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HISTORY OF THE LAKE STATES FORESTS: NATURAL AND HUMAN IMPACTS

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INTRODUCTION

Forests in the Lake States are relatively young, dating to the retreat of the ice sheets of the Wisconsin Glacial Epoch 10,000-14,000 years ago. The tree species, shrubs, herbaceous plants, microorganisms, and invertebrates, as well as the birds and mammals of these forests survived mostly south and east of the glacial borders. As the ice retreated, they migrated northward not as intact forest communities but individually as species populations. The forest communities that developed were often short-lived and changed as the climate shifted and as other species reached the area. Much change was driven by natural forces: the opening of new habitats, climatic fluctuation, successional processes, and disturbance by wind, fire, disease, and insect infestation. These factors still operate. In addition, change resulted from human activities as varied as the hunting practices of the PaleoIndians, clearcutting, selective logging, effective fire protection or dam building. In the northern forests, disturbance was the key factor in change, and it remains so today.

Each of the Lake States was heavily glaciated; each has a distinct climatic regime, an individual mixture of soils and of vegetation and a similar but discreet logging history.

This paper provides a brief history of the Lake States forests as a whole and also notes some differences among the forest histories of the three States.

POST-GLACIAL CLIMATE AND RETURN OF THE FOREST

When the first European settlers reached the Lake States they found, in the south, patches of upland hardwood forest interspersed with grassland, savanna, and open wet meadow. The northern forests appeared as vast areas of hardwoods and conifers within which were found many lakes, impenetrable swamps, patches of scrubby pine or oak, open bogs, and scattered areas of burned or windthrown timber. These forests were diverse in species ranging from pines on the sandy soils or hardwood and mixed hardwood-conifers of the more fertile loams to the swamp forests of cedar, spruce, and larch. They varied in age from young stands largely of aspen/birch, pine, or maple, to older stands mostly of pine, hemlock, or northern hardwood that ranged in age from 250 years to over 400 years. These forests were not uniform and were always subject to change as a result of increasing age, natural succession, wind, fire, or other disturbance.

These forests owe much of their diversity to the extensive continental glaciations, especially the last. The Wisconsin epoch persisted for at least 25,000 years and produced a complex pattern of

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landforms, from level or pitted plains to steep morainic hills, and left the land surface with expanses of outwash sands, lake clays, or extensive areas of unsorted till. The tills ranged in texture from sand, silt, and clay to large boulders. Only west central portions and southwestern Wisconsin and adjacent Minnesota were untouched by the physical action of the ice, but even there, the periglacial climate precluded survival of all but the most cold tolerant species.

As the climate warmed during the retreat of the last Wisconsin ice sheets between 14,000 and 10,000 years before present (BP), trees, other plants, and animals began dispersing northward and westward to re-colonize the land. Each species moved independently from their ice age refuges--some from the southern Appalachians, others from the Ozarks, the central Great Plains and the southeastern Coastal Plain. Since individual species disbursed at different rates, they arrived in the Lake States at different times and under different climatic conditions. The forest communities that developed were often relatively short-lived as the climate changed and additional species arrived.

Most of our species had evolved prior to the advent of the ice ages and had often been influenced by disturbance during 20 to 30 million years of the late Tertiary period.

“Only 14,000 years ago, tundra and spruce-pine woodland covered much of what is now the eastern United States” (Davis 1969). Spruce and larch had grown close to the tundra or on the ice margin and during re-advances of the ice some of these stands were obliterated and now are found as buried forest. Much of the Lake States was still covered by ice. Larch and spruce that had formed extensive forests in the Great Plains 14,000 to 12,000 years BP (Before Present) were the first tree species to follow the retreating ice sheets northward. They were followed by jack pine, red pine, and balsam fir 11,000-10,000 years BP. White pine arrived in southern Michigan about 10,000 BP, in Wisconsin 9,000 to 8,000 BP and in Minnesota between 7,000 and 5,000 BP.

Deciduous species were also entering the Lake States: oaks from the south between 11,000 and 10,000 BP and maples moving northward and westward several thousand years later. Sugar maple reached northern Wisconsin and Michigan only 7,000 to 6,000 BP. The most recent arrivals were American beech that entered the Upper Peninsula about 4,000 BP and Hemlock that reached its western limit in Wisconsin about 1,500 BP. The pollen record has not been examined in as great detail for shrub and herbaceous species, but they too migrated northward and westward to become part of the forest communities that we observe today.

A slow warming, starting about 16,000 BP, had begun to result in retreat of the continental ice sheets. However, between that time and the final retreat of the ice (about 9,500 BP), there were numerous re-advances of various glacial lobes. Between 10,000 and 8,000 BP, the Midwest sustained a somewhat abrupt change to a warmer and relatively moist climate that favored spruce and pine. As the warm conditions continued, drier conditions became the rule (8,000 to 3,500 BP). By 7,000 BP, grassland and savanna had expanded from western Minnesota into southern Wisconsin and Michigan. This "Prairie Peninsula" also extended eastward from Missouri and Iowa across Illinois and Indiana and into Ohio. Farther north, oak and white pine forests flourished. After 3,500 BP, the climate again became somewhat cooler and more moist permitting westward spread of the deciduous forest. Within these several time periods there were

numerous fluctuations as well as variation in climate between northern and southern portions of the Lake States.

Climate and vegetation changes have been deduced from studies of pollen and other materials (charcoal, wood, snail shells, etc.) deposited in bogs and lakes, from varves (layers in lake sediments) and from plant distributions. Sediment layers in major rivers also provide evidence for periods of excessive rainfall and major floods. Recent fluctuations in climate (e.g., the Little Ice Age) can be interpreted from records of ocean ice, plant disease epidemics, movement of mountain glaciers, tree rings, and other data.

The past 1500 years have shown considerable variation. A warm, moist period began about 500 BC and lasted until about 1,300 AD. This was followed by the cool and drier but stormy years of the Little Ice Age and then the warm "corn" climate from 1930 to 1970 AD. Climate also varies from year to year as influenced by changes in atmospheric and oceanic circulation, volcanic eruptions, and similar events. These have resulted in the now familiar effects of El Nino in the Pacific Ocean and the year of the two winters (1883) when Krackatoa erupted in Indonesia.

Throughout post-glacial time, shifts in both temperature and moisture have been common and have often persisted for several hundred years. The "Little Ice Age" that lasted from the mid-1400's until the mid-1800's is the most recent example. The major fires of the more recent past were favored by climatic fluctuations of relatively short duration. In addition to climatic shifts, Lake States forests have throughout postglacial time been subjected to much natural disturbance.

EARLY HUMAN ACTIVITY AND NATURAL DISTURBANCE

The first two-legged tourists (PaleoIndians) were few in number and were primarily hunters of big game. They generally made their camps at the juncture of flowing rivers. These hunters may have helped to eliminate the large grazers--mammoths, mastodons, giant beavers, and similar herbivores that may well have influenced early forest development. As the climate became warmer and drier about 7,500 BP, other human groups followed. Between 7,000 and 6,000 BP many more hunters were present. Some used copper spears while others fashioned arrowheads from silicified sandstone. Copper was traded extensively. Many village sites have been found. Cooler climate prevailed after 3,500 BP but with many fluctuations. Warming began again around 3,000 BP (1,000 BC).

The Hopewell phase, related to the middle Woodland culture, developed in Ohio and Illinois and by 200 AD had spread into Michigan and Wisconsin. Villages, usually located on river banks or islands, varied in size from 2 to 5 acres; some villages were much larger. This culture collapsed about 400 AD amid unsettled times when large populations resulted in increased competition. The middle Woodland culture that became prominent about 800 AD prospered until about 1300 AD. Village locations shifted to the southeast shores of lakes, and wild rice became a part of the diet. A warm period about 1200 to 1250 AD preceded the "Little Ice Age." For a time after 1400 AD, few Indians were believed to be present in much of the northern forest. However, in the 1600's other tribes were driven westward by the advance of European settlers from Canada and the Atlantic coast.

The Chippewa (Ojibwa) reached the Apostle Islands about 1680 AD coming into conflict with the Sioux (Dakota) in Minnesota. Other eastern tribes were driven into Lower Michigan and then Wisconsin. By the early 1700's, following contact with Europeans, disease had greatly reduced Indian populations. (Some estimates suggest a 95% reduction) However, it is clear that Native Americans influenced the Lake States forests long before European settlement began. Their influence was greatest on fire-susceptible communities such as savanna, grassland, and pine forests. These were intentionally burned for ease in travel or to aid hunting. Sometimes considerable areas were cleared for cultivation or around settlements for fuel wood and to build stockades. In some locations, long "fences" of brush were constructed to funnel game to the hunters, whence names like "Fence Lake." The Indians also transported native plants for food, medicinal, and ritual purposes.

The "Little Ice Age" may have had a direct effect on the origin of the forests that so impressed the early settlers. The generally cooler climate was attended by greater frontal activity (storminess), and cool moist periods were interrupted by warmer, drier ones, and even drought. These conditions may have favored the development of the massive stands of white pine and hemlock that appeared inexhaustible to the settlers. In 1850, many of these stands were at least 250-300 years old. Some included two or three age cohorts indicating several periods of disturbance. The landscape also supported patches of aspen and white birch as well as young stands of hardwood and pine. Fire return frequency in the pine forests ranged from 20 to 150 years, but many of those fires were not catastrophic in nature.

Windthrow was the most serious disturbance in the hardwood stands where return time of catastrophic blowdowns has been calculated (based on current storm frequency) to be over 1200 years. Less severe storms were and are much more frequent, and their effects range from loss of individual stems to major damage over large areas. Less dramatic climatic fluctuations such as major summer and autumn droughts favored the slash fires of the recent past.

The early European visitors appeared to have had little direct impact on Lake States forests. The French controlled the region but had not explored westward before Jean Nicolet landed near Green Bay in 1634. Their period, one of exploration, missionary efforts, and fur trading, lasted until it was ended by the British capture of Quebec in 1760 and the treaty of Paris in 1763 that ceded the region to the English. Small settlements that had been established as trading centers, army posts, and missions persisted through the English period (1763 to 1815) and were then foci for American settlement. During both periods, conflicts with various Native American tribes were frequent; sometimes these were resolved peacefully, but more often violently as allegiances changed. Efforts of the English largely involved the fur trade and their efforts to take control of the region, first from the French and then from the Americans.

Indirect effects on the forests resulted from activities of Indian populations, including heavy hunting pressure on beaver and large ungulate populations that reduced grazing, browsing, and flooding of lowlands. The Indian populations also declined both as a result of warfare as well as of spread of European diseases. Villages were eliminated lowering agricultural activity. Wildfire probably increased in some areas while in others it probably decreased. These years included the later part of the "little Ice Age," a period with an unsettled and variable climate during which Indian legend noted at least one catastrophic fire. Reduction in beaver, deer, bison, elk, and

moose may, in a small way, have encouraged forest reproduction although the effect would have been small and localized. The growing number of European residents (mostly of French and mixed heritage) and the knowledge gained from the numerous explorers clearly provided the basis for more rapid exploitation and agricultural development.

Well before the end of the War of 1812, Americans had begun to move into what would become the Michigan, Wisconsin, and Minnesota territories, to explore and trade. After 1815, they began to administer the territories and to gradually take over the fur trade.

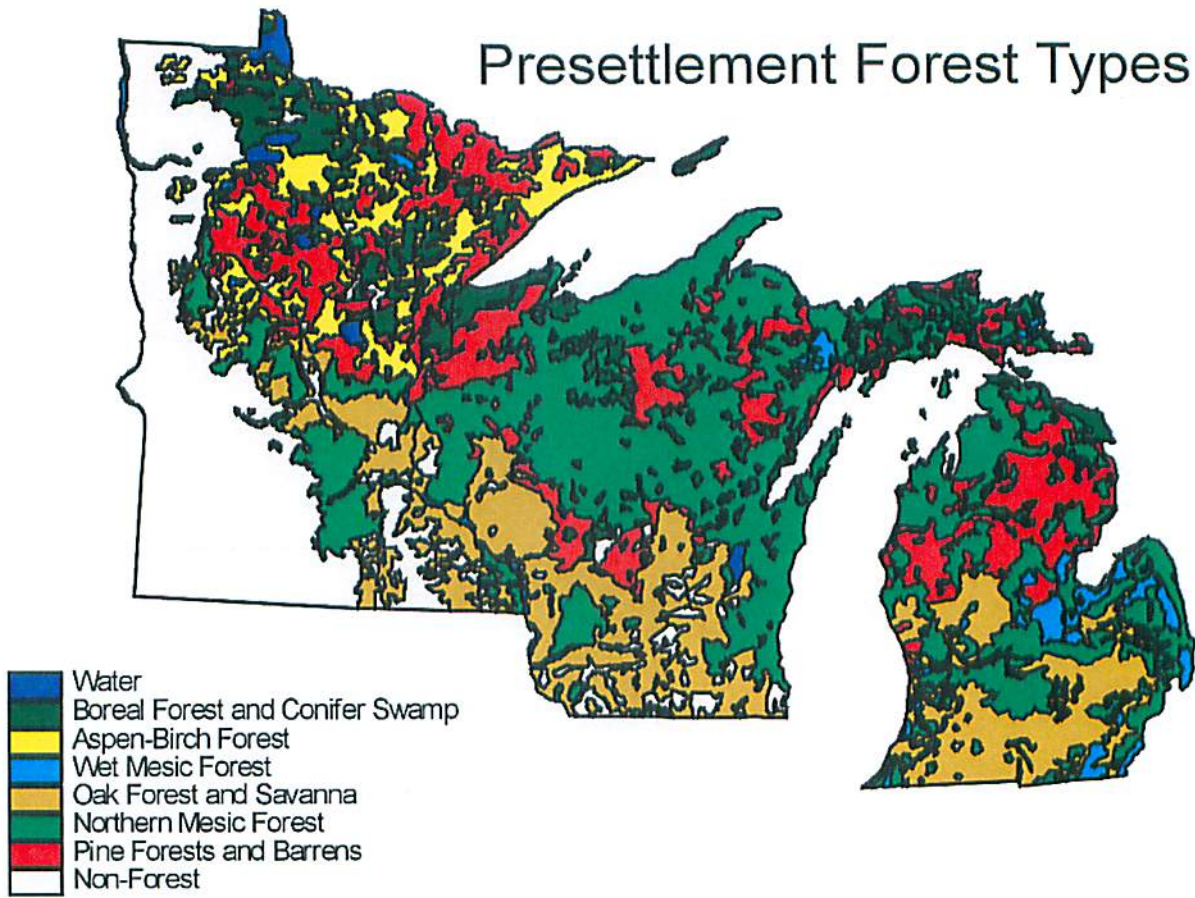
The General Land Office and the Presettlement Forest

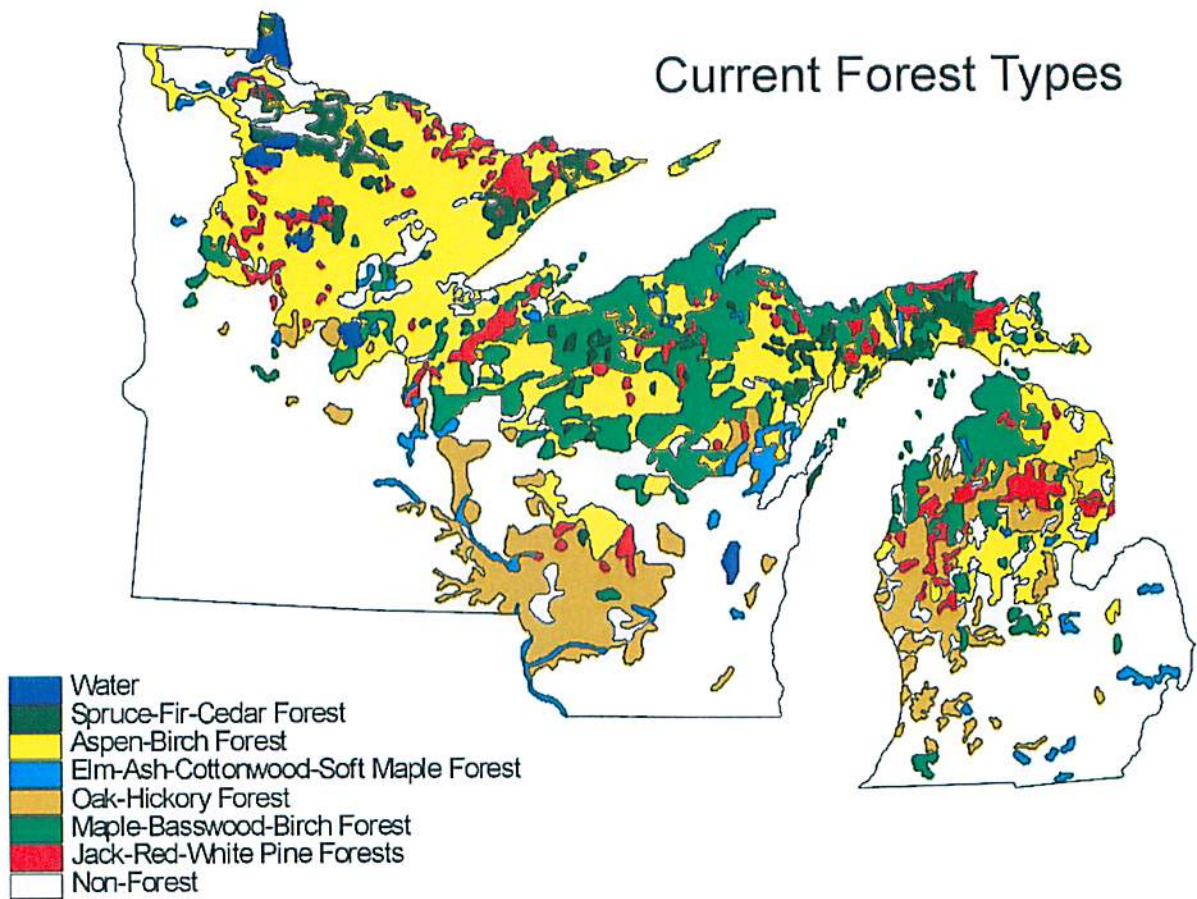
During the early 19th century, major land purchases and various treaties resulted in immense areas of federally-owned land. The Commissioner of Public Lands and the General Land Office were responsible for the disposal of such lands in ways that would encourage settlement and benefit public needs. Before these lands could be made available for sale to individuals or for grants to States for schools, railroads, etc., a survey was essential to locate and divide the land into townships and sections. As the land was surveyed, the surveyors were asked to report on the natural features present including lakes and streams and on the land's agricultural value. The surveyors located section corners in reference to witness trees that were blazed, measured, and recorded in their notes. These records of witness trees have been studied and combined with knowledge of soils and natural features to provide a quantitative picture of what is called the "presettlement vegetation." This record provides the base for comparison of past with present vegetation (Plate 1a, b).

The land survey began in Michigan in 1826, in Wisconsin in 1832, and in Minnesota in 1847. In each State, the survey began at the southern border and proceeded northward. Although very useful, this record provides only a "snapshot in time" of the forest before logging began.

As the nation expanded, so did the demand for lumber. Towns that were only frontier settlements in the early 1800's grew rapidly into cities, at first drawing on their immediate surroundings and then reaching out for building materials. By the 1840's, lumbermen in Pennsylvania, New York, Maine, and New Brunswick found their supplies of white pine becoming scarce and their profits declining and so they looked westward to supply the ever-growing demand. Although some logging took place well before legal title to the land was established, major development began after the land was surveyed. As in the East, white pine was considered the only species worth logging in quantity. Easily worked, light and strong, white pine floated well and so was readily transported from the woods to the mill. The Lake States were viewed as having an ample supply.

Presettlement Forest Types





THE WHITE PINE ERA

White Pine logging began in earnest about 1836 when the first white pine was shipped east from central Michigan. Logging also began in Wisconsin and along the St. Croix River in Wisconsin and Minnesota. The cut accelerated rapidly continuing for over 50 years. Logging followed a similar pattern in each of the Lake States. The white pine harvest reached a peak between 1890 and 1910 by which time virtually all of the merchantable pine had been cut or destroyed by fire.

Pine logging usually took place during the winter with the loggers living in camps scattered throughout the forest. The logs were stacked along stream banks where they could be floated to the mill on the spring runoff. Frequently, small dams were constructed on feeder streams to store water to assist in the log drive. As more companies began to use the same large streams, boom companies evolved to better control the log drives and to sort logs from different owners. Lumber mills were usually located along large rivers or where major rivers entered one of the Great Lakes. Lumber from western Michigan and northeastern Wisconsin was transported by schooner to Chicago and other Lake Michigan ports while lumber from Saginaw and ports on Lake Huron was shipped to destinations such as Buffalo and Syracuse. Later, schooners were supplemented by barges and steam-powered tugs. Log rafts were the first form of transportation on the Mississippi, Wisconsin, and other major rivers. When mills were built upstream, log rafts

were soon altered to carry lumber southward to Mississippi river towns including St. Louis. From those towns, lumber soon moved westward by rail into the Plains.

When the pine supply in the Lower Peninsula declined, large log rafts were towed from Ontario and the Upper Peninsula to Saginaw. However, rafting had limited early use on the Great Lakes. Later, log rafts were used effectively between 1923 and 1972 to bring Minnesota and Canadian pulpwood to Ashland, Wisconsin. Rafting was relatively inexpensive and an appropriate means of transportation on large rivers but it often proved risky on the Great Lakes. In the 1870's and 1880's, railroads began to spread into the northern forest, and both logs and lumber became major revenue items for the railroads, especially in Michigan's Upper Peninsula, Wisconsin, and Minnesota.

As the timber industry matured, many changes took place in the social and physical arrangements and in manufacturing processes. In the roughly 60 years that white pine was king, lumber mills shifted from reliance on water power to steam power. Waste wood from the mills provided ample fuel. The slow sash saw was replaced by the muley saw and the circular saw. Although circular saws were retained for various uses, their wide kerf wasted much wood and they eventually gave way to the band saw. Larger mills usually had several types of saws and also added planers and other equipment. Mills grew from primitive ones that required only two or three men to operate to complex facilities that employed hundreds of men, and production increased from a few hundred board feet per day to hundreds of thousands of board feet. To provide the raw logs, the wood crews expanded as well. Camps became much larger and more expensive, although most remained relatively primitive. In the woods during the 1870's, the crosscut saw began to replace the ax.

Shingles, at first a major byproduct, were joined by other products including lath, bowls, kitchenware, barrels, boxes, and furniture. In the Saginaw area, where sawmill waste was used as fuel to evaporate the brine, salt was a major byproduct.

The rapid spread of railroads resulted in a large demand for ties, timbers, and poles while the developing cities also needed wood, not only for housing but for plank sidewalks and other needs.

While supporting the explosive growth of the Midwest, the white pine era was one of increasingly rapid and often wasteful exploitation of the forest resource. On the pine lands, the impact of logging was amplified by frequent and often catastrophic wild fire.

In the early 1880's while white pine logging was still in full swing, another vigorous but short-lived forest industry came into being.

Hemlock and the Tan Bark Industry

Eastern hemlock was common in Michigan especially in the western Upper Peninsula and was abundant in much of northern Wisconsin. It grew in mixture with both white pine and northern hardwoods often forming dense stands, many of which were of considerable age. In hardwood areas, hemlock was often associated with yellow birch as well as white pine. Hemlock often

occurred on somewhat poorly drained soils of low fertility, but it was also productive on more fertile mesic upland hardwood sites.

During most of the white pine era, hemlock was considered worthless. The wood was brittle, prone to windshake and splintering, weak and coarse-grained. However, in New England and later in Pennsylvania, hemlock bark was widely used to convert hides into leather, and tanneries were often located near sources of hemlock. After the Civil War, the livestock industry began to expand in the Midwest, and soon large numbers of hides became available from the slaughterhouses of Chicago and other Midwestern cities. Beginning in the mid 1880's and continuing into the 1920's, hemlock was cut heavily as a source of tan bark and soon also for rough lumber.

Hemlock bark was not easily transported, and at first it was moved by ship to tanneries in Racine, Kenosha and Milwaukee. By 1909, Milwaukee was the major tanning center of the world. As the railroads extended into northern Wisconsin and as companies made increasing use of logging railroads, the tanneries moved north to be near the source of bark. The market for hemlock bark lasted until other materials (Quebraco bark and various chemicals) came into use in the 1920's.

Peeling of hemlock bark provided jobs for loggers during the summer when hardwood logging was not feasible. The peeling season lasted through May, June, and July. A spud or an ax was used to loosen the bark in 4 to 4.5 ft lengths, and the slabs were piled to cure. Before logging began again in the autumn, the bark piles were removed and shipped to the tanneries. The piled bark was scaled in cords with an average of 2260 pounds per cord. Some companies might peel as much as 3000 cords a season. At first, the peeled logs were left to rot in the woods where the branches and remains of the crowns added to the summer fire hazard and the peeled logs were a nuisance when logging the remaining trees. In later years, the hemlock logs that remained after peeling were cut and moved out of the woods to be used for ties, mining timbers, rough lumber, or pulp. Hemlock reproduces irregularly and only under specific site and climatic conditions. So, it is probable that the heavy cutting of hemlock for tan bark may account in considerable measure for the absence of hemlock in large areas of today's forests.

THE HARDWOOD ERA AND RAILROADS

As the supply of white pine declined, the lumbermen considered their next move. In the 1890's, it was clear that for Michigan, and soon for Wisconsin, the white pine bonanza was over. Many large and small lumbermen picked up, sold their holdings and invested elsewhere. Some moved to Duluth to take advantage of Minnesota pine. Others moved to Oregon, California, Washington, and Idaho, or to Texas and Louisiana.

However, some, especially the larger operators familiar with the hardwood resource in the Upper Peninsula, bought more hardwood lands and built new mills or converted their current mills to hardwood production. A few companies, mostly from northeastern Wisconsin, had also had experience in logging and marketing hardwood mostly to flooring, furniture, carriage, and other specialty factories. By 1900, several of these Wisconsin companies had also purchased forestland, both pine and hardwood, in the Upper Peninsula as well as in central and northeastern Wisconsin.

Since hardwood logs float poorly if at all, transport of logs from the forest to the mill shifted from water to rail. A successful lumberman in the hardwood era required rail access to large blocks of land and an expensive mill to effectively deal with the diverse products available from the species mixture typical of the hardwood forest. In the hardwood forest the lumbermen found, intermingled, many different hardwoods: maple, birch, ash, basswood, and elm and some conifers--hemlock, cedar and fir each with special attributes and uses. In contrast, the lumbermen who had removed the pine forest had been dealing with only a few species and primarily with white pine.

The transition from pine to hardwood logging was often rapid. In the mid-1890's, several experienced and well-financed companies had moved quickly into hardwood logging. Each purchased large areas of hardwood timber in Michigan's Upper Peninsula (while the price was still low) in or near locations where they already had holdings.

Railroads were built to provide access to the timber and to markets. Other investments were made to utilize by-products, and company towns were created. When a railroad from Munising on Lake Superior to the main line of the Chicago Northwestern along Lake Michigan was constructed, it attracted several businesses such as a cooperage firm planning to use elm in production of barrels while another company constructed a mill to use swamp cedar. Soon, Cleveland-Cliffs Iron Company purchased 84,000 acres and the railroad. That company clearcut the area removing trees and limbs of all species with the better material going to veneer plants or for use in supporting mine shafts and much of the rest to pulp wood or fuel wood. Small and rotten material was removed from the forest and shipped to the wood chemical plant. Such a complex operation depending upon a rail network to collect and distribute wood was typical of several large companies.

Rail access was essential. In the Upper Peninsula, most railroads were built at standard gauge so that they could carry heavier loads and so that rolling stock could be moved directly onto the trunk lines that crossed the peninsula from east to west. In Wisconsin, the main trunk lines such as the Wisconsin Central, Chicago Northwestern, and Chicago, Milwaukee and St. Paul Railroads had, by the late 1880's, extended northward into the hardwood country and then beyond. One of the first true logging railroad began operations in 1881. It used the cheaper narrow gauge as did many other such logging railroads in Wisconsin. The last Wisconsin logging railroad ceased operations in the 1940's, but in the 60 years intervening, about 250 different short lines had served both pine and hardwood loggers. In addition to the railroads, other steam-driven machines like the steam hauler, a locomotive with crawler tracks operating on ice roads, were used to move logs from the woods to the mill or the railroad. In the 1920's, gasoline powered tracked vehicles served the same purpose.

In 1870, the Lake Superior and Mississippi Railroad linked St. Paul and Duluth and opened large areas of pine to logging. Earlier, in the late 1850's, rail lines serving the new agricultural areas of western Minnesota were expanding. Documentation of logging railroads in Minnesota is limited, but most were probably standard gauge lines to connect with the trunk lines heading westward.

Changes during the Hardwood Era

During the hardwood period, land holdings grew larger. By 1913 for example, Cleveland Cliffs, then the largest land owner in the Upper Peninsula, held a total of 1.5 million acres. Many other companies such as the Wisconsin Land and Lumber Company of Michigan and the Ford Motor Company also developed large holdings. The period from 1900 to the 1940's was one of rapid change in transportation from water to rail and finally to gasoline and diesel trucks.

For some companies, woods operations also changed from large company-owned camps to elimination of all woods operations. Instead, for logs the company would depend upon small independent operators or jobbers. The company usually retained the timberland but contracted with the jobbers to produce a given amount of timber for the mill. The jobber might be told which tracts to cut or he would locate the timber and negotiate a price for the logs in advance, betting on the weather and his crew. The jobber set up his own camps which might be moved every year or two. Railroad camps using modified railcars were sometimes used to increase mobility. Company towns replaced camps especially for firms that had a mill within a substantial land base.

During the hardwood period, several firms experimented with selective cutting but most soon returned to clearcutting (thus limiting the life of the mill). In addition to the timber, clearcutting utilized most small trees and often some of the slash. In Wisconsin as well as in the Upper Peninsula, hardwood logging, like the earlier pine logging, left few standing trees. Fires in the dry slash, although usually not as hot as those during the pine era, consumed the surface debris and resulted in open "stump pastures." These fires were often set to clear the land for farming or were started from sparks thrown by the railroad locomotives.

After the forest was removed, the lumber companies frequently advertised the cleared land for sale as prime farm land. Earlier, this had also been the case during the pine era when repeated fire had been even more destructive and the sandy soils supporting pine were even less productive than those under most hardwood stands. Cut-over land was a liability save for those few companies that were attempting to practice sustained yield forestry.

After the widespread pine logging, some forests had begun to regenerate, but many pine areas lacked seed trees, repeated fires had eliminated reproduction, organic matter was consumed, and the soil degraded. These conditions favored open areas of brush, grass, and sedges (i.e., "stump pastures") and establishment of pioneer species--aspen, white birch, and cherry greatly changing the previous species mix. Occasionally, some residual pine, a less intense fire and absence of repeated burning permitted the regrowth of pine. Much of that second-growth pine has already been or is now being harvested.

"Stump pastures" and other open lands were also common in cut-over hardwood areas where the land surface was disturbed. These openings persisted where heavy sod had formed and where "frost pocket" conditions existed. In other cases, regrowth from roots and residual seedlings was abundant although the resulting stands are less diverse than the original ones, and sugar maple usually became dominate.

There were several early efforts at reforestation such as a private venture in central Wisconsin in 1876 that used wild seedlings. In 1911, Wisconsin established a nursery at Trout Lake from

which seedlings were used in 1913 to create the Star Lake Plantation. In Minnesota, the first State tree nursery was created in 1903, and the first seedlings planted in 1914. However, additional Minnesota nurseries were not authorized until the 1930's when tree planting expanded greatly with the help of the CCC as was also the case in both Michigan and Wisconsin. In 1925, the Nekoosa Edwards Paper Company hired a forester to start the first industrial forestry program in Wisconsin and establish a tree nursery.

The Tree Farm program initiated by the forest industry in the 1940's was also successful in promoting planting and forest management on privately owned tracts. The impetus for forest planting had been building with the growing realization that agriculture was not an appropriate land use in much of the north and that tax delinquency threatened the survival of the northern economy.

As part of an attempt to better manage its lands, Cleveland-Cliffs hired professional foresters and in 1905 started a nursery and soon began to establish plantings near Munising. This effort faded in a few years as did selective cutting and sustained yield experiments. However, the program emphasis on fire control proved valuable and in 1910 resulted in the formation by the industry of the Northern Forest Protective Association. This was later augmented and later replaced by State and, later, federal activity.

White pine blister rust reached the Midwest around 1910. It was introduced on infected nursery stock brought in from France and Germany because tree nurseries in the U.S. could not meet the demand. This serious disease precluded the use of white pine and slowed interest in planting. Other less productive species (Jack, Scotch, and Austrian pine) were planted while only recently has white pine been accepted as a viable choice for management.

In 1923, the Lake States Forest Experiment Station was established at St. Paul, Minnesota, with a staff of five foresters and one clerk. Initial activity was directed to problems of the cutover, i.e., reforestation, fires, and economic factors. Cooperative efforts were emphasized as was timely publication. Prior to establishment of the LSFES, planting had become an important State activity, but information was needed on effective techniques and on probable success under different conditions. The first Lake States Forest Survey was begun in 1933 and by 1938 volume and yield tables had been developed for most species. During the Depression years, much Station effort was expended in support of work in the already established and new National Forests. Experimental plantings, nursery studies, and numerous other projects utilized labor and other support provided by the CCC and other emergency programs (WPA, CWA, and PWA). After 1946, work at the Station and field sites expanded greatly. On January 1, 1966, the Lake States Station was joined with the Central States Station to become the North Central Forest Experiment Station. Research continued; some projects were combined and others were begun while the headquarters remained in St. Paul.

The Great Depression gave major impetus to reforestation through the programs of the federal government. In 1929, there were extensive tracts of tax-delinquent land in each of the Lake States. The Forest Service acquired many of these clearcut, burned, and barren lands in cooperation with the States. With the advent of the Civilian Conservation Corp., large forest nurseries were developed and pine plantations were established. Many of these pine plantations

as well as the regenerated hardwood stands now range from 60-80 years of age and are producing wood. Fire fighting was another major effort of the CCC vital to the reforestation process. Effective firefighting required the building of truck trails to provide access to fires and to recreation facilities that were also being created.

Federal and State Policies in Relation to Forest Lands

Throughout the 19th and early 20th centuries, federal and State policies had favored widespread and intensive logging. It was viewed as a way to clear the land and provide roads and other infrastructure that would lead to the rapid expansion of a permanent agricultural economy as well as to creation of wealth that would accelerate other development. The forest area appeared so vast that few were concerned that the resource would be exhausted. Various treaties had left the federal government with immense areas of land and the desire to have it settled. For these purposes, as new States were formed, they were granted lands for a variety of purposes, for example, to stimulate the building of railroads, or to support schools (e.g., the 1862 Morrill Act). Other federal legislation designed to provide lands to settlers included the Military Bounty Land Warrants (1850's) and the Homestead Act of 1862 as well as cash land sales to individuals. However, much of the land granted or sold to individuals ended in the hands of speculators or lumber companies and much of the land granted for railroad construction that was eventually purchased by lumbermen.

Usually when lumbermen acquired stumpage rights or title to timbered land, they cut the timber as rapidly as possible and moved on. Several major economic depressions (1857, 1873, and 1893) slowed lumber production, but only briefly until the cut was eventually limited by the available timber. Some large firms held enough land to provide a continuing source of supply for their mills until business objectives changed or taxes increased. A few firms retained lands on which they practiced sustained yield forestry.

As timberland was cut, tax delinquency soon became a general problem. As more land in a county became tax delinquent, local governments were forced to raise taxes on the remaining land to pay for essential services, that in turn resulted in more delinquencies. By the 1920's, it was evident that the best use for the cut-over lands in the north was for forestry and not agriculture. The soils were not suitable for most crops, growing seasons were too short, and markets were too distant. After logging ceased, the subsistence farmers were left with no opportunity for seasonal employment; the nearby markets, logging camps and towns had disappeared and the marginal farms could not survive. Counties began to recognize the considerable problems (and costs) of serving scattered families and some undertook to zone outlying areas for forestry and even to resettle families from depressed areas.

The problems created by tax delinquency were universal across the region and each of the three Lake States devised somewhat different solutions that varied in timing, direction and result. In Michigan, the problem was first confronted about 1890 in the Lower Peninsula when settlers on the sandy lands in the north had abandoned worthless farms. The State attempted to get these lands back into private ownership and enacted a Homestead Act in 1893 and later approved direct sale of the land. Much land was returned to private ownership, but most new owners merely cut any timber present and again defaulted on taxes. To keep local government alive, the State had

paid taxes on the delinquent lands that had reverted to the State but did not have clear title. In 1897, The General Property Tax Law was enacted giving the State full taxing authority and providing for foreclosure of tax delinquent lands. This legislation then vested full title in the State. A Forestry Commission was named in 1899 and was later replaced by The Public Domain Commission in 1900. Reverted lands and other State holdings, that had no value or use in private hands, were placed in Forest Reserves.

The Land Economic Survey begun in 1922 provided data that permitted the State and local committees to adjust the boundaries of the reserves depending on land capability. These reserves later became the State Forests that were much enlarged in 1931. The first forest reserves, established in 1903, are now the Higgins Lake and Houghton Lake State Forests. Reforestation was begun in 1904, and the Higgins Lake State Nursery was established. By 1916, Michigan had seven State forests.

As the pine era neared the end in Wisconsin, tax delinquency was already becoming a major problem, and it increased drastically when prices of farm products dropped after World War I. At the same time, the value of both farm and cut-over land fell severely.

Marginal farmers as well as lumbermen, land agents, and speculators hurt by rising taxes soon began to abandon their lands producing another round of tax increases. The property tax had long contributed to the pattern of "cut and get out" practiced by the lumber industry. In 1878, State Park lands were designated in Iron and Vilas Counties, and in 1903, a comprehensive Forestry Law created a Forestry Commission providing for a superintendent of forests and establishment of a forest reserve. A 1910 amendment to the State Constitution permitting the State to undertake active forestry was invalidated by the State Supreme Court halting progress; in 1924, a second amendment was enacted that allowed the acquisition and management of forest lands as a legitimate State activity. The first State forest was established in 1925. Ten others have followed with land acquired by exchange or purchase.

In Wisconsin, counties are responsible for setting and collecting the property taxes to support local needs, hence tax delinquent land reverted to the counties. By the early 1920's, most citizens had been convinced that forestry, not farming, was the best use for these lands, and the counties began to take steps to deal with the tax delinquent land to which they had title. The State acted to assist the counties by passing legislation to permit counties to establish reserves (i.e., county forests), and later to approve entry of these forests under the 1927 Forest Crop law, a law that provided tax relief to owners of forest land. Other legislation permitted municipalities and schools to establish forests and a 1919 amendment to the Constitution established a mill tax on real estate to provide funds for management of State forest lands.

In time, the counties met the challenge with help from University Extension and other State agencies. Costs were reduced in part by zoning and relocation of isolated and marginal farm families. Many county forests were established, planted, and protected from fire. Today 28 counties have county forests, in aggregate about 2,288,000 acres, now producing timber and providing recreation opportunities.

The situation in Minnesota was similar. Stimulated to some extent by the disastrous Hinckley fire of 1894, a Chief Fire Warden was appointed in 1895 but was allocated minimal funding. In 1899,

a Forestry Board was created to manage lands granted to Minnesota by the federal government. The first Forest Reserve established was formed from land donated in 1903. In 1904, the Forestry Board obtained from Congress a grant for an additional 20,000 acres not suitable for agriculture. A 1914 amendment to the State Constitution designated Trust Fund land as State Forest and stimulated reforestation. The Conservation Commission was created in 1925. Minnesota, following the action of Wisconsin and Michigan two years earlier, in 1927 enacted a statute called the Auxiliary Forest Law to assist forest owners. This law enabled them to pay a low annual property tax but to be taxed on the forest crop only once at the time it was harvested. Tax delinquent lands in Minnesota reverted to the State but were managed in the interest of the counties and other entities that had tax claims against that land. This resulted in large areas being returned to county control but also left much land in State forests with the intermixture forming a complex ownership pattern.

The Great Depression, National Forests, and the Pulp Era

The Depression of the 1930's shook the financial stability of all levels of government as well as of individuals and companies and resulted in large changes in the forests of the Lake States. Much of the area had recently been logged and burned. Reforestation had progressed slowly if at all and communities were still recovering from the effects of the post-WWI economy. The region was in need of massive help as was much of the rest of the country. One result was the expansion of public ownership that absorbed much of the tax delinquent land in the region. Other federal and State actions were helpful as well.

Establishment of the CCC and location of many camps in the region vastly increased the rate of reforestation by providing essential manpower, developing substantial forest nurseries and controlling wildfire. Other measures such as the Northern Wisconsin Settler Relocation Project were established to help move isolated settlers from marginal farms and concurrently to reduce the cost of relief for the counties. Farms were purchased and help given to the families to relocate. Other federal programs such as the WPA contributed.

The Minnesota National Forest (Chippewa NF) was created in 1908, and a core area withdrawn from sale by the General Land Office in 1908 was increased from public-domain lands and became the Superior National Forest in 1909. Similarly, in Michigan, the Huron National Forest was created in 1909. Tax delinquency increased after 1918 and extensive areas of cutover, burned over, and exhausted lands reverted to the States and counties.

The Weeks Act in 1911 had authorized the purchase of private lands for National Forests east of the Great Plains, and in 1924, the Clarke/McNary Act increased purchase authority and expanded federal-State cooperation on reforestation and fire control. Research initiatives, approaches to encourage private forestry, and cooperative educational programs were also included. In the late 1920's, Purchase Units were created to obtain lands for the Nicolet, Chequamegon, Ottawa, Hiawatha, Marquette (later incorporated into the Hiawatha NF), and Manistee National Forests. These forests were established during the early 1930's. The result was to greatly accelerate renewal of the forest resource on what had been worthless land.

Industrial forestry began to flourish during the years from 1920 to the mid-1940's with many companies beginning to replant burned-over lands, experimenting with selective cutting in hardwoods, establishing nurseries, cooperating with the States in fire control, hiring foresters, and examining sustained yield approaches. This activity was encouraged by laws stipulating that property taxes could be deferred until the growing timber was finally sold. Lands were entered under these plans as well as in the growing Tree Farm programs.

The end of WWII is sometimes said to mark the beginning of the Pulpwood Era or perhaps more appropriately named the Industrial Era. Although the Pine Era was relatively distinct, the Hardwood Era was less so, melding into the Pine Era as it began and exhibiting early industrial characteristics even while emphasis was on hardwood lumbering.

However, major emphasis in each of these exploitive phases sets them apart. Some of the overlaps appear in transportation. Pine lumbering depended largely on water transport. However, during the later part of the 19th century, many firms, in northern Wisconsin and especially in Minnesota, were moving logs from the stump to the sawmill by rail. Railroads were the principle mode of transportation for hardwood logs, but soon after 1900, trucks were sometimes used to move logs, first from the woods to railroads and later from the woods to the mill. Even so, truck transportation of logs only became common after WWII.

Papermaking was closely associated with lumbering. Pulp mills served to utilize the small trees cut during clear cutting of pine and as newer pulping processes developed to utilize the vast acreages of aspen and birch that developed on the cutover and burned lands. In Minnesota, paper mills were constructed during the 1860's at six locations from Cloquet to International Falls. In 1872, a ground-wood pulp mill was built at Kaukana in the Fox River Valley, and a few years later in 1887, an integrated pulp and paper mill was built on the Wisconsin River at Wisconsin Rapids. These locations have continued as major centers for papermaking. Few, if any, pulp and paper mills developed in the Lower Peninsula of Michigan, but pulp producers and users burgeoned in the Upper Peninsula starting in the 1920's. The increased use of fiber for building materials such as cellotex and wallboard as well as for plywood was a factor. Yet, in 1936 there were only six paper mills in the Upper Peninsula. Much of the pulp wood produced was shipped to the large Wisconsin mills. Aspen became an important pulp species and was also used for shredded packing, boxes, and pallets. Later, aspen and other species became basic components of chipboard and similar building products

The most abrupt change in the evolution of the industrial era came in the late 1940's with the rapid mechanization of logging following WWII. The introduction of the chain saw and the use of trucks for transporting logs changed not only the woods operation but even the living arrangements and logger behavior. Increased mechanization using tree skidders, hydraulic loaders on trucks, and even motorized tree shearers, reduced injuries and labor costs but involved a large investment. Woods labor became scarcer and workers demanded better living conditions.

Many of the younger "rubber tire" loggers commuted to work from home and families. The lumber camps that had been on the decline during the hardwood era disappeared by 1950 and the major pulp and paper companies (that had acquired immense land holdings) obtained their wood from independent jobbers. Many of these loggers depended on company lands for their timber or

obtained it from public lands by bid. The jobbers also depended on the big companies for their markets and so lost some independence.

The northern forests have been a popular recreation location ever since the mid-19th century. Resorts and cottages began to fringe our lakes as soon as the railroads made them accessible. The ease of automobile transportation plus the impact of tourist dollars has and is putting considerable stress on the forest environment, and if not better controlled, may destroy both its appeal and many of its functions.

In the immediate future, prospects for the Lake States forests appear good. Growth exceeds wood removal, and most forest managers are giving attention to sustained management. New silvicultural approaches are being investigated, and the public is becoming better informed. Climatic change is probably the major threat, although, the simplification of the many forest systems may produce unforeseen declines as may infestations of exotic insects and disease. Increasing human use, especially for housing sites, also pose short- and long-term dangers. Our forests are recovering from the destruction visited on them by fire and human need and greed. To continue to do so, they must be managed wisely and conservatively.

SIGNIFICANT EVENTS IN MICHIGAN FOREST HISTORY

- 1814 First Federal Land Office in Michigan.
- 1822 First mill in Upper Peninsula built by US Army at Sault St. Marie.
- 1825 Erie Canal completed.
- 1826 Federal Land Office survey began in SE Michigan.
- 1830 A few small sawmills along major streams in Lower Peninsula began producing for local markets.
- 1836 First large tract of pine land purchased by eastern lumbermen.
First lumber shipped to east from pineries of Central Michigan.
- 1837 Michigan became a state. Federal land grants provided funds for state government operations, railroads, and schools. Michigan has 37,000 residents. Office of Geological Survey established.
- 1840 Copper mining began in the Upper Peninsula in the Keewanaw. Schooners were built to transport lumber from Menominee, Muskegon and other towns to Chicago and elsewhere on Lake Michigan. Used until the 1890s and were supplemented in the 1870s by barges.
- 1843 State Land Office created to sell 12,000,000 acres from federal land grants.
- 1850 Michigan population reached 398,000 (consisted largely of farmers in the southern four rows of counties) in contrast to about 8,800 Europeans present in 1820.
- 1853 Court determines that a stream with capacity for floating logs is navigable. Gives all individuals equal rights to streams. Origin of early water laws.
- 1854 Marquette Iron Range opened in Upper Peninsula.
- 1855 St. Mary's Falls ship canal completed.
- 1862 Menominee Boom Company formed to handle logs from the many logging firms on the Menominee River.
- 1871 Fires burned 4,000 square miles, from Muskegon to Lake Huron. Coincident with the Peshtigo fire in Wisconsin. Twenty-five thousand loggers working in Michigan forests.
- 1872 1874 and 1879 major fire years in central Lower Peninsula.
- 1873 1,600 sawmills operating in Michigan, 100 on the Saginaw River.
- 1876 W.S. Gerrish of Clare County builds the first narrow gauge railroad changing the lumbering industry in Michigan.
- 1880 Market hunters shipped 100,000 deer carcasses from the northern Lower Peninsula.
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1881	Fire burned 1,500 square miles in the thumb and again in 1891. First course in Forestry offered at the University of Michigan. Detroit, Mackinac, and Marquette Railroad completed. The railroad received land grant of 1,300,000 acres.
1882	Peak year for lumber shipment from Saginaw (over 1 billion board feet).
1885	Log rafting from Canada and Upper Peninsula to Saginaw and to eastern ports began and continued into the 1890s. Farm population on sandy cutover land in northern Lower Peninsula reaches peak, farm abandonment begins in 1888.
1887	Forestry Commission established to preserve, protect, and restore Michigan's forests, soon the Commission legislation was repealed. Peak year for Muskegon (730 million board feet) production.
1889	Railroad logging pioneered along the Ontonagon River in the UP.
1890	Peak year of lumber production in Michigan.
1893	General Property Tax Law enacted. Gave taxing power to state and enabled foreclosure on tax delinquent cutover lands.
1894	Michigan Academy of Science was organized and soon became an advocate for forest conservation and better use of cutover lands.
1897	Calculations indicated that total cut had reached 162 billion board feet, equal to 29,100 sq. miles -or almost 50% of land area of Michigan.
1899	State Forestry Commission re-established.
1900	First state land reserves established for reforestation.
1902	State Forestry Commission reports that the success of forest management depends on effective fire protection. This was followed in 1903 by passage of a comprehensive fire law that authorized state to take part in fire control outside of state forest land reserves.
1903	First state forests established in Roscommon and Crawford counties (Higgins Lake and Houghton Lake). Charcoal furnaces in Upper Peninsula were burning average of 30 acres of hardwood per day smelting iron.
1904	Between 1904 and 1908, the state sold almost a million acres of land, an amount about 17 times greater than that entered as tax homesteads. A commission reported that the state lost about \$10.5 million on land sales from 1902 to 1908. Huron National Forest created.
1909	Public Domain Commission created absorbing State Land Office and Forestry Commission. Forest Reserves established.
1910	Peak cut reached for Manistique in the Upper Peninsula.
1913	A reforestation policy is established—provides seedlings.

1917	First appropriation to purchase State Park land approved and Interlochen State Park acquired.
1918	Elk introduced to Pigeon River State Forest.
1920	Michigan cut of pine was exceeded by hardwood cut.
1921	Dept. of Conservation was created with nine divisions including Fire Control, Game Protection and Propagation, Fish Culture, Predatory Animal Control, Public Lands, State Parks and Education. Conservation Commission established to oversee the Department.
1922	Land Economic Survey established. Over 11 years of the survey, 8.4 million acres were examined in 18 northern Michigan counties.
1923	Forest Fire Law enacted providing authority for fire control outside of state forest preserves.
1924	Congress passed the Clarke-McNary Act providing for cooperation between Federal, State and private entities on fire control, reforestation, land purchase and exchange, etc.
1925	Commercial Forest Act created. Required a permit to cut forest products. Also, a fire year with 3,887 fires that burned 733,750 acres.
1929	Forest campground system began with Spring Lake in the Fife Lake State Forest.
1931	Purchase orders approved for the Ottawa, Hiawatha and Marquette National Forest units formed primarily from cutover lands.
1932	Between 1921 and 1932, the state had obtained title to almost 2 million acres of abandoned land that clearly could not be made permanently productive in private ownership. There were now eight forest reserves with 170,000 acres managed and 105,000 acres in unmanaged, unnamed units.
1933	Enabling legislation for the Civilian Conservation Corps signed by President Roosevelt. In time, over 100,000 CCC members reforested 134,000 acres, installed thousands of waterwells for fire fighting, and carried out many other valuable activities. Called the "single most productive conservation effort in our history."
1934	Conservation classes began in schools.
1935	Land Use Planning Program using results of the Land Economic Survey to involve local citizens on study committee. Committee recommended that over 80% of state-owned lands should remain in state ownership.
1936	Worst year for forest fires in the Upper Peninsula.
1937	Wood workers unsuccessful strike in the Upper Peninsula.

1940	Michigan Wisconsin Timber Producers Association formed. Timber sale program begun on state land to improve food and cover for game (deer).
1944	Funds appropriated for land purchase in southern Michigan and for the Porcupine Mountains. State forest lands total nearly 2 million acres with 13 State Forests under management.
1946	All state Game Area lands (1,400,000 acres in northern Michigan) were transferred to the Forestry Division and dedicated as State Forests.
1947-1950	Chain saws came into common use in the woods.
1948	After six years of study and controversy, the Conservation Department was reorganized, decentralized, and several new or renamed divisions including both forestry and recreation divisions were added to the field units.
1949	Since 1931, 642 school forests and 223 community forests had been established on 65,433 acres of Conservation Dept. land (mostly tax reverted).
1950's	Logging camps became rare, none remained by 1960. Most large industrial users depended on "independent" jobbers for timber. Motorized and gasoline powered logging machinery became the rule.
1960	State Forest ownership reached 3,765,000 acres and included 105 campgrounds.
1968	The Department of Natural Resources replaced the Conservation Department that had been reorganized in 1948 and again in 1964-65. The Dept. of Natural Resources was itself reorganized in 1973 and in 1976.
1973	Department of Natural Resources divided into two branches: natural resources and environmental protection, each with its own funding.
1977	Forestry and Forest Fire Divisions were merged and given management responsibility for managing 3,800,000 acres of state forest lands and fire and insect control on all forested lands.
1983	Michigan Forest Resources: Directions for the Future—A Statewide Forest Resources Plan is released giving recommendations.
1984	The Task Force on Public Lands Policy provided recommendations for the role of the state in land ownership. Strongly opposed disposal of state lands as not in the State's best interest.
1988	Forest and Mineral Resources Development Act created fund to promote forestry and forest products in Michigan.
1990	State Park System downsized because of budget constraints. Governor creates Michigan Forest Finance Authority to finance investments in the State's best interest.

1993	Department of Natural Resources reorganized and new department is created by Executive Order.
1995	Executive Order creates a Department of Environmental Quality and transfers its functions from the Department of Natural Resources leaving the Divisions of Wildlife, Parks and Recreation, Fish, Forestry, Real Estate, Administrative Services, and Law Enforcement. The DNR is again reorganized eliminating the regional field structure.

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SIGNIFICANT EVENTS IN MINNESOTA FOREST HISTORY

- 1821 A primitive sawmill was erected at St. Anthony Falls to cut lumber for construction of Fort Snelling.
- 1837 Treaty with the Chippewa (Ojibwa) and Sioux (Dakota) tribes transferred a large area of Indian lands to the United States.
- 1838 Treaty was ratified.
- 1839 First settlement with a lumber mill named Marine was established on the St. Croix. Mill used water power and a muley saw and began to cut timber in 1839. The mill was hauled in by steam boat, and with some changes, it remained in operation for 50 years.
- 1840 Rafting logs and then lumber southward on the Mississippi began using man power. Within a few years, tows were pushed by steam boats to Winona, St. Louis, and other river towns. Towing continued even after 1900.
- 1843 Stillwater was established and its first lumber mill built in 1844.
- 1847 General Land Office Survey began in Minnesota.
- 1848 Government Land Office opened at St. Croix Falls selling land in the St. Croix Valley including sites of St. Paul and Stillwater. Water-powered sawmill was erected at St. Anthony Falls to serve the local market.
- 1849 Territory of Minnesota was organized.
- 1850 Minnesota population now 6,000 grew to 150,037 by 1857.
- 1851 Treaty of Traverse des Sioux brought Minnesota about 19,000,000 acres of farm land on west side of State, increasing lumber markets. A log boom was chartered on the St. Croix near Stillwater. By 1874, 3.5 billion feet of logs had passed through this boom.
- 1853 Land purchases began on a large scale paid for either in cash or with military bounty land warrants.
- 1854 Stillwater now had 5 mills including the first steam powered mill with gang and circular saws. Minneapolis had 3 door and sash companies. Lumber industry was a major factor in development of Minneapolis, exceeding grain. Food for settlers and lumber camps was sometimes a limiting factor.
- 1855 Settlement began at Winona, and one sawmill was built followed within 2 years by two others. Farmers traded produce for lumber. Duluth also began to attract interest and a small saw mill was built.
- 1858 Minnesota gained statehood.
- 1859-1860 Low water on the Minnesota River influenced price and availability of lumber from St. Anthony Falls to Mankato.
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1860	At Stillwater, a large steam powered mill with two gang saws was built to serve the St. Louis market. 1860's were a period of great expansion in the lumber industry and in rail transportation. By 1859 the existing railroads were experiencing difficulty in transporting westward all the lumber needed. Railroads themselves used much wood-for ties, bridges, poles, and grain elevators as well as for the associated towns. In 1867, the city of Minneapolis had 67 miles of boardwalk, a total of 6 million board feet.
1862	Morrill Land Grant Act provided States large land grants to support agricultural and engineering colleges. Homestead Act also increased land transfer to individuals, but the land often ended up in the hands of the lumber companies.
1870	Completion of the Lake Superior and Mississippi Railroad from St. Paul to Duluth opened a large area (enough pine to last until 1880). Other centers were developing, such as Anoka and Brainerd. By 1869, the population of Duluth had reached 3,500 people. During the past decade paper mills were built at Cloquet, Grand Rapids, International Falls, Brainerd, Little Falls, and Sartell to utilize smaller trees being cut. Likewise during the 1870's the crosscut saw was replacing the ax, and horses were replacing oxen in the woods.
1871	Tree bounty law was passed providing payment for trees planted on the prairies and other open land.
1876	The Minnesota State Forestry Association was formed.
1877	An act was passed that required that standing timber be estimated, appraised, and sold before the land could be sold.
1887	A company from Saginaw, Michigan established a sawmill in Duluth followed during the next few years by at least 4 other Michigan companies that purchased sizable holdings.
1888	A log boom opened at St. Paul and between 1888 and 1913 moved 1,709,062,520 ft. of logs. Even so, yellow pine from Arkansas became competitive and fewer logs were sent down the Mississippi from the St. Croix and the Chippewa drainage in Wisconsin.
1890's	Timber ownership became concentrated in a few hands. The land grant of the Northern Pacific RR was purchased by Weyerhaeuser who had also begun operating in Washington Territory in 1887.
1891	Legislature established Itasca State Park, and in 1892, Congress granted the federal lands within the park to the State.
1893	Panic of 1893 reduced the cut as did low water in 1900 and no snow in 1901-02. In 1893, Duluth firms stopped competing westward and shipped mostly eastward.

1894	Hinckley Fire caused 418 deaths. In the late 1890's and early years of the 20th century, agitation began for conservation legislation.
1895	The legislature named the state auditor as Forest Commissioner and authorized him to appoint a chief fire warden to enforce the fire laws. General C.C. Andrews was appointed. Only \$5,000 was allocated for fire control for a forest area estimated by Andrews at 11,890,000 acres.
1899	A Forestry Board was created by the legislature to manage lands granted to the State by the federal government.
1891-1902	Fraud involved in sales of Indian land referred to as the "Red Lake Pine Muddle." Stumpage on thousands of acres of Indian land was vastly under-estimated resulting in large losses to federal government and to Indians from 1896 sale. Eventually resulted in the Morris Bill amending the Nelson Act, that established reserve areas including the one designated as the Minnesota National Forest and controlled timber sales. It brought in greater returns to the government but also left the Indians with large cutover areas. In 1917, half of the Red Lake Indian Forest was clearcut. Similar serious problems affected the White Earth Reservation after 1906 when that tribe agreed to accept individual land allotments.
1899	Minnesota State Forestry Board was created and in 1900 received 990 acres of cutover land. That land was combined with 1,000 acres of cutover land given by Gov. Pillsbury and was designated as a forest reserve in 1903 and later became the Pillsbury State Forest. A nursery was established to produce seedlings.
1903	University of Minnesota School of Forestry was formed.
1904	Congress was asked by the Forestry Board to grant land not fit for agriculture to State and agreed to deed to Minnesota 20,000 acres that was accepted in 1905 as the Burntside Forest Reserve.
1908	Congress established the Minnesota National Forest, renamed the Chippewa NF in 1928. After Chisholm fire, the chief fire warden was authorized to appoint fire rangers to help fight fires, but funding was not adequate.
1909	Land withdrawn by the General Land Office at request of General Alexander became nucleus of the Superior National Forest established with 909,734 acres by Presidential Proclamation.
1910	Baudette and Spooner were destroyed by fire with 42 victims.
1911	Revised legislation for fire control. Appointment of State Forester W. T. Cox who organized the State forest protection system with district rangers.
1914	A constitutional amendment was passed designating trust fund land as State forests, and soon, extensive tree planting was in progress.

1918	Cloquet Fire destroyed Cloquet and numerous small villages with a loss of 438 lives. Resulted in passage of a law requiring burning permits.
1923	Lake States Forest Experiment Station set up by U.S. Forest Service.
1924	Passage of the federal Clarke-McNary Act provided State with funds for fire protection and other activities.
1925	First Conservation Commission was created, and Department of Conservation formed laws regarding forestry were codified.
1927	Law was enacted regulating cutting of Christmas trees. Changes to this law in 1935 required that all Christmas trees must be tagged.
1931	Department of Conservation was reorganized, and the Conservation Commission was enlarged to 5 members appointed by the Governor. Most of duties regarding State lands and resources held by the State auditor were transferred to the Commissioner of Conservation. Made sale of State timber and management of State parks the responsibility of the Division of Forestry. Production of conifer planting stock was authorized.
1932	Appointment of Minnesota Committee on Land Utilization by Governor. Report was published in 1934 with title "Land Utilization in Minnesota: A State Program for the Cut-Over Lands."
1933	Legislation passed that specified that all income from acquired lands within State forests would go to the general revenue fund and that 50% of gross amount would go to the county where the revenue was generated. Civilian Conservation Corps was created by Congress and 13 additional State forests were created by the legislature.
1935	Lake States Forest Experiment Station published Forest Survey Release No. 2 on the Forest Situation in the Cloquet-Superior District. Separate State Parks Division established as were 13 more State forests. Peat lands were withdrawn from sale, and various fire control regulations were authorized.
1937	Conservation Department again reorganized. Conservation Commission abolished and Commissioner appointed by Governor.
1939	County land zoning was authorized. Eight counties zoned their lands. New law required the classification and appraisal of timber on tax-forfeited lands and approval by the Commissioner before sale.
1943	State forest laws codified, and 29 State forests were re-established. Minimum cutting regulations were enacted.

1944	Keep Minnesota Green was organized in Minnesota providing for forest fire prevention education and the Tree Farm program. By 1958, over 1000 tree farms established including over 600,000 acres.
1945	Legislature authorized establishment of county memorial forests from tax-forfeited lands.
1946	Assistance in management of private forest lands provided by forest industry and in 1947 by State funds. State nurseries were authorized to produce planting stock for privately owned lands.
1953	Norway Pine was designated as the Minnesota State tree and the Chengwatana State Forest was established. This was followed in 1954 by the White Pine State Forest, totaling 34 State forests.
1956	Division of forestry was reorganized into 4 regions with 74 Ranger Districts. Cooperation was undertaken with Soil Bank Conservation Reserve Program and Agricultural Conservation Program providing planting stock and technical assistance. Nurseries were enlarged.
1957	Passage of the Minnesota Tree Growth Tax Law to permit privately owned forest lands to be taxed on the annual increase in value.
1959	Commissioner of Conservation reserved 830,116 acres of State land to be added to State forest system. Fire laws were strengthened.
1963	Legislature established and/or re-established 54 State forests total of 2,926,570 acres. Minnesota Outdoor Recreation Act was passed.
1965	Bill passed prohibiting Land Exchange Commission approval of federal acquisition within the Superior National Forest and land exchanges between the U.S. and the State in this area.
1967	Legislature again reorganized the Department of Conservation and repealed or updated various earlier legislation.
1993	Minnesota Environmental Quality Board releases the draft of the Generic Environmental Impact Statement and 15 briefs that summarize the report.
1995	Massive July blowdown in two areas southwest of Bemjidi and south of Grand Rapids totaling 188,000 acres of forest land for total of 2,790,000 cords of mostly aspen in west and conifers in east. Salvage is planned.

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SIGNIFICANT EVENTS IN WISCONSIN FOREST HISTORY

- 1809 First sawmill built on Fox River near DePere.
- 1819 Sawmill built on Black River near Black River Falls.
- 1822 Permit for timber cutting issued in Chippewa Valley by Indian Agent.
- 1831 Sawmills built on Menominee River (Marinette Co.), on Red Cedar River (Dunn Co.), and on Wisconsin River (near Nekoosa).
- 1832 General Land Office Survey begun at the intersection of Illinois State Line and the 4th Principal Meridian.
- 1837 First permission given by Indians to white men to cut timber and build mills in the St. Croix River Valley.
- 1840 Lumber rafts dispatched down the Wisconsin River from Biron (near Wisconsin Rapids).
- 1841 Law passed regulating dam construction on navigable rivers relative to log drives.
- 1848 Papermill using rag stock to make newsprint built at Milwaukee. Steam tow boats used to tow log rafts on the St. Croix River. Wisconsin gains statehood.
- 1854 Boundaries of Menominee Reservation established after treaty.
- 1858 Upper Wisconsin River log drive from Eagle River to Mosinee.
- 1867 Legislature authorized Forestry Commission to study forest destruction in Wisconsin.
- 1871 The Peshtigo Fire and associated fires in Brown and Door Counties resulted in great loss of life and property.
- 1872 Kaukauna becomes site of first ground-wood pulp mill in Wisconsin. Forest fires were common in Wisconsin during the later half of the 19th and early 20th centuries. Serious fires were recorded in 1863, 1864, 1868, 1880, 1891, 1894, 1897, 1908, 1910, 1923, 1931, and 1936.
- 1873 Wisconsin Valley Railroad built from Tomah to Grand Rapids (Wisconsin) was the start of rail transportation for logs and lumber in central Wisconsin.
- 1876 Private reforestation project near Hancock using wild stock.
- 1878 State Park lands (50,000 acres) established in Vilas and Iron Counties.
- 1881 Steam-driven logging railroad became operational for the Shell Lake Lumber Company in Washburn County. Strike of mill workers in Eau Claire called the "Sawdust War."
- 1883 Veneer plant established near Antigo.
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1884	Plywood plant built in Two Rivers, and woodpulp mill built on the Wisconsin River at Centralia (Wisconsin Rapids).
1887	Integrated pulp and paper mill established at Centralia. Menominee tribe rejected option in General Allotment Act that would have permitted division of tribal communal lands to individuals.
1894	Forest fire destroyed town of Phillips (Price Co.).
1895	Legislature authorizes formal forest protection organizations.
1900	Groundwork begun through first land acquisitions for future St. Croix Interstate Park.
1903	Comprehensive Forestry Law creates a Forestry Commission, provides for a Superintendent of Forests and establishment of a forest reserve. Instruction in forestry offered at the University of Wisconsin.
1904	E. M. Griffith appointed as first State Forester.
1905	State Board of Forestry created consisting of President of University of Wisconsin, Dean of College of Agriculture, Director of Geological Survey, Attorney General, and one citizen appointee.
1907	State Park Board established.
1908	Construction of modern sawmill at Neopit provided by LaFollette Act.
1910	Forest Products Laboratory established in Madison for research on forest products by U.S. Forest Service. Wisconsin State Constitution amended, enabling the State to engage in forestry as work of internal improvement.
1911	First integrated Kraft (sulphate) pulp and paper mill in North America built at Mosinee. State-operated tree nursery and headquarters of State Forester established at Trout Lake in Vilas County.
1913	Pine plantation near Star Lake (Vilas Co.) planted by State with seedlings from Trout Lake Nursery.
1924	Forestry consulting firm organized in Milwaukee supervised first selective logging operation in Wisconsin in Oconto County. Second forestry Amendment to State Constitution was adopted providing authority for forest land acquisition and management. Clarke-McNary Act enacted by Congress provided for State-Federal cooperation in fire control and reforestation, etc. Tax delinquency in cutover counties becomes critical problem.
1925	Northern Highland State Forest established in Vilas County. Industrial forester hired by Nekoosa-Edwards Paper Co. established nursery and began forestry program. State gave approval to federal government to begin purchase of land for National Forest.

1926	Agreement between Wisconsin Conservation Department and University of Wisconsin to establish a program to improve forestry for private land owners and farm forestry extension work began.
1927	Forest Crop Law passed providing tax relief for forest land owners. School districts and municipalities permitted to own land for forestry purposes. Initial meeting of Conservation Commission.
1928	Goodman Lumber Company enters land under Forest Crop Law. U.S. Forest Service acquires 12,940 acres near Three Lakes as initial purchase for the Nicolet National Forest. Farm abandonment and tax delinquency addressed by report entitled "Making the Most of Marinette County Lands." Laona and Crandon School Districts establish school forests.
1929	Mil tax on real estate passed to provide funds for management of State-owned forest lands.
1930	Marinette County establishes county forest under Forest Crop Law. Cooperative fire control agreement arranged between the Nekoosa-Edwards Paper Company and the Wisconsin Conservation Department.
1933	Creation of the Chequamegon and Nicolet National Forests.
1933	Nicolet National Forest receives first two CCC camps in Wisconsin. Within a short time the Nicolet and Chequamegon NF had many camps aiding in reforestation, road building, and other activities. Oneida County adopts first Rural Zoning Ordinance in United States.
1934-1940	Northern Wisconsin settler relocation project. Moved over 400 families from isolated marginal lands in cutover.
1941	Industrial forests had grown to 800,000 acres.
1944	Trees for Tomorrow (funded by 9 paper companies in cooperation with USFS) initiates conservation education programs. Forest tree planting machines, developed by University of Wisconsin, Dept. of Agricultural Engineering and Extension, come into widespread use.
1946	Wisconsin Conservation Department appoints farm foresters to assist farm woodland owners.
1950	Cooperative State/Federal/County forest inventory undertaken.
1965	Wisconsin Arborist Association founded.
1967	Wisconsin Department of Natural Resources created from Department of Conservation with added responsibility for air, water, and other environmental issues, a result of the Kellet Commission.
1970	Peeled aspen pulpwood production hastened by satellite debarking, first plant built at Mercer.

1972	Aspen chips for pulping produced by satellite chipping plant at Ashland.
1974	Chippewa Indians sue for timber harvest rights on northern Wisconsin public lands. The case was finally resolved in 1991 when a federal judge ruled against the Chippewa claim.
1976	Industrial tree farm area reaches 1,351,535 acres. Forest History Association of Wisconsin formed. UW Stevens Point established an urban forestry option as part of its undergraduate forestry major. Serious drought hit Wisconsin lasting into 1977 when ended by late spring rains. In 1976, 4,000 fires burned 48,000 acres and 100 structures and in 1977, 3,000 fires burned 60,000 acres.
1977	By this year there were 328 school forests (25,084 acres) most with active education and/or forestry programs. A major storm crossed the State leveling about 344,000 hectares of forest in 25 separate downbursts including much of the Flambeau State Forest. Project Learning Tree began, co-sponsored by WDNR and WI Dept. of Public Instruction. With numerous changes over the years, the program continues under the guidance of an advisory committee.
1979	Association of private non-industrial woodland owners organized. Waferboard plant constructed at Hayward by Louisiana-Pacific Corp.
1980	Lake Superior District Power Co. at Ashland began to produce electricity burning chips, sawdust, and bark. Two fires in northwest Wisconsin burned 16,000 acres and destroyed 100 homes and other buildings. A Governor's Commission on Forest Fire Control was appointed and encouraged cooperative efforts between local and State agencies.
1981	Hayward State Forestry Nursery acquired by WNDR from USDA Forest Service. Planting from State nurseries had already passed the one-billionth seedling.
1983	Wisconsin forest land area reached 14.8 million acres increasing by 300,000 acres since 1968.
1984	Great Lakes Forest Fire Compact formed. States of Wisconsin, Michigan, Minnesota, and Province of Ontario agreed to share resources for wildlife management.
1985	Managed Forest Law enacted replacing the 1927 Forest Crop Law and the Woodland Tax Laws. This law provides tax incentives to manage forest resources for multiple benefits. Federal Farm Bill established the Conservation Reserve Program (CRP) with the result that, from 1985 to 1995, 60,000 acres were planted to trees in Wisconsin.
1989	Congress passes the 1990 Farm Bill authorizing federal urban forestry assistance to states. Within a year, WDNR hired a State Urban Forestry Coordinator.

1991	A blister rust resistant white pine seed was collected from a WDNR seed orchard. Wisconsin Legislature amends statutes to establish a state urban forestry grant program to begin in fiscal year 1993.
1992	First State Urban Forestry Conference and appointment of an Urban Forestry Council.
1994	Wisconsin Forest Accord signed by 13 organizations with the purpose to improve communication concerning statewide forest management. Included agreement that the Habitat Classification System and National Hierarchy of Ecological Units can work together to achieve resource management goals.
1995	County forests' revenues exceed \$8,000,000 annually. Wisconsin Department of Natural Resources loses former apolitical status as 1996 Budget Bill places Secretary in Governor's Cabinet. Departmental reorganization is begun. DNR issues major report "Wisconsin's Biodiversity as a Management Issue."

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