

IV. RESOURCE INVENTORIES

A. Soils, Geology and Hydrology

Iron County is characterized by level to rolling topography, with large areas of swamp and marshlands. The Penokee Range, a continuation of the Upper Michigan Gogebic Range, extends forty miles into the county. Land area accounts for 473,470 acres (93.9%) and water accounts for 30,723 acres (6.1%). Iron County has four of the thirteen highest points in the state and extensive deposits of low-grade iron ore (taconite).

The flowage lies within the glacially created Superior Highland Province. A large quantity of glacial outwash and ground moraine remained after the last glacial advance. Stratified sand and gravel was also discarded by the glacier's meltwater streams. The region's irregular rolling topography and sandy soils, including the flowage's convoluted shoreline and many islands, are a result of this glacial activity.

The flowage is located at the top of the Chippewa River watershed at the junction of the Turtle and Manitowish Rivers. The flowage was created by flooding lowland wetlands, forests, 25 miles of river, and 16 smaller lakes totalling 1,476 acres. The uplands are gently rolling to hilly, approximately 1,572 to 1,680 feet above sea level. The flowage is surrounded by almost 14,000 acres of wetlands. The surrounding lands are generally low-lying, with the exception of higher ridges on the southcentral and northwest part of the flowage, including Big Island.

Field observation indicate geologic and soil variations, from ledge rock, mixed glacial till to pure sand pockets. Upland soils around the flowage are a complex of three soils: organic, silt loam (Champion-Padus) and sand (Vilas Series). Silt loams, underlaid by several feet of sandy loam, have moderate to severe erosion potential and the steepest slopes (6-20%). Sand soils are excessively drained with low fertility, low available water capacity and generally located on moderate slopes (0-3%). Alluvial soils, composed of undifferentiated material, are well drained to somewhat poorly drained. Randomly located organic soils are level and poorly drained. Because these soils have high water table and/or peat content, they are susceptible to rutting, often have development restrictions for logging roads and access trails, and possess low load bearing strength. Shorelines and islands on the flowage, especially those exposed to strong waves, are subject to wave action erosion.

The flowage averages 8 to 10 feet deep and includes approximately 327 miles of convoluted shoreline and 314 islands, landscape irregularities formed when the continental ice sheet covered the area. In surface area, the flowage is Wisconsin's seventh largest body of water. The flowage is fed by three major inlet streams, the Turtle River from the north and the Manitowish and Bear River from the east. One minor watershed, the Little Turtle River, and three feeder streams, Four Mile Creek, Otter Creek and Beaver Creek, also feed into the flowage. The North Fork of the Flambeau River is the outlet. Groundwater is relatively high near the flowage. Wetlands play an important role in groundwater recharge.

The flowage has a maximum depth of 50 feet. Water clarity is light brown with an average Secchi disc reading of 64 inches, pH of 7.65 and total alkalinity of 30. The Manitowish River has an average depth of 1.5 feet, a gradient of 2 feet per mile, an average width of 89 feet, light brown water clarity, pH of 7.6 and total alkalinity of 41. The Turtle River has an average depth of 2 feet, a

gradient of 3 feet per mile, an average width of 117 feet, light brown water clarity, a pH of 7.6, and a total alkalinity of 45.

The department has designated the Turtle-Flambeau Flowage, Trude Lake, and the North Fork of the Flambeau River as "Outstanding Resource Waters" and the Manitowish River as an "Exceptional Resource Water" under Chapter NR 102 of the Wisconsin Administrative Code. See Table 6 for more information about surface waters within the project boundaries.

B. Wetlands, Wildlife and Endangered Resources

1. Wetland Resources

The wetland communities found within the proposed TFSWA project boundary (Figure 4) include bogs, emergent/wet meadow, aquatic beds, scrub/shrub and forested wetlands.

A patterned bog (patterned peatland), made up of several wetland communities, is found adjacent to the Boot Lake Wildlife Area, east of the flowage. Common in Canada and northern Minnesota, they are extremely rare in Wisconsin. This complex bog community includes water tracks, sphagnum lawns and discrete areas of larger trees. Emergent vegetation in adjacent wetlands is characterized by cattail, bulrush, horsetail, sedges, sphagnum moss and various bog shrubs. Submergent vegetation includes pond weed, coontail, burr reed and musk grass.

2. Rare, Threatened and Endangered Species

The flowage has the largest concentration of bald eagles and osprey breeding pairs in Wisconsin. Osprey, abundant in the 1920s to 1950s, dropped to 15 pairs in 1967 and a low of seven to eight pairs in the early 1970s. Osprey have recovered to 22 active pairs and are stable. Bald eagles have increased from three to four pairs in the 1970s to 10 pairs in 1991. Eagle and osprey appear to be stable and at maximum sustainable numbers.

Eagles and osprey are the dominant raptors on the flowage. Eagles scavenge for dead fish and hunt for larger live fish, especially suckers, bullhead and northern pike. Larger fish are important in the eagle diet because they are easy to scavenge. Osprey feed almost exclusively on live fish, especially panfish, with an average size class between six and eight inches. These panfish include perch, bluegill, crappie, and small- and medium-sized walleye and northern pike. Osprey thrive on the abundant fish and shallow waters of the flowage. Loons, also present on the flowage, eat small fish and crustaceans.

Moose, rare in Wisconsin, have been observed on or near the flowage in recent years. Unconfirmed sightings of timber wolves, once common in Iron County, have occurred near the flowage. Merlins, first found nesting on the property in 1990, have increased in numbers. Single common terns have been seen during three different years. Black terns are a "Species of Special Concern" in Wisconsin; 40-60 terns in three stable colonies are known to exist. The TFSWA may provide future habitat for resident wolves, moose, pine martin and common terns.

The TFSWA has suitable habitat for other endangered and threatened species of wildlife not yet documented on the property. These include lynx, red-necked grebe, Blanding's turtle, wood turtle, western ribbon snake and Tremblay's salamander.

At least three plant "Species of Special Concern" are found in the patterned bog community: dragon's mouth orchid, white bog orchid and sparse-flowered sedge.

3. Game Species and Other Furbearers

White-tailed deer, black bear and ruffed grouse are more abundant now than prior to occurrence of the original logging. This plan will maintain these species at moderate levels. Carrying capacity for deer will be about 15 per square mile, which is the current management goal for this area. Furbearers present in the TFSWA include bobcat, raccoon, fisher, otters, muskrat and mink.

4. Non-Game Species

Surveys show 124 different species of birds, 20 species of reptiles and amphibians, and 29 species of mammals occur on the property (Table 3, Table 4 and Table 5). No historical data exists prior to the creation of the flowage, but information on the forest communities present at the time indicate there is more variety of wildlife presently than at historical times. This variety will be maintained by managing early successional aspen forests while also managing for communities present during historical times, such as old-growth stands of pine and northern hardwoods. Reptiles and amphibians should increase with the rise in woody debris and forest floor habitat.

The flowage has the largest breeding population of common loons in Wisconsin. Common loons are stable at 20-21 pair since 1981, and appear to be at maximum allowable numbers.

C. Fisheries and Other Aquatic Resources

The flowage supports a fairly complex fish community and fishery (Table 2). The current fish species assemblage in the flowage is largely a function of the habitat types that are present as well as the water level regime. The fish community evolves naturally as a flowage ages and, for example, as the woody cover gradually deteriorates or available nutrients decline from the high levels present in a new reservoir.

a. Walleye - The current habitat in the flowage and Trude Lake favors a fish community with walleyes as the dominant predator. An abundance of clean gravel and rubble shoreline is available that provides ideal walleye spawning habitat, and the two main rivers entering the flowage also have important spawning areas. In the Manitowish River, walleyes from the flowage spawn at various locations along the river where gravel is available. The largest single concentration of spawning walleyes occurs at the Turtle River inlet immediately below Lake of the Falls.

The abundant spawning habitat results in high levels of walleye reproduction and recruitment compared to most other waters in northern Wisconsin. Reproduction has never been a limiting factor, and has usually been very high.

The flowage is dominated by small and intermediate size walleyes but has few large fish. The walleye population in the flowage is heavily dominated by fish under 18 inches. In spring 1992 fyke net samples, less than 12 percent of adult walleyes were 18 inches or larger, and only 3.5 percent were 20 inches or larger.

Walleye population estimates done in spring of 1992, for adult fish 11 inches and larger, were 5.3 per acre for Trude Lake and 4.6 per acre for the remainder of the flowage. These estimates compare

with an average of 3.9 adult walleyes per acre on all walleye lakes in the ceded territory where estimates were done from 1980 through 1989.

Typical of populations with high recruitment, the walleyes in the flowage have relatively slow growth rates due to competition. The size structure of the adult stock is heavily dominated by fish under 18 inches.

Anglers on the flowage during the 1989-1990 season harvested a total of 32,703 walleyes. Open-water anglers harvested 261 walleyes averaging 15.0 inches on Trude Lake and 30,913 walleyes averaging 13.9 inches on the remainder of the flowage. Ice anglers on the flowage harvested 1,529 walleyes averaging 16.2 inches.

Also typical of waters with high walleye reproduction and recruitment, walleyes in the flowage, simply due to their sheer numbers, have a controlling influence on other species, especially panfish. Panfish and other prey populations in the flowage are kept at relatively low levels, apparently due to heavy predation by the abundant walleyes. The younger age classes of walleyes, due to their higher relative abundance, probably have the greatest impact on prey populations. As a result, few panfish survive their first year of life, but those that do survive grow well and often reach large sizes. The panfish harvest in the flowage consists of mostly larger fish; black crappie and yellow perch are the most numerous species, followed by rock bass, bluegill and pumpkinseed. Panfish fishing success, however, is often inconsistent because of their relatively low numbers.

b. Northern Pike - Northern pike are an abundant predator in the system. Population estimates in 1975 ranged from 1.6 to 2.5 per acre. Pike very rarely reach large sizes in the flowage. The 1989-1990 harvest of nearly 7,000 fish averaged just over 18 inches in length. Only one pike over 30 inches has been captured in all fishery surveys from 1984 through 1992. The near total absence of larger pike is probably habitat/food related rather than harvest related.

c. Muskellunge - Muskellunge, though they are present in relatively low numbers, provide a popular trophy fishery. Anglers in 1989 caught an estimated 494 muskellunge, of which 85 fish averaging 40.7 inches were harvested. Due to their low numbers, no estimate of muskellunge population size has been attempted. Natural reproduction of muskellunge has declined to very low levels, resulting in a fishery that is almost totally dependent on stocking. Stocking of surplus muskie fingerlings several times during the late 1980's may have made an impact, as anglers have reported having improved fishing action by smaller muskies.

d. Smallmouth Bass - Surveys have not targeted bass populations, but by all indications smallmouth bass populations have increased in recent years and average size improved significantly between 1989 and 1992. In 1989, the first year of the 12-inch minimum bass length limit, the 1,712 smallmouth bass harvested on the flowage averaged 11.2 inches. The 1992 average length was 13.2 inches.

e. Lake Sturgeon - The lake sturgeon population appears to be reduced to relatively low numbers of large, old fish, with no evidence of recruitment occurring in the system. Four individuals that were captured in 1991 in the Baraboo Lake area of the flowage measured 66, 66, 68, and 77 inches in length. These fish apparently run upriver to spawning areas in the Manitowish River above Benson Lake in Vilas County, based on the movements of a radio-tagged fish from the flowage, as well as observations of other sturgeon in the Benson Lake area. Sturgeon have been observed in the Bear River it is likely that they are from flowage populations. Reasons for the lack

of reproduction are not understood at this time, but this population may eventually disappear if rehabilitation efforts are not successful.

f. **Lake Herring** - Cisco (lake herring) are present in relatively low numbers in the flowage. They are generally confined to the deeper lake bed areas. Gill netting in 1990 and 1991 confirmed their presence in Trude, Baraboo and Merkle Lakes, with fish ranging from 7.6 to 16.5 inches. Anglers have reported catching ciscos from Blair Lake also. Habitat conditions are probably marginal for ciscos in the flowage, as in summer the fish are limited to a narrow zone of depth where temperatures are cool enough and oxygen levels are adequate.

D. Forest Resources

Iron County is one of the most extensively forested areas in Wisconsin. Common tree species include aspen, maple, spruce, balsam fir, pine, yellow birch and basswood.

Upland forests near the flowage are characterized by aspen/birch, northern hardwood/conifer mix (including maple, basswood, balsam, hemlock, and spruce), oaks (red and white), and red and white pine (Figure 4). Evergreen trees, evergreen shrubs, sphagnum moss, and slow decomposition rates are characteristic of the acidic and nutrient poor bogs. Hemlock, once common, is now limited but is valuable to wildlife.

Up until the early 1900s, large white and red pine dominated the TFSWA. After the area was logged, large fires swept through, encouraging aspen growth. Since then, the area has been primarily managed for aspen.

The predominance of aspen and birch account for the relatively abundant populations of deer and grouse. Aspen comprises only 20% of the surrounding forest types, but the TFSWA is comprised of 50-60% aspen-birch types.

Northern hardwoods comprise approximately 10% of the forest lands in the TFSWA. The northern hardwoods are concentrated south of Popko Circle, the south half of Big Island, and north of the dam on the west side of the flowage. Small scattered stands exist throughout the TFSWA property. Red oak exists in scattered patches in these northern hardwood stands.

A system for classifying land based on ecological characteristics is currently being developed for northern Wisconsin. The system, called the National Hierarchy of Ecological Units (NHEU), describes the landscapes (regions) of an area based on site-specific climate, soil, landform and vegetation characteristics. The NHEU, which can be used to place an area within a wider regional or state-wide context, will be applied to the TFSWA project area.