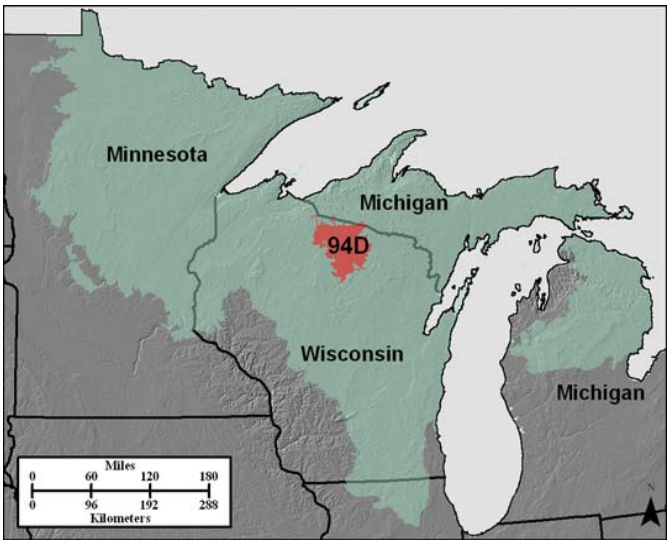

Location of MLRA 94D in Land Resource Region K.

94D—Northern Highland Sandy Drift

This area is in Wisconsin (99 percent) and Michigan (1 percent). It makes up about 2,100 square miles (5,445 square kilometers). It includes Rhinelander, Eagle River, Minocqua, Tomahawk, Mercer, and Land O'Lakes, Wisconsin. Almost all of the Northern Highland-American Legion State Forest is in the north-central part of the area. Small parts of the Chequamegon and Nicolet National Forests are just inside the northwestern and northeastern boundaries of this area, respectively. Almost all of the Lac du Flambeau Indian Reservation is in the northwestern part of the area.

Physiography
This area is in the Superior Upland Province of the Laurentian Upland. Three distinct glacial lobes of the Laurentian Ice Sheet (Wisconsin Valley, Langlade, and Ontonagon) have played major roles in shaping the landscape. The area is characterized by outwash plains (some of which are pitted or collapsed) and kame moraines intermixed with bogs and swamps and a few isolated drumlins. It has many lakes. The streams generally form a dendritic drainage pattern. Elevation ranges from about 1,500 feet (455 meters) to about 1,850 feet (565 meters). In much of the area, slopes are nearly level to gently rolling and local relief is only 10 to 20 feet (3 to 6 meters). Relief ranges from 20 to more than 330 feet (6 to more than 100 meters) on the moraines.

The extent of the major Hydrologic Unit Areas (identified by four-digit numbers) that make up this MLRA is as follows: Wisconsin (0707), 68 percent; Chippewa (0705), 29 percent; Southern Lake Superior-Lake Superior (0402), 2 percent; and Western Lake Superior (0401), 1 percent. The Wisconsin, Tomahawk, and Manitowish Rivers are the major rivers that drain this MLRA.

Geology
Precambrian-age bedrock underlies most of the glacial deposits in this MLRA. The bedrock is a complex of folded and faulted igneous and metamorphic rock that has been modified by glaciation. The bedrock is covered in most areas by Pleistocene deposits as much as 330 feet (100 meters) thick. Most of the Pleistocene sediment was deposited during the last part of the Wisconsin Glaciation.

Climate
The average annual precipitation in this area is 30 to 35 inches (760 to 890 millimeters). About two-thirds of the rainfall occurs as convective thunderstorms during the growing season. Snowfall generally occurs from October through April. The average annual temperature is 39 to 41 degrees F (4 to 5 degrees C). The freeze-free period averages about 140 days and ranges from 125 to 155 days.

Water
Following are the estimated withdrawals of freshwater by use in this MLRA:
Public supply—surface water, 64.3%; ground water, 0.0%
Livestock—surface water, 18.0%; ground water, 17.7%
Irrigation—surface water, 0.0%; ground water, 0.0%
Other—surface water, 0.0%; ground water, 0.0%
The total withdrawals average 4 million gallons per day (15 million liters per day). About 18 percent is from ground water sources, and 82 percent is from surface water sources. Surface water and ground water are very abundant and readily available. The sources of surface water are the many lakes and streams. Water quality is generally good. Most of the lakes and streams are clear, but those that receive deposits of organic material from wetland vegetation are tinted brown. The surface water is used mostly for recreational activities. Extensive building of cottages and houses along the lakes and streams is a potential problem for maintaining water quality. Effluent from sewage disposal facilities pollutes the

water and results in the growth of weeds and algae. This problem is especially severe in seepage lakes where there is little water exchange.
This MLRA has three types of lakes—spring lakes, seepage lakes, and drainage lakes. Spring lakes seldom have an inlet, but they have an outlet with substantial flow. They are fed by ground water. Seepage lakes generally do not have an inlet or an outlet but may have an intermittent outlet. The water level is maintained by the water table or a well sealed lake bottom. Drainage lakes have an outlet and at least one inlet. Their main water source is drainage from streams. Spring lakes have a high mineral content because they receive the greatest amount of ground water. Drainage lakes have a lower mineral content than spring lakes, and seepage lakes have a very low mineral content. Drainage lakes have the greatest range in reaction. Water in the spring lakes has reaction similar to that of the ground water. Seepage lakes commonly are acid, and some of the drainage lakes are alkaline. About 80 of the lakes are acid, having a pH of less than 7.0. The rest are neutral or alkaline, having a pH of 7.0 or higher.

Good-quality ground water comes from glacial deposits. The total mineral content in this water is commonly less than 150 parts per million (milligrams per liter). The main components of the water are calcium, magnesium, and bicarbonate ions. Locally, the dissolved mineral content can be much higher because of a high content of limestone in some of the glacial deposits. In some areas minor problems may be caused by hardness or by high concentrations of iron. Pollution of surface water is minimal because the area is relatively undeveloped and there is little municipal or industrial waste. Ground water meets domestic, agricultural, municipal, and industrial needs in this MLRA.

Ground water yields from glacial deposits vary. Glacial drift consisting mainly of sand and gravel yields 100 to more than 1,000 gallons per minute (380 to more than 3,785 liters per minute). Glacial till yields generally less than 100 gallons per minute (380 liters per minute). Supplies of ground water may be inadequate where glacial deposits are thin over crystalline bedrock. Generally, the fractured crystalline bedrock does not supply much water, although locally it provides a small amount (8 gallons, or 30 liters, per minute) for domestic uses.

Soils
The dominant soil orders in this MLRA are Spodosols and Histosols. The soils have a frigid soil temperature regime, an aquic or udic soil moisture regime, and mixed mineralogy. The soils on uplands are very deep, excessively drained to somewhat poorly drained, and sandy or loamy. The soils on lowlands are very deep, poorly drained or very poorly drained, and sandy, loamy, or mucky.
Haplorthods formed in sandy outwash (Croswell, Rubicon, Vilas, Sayner, and Karlin series) or loamy drift over sandy outwash (Manitowish, Tipler, Pence, and Padus series) on outwash plains (some of which are pitted or collapsed) or kame moraines, in sandy mudflow sediments or till (Keweenaw and Springstead series) on kame moraines and drumlins, or in loamy and silty glaciolacustrine sediments (Annalake, Alcona, and Fence series) on lake plains. Endoaquods formed in sandy outwash (Kinross and Au Gres series) or loamy drift over sandy outwash (Wormet and Worcester series) on outwash plains or in sandy mudflow sediments (Pequaming series) on kame moraines. Haplosaprists formed in sapric material in swamps (Markey, Carbondale, and Seelyeville series) and bogs (Dawson, Loxley, and Greenwood series).

Biological Resources
This area supports conifer-hardwood forest. Sugar maple, yellow birch, white ash, red oak, aspen, white birch, balsam fir, white spruce, eastern hemlock, red pine, white pine, and jack pine are the dominant trees. Poorly drained soils support black ash, green ash, red maple, black spruce, tamarack, and speckled alder.

Some of the major wildlife species in this area are white-tailed deer, black bear, eastern gray wolf, ruffed grouse, sharp-tailed grouse, woodcock, gray squirrel, red squirrel, snowshoe hare, porcupine, ducks, and geese. Red fox, bobcat, coyote, muskrat, fisher, mink, otter, raccoon, and beaver are the main furbearers. The many lakes and forests in this area provide substantial wildlife habitat. Fishing occurs in the many lakes and rivers. The species of fish in the area include rainbow trout, brook trout, walleye pike, largemouth bass, smallmouth bass, bluegill, black crappie, yellow perch, musky, and northern pike.

Land Use
Following are the various kinds of land use in this MLRA:
Cropland—private, 2%
Grassland—private, 2%
Forest—private, 65%; Federal, 5%
Urban development—private, 6%
Water—private, 13%; Federal, 1%
Other—private, 6%

Forests make up most of this area. Timber production and the production of large amounts of pulp are important land uses. The paper industry is the largest manufacturer. Sap collection from sugar maple and syrup production are important forestry enterprises. Agriculture is a minor land use because of sandy soils and the short growing season. Some corn silage, oats, and alfalfa hay are grown. Specialty crops include snap beans, potatoes, strawberries, and cranberries. Tourism, recreation, and wildlife management are extremely important. The vast number of lakes and public forests provide year-round opportunities for recreation and tourism, especially recreational hunting, fishing, and hiking.

The major soil resource management concerns are water erosion, excessive soil wetness, soil fertility, and soil tilth. Conservation practices on cropland generally include crop rotations, conservation tillage systems (especially no-till systems), contour farming, contour stripcropping, and grassed waterways. A combination of surface and subsurface drainage systems is needed in most areas of poorly drained soils. Conservation practices on forestland include forest stand improvement and forest trails and landings. These practices reduce the impact of timber management activities on water quality. Riparian forest buffers help to protect streams and rivers from timber harvesting activities, improve wildlife habitat, and protect water quality.