Wisconsin's Abiotic Forest Resources

Landforms

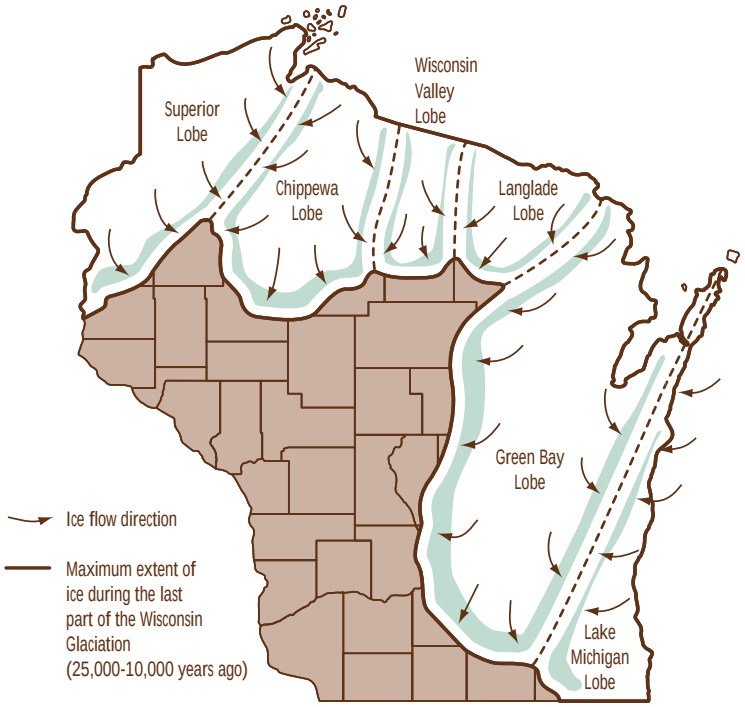
Wisconsin is unusual because it contains large areas of pre-cambrian bedrock outcrops that are aged at 1,640 million years. Their unique structure, which has been preserved by erosion resistant caprock has drawn scientists from around the world.

Prominent bedrock features of Wisconsin are the Gogebic Range, Baraboo Range, Barron Hills, Rib Mountain, McCaslin Mountain Silurian "Niagara" escarpment in the east, Blue Mounds, and the dolomite escarpment that forms Military Ridge in the southwest. Bedrock affects mineral composition of soils locally and the eight major soil regions of Wisconsin relate closely to land forms and geologic materials.

Glaciation has largely determined the surface and topography of the state. Glaciers repeatedly advanced into and retreated from the area that is now Wisconsin between 2.4 million years ago. About 11000 years ago about two-thirds of the state was covered by glacial ice.

When the most recent glaciers melted, they left a rolling terrain covered in layers of glacial till and outwash. Among the characteristic landforms left behind by the glaciers are moraines, till plains, drumlins, outwash plains, eskers, kames, and lacustrine plains. During glacial retreat, loess was deposited by wind on the surface of many adjoining areas, whether recently glaciated or not. The profusion of lakes, spring ponds, headwater streams, and wetlands found throughout the northern portion of the state are the result of glacial action, which interrupted the normally dendridic drainage pattern of streams.

Figure 1 — Glacial Lobes of the Wisconsin Glaciation



Though glacial deposits covered most of the bedrock in the eastern portion of the state, outcrops of dolomite, limestone, sandstone, basalt, granite, quartzite, and serpentine also occur. Such outcrops can be biologically significant, because they provide a substrate for a number of plants including some that are rare.

Another geographic region of interest is the driftless portion of the Central Plain, also known as the Central Sands. Many processes contributed to its topography. One formative agent was Glacial Lake Wisconsin.

Within the Driftless Area of the Western Upland, the primary geomorphic processes are fluvial erosion (erosion by flowing water); mass-wasting (weathering of bedrock in place), and karst formation (the dissolution and deposition of carbonates). Karst landforms include caves.

An important forest will have unique landforms and enhance their associated biologic communities.

Mineral Resources

Mining for metals such as copper, lead, iron and zinc shaped the history of several regions of Wisconsin beginning with the Old Copper Culture, 4000 to 1000 BC, to the lead mining activities of the early European settlers. The first permanent European settlers in Wisconsin were lead prospectors and miners who sought out deposits of lead and zinc in the southwestern part of the state in Grant, Iowa and Lafayette counties. Mineral Point, located just west of Madison, was an early mining town.

Other important mineral mining activity occurs, and has occurred, around the rest of the state. Iron ore is found in Jackson County. There are some large deposits in Ashland and Iron counties. Zinc deposits are found in northern Wisconsin, also. Sulfide deposits containing large amounts of copper and zinc are found in Forest, Oneida and Rusk counties. The sulfide deposits at Crandon in Forest County are believed to include one of the five largest supplies of zinc ever discovered in North America.

In addition to minerals, stone, gravel, basalt, clay, peat, quartzite, sandstone, sand, silica sand, shale, peat, and rich soils are mined in Wisconsin. Stone, such as dolomite and granite is also a valuable resource in Wisconsin. Dolomite is found mainly in the southern part of the state and granite in the central and northern areas. Red granite became the state

rock in 1971. Red granite was selected because of its beauty, economic value as a construction material, historical significance, and because it is unique to the state of Wisconsin.

Because of the gravel bound up in the great ice sheets, the continental glaciers, which moved across Wisconsin, almost all of the counties of Wisconsin have sand and gravel deposits. The Southwest corner of the state has the smallest gravel resource. As the glacial ice melted the sand and gravel were released in streams of outwash, the material was sorted by stream action. These outwash plains are rich sources of sand and gravel and have been mined since the days of early settlement. The sand and gravel was important to settlers and loggers during the early years of road construction.

Mining has shaped the landscape in some parts of the State and continues to do so at the present. Where mining could present an impact on the sustainability of the forest within a legacy tract, easement language and management plan recommendations will reflect the need to protect and sustain the forest systems first and foremost. In some cases, where a high potential for conversion to active surface mining exists in a proposed legacy tract, the purchase on mineral rights will be part of the conservation easement.

Soil and Water Values

The conservation of soils and water resources is key to sustainable forest management. These factors profoundly effect the forest. One method that is used by Wisconsin resource managers, foresters, and private individuals to protect soil and water is the implementation of *best management practices*. These proven successful techniques are currently used to protect Wisconsin's private forestland and will be integrated into the implementation of management on Forest Legacy Program Tracts.

Monitoring of randomly selected timber sales harvested between 1994 and 1996 has shown that statewide, forestry BMPs were applied correctly where needed 85% of the time, indicating that Wisconsin's forestry BMP program has had a very successful start. In addition, monitoring of the effectiveness of forestry BMPs has shown that when BMPs are applied correctly, they are effective in protecting water quality in 99% of cases. The use of voluntary *best management practices* (BMPs) has been a practical and cost effective way to assure that forestry operations do not adversely impact water quality and thus worth adopting into Wisconsin's Forest Legacy Program.

Sediment from soil erosion is the primary pollutant associated with forestry activities. Forest floor vegetation and the litter layer of leaves and twigs protect forest soils from the erosive action of raindrops and water runoff. Forest management activities, such as skidding on wet soils, can remove this protection. This can lead to soil erosion, especially on steep slopes and erodible soils. Other water quality damage that forestry activities can generate include: excessive organic debris from slash in streams; excessive levels of nutrients attached to soil that wash into streams and lakes; high stream temperatures due to the removal of stream-side vegetation; and chemicals from equipment oil/hydraulic fluids and pesticides.

Riparian Management Zones (RMZs) are one important tool for protecting water quality. Forested riparian areas help stabilize lakeshores and stream banks and help filter sediment and nutrients in runoff. Riparian areas are also valuable as corridors for wildlife. Plants, mammals, birds, reptiles, and amphibians all travel and disperse along streams and lakes. In Wisconsin, the recommended RMZ along lakes and navigable perennial streams is 100 feet. Studies show that 70-100% of all the water quality and wildlife benefits provided by riparian areas occur within the first 100 feet. BMPs for Riparian Management Zones include:

- Do not operate wheeled or tracked harvesting equipment within 50 feet of the ordinary high-water mark except on roads or at stream crossings.
- Use selective harvesting and promote long-lived tree species appropriate to the site. Long-lived tree species include: (1) hardwoods such as sugar and red maple, white and black ash, elms, and oaks; and (2) conifers such as eastern hemlock, white pine, red pine, and white-cedar.
- Harvesting intervals should be a minimum of 10 years.
- Harvesting plans should leave at least 60 square feet of basal area per acre in trees 5 inches DBH (diameter breast height) and larger, evenly distributed.

Other BMPs provide guidelines on protecting water quality when constructing or maintaining forest roads. Forest roads that are poorly located, constructed, or maintained are the largest source of non-point source pollution from forest management activities. Roads over steep slopes, erodible soils, or stream crossings hold the greatest potential for degrading water quality. BMPs for forest roads provide guidelines on the proper installation of stream crossings, proper road construction and drainage, and soil stabilization.

BMPs for wetlands are also extremely important in protecting water quality. These BMPs help minimize changes to the surface and below-surface water movement in wetlands. Changing water flow in a wetland can affect its flood protection function as well as the health of the wetland ecosystem, which provides habitat for many rare and endangered plants and animals. BMPs for wetlands include:

- Construct upland road approaches to wetlands so that surface runoff is diverted a way from the road so the runoff does not enter the wetland.
- Whenever possible, forest management activities in wetlands should occur on frozen ground during the winter to minimize rutting.

Currently, Wisconsin has excellent compliance and results through the voluntary adoption of BMPs. The Forest Legacy Program will support these efforts by requiring that all management plans for Forest Legacy Tracts include reference to these guidelines as standards to be used during any harvesting activities.