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 Thunder Bay River, discusses how human activities have influenced the river, and serves as an information base for future management of the river.

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 the river, watershed landscapes, biological communities, and humans. These assessments will provide an approach to identifying opportunities and solving problems related to aquatic resources in the Thunder Bay River watershed. 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. 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 Thunder Bay River and its watershed in twelve 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 section of the report identifies a variety of actions that could be taken to protect, restore, rehabilitate, or better understand the Thunder Bay River and its watershed. 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 future management activities for the watershed.

The Thunder Bay River drains 1,250 square miles of northeastern Lower Michigan in Lake Huron. Its basin contains portions of five counties: Montmorency, Oscoda, Alcona, Presque Isle, and Alpena. For the purposes of discussion, the mainstem Thunder Bay River is divided into five segments, each reflecting the characteristic of the river as it flows across different landforms, receives tributaries, and passes through impoundments. The major tributaries to the Thunder Bay River are also divided into segments.

Like the rest of northern Michigan, glaciers left behind the intricate Thunder Bay River watershed. Glacial scouring of the land formed many lakes, creeks, tributaries, and mainstem that we know today. Indian tribes occupied the land prior to European settlement, particularly near the river mouth and at Hubbard Lake. Their occupancy in the watershed, however, was typically in low numbers. This was a product of the harsh climate and extensive forest and swamp land within the watershed's interior. The early European settlers harvested the plentiful biological resources of the region to survive. Soon afterwards, the interior virgin forests were stripped with the onset of the logging industry. The great arterial system of the watershed was then suitable for transportation of logs. Dams were built to harness the river's power and to enhance log transport. Logging then gave way to farming, and wetlands were drained to accommodate agricultural practices. Alpena continued to prosper even after the logging industry as a result of limestone excavation. The history and growth of the Thunder Bay River watershed parallels Michigan's growth as a state.

The geology of the Thunder Bay River watershed supports high groundwater inflow in the headwaters, and lower amounts in the downstream reaches. The headwaters typically have stable flows and colder water temperatures. River flows in the downstream reaches are less stable and

typically have warmer water temperatures. The differences in geology and hydrology and the operation of some dams results in low flow stability in some parts of the watershed.

The mainstem Thunder Bay River from its headwaters to Hillman Dam receives the highest inflows of groundwater. Some tributaries to this segment are the highest quality trout streams found in the watershed. However, most of the mainstem is classified as a second-quality cold water stream because groundwater inflows are insufficient to offset water warming by natural lakes and human-made impoundments whose outlets flow into the river.

The mainstem from Hillman Dam to the confluence with the Upper South Branch flows through peat and muck soils, receiving little or no inflow of groundwater. However, flow stability remains relatively high in this river reach. The Hillman Dam is operated in run-of-river mode so it rarely affects flow stability, although the impoundment does increase water warming. Groundwater inflow is also relatively low throughout the remainder of the mainstem from the confluence with the Upper South Branch to the river mouth at Alpena. Flow stability decreases steadily through this reach, in part due to the influence of the major tributaries, the Lower South Branch and the North Branch.

Groundwater inflow is generally high in the headwaters of both the Upper and Lower South Branch Thunder Bay River. All top-quality cold water streams are located in this portion of these river segments. Flow stability is very low at the mouths of these rivers after they flow northward through Fletcher Pond (also known as Fletcher Floodwaters) and Hubbard Lake. Operation of the Fletcher Pond and Hubbard Lake dams to raise and lower lake levels by two feet each spring and fall, respectively, contributes to flow instability of these rivers. The entire North Branch Thunder Bay River has low flow stability due to a lack of groundwater inflow. Spring flood flows are relatively high due, in part, to drainage from agricultural lands.

Although a relatively small portion of the watershed is classified as “urban” in land use, development is having an effect on the watershed. A dramatic loss of wetlands has occurred since 1800 as those lands were converted to agriculture and residential development increased. Oil and gas wells are presently found in high density in the watershed in comparison to other regions in Michigan.

Gradient, or drop in elevation over distance, is an important factor in determining habitat characteristics of a river. River gradient can affect important factors such as water velocity, substrate composition, and overall channel form. Gradient in the Thunder Bay River watershed was calculated using a geographic information system, and categorized into recognized classes. Based on this analysis, approximately 38% of the basin is of very high gradient (10-70 ft/mi) with excellent hydraulic diversity. Most high gradient habitat is in the small tributaries or masked by effects of impoundments. The rest of the watershed is of relatively low gradient with poor hydraulic diversity.

Channel cross section and discharge measurements can be used as a measure of habitat diversity in a river system based on expected widths for a given discharge. Deviations from the expected widths can indicate alterations such as impoundments or channelization. Most mainstem measurements were within the expected widths, while less than 40% of the tributary measurements were within the expected range. The majority of the unexpected widths were in flashy tributaries with variable streamflow.

Seventy-three dams are presently in the Thunder Bay River watershed. More than 90% of these structures are on tributaries to the mainstem and most are small in size. Except for four hydropower dams and two storage reservoirs, effects of dams in the watershed have not been quantitatively evaluated. By changing flowing water habitats to impounded reaches, dams may affect rivers by: altering dissolved oxygen and temperature regimes; interrupting flow and sediment/woody structure transport; altering channel morphology and making suitable substrates unavailable; starving catch basins of nutrients; preventing proper fish passage and invertebrate drift; and changing biotic

communities permanently. Lake-level control structures are also prominent in the Thunder Bay River watershed. These dams often: disrupt natural variations in lake levels needed to maintain shoreline wetlands; disrupt spawning activities of fishes associated with shoreline wetlands; prevent movement of fishes between lake and river habitats; and if improperly managed, produce detrimental flow conditions downstream.

Four dams in the Thunder Bay River watershed are large hydroelectric facilities and two are storage reservoirs associated with the hydropower projects. Four of these structures impound reaches of the mainstem, while the remaining two structures are on the Upper and Lower South branches. These two latter dams are on Fletcher Pond and Hubbard Lake. These are two very popular water bodies in respect to recreational use. Alteration of temperature and dissolved oxygen regimes of the river are less evident from the mainstem dams, especially the lower hydroelectric facilities such as Seven Mile, Four Mile, and Ninth Street dams. Their detriment to aquatic communities arise more from their fragmentation and isolation of fish communities. These lower dams block spawning migrations of native walleye and lake sturgeon, a state-threatened species. They also prevent development of valuable potamodromous fisheries by inhibiting popular naturalized species such as Chinook salmon and steelhead from reaching upstream spawning grounds. In addition to preventing proper downstream transport of sediments and woody structure, hydroelectric dams entrain and kill all types of fish. Operating licenses issued to Thunder Bay Power Company in 1998 provide mitigation for some of the effects of hydroelectric projects on the Thunder Bay River. Selective dam removal and/or fish passage structures at the lower mainstem dams would help alleviate some negative effects of these projects and ensure a free flowing, healthier lower mainstem Thunder Bay River.

Recent surveys by the Michigan Department of Environmental Quality (MDEQ) indicate that most of the watershed is meeting state water quality standards. The Thunder Bay River watershed has relatively few point source pollutant sources. Few factories and wastewater treatment plants can be found in the watershed, with only six permitted discharges in the basin. Nonpoint source pollution, such as sedimentation, is a threat to the Thunder Bay River watershed. Sedimentation can cover substrate suitable for fish spawning and nursery habitat, and decrease invertebrate diversity and density. Air borne pollutants also are deposited in the watershed, and contribute to fish consumption advisories.

Many governmental units have varying degrees of jurisdiction over the Thunder Bay River watershed. The Federal Energy Regulatory Commission regulates the dams associated with hydroelectric projects on the mainstem and Upper and Lower South branches. Twenty-five percent of the Thunder Bay River watershed is managed as state (24%) and federal forests (1%). Sport fishing regulations, fish consumption advisories, and legal “navigability” of portions of the river are established by various state government agencies. Water quality within the watershed is administered by state government through the Federal Clean Water Act. Local units of government influence the river through special ordinances and restrictions, road commission activities, and maintenance of legal-lake levels (through state law).

Currently, 81 fish species inhabit the Thunder Bay River watershed. Coldwater fish communities, typically with brook/brown trout and mottled/slimy sculpin, are found primarily in the southern portion of the watershed. The remainder of the riverine portion contains a mix of cool- and warmwater species whose distribution is a product of progressively warmer water temperatures downstream. Coolwater species include esocids (e.g., northern pike) and percids (e.g., walleye and yellow perch), while warmwater species include centrarchids (e.g., smallmouth and largemouth bass and bluegill) and many cyprinid species.

The biological communities of the Thunder Bay River watershed are affected by numerous dams. These dams serve as a barrier to migrating fish, and fragment the biotic communities of the inland

watershed. If the river system were open to Lake Huron, it would likely support seasonal migrations of many fish species and provide spawning and nursery habitat for some.

Two rare fish species are found in the Thunder Bay River watershed. The lake sturgeon, although rare, may currently be found below Ninth Street Dam. This species is precluded from accessing the rest of the watershed because of this and other dams. The pugnose shiner is also present in the watershed, but its distribution is limited due to specific habitat requirements.

Aquatic invertebrates in the watershed have been sampled by the MDEQ during water quality surveys. These surveys show a diverse and abundant macroinvertebrate community in most locations sampled. A variety of amphibians, reptiles, birds, and mammals inhabit the Thunder Bay River watershed. Habitat loss and specific habitat requirements threaten some of the rare species. Aquatic nuisance species such as purple loosestrife and zebra mussels have also colonized parts of the watershed and compete with native species.

Historical and recent fisheries management in the Thunder Bay River watershed has been shaped by the wide variety of aquatic habitat types present. Early fish management can be traced to the first half of the twentieth-century. Early managers surveyed many water bodies at this time to gain baseline fish community and habitat information. Simultaneously, fish stocking became a widely used and popular management tool. Early stream stocking efforts centered on trout species, with little regard to the thermal nature of these waters. This management practice was slowly abandoned, as managers began to understand the limitations of each individual reach of river or creek. Stocking was then redirected to lakes and impoundments by the middle part of the century. Current fish stocking efforts are a result of the learning associated with the success and failure of this management activity over the twentieth-century. Today, fish managers strive to understand the system and any associated limitations. The few remaining stocking programs are based on the survival of the species and the establishment of a fishery.

Most lakes and streams in the Thunder Bay River watershed today are managed for natural, self-sustaining fisheries. Standard State of Michigan fishing regulations apply at most of these water bodies. Size and harvest limits for warm- and coolwater species have changed over time not only in the watershed, but also throughout the state. Regulations are an important form of fish management established by the Michigan Department of Natural Resources. Fishery regulations have been designed to provide for sustainable fisheries. Special trout regulations apply for some streams and a handful of lakes in the watershed. With the exception of the lower mainstem, the trout streams of the Thunder Bay River watershed are managed with Type 1 stream regulations.

The unique character of the Thunder Bay River watershed is derived from the variety of lake and stream environments within the system. Fish communities typical of high-gradient, cool water, large river habitats have been reduced or eliminated in some areas as a result of impoundments. Fragmentation of the river system has resulted in lost production of fishes and reduced the potential of the river for supporting popular fisheries. Future management activities should attempt to restore connections between isolated reaches and Lake Huron.

Little is known about recreational use in the Thunder Bay River watershed. Angling pressure is highest on the lakes of the watershed, while the upper and lower mainstem segments provide quality seasonal fisheries. Habitat fragmentation by dams limits the fishing potential in the middle reaches of river. The high-gradient reaches of the lower mainstem suggest that in a fully, free-flowing state it would provide considerable recreational angling and canoeing potential. Present recreational use on lower mainstem ponds needs to be better documented to help guide management of the lower watershed reaches.

The management options offer a variety of ways for communities and governments to look at the opportunities and problems that are before them now and that will be in the future. Public involvement is critical for the long-term protection and enhancement of the Thunder Bay River watershed. Many forums exist for which interested people may become actively involved. Groups must work together at identifying important issues in the watershed, and developing a shared vision and a set of common goals for the watersheds future.