Snell energizer and battery.

pine/jack pine plantation was also well stocked with trees averaging 3.5 feet high. In 1986, at the end of the growing season, the trees averaged 10.5 feet high. Growth rate on the control was the same as on the grazed area, so in five years there was no measurable difference. Trees in this plantation were relatively tall at the beginning of the grazing and didn't suffer any damage, even in loafing areas.

Plantation Release

After the first year of grazing on the administrative study area the reforestation forester came to me and said he was going to spray herbicide on a couple of plantations unless I wanted to put some cows out there instead. These were two red pine plantations with seedlings less than a foot high, some of which had just been fill-in planted. The following spring we blasted waterholes in low areas and in the summer the Youth Conservation Corp were out building fence.

The first year we put the cattle on during the first week of July. Over the next three years we increased the stocking level and put the cattle on earlier. Now they go on the first week in June and stay until the end of August or first part of September.

After five years:
- the trees have grown without mortality
- the amount of forage almost doubled
- lateral branches were stepped down (broken), its unlikely that it hurts the tree.
- a two wire (both live) electric fence will hold cattle

Summary

After six years of grazing on the Superior National Forest we have found that grazing is a viable resource management tool to meet timber management objectives and at the same time provide forage for livestock. The cows did not eat the trees, or any portion of the trees.

Although there was one confirmed kill by a timber wolf during this time period, there were two confirmed timber wolf kills on the permittee's pasture within sight of his house.

No cattle were rustled or shot. This has been a real fear of the permittee.

The cost/benefit ratio is favorable when compared with the use of herbicide for release. It depends on the amount of area enclosed, but we have found that the cost of improvements including an electric fence can be half the cost of conventional methods. The grazing fees also help to offset the cost.

This was an exciting project and it proved that transitory range in conifer plantations in a northern boreal forest is not only possible but can be a practical and effective management tool.

Historical Sketch and Facts—Minnesota

Herbert R. Boe

Generally accepted recorded history of Minnesota dates back to around 1654 when Radisson and Groseilliers, French traders, made an exploration into the west, reaching what is now called Minnesota country. Another event, disputed by some, was the discovery in 1498 of the Rune Stone in western Minnesota. This stone had an inscription which stated that in 1362 twenty-two Norwegians and eight Goths travelled from Vinland westward to the location where the stone was found. In 1680 Father Hennepin discovered and named the Falls of St. Anthony. In 1727 the French established a Fort Beauclairenois on Lake Pepin, on the Mississippi River in southeastern Minnesota. In 1763 France ceded the part of Minnesota east of the Mississippi to England. From 1850 until the early 1800's the French and later the English Hudson Bay Co. carried an extensive fur trading in northern Minnesota and Canada. The Pigeon River served as the connecting link with trading posts and inland waterways and Lake Superior and then through the Great Lakes to eastern markets and eventually Europe. This was the era of the famous Voyageurs and their large cargo canoes transporting supplies and trading goods into the trading posts and furs back out.

During these early years, parts of Minnesota, at different times, belonged to Spain, France, England, and the USA. Also, before statehood various parts of Minnesota were within the territories of Indiana, Illinois, Michigan, Missouri, 

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Wisconsin and finally the Territory of Minnesota covering the area now known as the State Minnesota.

Two great Indian "families" of major importance in Minnesota history were the Sioux or Dakotas, and the Chippewa or Ojibway. The Sioux were a large Confederation of seven tribes or council fires. The Santee tribe lived primarily in the area of Minnesota. Some archaeologists have dated artifacts as far back as 1000 B.C. And, a skeleton found in 1931 indicates a homo sapiens lived in this area ten to twelve thousand years ago. This is believed to be a group of humans pre-dating Indians. Some evidence indicates Indians may have lived and hunted in Minnesota six to seven thousand years ago.

The Sioux tribes extended as far west as west of the Missouri River and south into Iowa and Missouri. The Chippewas moved into northern Minnesota from eastern regions and displaced the Sioux in the early 1700's. The Chippewas had earlier contact with white people and had adopted some of their customs and material things, including firearms, which gave them a decided advantage in fighting the Sioux. Some think they may also have had counsel and leadership from the French.

The first US military expedition into Minnesota territory was in 1805, led by Lt. Pike. He received his orders (not from the President) but from General James Wilkinson stationed in St. Louis. His instructions given to Lt. Pike were comprehensive and well conceived. Pike was to go up the Mississippi and find its source if possible and to conciliate the Indians and "attach them to the United States." He was instructed to learn about their population and lands as well as the kinds of skins they bartered and the people with whom they traded. He was to confer with the Indians about building military posts, "trading houses" as part of a "factory system" at critical points which included the Falls of St. Anthony at the mouth of the Minnesota River, and to keep a diary of his observations. The young officer observed his instructions faithfully. He asked the Indians to stop their trade with the English and signed a treaty with them allowing the Americans to build a fort at the location now known as Fort Snelling at the confluence of the Mississippi and Minnesota Rivers.

The building of Fort Snelling was completed in 1824 and named after Col. Josiah Snelling, its first commander. Col. Snelling was given the mission to direct relations with the Indians, re-organize trade (the British still operated trading posts in the territory), prepare for the coming of missionar-
ies, and guide settlement and exploration. No master plan existed, except for the broadly expressed and somewhat open-ended mission. However, diverse talents of naturalists, cartographers, engineers, writers, artists, men of the cross, and even observant tourists contributed to the total information about the territory.

In 1734 LaVerendrye queried the Indians about iron. They were familiar with iron but their reports of locations were further west than the large mines of later years. As early as 1826 a treaty was signed with the Chippewa Indians on the St. Louis River near the western tip of Lake Superior, giving the United States "The right to search for, and carry away any metals or minerals from any part of their country." But it wasn't until 1854 that iron ore was discovered in northcentral Minnesota, later to become known as the Iron Range. Actually there are three ranges: the Vermillion, the first one to be developed; the Mesaba, the largest; and the Cuyuna, which contained large amounts of manganese. This range supplied nine-tenths of the U.S.'s manganese needs during World War I.

A U.S. geologist, David Owen, made extensive surveys in northern Minnesota and published a report in 1852 containing references to iron ore. The Chippewa land cession of 1854 is commonly called the "miner's treaty" and copper and gold seemed to be uppermost in men's mind at that time. There was a minor gold rush in 1865 and 1866, but nothing came of it and iron proved to be the principal ore of the region. However, development was delayed until financing could be arranged from eastern bankers for actual mining operations and to construct railroads plus handling and loading facilities for shipping on the Great Lakes to haul the ore to steel mills. The first train load of ore arrived at Two Harbors, Minnesota, on the western shore of Lake Superior in August 1884 with twenty-two cars containing 220 tons of ore. From then until the late 1950's, iron was king on the iron range. Workers from many nations streamed to the iron mines; "range cities" were founded and grew. When the years of rich natural ore seemed numbered, laboratory research opened ways to the profitable mining of lower grade ore called taconite. In 1953 only 81,000,000 tons of ore were shipped, but already research at the University of Minnesota's Mining Experiment Station had developed the technique for processing taconite into pellets with enough iron content to be profitable. Many taconite plants were built and remained in full production until the late 1970's when world competition in mining and steel production caused a major shut down of mining on the famous "Iron Range". This greatly reduced rate of mining has brought on great unemployment, caused migrations of many of the younger families, and closing a large numbers of support industries.

Lumber, after fur, ranked as the second industry of Minnesota from the 1820's until 1900, when wheat became a major crop and flour milling a major industry. By 1930 the State Planning Agency became alarmed that only a third of the state remained forested. An estimated two thirds of the land had originally been covered by commercial timber. The timber industry supplied lumber at a time of tremendous expansion and growth of the nation. The first sawmills were located on the St. Croix River at Marine and Stillwater. The extensive river systems in the state provided means for floating logs to mills or "landings" to be loaded on rail cars. Timber remains a major resource today and is under better management by the Minnesota Department of Natural Resources, the U.S. Forest Service, County Foresters, other resource agencies, and private consultants assisting private land owners and commercial companies. State, Federal, and private forests now cover about two thirds of the state.

Wheat became the major agricultural crop in the 1850's. By 1890 there were 5,900,000 acres of tilled land in Minnesota with wheat grown on half of it. Wheat has now been replaced by corn, soybeans, and alfalfa, with dairying a major farming enterprise. Cattle and hog feeding flourished for many years but is no longer as extensive. Minnesota is second in the nation in turkey production. Current farm census figures list 6.5 million acres of cropland in Minnesota, with about 5 million eligible for the for the Conservation Reserve Pro-
Minnesota widely advertises its 10,000 lakes, but it has many more wetlands. The glaciers that created Minnesota's famous lakes also formed thousands of low areas which eventually developed into wetlands. These wetlands vary according to the state's major ecological units or biomes. Northeastern Minnesota is characterized by boreal forests and extensive peat bogs. Western Minnesota is characterized by tallgrass prairie with its pothole wetlands. Southeastern Minnesota is characterized by hardwood forests and high plateaus which are dissected by numerous streams and floodplain forest wetlands.

Wetlands provide valuable and essential habitat for fish and wildlife and maintain environmental quality by removing excess nutrients and sediments from watercourses. Since settlement, the draining or filling of wetlands for agriculture and urban development have caused the loss of many of the state's wetlands. The Minnesota Department of Transportation (Mn/DOT) fills wetland habitat in the course of improving and maintaining the state's highway system. During the past two decades, actions affecting wetlands have been regulated by a variety of federal and state laws and regulations. To insure that wetland impacts were assessed and mitigated in an appropriate and efficient manner, Mn/DOT in cooperation with other state and federal agencies has developed wetland mitigation banking. In this banking system the loss of unavoidable wetland habitat is offset by wetland enhancement, restoration and creation.

Activities in Minnesota's wetlands are regulated by the Army Corps of Engineers (in consultation with the U.S. Fish and Wildlife Service) and the Minnesota Department of Natural Resources. When federally funded transportation projects affect wetlands, it is Mn/DOT's responsibility to mitigate these losses (Executive Order 11990). Wetland Mitigation Banking is a formal procedure that quantifies and qualifies both wetland impacts and wetland mitigation. It encourages maximum use of resources and opportunities available on or adjacent to highway projects. Mitigation banking promotes cost effectiveness by allowing projects affecting wetlands to proceed without costly delays.

Mn/DOT has, in the past, mitigated wetland impacts without a mitigation banking process. However, the old ad hoc approach to mitigation sometimes resulted in problems including high cost for the amount of mitigation gained, project delays, and loss of the wetland resource. Significant and moderate level impacts were mitigated, but much time was spent in coordination and negotiation with natural resource agencies. Coordination was done on a case-by-case, piecemeal basis. Agreements reached on a given project might not necessarily apply to other projects. Cost effec-

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