EXECUTIVE SUMMARY

This assessment for the Jordan River watershed is one of a series being prepared by the Michigan Department of Natural Resources (MDNR), Fisheries Division for Michigan rivers. This report describes the Jordan River watershed and its biological communities.

River assessments are intended to provide a comprehensive reference for individuals who seek information about a river system. It pulls together known information about the watershed and demonstrates how the river is influenced by the physical landscape and its relationship to biological communities. Assessments are prepared to help identify problem areas and provide opportunities for solving these problems. It also identifies areas where information is needed to better understand, manage, and protect the river. Also, it is anticipated that this assessment will encourage citizens to become involved in the decision-making process that will benefit the river and its users.

This document consists of four principal sections: introduction, watershed assessment, management options, and public comments (with our responses). The watershed assessment is the nucleus of the document. The characteristics of the Jordan River watershed are described under twelve sections: geography, history, geology and hydrology, soils and land use patterns, channel morphology, dams and barriers, water quality, special jurisdictions, biological communities, fisheries management, recreational use, and citizen involvement.

The management options section identifies a variety of challenges and opportunities for protection, rehabilitation, or obtaining additional information to better understand the Jordan River. These management options are organized similar to the main sections in the river assessment. The management options listed are not necessarily recommended by MDNR, Fisheries Division, but are intended to provide a foundation for public discussion and aid in planning for the future of the Jordan River watershed.

The Jordan River is located in the northwest portion of Michigan's Lower Peninsula and drains an area of approximately 127 square miles in Antrim and Charlevoix counties. The mainstem of the Jordan River is 22.9 miles long, with a 485 foot drop in elevation between the source and the mouth at Lake Charlevoix. There are 29 named tributaries totaling approximately 90 miles. Major tributaries include Green River, Deer Creek, and Landslide Creek. The Jordan River watershed is primarily a riverine system since there are only three natural lakes (Deer, Mud, and Satterly) in the watershed. Nearly one-third (31%) of the watershed is state-owned land and the remainder is private.

For purpose of discussion, the Jordan River watershed is divided into three mainstem valley sections. Sections were identified based upon surficial geology, topography, and channel and valley characteristics. The upper Jordan River section flows across glacial outwash sand and gravel. It flows through predominately state-owned land its entire length from its origin downstream to Graves Crossing. Average gradient in this 12.9-mile section is 31.8 ft/mi. The riparian stream corridor consists of lowland swamp conifer forest. Upland hardwood forest dominates the steep rolling hills adjacent to the river valley. Water temperatures are cold and the stream channel is full of large woody structure. The lower Jordan River from Graves Crossing downstream to Lake Charlevoix flows across lacustrine sand and gravel. Average gradient in this 10-mile section is 7.5 ft/mi. The river lies within a wide valley and has a more defined stream channel. Lowland conifers border the stream and land ownership is a mixture of state and private. Agricultural lands are scattered along tributary streams. Deer Creek flows across a mixture of outwash sand and gravel, coarse glacial till, and lacustrine sand and gravel. It flows through private land and drains an extensive lowland swamp conifer forest. This 9.6-mile stream has an average gradient of 13.0 ft/mi. Agricultural lands dominate the upper reaches with a mixture of residential and light industrial land in the lower reaches.

Bands of Ottawa Indians are believed to have periodically inhabited the Jordan River watershed. Europeans settled the watershed around the mid-1800s, near the mouth of the Jordan River. Lumbering began in the late 1800s and continued into the 1920s. Pine were the first trees harvested for building material followed by the harvest of the vast stands of upland hardwoods. Hardwoods were used for lumber, wood alcohol, and charcoal in the manufacturing of pig iron.

The Jordan River is one of the most stable flowing streams in Michigan and has one of the highest baseflow yields in the state. It is one of only a few streams in the state that capture groundwater from adjacent watersheds. The hydrology of the watershed is strongly influenced by glacial deposits. The majority of the surficial geology deposits are glacial outwash sands, gravel, and coarse textured moraines. These glacial deposits contribute to the abundance of cold water and extremely stable flows. The Jordan River does not experience flood or drought conditions typical of many Michigan streams.

Approximately 61% of the watershed is classified as deciduous forestland and 27% as agricultural. Agricultural land uses include croplands (row crops and hay), pasture lands, and abandoned or fallow grasslands. Forestland uses include timber for building materials and paper products. Recreational uses are fishing, canoeing, hunting, camping, hiking, and general outdoor activities. There are 192 natural gas wells and one oil well in the watershed, the majority located on private land. There are 88 road-stream crossings identified. It is estimated that 30% of the crossings inhibit fish movement. The watershed is still rural, as there are no urban areas. The City of East Jordan lies at the mouth of the Jordan River outside the watershed boundary.

The average gradient of the Jordan River mainstem is 21.2 feet per mile, ranging from 32.3 feet per mile in the upper Jordan River to 3.3 feet per mile downstream from Webster Bridge. The gradient in the upper Jordan River does not appear high due to abundance of large woody structure creating numerous small diversions and mini-waterfalls, thus reducing the stream energy that could be used to incise the stream channel. The stream channel is shallow, wide, and in many places braided as it flows through glacial outwash sand and gravel. Excluding the extensive braiding of the stream channel, it averages about 94 feet wide. The stream returns to a single channel below Graves Crossing and averages about 60 feet wide. Deer Creek ranges from 12-15 feet in width above Patricia Lake.

Within the watershed there are only three dams registered with Michigan Department of Environmental Quality. One is located on the Green River and two are located on Deer Creek. The uppermost dam on Deer Creek is a lake-level control structure that maintains a legally established lake level for Deer Lake. The lowermost dam on Deer Creek is a retired hydroelectric dam that creates Patricia Lake. This dam blocks fish migrations including spawning sea lamprey, a serious pest in the Great Lakes. The dam on the Green River diverts water through a series of ponds that have been used for trout rearing. At the present time this facility is not commercially raising trout. Patricia Lake and Green River dams are detrimental to the overall health of the river because they impound high gradient fish spawning habitat, impair habitat for aquatic invertebrates, block fish movements, increase water temperatures, trap sediment, and fragment aquatic habitat. There are probably less than 20 small human-made dams and barriers on the smaller tributary streams.

There is one seasonally operated electric barrier on the mainstem of the Jordan River. This barrier was initially constructed to block adult migrating sea lamprey and is still operational each spring. It is also operated in fall to block salmon migrations in lieu of an abandoned mechanical barrier at the river mouth in the City of East Jordan.

Overall water quality is excellent in the Jordan River. There is very little development in the watershed. Geology of the watershed permits most precipitation to percolate through the extensive sand and gravel moraines. Most of the river water is from high-quality groundwater sources. Sand

and sediment from point and nonpoint sources have been a major concern. A great amount of effort has already been directed at controlling sediment input by Antrim and Charlevoix Conservation Districts, Friends of the Jordan River Watershed, Michigan Department of Environmental Quality, and Michigan Department of Natural Resources. Maintenance of stabilized banks, road stream crossings, and sand traps in the river are ongoing. Additionally, there are a few areas affected by excessive nutrients and these are being addressed through improvements in technology and best management practices.

Several governmental agencies have regulatory responsibilities that affect the river. The Michigan Departments of Natural Resources and Environmental Quality manage natural resources and state-owned lands, and enforce environmental regulations. The US Fish and Wildlife Service, US Department of Agriculture, Natural Resources Conservation Service, and US Environmental Protection Agency have responsibilities for specific Federal mandates. Counties and townships are involved in planning and zoning activities. Friends of the Jordan River Watershed, Inc. is the most active of the local, nonprofit organizations working within the watershed.

Fifty-one species of fish were native to the Jordan River watershed. Earliest written records that mention fish in the Jordan River are from the mid-1800s. Those records speak of the abundant grayling. Brook trout were first documented in the Jordan River in 1857. They were either native or recent migrants across Lake Michigan from Michigan's Upper Peninsula. The Jordan River now contains about 58 species of fish; eight of these are non-indigenous. One of the original species (Arctic grayling) is extirpated and four (finescale dace, common shiner, mimic shiner, and banded killifish) are of unknown status. No species of fish found in the watershed is listed as endangered, threatened, or of special concern by the Michigan Natural Features Inventory (MNFI).

Thirty-six species of amphibians and reptiles requiring water or wetlands for at least part of their life cycle have been identified as likely to be found in the Jordan River watershed. Three reptiles (wood turtle, Blanding's turtle, and eastern massasauga rattlesnake), but no amphibians are listed as special concern by MNFI.

One hundred sixty two species of birds are likely to be found in the Jordan River watershed. Fifty-six species have confirmed breeding status in the watershed. Seven species are listed as threatened and eight species are listed as special concern by MNFI.

Fifty-two species of mammals are listed as likely to be found in the Jordan River watershed. The woodland vole is listed as special concern by MNFI.

There have been 19 different vegetative cover-types inventoried on state land. Upland hardwood forests comprise 66% (including 12% aspen) and mixed swamp conifers 10%.

Three aquatic pest species are found in the Jordan River watershed. The sea lamprey (*Petromyzon marinus*) is the most serious pest. Also present are the microscopic protozoan *Myxobolus cerebralis*, a parasite that causes "whirling disease" in salmonid fishes, and purple loosestrife (*Lythrum salicaria*) a wetlands plant that displaces native plants.

The Jordan River and tributary streams are designated trout streams and are managed for trout and salmon. Brook and brown trout are abundant in the mainstem and in most tributaries. Potamodromous species, such as steelhead, coho salmon, and chinook salmon are also found in streams not blocked by barriers.

The Jordan River, from the headwaters downstream to Graves Crossing, has stable flows and cold water temperatures. The stream has an abundance of large woody structure and sand dominates the

stream bottom. Brook, brown, and steelhead in addition to coho and chinook salmon are found in this section. Brook trout dominate from the headwaters downstream to the Jordan River National Fish Hatchery (JRNFH). Angling for brook trout is considered good with average size being small. Brown trout numbers increase from the JRNFH downstream to Graves Crossing.

The Jordan River from Graves Crossing downstream to Lake Charlevoix is a larger river. There is less woody structure in the stream and sand bedload is still common, although there are more gravel areas. Salmon and steelhead dominate this section of river. Most potamodromous angling occurs downstream from the electric barrier that blocks the upstream migration of fish from Lake Michigan. The electric barrier is operated in spring to block adult sea lamprey, but it also blocks most spring-run steelhead. In fall it is operated to block migrating chinook salmon, but also blocks some steelhead and coho salmon. There is a limited fall potamodromous fishery upstream from the electric barrier.

Deer Lake is the headwater of Deer Creek. The lake contains warmwater species of fish and provides good fishing for largemouth bass, yellow perch, rock bass, bluegill, and pumpkinseed. Deer Creek downstream to Patricia Lake has good gradient, with pool and riffle habitat. Water temperatures are cold and water quality is good. Angling is reported to be good for brown trout with an occasional brook trout. Development of public access on Deer Creek would enhance angling opportunities. Patricia Lake dam blocks potamodromous fish including sea lamprey. Passage of potamodromous fish over the dam would enhance natural reproduction of these species and provide additional angling opportunities. Removal of the dam would rehabilitate high gradient spawning gravel for fish. However, sea lamprey would have to be blocked from using Deer Creek for spawning or the creek would have to be chemically treated.

The Jordan River supports a wide variety of recreational activities. Many activities center on the river and river corridor and include fishing, canoeing, swimming, hunting, trapping, mushrooming, hiking, photography, and snowmobiling. There are three designated state watercraft launches on the mainstem of the Jordan River (Graves Crossing Forest Campground, Webster Bridge, and Rogers Road) and one on Deer Lake. There are two designated state Forest Campgrounds, one at Graves Crossing and the other at Pinney Bridge.

Management and preservation of the Jordan River receives strong public support from many different organizations. Some organizations work on specific issues such as fishing, hunting, and trapping. Friends of the Jordan River Watershed, Inc. work to educate and involve citizens regarding management and preservation of the entire watershed. It is important that local organizations and citizenry continue working to protect, manage, and rehabilitate the aquatic resources of the Jordan River because of public and private ownership, multiple user-groups, and limited governmental funding.