the late 50s" (Anderson 1997).

--**Marble Lake Lookout Research Natural Area** (Lake County). Sixty acres of old-growth northern hardwood forest. Sugar Maple, Yellow Birch, and American Basswood are the dominant canopy species within the 120-acre RNA. Two plant species of special concern or watch status in Minnesota occur in the ground layer: Broad-leaved Spring Beauty and White Baneberry (Rusterholz 1993, Williams 1993).

--**Pearl Lake** (Cook County). A 2652-acre potential RNA, presumably with old-growth northern hardwoods and old-growth Northern White-cedar swamp and upland Northern White-cedar. A portion of the hardwoods have been high graded, but researchers singled out for description a south-east and east-facing slope of approximately 100 acres dominated by Sugar Maple with some White Spruce but no Yellow Birch. The slope has no signs of logging, and is apparently too dry to support Yellow Birch (Anderson 1997, Vora 1997).

--**Schroeder Research Natural Area** (Cook County). Forty acres of "virgin" (Williams 1993) northern hardwood plus a 320-acre buffer, mostly of northern hardwoods in secondary succession. In scattered low parts of the 40 virgin acres are up to 10 acres of Black Ash and Northern White-cedar (Williams 1993, Rusterholz 1993).

--**Watertank Lake** (Lake County). A potential RNA of 854 acres, presumably with upland and lowland old growth. Anderson characterized a 2709-acre Watertank Lake site as a "large block of contiguous old and old growth forest encompassing both upland and lowland communities. . . . Old growth black spruce and cedar dominated lowlands." She noted relatively few disturbances. Scattered stumps indicated selective logging of the northern hardwoods; and there was "some degree" of fire impact. The site showed "a few recent small cuts," and a road bisected it from north to south. Vora gave it 15 out of a possible 20 points for lack of disturbance (Anderson 1997, Vora 1997).

--**Wolf Lake** (St. Louis County). A potential RNA of 1097 acres, which presumably includes upland and lowland old growth. Anderson singled out for description an old growth conifer forest dominated by Northern White-cedar on a wet-mesic site grading to swamp. Yellow Birch and Paper Birch are in the canopy. The understory is mostly open patches of *Corylus cornuta* and *Acer spicatum*. She ranked it "AB." She also noted that the lowland communities have had "little or no disturbance." The potential RNA would remove 566 upland acres and 292 lowland acres from the timber base (Anderson 2002).

**Red Lake Peatland**, north and east of the Upper and Lower Red Lakes (Beltrami, Koochiching, and Lake of the Woods Counties)

A core area of 83,000 acres (now a state Scientific and Natural Area), surrounded by a 150,800-acre wetland and within which are more than 1000 acres of forest. Red Lake Peatland is "the largest, most highly developed, and diverse patterned peatland in the United States." It is second only to Lost River Peatland in rare plant species, with *Drosera linearis*, *Drosera anglica*, *Carex exilis*, and *Xyris montana* among others. Rare animals include the Short-Eared Owl, Yellow Rail, Eastern Timber Wolf, Wilson's Phalarope, and Greater Sandhill Crane. A small amount of drainage work has been

attempted; some trees have been cut on bog islands and on the crested divide near highway 72 that bisects the east-central watershed; and some trees have been cut for Christmas decorations. As of 1984, ownership was 94% state (Beltrami Island and Pine Island State Forests and Red Lake Wildlife Management Area); 1% the federal Bureau of Land Management; 3% Red Lake Indian Reservation; and 2% private (MDNR 1984b).

### **Myrtle Lake Peatland** (Koochiching County)

A 23,000 acre core area and a 13,300-acre surrounding wetland, in the eastern end of the Agassiz Lowlands peatland area. Myrtle Lake ranks second to Red Lake Peatland in ecological significance. A very big water tract passes along both sides of a huge raised bog. Disturbance is minimal-- winter trails. As of 1984, ownership was 97% state, 2% county, and 1% private (MDNR 1984b).

In a 1970 article on the Lake Agassiz Peatlands Natural Area, containing Myrtle Lake Peatland, Heinselman described seven types of peatland vegetation: 1) rich swamp forest, generally dominated in number of trees and basal area by Northern White-cedar, often overtopped by Tamarack, ash, or spruce; 2) poor swamp forest, usually dominated by stunted Tamarack in pure, open stands; 3) cedar string bog and fen complex; 4) larch string bog and fen complex; 5) Black Spruce-feathermoss forest, with tall, thickly set spruce; 6) sphagnum-Black Spruce-leatherleaf bog forest; 7) sphagnum-leatherleaf-Kalmia-spruce heath, with the only trees being occasional Tamarack and clumps of Black Spruce.

### **Manitou Forest Collaborative Management Area**, North Shore Highlands, northeastern Minnesota (Lake County)

A 75,000-acre forested landscape, adjacent to Crosby-Manitou State Park, which includes extensive old growth:

--A block of 3100 acres of old-growth northern hardwoods (dominants are Sugar Maple and Yellow Birch with occasional White Spruce and Northern White-cedar and White Pine). In northeast Minnesota, northern hardwood forests occur as large patch communities within the near-boreal aspen-birch-spruce-fir forest. The only known logging has been the historic removal of an occasional White Spruce and White Pine. Northern White-cedars are estimated to be up to about 300 years in age; Sugar Maple and Yellow Birch, up to about 200. The forest supports "exceptionally diverse fungi and uncommon plants, including Doll's eyes (*Actaea pachypoda*), Bloodroot (*Sanguinaria canadensis*), and Broad-leaved Spring Beauty." The Nature Conservancy purchased 1600 acres of the old growth as part of a 2000-acre tract that it bought from Wolf Wood Corporation in 2000. The state of Minnesota and other entities own the balance of the old growth hardwood community (Duffus 2001). The state has designated 1038 acres of its northern hardwoods within and outside the block (see below) as old growth (Carlson 2001).

--Additional old-growth northern hardwoods communities. They total some 1500 acres on state, county, and private land. The 1500 acres have experienced little logging. They were identified by the County Biological Survey and by an independent contractor employed by The Nature Conservancy as part of its Upper Forest Project. The Conservancy is engaged in a collaborative process with other key landholders, including

Lake County, to protect a natural range of conditions and growth stages including old growth, within this 75,000 acre landscape. "TNC is learning from its partners as they are learning from TNC on sustaining natural and working forests" (Duffus 2001, TNC 2000).

--Also within the Collaborative Management Area, 817 acres of upland Northern White-cedar, 5 acres of lowland hardwoods, and 19 acres of lowland Northern White-cedar, owned and protected as old growth by the state (Carlson 2001).

**Itasca State Park**, in northwestern Minnesota (Clearwater County)

Within a 32,690-acre State Park, a total of 4094 acres of designated old growth. Of the 4094 acres, 654 acres are within the Itasca Wilderness Sanctuary Scientific and Natural Area (Manolis 2003). The old growth is mainly comprised of Red Pine, White Pine, and mixed Red and White Pine stands. The pines are 100 to 300 years in age. Controlled burns are being used to remove underbrush and stimulate regeneration of the pines (MDNR 2003). Because of an abundance of deer and the absence of fire in the 20th century, regeneration had almost stopped. As a result, shade-tolerant late successional trees or hazel had grown up to dominate the understory in most stands (Rusterholz 1993).

**St. Croix State Park**, east-central Minnesota (Pine County)

A large complex of ash and lowland hardwoods in the 34,037-acre St. Croix State Park, along the St. Croix River. The state has designated 1127 acres of Black Ash, 461 acres of lowland hardwoods, 76 acres of upland Northern White-cedar, and 18 acres of oak as protected old growth. Black Ash is up to 220 years in age (Carlson 2001).

**CHIPPEWA NATIONAL FOREST**, in north-central Minnesota

In 1993 the forest staff described the four sites immediately below as showing no signs of logging and apparently qualifying as "true ecological old growth." All support Gray Wolves, a Threatened species (Mathisen 1993). To them can be added a fifth site, described in the literature and confirmed by Al Williamson (Williamson 2001).

--**Pine Point Research Natural Area** (Cass County): a 673-acre area on a peninsula extending into Leech Lake. It is predominantly Red Pine older than 275 years and has riparian associations. Jack Pine, Red Maple, aspen, and oaks are among the other species. Bald Eagles nest at this site.

--**Stony Point Research Natural Area** (Itasca County): a 404-acre hardwood area. It is on the north shore of Lake Winnibigoshish, and its ecology is strongly influenced by the lake. American Basswood, Black Ash and other hardwood species older than 100 years dominate. Spring ephemerals flower in abundance. A Great Blue Heron rookery is on the periphery of the area, and Bald Eagles nest nearby (Mathison 1993).

--**Lost Forty** (Itasca County): a 144-acre area with large old Red Pine and White Pine, plus aspen and hardwoods. The majority of the acreage is in the National Forest's Lost Forty Special Interest Area; the balance in the state's Lost Forty Scientific and Natural Area. Minnesota DNR describes two types of old growth: 28 acres of mostly Red Pine forest with White Pine more than 300 years old, and 18 adjacent acres of White Spruce and Balsam Fir (2003). Wingard believes that most of the Lost Forty was not logged, due to its being mapped as a part of a lake; but says that the pines are densest in

the east end of the Lost Forty and that the area probably burned repeatedly (1993).

--**Sugar Point** (Cass County): a 143-acre stand comprised primarily of northern hardwoods, including basswood, ash, and maple, more than 100 years old. The site supports a population of Goblin Ferns (*Botrychium mormo*), a sensitive species in Minnesota (Mathisen 1993).

--**Star Island** in Cass Lake (Beltrami or Cass County): No more than 100 acres of old growth on a 1200-acre island, about a fifth of which is occupied by a lake. The old growth, one of the few USFS sites that measured up to MDNR's scoring system, is in the northwest corner of the island. According to a 1993 map, this corner encompasses areas of Norway Pine, Jack Pine, maple-basswood, and aspen. The island has a number of summer residences (Alway and McMiller 1933; Williams 2001).

**Kabetogama State Forest**, adjacent to Voyageurs National Park and Superior National Forest in northern Minnesota (Saint Louis County)

Actual old growth 1491 acres in extent plus 455 acres of future old growth (Manolis 2003). Within the Little Fork-Vermillion Highlands ecological subsection, where most of the Kabetogama State Forest lies, actual old growth is represented by the following six cover types: Black Ash 254 acres, Northern White-cedar 543 acres, lowland hardwoods 488 acres, Red Pine 746 acres, White Pine 385 acres, White Spruce 88 acres, for a total of 2504 acres (Baumann 2003).

Ownership of the 697,363-acre Kabetogama Forest as a whole is divided among Saint Louis County, Superior National Forest, and the state. Most of the forest, which is largely on bedrock and shallow soils, was cut at the turn of the century and experienced fires in the 1920s and 30s (Helquist 1993). We do not know whether there is old growth on county and federal land.

Sites of actual old growth on state-owned land include:

**Ash Lake:** About 89 acres of little disturbed White Pine forest. The stand is about 125 years old (Rusterholz 1993).

**Black Duck Lake:** Upland Northern White-cedar old growth on an unnamed island (Wilson 2002).

**Johnson Lake:** Approximately 73 acres of old-growth White Pine forest, without evidence of disturbance. Much of this forest could be categorized as aspen-birch-White Pine.

**Pine Island:** in Vermillion Lake: White Pine forest, with Red Pine. The forest is 60 acres in size, 180 years old and has had "little human disturbance" (Rusterholz 1993).

**Savanna State Forest**, west of Duluth (Aitkin County)

Several old-growth northern hardwood candidate stands each greater than 100 acres in size (Rusterholz 1993). MDNR has designated 942 acres of actual old growth and 27 acres of future old growth (Manolis 2003).

**Nemadji State Forest**, east-central Minnesota, on the Wisconsin border (Pine County)

Four large clusters of old-growth northern hardwoods:

--283 designated acres of old-growth northern hardwoods. Includes 150-year-old Sugar Maple.

--101 acres of old-growth northern hardwoods, 90 acres of old-growth Black Ash,

and 38 acres of old-growth oak. Sugar maples are up to 140 years in age; Black Ash, to 217 years.

--59 acres of old-growth Black Ash and 38 acres of northern hardwoods. Sugar Maple are up to 200 years of age; Black Ash, 120 years.

--Ludwig Memorial Forest on an upland island almost surrounded by Black Ash swamps, Black Spruce swamps, and shrub swamps. Rusterholz wrote in 1993 that 274 acres of northern hardwoods occupy the western half of Memorial Forest. Adjacent to these hardwoods is a 119-acre stand of old-growth Black Ash. Other smaller areas of Black Ash are within the forest (Rusternholz 1993). The state has since designated 330 acres of current old growth within the Forest (Manolis 2003). The designated old growth includes Sugar Maple to 155 years of age and Red Maple to 135 years (Carlson 2001).

The northern hardwood stand in Memorial Forest has been disturbed only by cutting of White Pine at the turn of the century. Rusterholz reported that Lee Frelich of the University of Minnesota characterized three northern hardwood associations in Memorial Forest: Red Maple forest; Red Oak-maple forest; and Sugar Maple forest, the last including some Yellow Birch and Red Oak. Within the first are big Red Maple, 40-60 cm dbh (diameter at breast height), and some White Pine stumps. White Pine and Red Maple together must once have dominated the stand (Rusterholz 1993).

**Tettegouche State Park**, in the North Shore Highlands (Lake County)

Within the 9346-acre park, old growth of four types: 294 acres of northern hardwoods, 142 acres of upland Northern White-cedar, 74 acres of Black Ash, and 94 acres of oak forest. Old White Pine grow in patches, but the pine here “do not by themselves constitute old-growth forest.” Yellow Birch are up to 290 years in age; Sugar Maple, 225 years; and Northern White-cedar, 220 years. Black Bear congregate in the Park in the autumn to feast on berries, hazelnuts, and acorns (MDNR 2003).

**Hovland Woods Scientific and Natural Area**, in the North Shore Highlands (Cook County)

A 2850-acre complex of northern hardwoods and upland Northern White-cedar within five miles of Spring Beauty Hardwoods SNA. The state has designated 348 acres of northern hardwoods, 78 acres of upland white-cedar, and 11 acres of White Spruce within the complex as protected old growth. Sugar Maple are up to 215 years in age; white-cedar to 240 years old. The subsequent addition of Swamp River West to the complex brought the total of current old growth to 508 acres. The complex is owned by MDNR. It is within the boundary of Grand Portage State Forest but was originally private land. Therefore it is not managed as a part of the forest (Carlson 2001, Wilson 2002).

\*\*Hovland Woods SNA, like several other SNAs in northern Minnesota, is open to hunting and dogs, picnicking, and non-commercial picking of berries (MDNR 2006). (*Update August 6, 2006*)

**Crosby-Manitou State Park**, in the North Shore Highlands (Lake County)

Within the 6682-acre park, old growth of two types: a 166-acre northern hardwoods forest and a 196-acre upland white-cedar Forest. Yellow Birch are up to 400 years old; Northern White-cedar, 300 years; and Sugar Maple, 200 years (MDNR 2003).

**Lutsen Natural Area Scientific and Natural Area**, North Shore Highlands (Cook County)

Within the 720-acre state-owned Natural Area, 276 acres of old-growth upland hardwood forest. The old growth is “essentially undisturbed.” Numerous individual trees range from 145 to 300 years in age (MDNR 2002, Manolis 2003). \*\*Like several other SNAs in northern Minnesota, Lutsen is open to hunting and dogs, to picnicking (in this case, on a designated snowmobile trail), and to non-commercial berry picking (MDNR 2006). (*Update: August 6, 2006*)

**Scenic State Park**, in north-central Minnesota (Itasca County)

Within the 3360-acre park, 163 acres of Red Pine and 78 acres of White Pine, designated as protected old growth by the state. Red Pine are up to 261 years in age and White Pine to 210 years (Carlson 2001). The White Pine is located in three groups of stands. DNR evaluators found no cut stumps in two groups of stands; the third had a "very few old, cut stumps." The Red Pine areas are, for the most part in adjacent stands. A "significant proportion" of the Red Pine stands have been salvage cut (Rusterholz 1993).

**\*\*Magney Snively Forest**, within and near Duluth (St. Louis County)

At least 250 acres of old-growth as defined by the state of Minnesota, within a forest complex of approximately 2600 acres (Duffus 2004). A major portion of Magney Snively Forest is within the 1800-acre Magney Snively Natural Area, which was designated by the city of Duluth in December 2005.

Accounts of the extent of the old growth within the natural area vary. In the 1990s, a city park of approximately 300 acres, Magney-Snively Park, now within the natural area, was described as including 175 acres of old-growth northern hardwoods (greater than 160 years of age). This stand is dominated by Sugar Maple and Yellow Birch. Also present are basswood and Northern Red Oak. The subcanopy is dense and multi-layered; the understory, sparse. The stand was selectively cut, probably for old-growth White Pine (Rusterholz 1990, 1993). An article in the *Minneapolis Star Tribune* about the new natural area states that it is “an old-growth hardwood forest loaded with maple and basswood.” Bob Bruce, city director of planning and development, told the author of the article that the natural area is unlogged, in part because the forest is on steep terrain with rock outcrops (Meersman 2005). Carol Reschke, the researcher who documented the 250 acres of old growth in Magney Snively Forest as a whole and who may have since found additional old growth, has not replied to an e-mail inquiry from us. One major road, the West Skyline Parkway, traverses the Magney Snively Natural Area. It is also crossed by hiking and ski trails.

Magney-Snively Natural Area is owned by the city of Duluth, which will permanently protect it. The Nature Conservancy assisted Duluth in setting up its natural areas program and in designating Magney-Snively. The Conservancy also purchased 65 acres of private land in the forest and donated it to the city for the area. Some 400 acres of Magney Snively Forest are owned by Spirit Mountain Authority (Duffus 2004). [*Updated January 15, 2006*]

**Big Island Scientific and Natural Area**, northeastern Minnesota (St. Louis County)

A 210-acre island with old-growth communities that have not been designated as old growth by the state, apparently because they do not fit the old-growth categories on which inventories of state land in Minnesota are based. The island has not experienced fire or human disruption for more than 150 years. Old-growth communities include hardwood-conifer forest and aspen-birch forest. Basswood, Bur Oak, White Spruce, and White Pine are prominent in the canopy. A lowland conifer swamp with Tamarack, Black Spruce, and Northern White-cedar crosses the middle of the island (MDNR 2002).

**Nerstrand Big Woods**, in southern Minnesota (Rice County)

A 1340-acre stand, some 30% of which shows old-growth characteristics, with trees in the 100-120-year-old range. Most of the stand was heavily cut at the time of settlement or later and the stand was perhaps lightly and selectively cut about a hundred years ago. It has a variable grazing history, as it was originally parceled out into 5- to 10-acre woodlots. Nevertheless, it still has a ground layer; and it is significant as one of the biggest remnants of maple-basswood forest left in the United States. It is also significant as a remnant of the "Big Woods" that once covered 5000 square miles of southeast and south-central Minnesota (MDNR 2003). The stand is mainly in Nerstrand Big Woods State Park, but partly on private lands (Chapman 1993, Arnosti 1993, Rusterholz 1993). The state has designated 411 acres in the State Park as actual or future old growth (Manolis 2003).

**Voyageurs National Park**, in northern Minnesota (St. Louis County)

Three areas of unlogged forest, totaling over 190 acres, within the 220,000-acre park. The dominant species are Red Pine and White Pine, estimated to be up to 450 years old. The block-shaped sites are on the mainland in the northeast section of the park. The largest is on the point, south and west of Surveyor's Island. The two smaller are about 20 miles to the south: one near King William's Narrows and the other just east of Mukooda Lake. All are on parcels held in trust for members of the Chippewa tribe (Brock 1992).

**Wolsfeld Woods State Natural Area**, western side of Minneapolis (Hennepin County)

Within a 221-acre state-owned natural area, 133 acres of old-growth hardwoods that are a remnant of Minnesota's Big Woods. Tree species include Northern Red Oak, Ironwood, butternut, maple, elm, and basswood. Among the herbaceous species in the ground layer are trillium, hepatica, Bloodroot, and Dutchman's Breeches (*Dicentra cucullaria*) (MDNR 2002; Manolis 2003).

**Spring Beauty Northern Hardwoods Scientific and Natural Area**, in the North Shore Highlands (Cook County)

A 400-acre Scientific and Natural Area (SNA) in which the state has designated 115 acres of northern hardwoods as protected old-growth forest (Carlson 2001). The balance of the preserve includes additional northern hardwoods, some boreal hardwoods, and some aspen. In the designated old growth, Sugar Maple forms a continuous canopy, and dominates in the subcanopy too. Northern White-cedar, White Spruce, White Pine, and Yellow Birch are occasional. The hardwoods, inside and outside the designated old growth area, have had some selective cutting, and a part of the designated old growth was used as a sugar bush. Spring Beauty Hardwoods SNA is owned by MDNR. The land is

within the boundary of Grand Portage State Forest, but, since it was privately owned when the State Forest was established, it is not managed as part of the State Forest (MDNR 1984a, Wilson 1993 and 2002, Carlson 2001). \*\*Spring Beauty SNA is open to dogs, hunting in seasons for protected game species, non-commercial berry picking, and picnicking (MDNR 2006). (*Updated August 6, 2006*)

**Gustafson's Camp Scientific and Natural Area**, north-central Minnesota (Lake of the Woods County)

One hundred twenty-one acres of designated actual and future old growth within a 185-acre state natural area (Manolis 2003). "While old-growth red and white pine are the most distinguishing elements of this site, the surrounding aspen forest and the white cedar stand bordering the upland are also of key ecological interest." The name refers to a former logging camp (MDNR 2002).

**Wood-Rill State Scientific and Natural Area**, western side of Minneapolis (Hennepin County)

A 93-acre old-growth remnant of Minnesota's Big Woods, within the 150-acre State Natural Area. The upland canopy is comprised of Northern Red Oak, basswood, Sugar Maple, and White Oak. Lowland forest containing Red Maple, Hackberry, basswood, Black Ash, and Green Ash grades into a small Tamarack Swamp. The Natural Area also includes a lake, ponds, and wet meadows. Bruce Dayton and his wife Ruth Stricker donated the 150 acres to the state (MDNR 2002, Manolis 2003, Rebuffoni 1996).

**Purvis Lake-Ober Foundation Scientific and Natural Area**, northeastern Minnesota (St. Louis County)

A block of 78 acres of old growth: 68 acres of Red Pine and 10 acres of White Pine, plus additional scattered old growth, within the 140-acre natural area (Wilson 2002). MDNR has designated a total of 115 acres of actual old growth (Manolis 2003). The owner of the land, who protected its forest and wolves for many years, donated it to The Nature Conservancy which transferred it to the state (MDNR 2002).

**Burntside Islands Scientific and Natural Area**, northeastern Minnesota (St. Louis County)

Among the 150 islands in Burntside Lake, two "little disturbed forested bedrock islands." Pine Island supports 15 acres of never-logged pines, including 300-year-old Red Pines. The 49-acre Snellman Island supports pine forest, aspen-birch forest, and spruce-fir forest, which have not been logged since 1900. The Nature Conservancy gave the site to the State (MNDNR 2002). MDNR has designated 67 acres of actual old growth on the two islands (Manolis 2003).

**Sakatah Lake State Park**, southeastern Minnesota (Le Sueur County)

Sixty-nine acres of old growth dominated by "ancient" oaks (MDNR 2003, Manolis 2003).

**Richter Woods** in southern Minnesota (Le Sueur County)

A 110-acre county park with 60 acres of old-growth maple-basswood forest,

dominated by Sugar Maple, American Basswood, and dying American Elm. The site, which is in the Big Woods section of Minnesota, has suffered some selective logging in the past (Rusterholz 1989).

**\*\*Moose Mountain State Scientific and Natural Area**, northeastern Minnesota (St. Louis County)

A 177-acre, the original 55 acres of which support old-growth forest dominated by Sugar Maple, basswood, and Yellow Birch, and northern hardwood forest that is growing back after wildfires in the early 1900s (MDNR 2006a). Moose Mountain exhibits “the pre-settlement makeup of tree species and age” and “includes one of the last virgin stands of red oak more than 200 years old” (DNR Moves Ahead 2006). Two uncommon plants White Baneberry and Moschatel are found here (MDNR 2006a).

The state acquired the original 55 acres in 1989 to protect the old growth and other wildlife. A landowner later offered to sell an adjacent 122 acres to the state. The state bought the land, but the St. Louis County Board and some state legislators blocked for a time its addition to the SNA. Minnesota DNR agreed to allow snowmobiles along an existing power line right of way that borders the 55 acres and bisects the addition and also to allow dogs under control, hunting with firearms and bows and arrows, berry picking for non-commercial purposes, and picnicking in the enlarged SNA. The hunting, open only in regular firearms season, will help to limit deer damage (DNR Moves Ahead 2006; MDNR 2006). (*Site added August 6, 2006*)

**Wabu Woods State Scientific and Natural Area**, northeastern Minnesota (Itasca County)

Thirty-seven acres of old-growth northern hardwoods within the 104-acre Natural Area provided to the state by The Nature Conservancy (MDNR 2002, Manolis 2003). Additional old growth is found on adjacent county land (Wilson 2002).

**\*\*Chisolm Point Island Scientific and Natural Area**, northeastern Minnesota (Itasca County)

A 28-acre island on Pokegama Lake, Cohasset. The island itself is an SNA dominated by old-growth maple-basswood forest. Northern White-cedar and Bur Oak are also in the canopy. Canada Yew grows in large patches under the trees.

Yew has become uncommon in Minnesota, because it is sensitive to sunlight and attractive to deer. The state bought the island and designated it as an SNA in 2002 because of the yew and the old growth that shades it. In 2004, however, deer began visiting the island and making inroads into the yew. In 2006 Minnesota DNR announced that it will allow the hunting of deer with bow and arrow on the island. DNR will also fence small parts of the island to allow the yew to grow back (MDNR 2006, MDNR 2006b, Myers 2006). (*Site added August 6, 2006*)

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