EXECUTIVE SUMMARY

This river assessment is one of a series of documents being prepared by Michigan Department of Natural Resources (MDNR), Fisheries Division, for Michigan rivers. This report describes the physical and biological characteristics of the Ontonagon River, discusses how human activities have influenced the river, and serves as an information base for future management activities. Our approach is consistent with Fisheries Division's mission to "protect and enhance fish environments, habitat, and populations and other forms of aquatic life and to promote the optimum use of these resources for the benefit of the people of Michigan."

River assessments are intended to provide a comprehensive reference for citizens and agency personnel seeking information on a particular river. By compiling and synthesizing existing information, river assessments reveal the complex relationships between rivers, watershed landscapes, biological communities, and humans. This assessment shows the influence of humans on the Ontonagon River and provides an approach for identifying opportunities and addressing problems related to aquatic resources in the Ontonagon River watershed. We hope that this document will increase public awareness of the Ontonagon River and its challenges, and encourage citizens to become more actively involved in decision-making processes that provide sustainable benefits to the river and its users.

This document consists of three parts: an introduction, a river assessment, and management options. The river assessment is the nucleus of the report. It provides a description of the Ontonagon River and its watershed in thirteen sections: geography, history, geology, hydrology, soils and land use, channel morphology, dams and barriers, water quality, special jurisdictions, biological communities, fishery management, recreational use, and citizen involvement.

The management options part of the report identifies a variety of actions that could be taken to protect, restore, rehabilitate, or better understand the Ontonagon River. These management options are categorized and presented following the organization of the main sections of the river assessment. They are intended to provide a foundation for public discussion, assist in prioritization of projects, and facilitate planning of future management activities.

The Ontonagon River is located in the western Upper Peninsula of Michigan and drains an area of 1,362 square miles. Its watershed covers portions of five counties: Gogebic, Ontonagon, Houghton, Iron, and Vilas (Wisconsin). Although the main stem is relatively short, the combined length of the Ontonagon River and its tributaries is approximately 1,291 miles. There are 200 lakes larger than 10 acres within the Ontonagon River watershed. Lake Gogebic, with a surface area of 13,048 acres, is the largest lake in the Upper Peninsula.

For purpose of discussion, the Ontonagon River basin is divided into seven subwatersheds: upper Middle Branch (above Agate Falls), lower Middle Branch, Main Stem, East Branch, Cisco Branch, South Branch, and West Branch. Criteria used to set boundaries for the subwatersheds included drainage patterns, barriers to fish passage, confluences with major tributaries, and changes in geology or soil types.

The Ontonagon River watershed has a rich and varied history that can be traced back to the late Archaic Period (approximately 4,000 years ago). Prehistoric peoples mined copper within the basin and established hunting and fishing camps along the Ontonagon River and its tributaries. By the time of European settlement, Chippewa Indians had constructed elaborate weirs in the main stem to harvest lake sturgeon. European fur traders set up outposts within the watershed as early as the 1630s, but no permanent (European) settlements were established until the 1840s.

Two resources attracted European settlers to the region during the nineteenth century: copper and timber. Europeans had known about the rich copper deposits in the Ontonagon River basin since at least 1670, but the first profitable mine (in historic times) was not established until 1847. The main copper rush spanned only two decades, but mining activity continued at a reduced level until 1921. Soon after the copper boom subsided, the logging era began. During the 1880s and 1890s, the vast forests of the Ontonagon River basin were cut down and the main stem and its tributaries were used to transport logs to sawmills at the mouth of the river.

During the first half of the 20th century, various branches of the Ontonagon River were harnessed to provide hydroelectric power. Numerous farms were also founded during this period, but most were abandoned due to the harsh climate and infertile soils. The Ottawa National Forest, which includes roughly 57% of the Ontonagon River watershed, was established in the 1930s. In recent years, the lakes and streams of the Ontonagon River system have attracted thousands of visitors, and tourism has become an important part of the local economy.

The hydrology of the Ontonagon River system is strongly influenced by the surficial geology of the watershed. Coarse-textured materials predominate in the southern and extreme eastern and western portions of the basin. Water rapidly percolates through these materials, providing substantial groundwater inflow to streams in these areas. For example, the upper Middle Branch Ontonagon River and the headwaters of the East Branch Ontonagon River receive strong groundwater inflows that produce relatively stable water flows and temperatures. Large deposits of finer-textured materials exist in the north-central portion of the watershed. These materials are less permeable, so the South Branch, lower Middle Branch, and main stem Ontonagon rivers receive minimal groundwater inflow. Consequently, these streams have flashy flow regimes with rapidly varying water temperatures.

Soils influence the hydrology, channel morphology, and water quality of river systems. Sandy soils allow greater infiltration and groundwater production compared to relatively impermeable clay soils. In addition, sandy soils are more easily eroded than clay soils, so sedimentation and bank slumping can be major concerns in sandy watersheds. Sandy soils are common in the upper Middle Branch and Cisco Branch subwatersheds. The soils in the South Branch, lower Middle Branch, and Main Stem subwatersheds primarily are composed of finer particles such as clay and silt. Both sandy and silt-clay dominated soils are found in the East Branch and West Branch subwatersheds. Small regions of peat and muck dominated soils are scattered throughout the southern two-thirds of the basin.

Approximately 74% of the Ontonagon River watershed is forested; however, the species composition of the forest community has been altered by human activities. Acreage of lowland conifers has declined since European settlement of the region, while acreage of lowland hardwoods (primarily aspen) has increased dramatically. Wetlands are the second most abundant land cover type (15% of watershed area). Due to its remote location, wetland losses within the Ontonagon River basin have been less severe than in southern Michigan. Approximately 5% of the watershed is in agricultural use, and only 0.1% is classified as "urban/industrial."

Gradient, or drop in elevation over distance, is an important indicator of fish habitat quality. The average gradient for the main stem and Middle Branch Ontonagon rivers is 11.1 ft/mi, which is considerably higher than the reported gradients for most Michigan rivers. Gradient varies throughout the watershed, ranging from 0.5 ft/mi at the mouth to 2,493 ft/mi at Victoria Falls. Gradient averages 12.6 ft/mi on the upper Middle Branch, 16.5 ft/mi on the lower Middle Branch, 2.4 ft/mi on the main stem, 12.2 ft/mi on the East Branch, 14.3 ft/mi on the Cisco Branch, 5.2 ft/mi on the South Branch, and 18.4 ft/mi on the West Branch.

The highest quality fish habitat generally is found in high gradient (5.0–69.9 ft/mi) stream reaches because a wide variety of water depths and velocities (i.e., habitat types) is available to fish in those areas. Relative abundance (expressed in percentage of stream length) of high gradient habitat varied widely between the different branches of the Ontonagon River system: main stem (12%), South Branch (31%), upper Middle Branch (47%), West Branch (73%), Cisco Branch (78%), East Branch (89%), and lower Middle Branch (98%). Although chutes and waterfalls (gradient ≥70 ft/mi) are present within the watershed, most of the remaining stream reaches have gradients lower than 5.0 ft/mi.

Fish habitat quality can also be evaluated by comparing channel cross-section measures with expected measures calculated from stream discharge data. Frequent flood events (e.g., from dam operations) create channels that are excessively wide. Unexpectedly narrow channels typically are caused by channelization or bank armoring. Most United States Geological Survey gauge sites in the Ontonagon River system have stream widths that are within the range predicted by average discharge values. The upper Middle Branch and Bond Falls Canal gauge sites have channel widths that are narrower than expected due to bridge construction and channelization activities.

There are 17 registered dams in the Ontonagon River watershed. Five of these dams are operated by the Upper Peninsula Power Company to facilitate power generation at the Victoria hydroelectric facility. Four dams are operated by various governmental organizations to enhance recreational opportunities, six dams are privately owned (i.e., for private lakes and ponds), and two dams are operated for other purposes.

Dams affect aquatic ecosystems by impeding fish spawning migrations, fragmenting resident fish populations, blocking downstream movement of large woody structure and detritus (e.g., small pieces of wood and leaves), disrupting the sediment balance above and below impoundments, altering flow regimes and channel morphology, and elevating stream water temperatures. Dams at lake outlets also prevent movement of fish between lake and stream habitats and may disrupt natural variations in water levels needed to maintain shoreline wetlands.

The Bond Falls Dam and Bond Falls Control Dam are operated to store water and divert flow from the Middle Branch into the South Branch via the Bond Falls Canal. (The South Branch ultimately flows into the West Branch a few miles upstream of the Victoria hydroelectric facility.) Operation of these dams strongly affects the seasonal flow patterns in the lower Middle Branch and the South Branch. The Cisco and Bergland dams are located at the outlets of natural lakes and are used to ensure a consistent water supply to the Victoria Dam and hydroelectric facility.

In 2003, the Federal Energy Regulatory Commission issued a new operating license for the five hydroelectric-related dams in the Ontonagon River watershed. This license specifies minimum flow releases from the Bond Falls Dam into the Middle Branch and Bond Falls Canal, and from Bergland Dam into the West Branch. The license also sets maximum allowable drawdowns for the Bond Falls Flowage and Victoria Reservoir. These new license conditions are expected to improve fish habitat quality in the impoundments and the stream reaches below the impoundments.

There are 24 named waterfalls and numerous unnamed waterfalls within the Ontonagon River basin. Some of the larger waterfalls (e.g., Bond, Agate, and Victoria falls) are natural barriers to fish movement. The two largest dams in the watershed, Bond Falls Dam and Victoria Dam, were constructed on low gradient stream reaches immediately upstream of major waterfalls.

In general, water quality in the Ontonagon River watershed is excellent, but poor land use practices have led to increased sediment in some areas. Because most of the dams within the basin are relatively small or were constructed at the outlet of natural lakes, thermal pollution from impoundments is a minor concern throughout most of the Ontonagon River system. Few factories and wastewater treatment plants are located within the watershed, with only eleven discharges permitted through the National Pollutant Discharge Elimination System.

Airborne mercury contamination affects the Ontonagon River and most other waters in Michigan. The rock surrounding many of the lakes and streams in the basin also provides a natural source of mercury to surface waters. Statewide fish consumption advisories apply to inland lakes and the Michigan Department of Community Health has issued additional fish consumption advisories for the Cisco Chain and Duck, Gogebic, and Langford lakes.

Numerous federal, state, and local units of government have jurisdictional responsibility over various portions of the Ontonagon River watershed. The Federal Energy Regulation Commission oversees operations at the five hydroelectric-related dams within the basin. About 57% of the watershed is in federal ownership and is managed by the United States Forest Service. The United States Fish and Wildlife Service is responsible for sea lamprey control in streams with Lake Superior access, and the United States Army Corps of Engineers possesses navigational jurisdiction over the lower Ontonagon River. Fishing and hunting regulations are established and enforced by the MDNR, and water quality regulations are administered by the Michigan Department of Environmental Quality. Local units of government influence the river through zoning restrictions and road commission activities.

Special restrictions on human activities have been established to protect areas with outstanding recreational or ecological values. Four of the five main branches of the Ontonagon River system have stream reaches that are classified as Federal Wild and Scenic Rivers, and twelve lakes are included in the federally designated Sylvania Wilderness Area.

Fisheries surveys conducted during the last 80 years have documented the presence of 74 fish species within the watershed, but identification was questionable for three of the species. Of the 71 species that have been positively identified, 60 are native to the Ontonagon River basin, five were intentionally introduced, and six colonized the drainage via canals, ballast water, or dispersal from previous introductions.

Coldwater fish species (e.g., brook trout and mottled sculpin) dominate the fish communities in groundwater-fed streams in the southern portion of the watershed. Water temperatures generally increase in a downstream direction, and coolwater fish species (e.g., walleye, smallmouth bass, and northern pike) become more common as the various branches approach the main stem. Several migratory fishes from Lake Superior (e.g., coho salmon and rainbow trout [steelhead]) spawn in portions of the East Branch, Middle Branch, West Branch, and the main stem.

Two threatened fish species are known to inhabit the Ontonagon River watershed: lake herring and lake sturgeon. Lake herring have been found in a few large lakes within the basin. Lake sturgeon were historically abundant in the Ontonagon River. Commercial overfishing and habitat degradation during the late 19th and early 20th centuries led to the extirpation of this species. The MDNR began stocking lake sturgeon in the main stem in 1998, but it will be several years before adult lake sturgeon are expected to begin reproducing in the Ontonagon River system.

Macroinvertebrates are an important indicator of water quality and are an integral part of the aquatic food web. Macroinvertebrate communities have been evaluated at 25 sites within the Ontonagon River system. The macroinvertebrate communities were rated as “excellent” at six sites, “acceptable” at 18 sites, and “poor” at one site.

Numerous species of mussels, amphibians, reptiles, birds, mammals, and plants occur within the Ontonagon River watershed, many of which are listed as threatened or of special concern. Several aquatic pest species have been found within the basin, including sea lamprey, ruffe, rusty crayfish, spiny water flea, Chinese mystery snail, and Eurasian water-milfoil.

Active fisheries management within the watershed began during the 1920s. For the first decade, fisheries management consisted primarily of surveying and documenting the fish populations within the basin and the human use of those populations. During the late 1930s and early 1940s, warmwater fish stocking became an important management tool. Walleye fry, largemouth and smallmouth bass, and bluegill were introduced into numerous lakes during this period. From 1945 to 1964, legal-sized trout were stocked into many of the streams in the Ontonagon River system. These high-cost stocking programs often produced only modest put-and-take fisheries, and trout stocking was greatly reduced after 1964. In recent years, trout stocking has been used to maintain or establish trout fisheries in several lakes and to enhance the steelhead fishery in the Ontonagon River.

During the mid-1980s, advancements in rearing operations and growing interest from anglers led to a rapid expansion of the MDNR walleye stocking program. Spring fingerling walleyes were stocked in numerous lakes during the last 25 years. Many of these stocking programs have been discontinued, but fisheries managers continue to use walleye stocking to maintain popular walleye fisheries and control the abundance and size structure of panfish populations.

Habitat protection and enhancement have been important components of fisheries management since the 1930s. Early habitat improvement projects primarily involved instream habitat work, such as installation of wing dams and other human-made structures. In recent years, resource managers have adopted a more holistic approach to habitat management. Riparian buffer strips are used to prevent sedimentation associated with timber harvest operations, and sediment traps are installed at problem locations to mitigate the effects of anthropogenic sedimentation on stream environments. New stream crossings are designed to withstand flood flows and facilitate fish passage. Hard-armoring techniques (e.g., riprap and bulkheads) are used sparingly, and more natural methods of stream bank protection (e.g., seeding and mulching, tree plantings, or whole tree revetments) are increasing in popularity. Beaver removals are prescribed to protect high-quality trout streams from thermal pollution, but beavers are allowed to persist in many warmwater streams. The various natural resource agencies also work with the Federal Energy Regulatory Commission to mitigate the effects of hydroelectric-related dams on aquatic ecosystems. Instream habitat projects still play a role in habitat management, but natural materials (such as root wads, boulders, or entire trees) are preferred over human-made structures.

Fishing regulations are one of the most broadly recognized tools for controlling the harvest, size structure, and abundance of fish populations. Restrictive regulations have been instituted to maintain high-quality smallmouth bass fisheries in the Sylvania Wilderness Area. Limitations on the use of live bait are enforced on some trout lakes to reduce the risk of colonization by undesirable species. Closed fishing seasons also protect many fish species from harvest during their most vulnerable periods (i.e., spawning).

The large tracts of publicly owned land in the Ontonagon River watershed provide a wide array of recreation opportunities. Popular outdoor activities within the basin include fishing, boating, water skiing and tubing, canoeing, kayaking, hunting, trapping, berry and mushroom picking, camping, swimming, off-road-vehicle (ORV) trail riding, snowmobiling, snowshoeing, cross-country skiing, hiking, bike riding, bird and wildlife watching, and waterfall viewing. Steep gradients and rock-strewn rapids make many stream reaches unsuitable for safe boating, so there are few boat launches on the Ontonagon River system. Boat launches have been constructed on over 30 lakes, and walk-in access is available for many additional lakes and streams.

Protecting and rehabilitating the aquatic resources in the Ontonagon River basin is a monumental task that cannot be accomplished solely through the actions of governmental agencies. Numerous citizen groups have been involved in watershed planning and aquatic habitat restoration projects during the last 70 years. As the human population grows and a greater percentage of the watershed is subdivided for residential and vacation homes, public involvement in natural resource protection will be critical for the long-term health of the watershed.