

EXECUTIVE SUMMARY

This is one in a series of river assessments being prepared by the Michigan Department of Natural Resources Fisheries Division for Michigan rivers. This report describes the physical and biological characteristics of the Au Sable River, discusses how human activities have influenced the river, and serves as an information base for managing the river's future.

River assessments are intended to provide a comprehensive reference for citizens and agency personnel who need information about a river. By pulling together and synthesizing existing information, river assessments show the intertwined relations between rivers, watershed landscapes, biological communities, and humans. This assessment shows the influence of humans on the Au Sable River, and is intended to increase public concern for the river. We hope it will encourage citizens to become more actively involved in decision-making processes that provide sustainable benefits to the river and its users. To help achieve this, assessments identify problem areas within a river system and identify potential opportunities for alleviating them. Assessments also identify the types of information needed to better understand, manage, and protect the river.

This document consists of four parts: an introduction, a river assessment, management options, and public comments (with our responses). The river assessment is the nucleus of each report. It provides a description of the Au Sable River and its watershed in twelve sections: geography, history, geology and hydrology, soils and land use patterns, channel morphology, dams and barriers, water quality, special jurisdictions, biological communities, fishery management, recreational use, and citizen involvement.

The management options section of the report identifies a variety of actions that could be taken to protect, restore, rehabilitate, or better understand the Au Sable River. These management options are categorized and follow the main sections of the river assessment. They are intended to provide a foundation for public discussion, setting priorities, and planning the future of the Au Sable River.

The Au Sable River drains 1,932 square miles of northeastern Lower Michigan into Lake Huron. Its basin contains portions of eight counties: Otsego, Crawford, Montmorency, Roscommon, Ogemaw, Oscoda, Alcona, and Iosco. For the purposes of discussion, the mainstem Au Sable River is divided into six sections or segments, each reflecting how the river changes as it flows across different landforms, receives tributaries, and passes through lakes and ponds. Progressing downstream from the river's headwaters, these segments are: Headwaters to Wakeley Bridge; Wakeley Bridge to Mio Pond; Mio Pond to McKinley Bridge; McKinley Bridge to Five Channels Dam; Five Channels Dam to Foote Dam; and Foote Dam to Lake Huron. Major tributaries of the Au Sable River include the North, South, and East branches Au Sable River, Big Creek-South, and the Pine River.

The Au Sable River has played many roles in the history of northeast Michigan. Native Americans used the river as a transportation route and its fishes for food. Early Europeans used the river for commercial lumbering, fishing, and trapping. Railroad access and the discovery of Arctic grayling resulted in development of major recreational fisheries on the Au Sable River in the late 1800s. In the early 1900s, the lower reaches of the river were harnessed to provide hydroelectric power. The Au Sable River continues to serve as one of Michigan's premier recreational assets.

The Au Sable River drains extensive deposits of coarse-textured sands and gravels. This unique geology causes the river to receive exceedingly high inflows of groundwater and have an

exceptionally stable flow regime. The Au Sable River has probably the most stable streamflow regime of any large stream in the United States. However, hydroelectric peaking operations at dams on the lower mainstem (Au Sable River from Mio Pond to Lake Huron) caused substantial daily flow fluctuations on the river until 1994, when new operating licenses went into effect. Two exceptions to this are Mio and Foote projects, whose flows have more closely mimicked run-of-river conditions since 1966 (Mio) and 1989 (Foote). Variable flows generally provide poor conditions for fish reproduction and survival. Flows are presently more stable, but are still affected by dams and improperly operated lake-level control structures.

Coarse-textured glacial deposits, in combination with the basin's relatively steep topography, result in extremely high inflows of groundwater to the Au Sable River. Groundwater dominated flows are key to cold water conditions needed by trout and salmon. Large pulses of groundwater appear to enter the river in discreet areas where steep topography and coarse-textured glacial deposits co-occur. Such areas are in portions of the upper mainstem (the mainstem Au Sable River upstream of Mio), several of its major tributaries, and on the lower mainstem. Dams on the lower mainstem offset the cooling effect of groundwater inflows, and substantially reduce populations of coldwater fishes.

Soils in the watershed are predominantly sands, poorly consolidated, and often quite vulnerable to erosion. Past logging activities, improperly designed road-stream crossings, unmaintained access sites, and other poor land use practices released considerable sand sediment into the Au Sable River. Sand smothers gravel and cobble habitats critical for reproduction and survival of many fish and invertebrate species, and fills in pools that are used by larger fish. Erosion sites along the mainstem and major tributaries have been inventoried and treated resulting in considerable declines in sediment delivery to the river. Ten sediment traps are periodically excavated to remove sediment currently in transport. Inventories are needed to characterize conditions at road-stream crossings and prioritize sites for treatment. Education, vigilance, and funding are needed keep erosion rates at more natural levels, and to minimize sedimentation due to human activity in the riparian corridor.

Over 80% of the Au Sable River's watershed is forested. The vegetative landscape however, has changed considerably. Much of the basin's conifer-dominated forest has been replaced by deciduous forest, and only a few remnants exist of the once extensive prairie-savannah habitat type. In many areas, riparian forests have been cleared for residential development. Riparian forests provide many benefits such as stabilizing stream banks, shading stream channels, controlling surface runoff, and providing large woody debris to the stream channel as habitat for aquatic organisms. Lowland conifer forest habitat along the lower mainstem is presently inundated by impoundments.

Residential development and growth within the watershed are proceeding at a rapid pace. Local units of government in areas characterized as very rural are dealing with residential development projects unprecedented in size for their area. Some residential development is occurring on glacial outwash deposits that are highly prone to fire. Several townships within the Au Sable River basin are presently not zoned or only have zoning at the county level. Planning is needed ensure that development occurs in a way that provides sustainable benefits to local communities and does not unduly harm the river.

The average gradient of the Au Sable River is 3.9 ft/mi (feet per mile), one of the highest of similar-sized streams in Michigan's Lower Peninsula. This gradient is not uniformly distributed throughout the river, but varies with the landforms over which the river flows. Gradient averages 4.2 ft/mi on the upper mainstem, 3.8 ft/mi on the lower mainstem, 4.9 ft/mi on the East Branch Au Sable River, 2.6 ft/mi on the South Branch Au Sable River, and 7.1 ft/mi on the North Branch Au Sable River. Diversity and productivity of fishes and other aquatic life generally increase with stream gradient, and highest values typically are where gradients are very high (10-70 ft/mi). The Au Sable River is

unique among large Lower Michigan rivers because it has several miles of very high-gradient habitat and more than 16 miles of high-gradient (5-9.9 ft/mi) habitat in its lower reaches. Unfortunately, all of the very high-gradient habitat and about half the high-gradient habitat is now impounded. Dams and their ponds have eliminated most of the best rapids on this portion of the river and prevent fish from migrating between Lake Huron and nearly the entire Au Sable River.

Historically, the Au Sable River's channel was complex, with a variety of depths, velocities, and substrates, and abundant cover provided by large trees and logjams in the river. The channel of the river has been altered by human activities. Historic log-driving activities widened the channel in areas, most notably in middle portions of the North Branch Au Sable River. Increased sedimentation filled in pool habitats and smothered gravel and cobble substrates needed by many aquatic species. Past logging and residential development eliminated the old growth forest along the riparian corridor, leaving a relatively young forest and fewer large, old trees falling into the river. Past stream clearing activities and operations at hydroelectric facilities removed many large trees from the river and prevented their natural downstream transport. Addition of large trees would help rehabilitate the channel complexity in the near term, but protection of riparian forests is needed to eventually bring the channel closer to its former condition.

One hundred and nine dams are presently in the Au Sable River watershed. More than 90% of these dams are on small, tributary streams and are small in size. Except for the six hydropower dams, effects of dams in the watershed have not been quantitatively evaluated. By changing flowing water habitats to impounded habitats, dams affect rivers by: altering their natural flow regime to varying degrees; modifying temperature and water quality conditions; changing aquatic conditions to favor lake species over river species; fragmenting the river for fishes and aquatic organisms; and disrupting natural transport of sediment and woody debris. In addition, dams at lake outlets (lake-level control structures) often: disrupt natural variations in lake levels needed to maintain shoreline wetlands; eliminate aquatic species associated with natural lake outlets; prevent movement of fishes between lake and river habitats; and if improperly managed, produce detrimental flow conditions downstream.

Six of the seven dams on the mainstem Au Sable River are large hydroelectric dams on the lower mainstem. These six dams dramatically change the character of the Au Sable River. They impound roughly 38% of the mainstem. They turn extremely rare, cold water, large-river, high-gradient habitats into marginally-productive, cool ponds. They warm riverine reaches downstream of dams, making them less suitable for highly-prized coldwater fishes, such as trout and salmon. They block natural downstream transport of sediment and large woody debris, and prevent formation of river delta wetlands. Fish are entrained or killed in hydropower turbines. Estimates for 1991 showed these six hydropower projects entraining over one million fish and killing over 230,000 fish. They block migrations of fishes between Lake Huron and 93% of the Au Sable River. They prevent access to spawning rapids needed by many, large-bodied Great Lakes fishes. Populations of some species are reduced such that they need special protection (e.g. state-threatened lake sturgeon and state-endangered channel and river darters) or must be stocked. They prevent development of valuable fisheries for potamodromous fishes. Operating licenses issued to Consumers Energy in 1994 provide mitigation for some of the effects of hydroelectric projects on the Au Sable River. Dam removal, fish passage structures, and cold water discharges at Mio and Alcona dams would help alleviate some negative effects of these projects.

Eighty-two percent of the river system consists of designated trout streams (which provide water quality conditions adequate for trout survival), so keeping waters cold and well oxygenated is of paramount importance. Dams can adversely affect stream temperature and oxygen levels. Excessive temperature elevation of cold water reaches of the mainstem happens at Grayling Dam and the six hydroelectric dams. In addition, dissolved oxygen levels fell below required minimums on several

occasions at the six hydroelectric dams. Continued monitoring is needed to document, and seek mitigation for, the effects of these dams. Surveys are needed to determine effects of other dams in the watershed.

Water quality in the Au Sable River is generally good, owing primarily to the limited amount of development within the basin. Nutrient levels appear to be lower than they were in the past. Relatively few point source discharges go into the river and compliance with permit requirements is good. Nonpoint source sedimentation remains an issue along portions of the river. Aside from the statewide fish consumption advisory due to mercury, no fish consumption advisories exist for fishes upstream of Foote Dam. Advisories due to high PCB levels exist for several fishes in Lake Huron and Van Etten Lake, on the lower Pine River. PCB levels in Lake Huron fishes have declined since the late 1970s and are now at relatively stable and lower levels. Levels of PCBs in Lake Huron fishes are lower than those in Lake Michigan and Lake Ontario fishes. Fish consumption advisories due to chlordane and dioxins occur for lake trout in Lake Huron.

Jurisdiction over the river happens at several governmental levels. Many federal and state statutes are associated with protection of the Au Sable River watershed. Federal Wild and Scenic River and State Natural River designations occur over 337 miles of the river system. Portions of the river are classified by the State of Michigan as Blue Ribbon Trout Streams. The Federal Energy Regulatory Commission regulates the six hydroelectric projects on the lower mainstem. Sixty-seven percent of the watershed is owned and managed by the State of Michigan (36%), U.S. Forest Service (30%), and Consumers Energy (1%). Sport fishing regulations, fish consumption advisories for the Au Sable River, and legal “navigability” of the portions of the river are determined by various entities of state government. Local units of government influence the river through special ordinances and restrictions, road commission activities, and maintenance of legal lake levels.

There is little information upon which to base characterizations of the Au Sable River’s original fish community. Most notable in the historic record of Au Sable River fishes were grayling, walleye, round whitefish, lake sturgeon, and suckers in the upper mainstem. Historic fisheries occurred in Lake Huron near the river mouth for lake whitefish, lake trout, lake herring, walleye, and yellow perch. Native Americans fished for whitefishes and lake sturgeon along the lower river.

The most dramatic changes to the river happened in the first several decades after European settlement. Arctic grayling were heavily exploited shortly after their discovery, and had disappeared from parts of the mainstem in the 1880s. Brook and brown trout were stocked during this time, and migratory rainbow trout (steelhead) were ascending the river around turn of the 20th century. Logging destabilized the river’s flow patterns, tore up stream banks, and caused tremendous sedimentation. Hydropower development fragmented the river system, eliminating migrations of fish from Lake Huron and throughout the lower mainstem. High-gradient, cold water rapids were replaced with marginally productive, cool ponds and reaches between dams were warmed. Low-head dams and lake-level control structures further fragmented the river system and altered river conditions.

Comprehensive surveys show 94 species of fishes presently or recently occurring in the Au Sable River drainage. Of these, 77 are native and presently exist within the drainage, 1 (Arctic grayling) is native but extirpated, 2 are native but their current status is unknown, 9 were intentionally introduced (8 presently exist and the current status of one is unknown), and 5 colonized the drainage via canals or dispersal from previous introductions and presently exist.

Little current information is available for characterizing present fish communities in the Au Sable River. The mainstem, East Branch, North Branch, and South Branch Au Sable rivers, Big Creek-North, and Big Creek-South drain lakes and wetlands, and in their upper reaches, and are mostly

warm- to cool-water streams, too warm or marginally warm for trout. These streams accrue groundwater in their downstream reaches, becoming cold water streams. Population estimates of brown and brook trout in several reaches of the upper mainstem, North Branch, and South Branch Au Sable rivers have been conducted nearly every year since 1957. These data demonstrate the variability of trout populations over time, with variations being attributable to a variety of possible causes including habitat and water quality changes, hydrologic changes, and changes in angling pressure, regulations, and methods.

Coldwater fishes (such as trouts, whitefishes, and sculpins) compose the bulk of the catch upstream of Mio Pond. Mio and Alcona Ponds warm the river such that free-flowing reaches downstream are more suitable for coolwater fishes. The river flows through the six ponds on the lower mainstem quickly enough that the ponds are unlike natural lakes, and more closely resemble large, cool pools in the river. As a result, fish communities of the ponds are dominated by fishes (such as bowfin, northern pike, and white sucker) more typical of cool, sluggish rivers than warm lakes. The river below Foote Dam has a variety of fishes and receives migratory runs of several Lake Huron fishes.

The three fishes of special concern in the Au Sable River (lake sturgeon, channel darter, and river darter) are all associated with reaches of the river that have cool summer temperatures, are large-sized, and free-flowing. This habitat is almost entirely impounded by the four lowermost dams on the river. Lake sturgeon (threatened) are occasionally seen below Foote Dam, and remnant populations of channel darter (endangered) are now restricted to the few patches of riverine habitat that still exist. The river darter (endangered) has not been collected from the river since 1925.

Little current information is available for characterizing invertebrate communities in the Au Sable River. However, comprehensive surveys from the early 1970s showed aquatic insect communities in the upper mainstem and its tributaries to be healthy, with species diversity generally increasing downstream in response to cooler water temperatures. Surveys from the 1970s and 1990s show the degrading effects of impoundments on aquatic insect communities of the lower mainstem. Riverine reaches below dams had lower insect densities, fewer species, and fewer “sensitive” (mayfly, stonefly, and caddisfly) taxa than undammed reaches just above the ponds.

A variety of amphibians, reptiles, birds, mammals, and plants occur within the watershed, a number of which are threatened or endangered, largely due to habitat loss. Aquatic pest species in the watershed include purple loosestrife, sea lamprey, whirling disease, zebra mussels, common carp, and rusty crayfish.

High groundwater loading, cold summer stream temperatures, and stable flows are key to the high-quality, self-sustaining trout fisheries that exist throughout much of the watershed. Cold water riverine habitat represents the key value of the Au Sable River system, and long- and short-term management goals should move toward protecting and restoring such habitat. Fish communities typical of high-gradient, cold water, large river habitats have been reduced or eliminated in areas where such habitats have been altered or impounded. Fragmentation of the river system has resulted in lost production of fishes, and reduced the potential of the river for supporting productive fisheries. Fish populations typical of natural lake outlets and habitats having gravel and rocky substrates have declined due to loss of these habitats. Management activities should attempt to restore connections between fragmented aquatic habitats and restore more natural rates of water, sediment, and woody debris delivery to Lake Huron.

The upper mainstem and its tributaries are largely free-flowing, and have supported nationally renowned fisheries for self-sustaining populations of brook trout, brown trout, and rainbow trout for the last century. However, the fisheries potential in portions of these streams is limited due to dams,

shoreline development, low channel diversity from a lack of trees in the stream, excessive sedimentation, and a heavy load of sand in the channel. Management activities need to address these issues.

The lower mainstem has the potential for providing valuable fisheries for resident coldwater and potamodromous fishes. Its large size, high-gradient, and cold, stable flows would support major runs of Lake Huron fishes including chinook and coho salmon, steelhead (rainbow trout), brown trout, lake sturgeon, walleye, whitefishes, channel catfish, burbot, and various redhorse and sucker species. In the river's free-flowing state, natural reproduction of chinook salmon and steelhead may be sufficient to support the Lake Huron fishery. The value of the potamodromous sport fishery that could be produced in the lower mainstem is substantial. In addition, much of this un-realized value would accrue to local communities along the river.

Primary impediments to achieving the river's fishery potential are the six hydroelectric dams on the lower mainstem. The dams block fish migrations, warm the river, and replace high-gradient rapids with ponds having limited fishery management potential. Only about 7% of the mainstem and none of its tributaries (except the Pine River) are connected to Lake Huron. Dam removal and installation of fish passage structures at existing dams can help restore some fishery potential and economic benefits. Available studies and observational data on eagle, mink, and river otter suggest that passing contaminated Great Lakes fishes upstream would pose little or no significant harm to their populations.

The Au Sable River is a very popular choice among anglers and canoeists. Anglers throughout the United States come to fish the river's wild trout stocks. Use by both anglers and canoeists is typically highest on high-gradient, riverine reaches, and puts a premium on this habitat type. Conflicts among groups using high-gradient reaches suggest the need for measures to prevent overuse and maintain a high-quality recreational experience. The high-gradient nature of the lower mainstem suggests that in a fully, free-flowing state it would have considerable recreational angling and canoeing potential. Present recreational use on lower mainstem ponds needs to be better documented to help guide management of the river.

As the future brings changes, it is important that the value of the Au Sable River to the region is kept, or enhanced. The many groups interested in the river have diverse ideas regarding the future of the watershed and how the river system should be managed. A basin-scale forum (watershed council) would provide a means for groups to work together at identifying important issues in the watershed, and developing a shared vision and a set common goals for the river's future.