

## EXECUTIVE SUMMARY

This is one in a series of river assessments prepared by the Michigan Department of Natural Resources, Fisheries Division for Michigan rivers. This report describes the physical and biological characteristics of the Tittabawassee River, details those human activities that have influenced the Tittabawassee River watershed, and serves as an information base for future management goals.

River assessments are intended to provide a comprehensive reference for citizens and agency personnel seeking information about a river. The information contained in this assessment is a compilation of not only river related problems but opportunities as well. The relationship between human influence and river status necessitates public awareness and involvement. This river assessment serves as a tool which can be used to assist the management decision process and increase public understanding and foster their involvement in management decisions. This cooperative stewardship by professional managers and the public will benefit the resource, and ultimately, the future generations of people that will live and recreate within the river watershed.

This document consists of four parts: Introduction, River Assessment, Management Options, and Public Comments (with our responses). The River Assessment is the nucleus of the report. It provides a description of the Tittabawassee 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, Fisheries Management, Recreational Use, and Citizen Involvement.

The Management Options section identifies a variety of actions that could be taken to protect, restore, rehabilitate, or better understand the Tittabawassee River. These management options are organized according to the main sections of the river assessment. They are intended to provide a foundation for public discussion, priority setting, and ultimately planning the future of the Tittabawassee River.

The Tittabawassee River watershed is centrally located in the Lower Peninsula of Michigan. The watershed encompasses a land area of 2,471 mi<sup>2</sup> and is the fifth largest in Michigan. All or part of Arenac, Bay, Clare, Gladwin, Gratiot, Isabella, Mecosta, Midland, Montcalm, Ogemaw, Osceola, Roscommon, and Saginaw counties lie within the Tittabawassee River watershed. The Tittabawassee River main stem is 91 miles long, and the network of contributing tributaries total 621 miles. There are 217 lakes greater than 10 acres within the watershed.

For analysis and descriptive purposes the main stem Tittabawassee River has been divided into three segments based on differences in channel features and soil types, surficial geology, and topography within the watershed. The headwaters segment is composed of the Middle, East, and West branches of the Tittabawassee River. All three branches begin as coldwater streams and quickly transition into coolwater. The middle segment begins at the upper end of the Secord Lake and extends south 36 miles to the Sanford Dam. This segment is a relatively large warmwater system that is greatly influenced by four hydropower dams: Secord, Smallwood, Wixom, and Sanford. The Sugar, Molasses, and Tobacco rivers enter the main stem within this segment. The mouth segment extends 35 miles from the Sanford Dam to the confluence with the Saginaw River. This segment is a large warmwater system with relatively low gradient. Major tributaries include Carroll Creek Drain (also referred to as Carrol Creek Drain); Sturgeon and Bullock creeks; and the Salt, Chippewa, and Pine rivers.

The natural resources of the Tittabawassee River watershed have played a prominent role in the history of human activities in the region. Native Americans and European settlers were drawn to the Tittabawassee River area because of the abundance of fish and wildlife. By the mid-1800s, the lumber

era was underway sparked by the abundant stands of white pine and other valuable trees in the region. Agriculture flourished following deforestation of the watershed and the discovery of brine and oil deposits led to industrial development. Human activity in the watershed has increased economic value and has resulted in serious environmental effects in portions of the watershed.

Soils and land use patterns have a major influence on the hydrology, water temperature, and water quality in the Tittabawassee River watershed. Soils in the northern and western portions of the watershed are highly permeable, are less suitable for agriculture, and produce stable flow, cold- to cool-water streams of good water quality. Soils in the central portions of the watershed have low permeability, support intensive agriculture, and produce flashy, warmwater streams of poorer water quality. The majority of urban areas are located in the central and eastern portion of the watershed. Together, agricultural (e.g., channelization, drainage of wetlands, and installation of artificial drainage systems) and urban (e.g., conversion to impervious surfaces) land use practices have altered flow stability, thermal regimes, and water quality especially in the central and eastern portion of the watershed.

Mean gradient (4.7 ft/mi) within the main stem Tittabawassee River is steep relative to other Michigan rivers and varies from 0.9 ft/mi near the mouth to 68.8 ft/mi in the headwaters. Rivers typically have steep gradient in their headwaters with more moderate gradient further downstream. In the Tittabawassee River, however, gradient remains quite steep within the central portion of the main stem. High gradient reaches in the main stem lie beneath impoundments making these rare and valuable habitats unavailable to stream biota.

Channel cross-section of the Tittabawassee River watershed is normal in most reaches, except the Pine River where widths were greater than expected. Excessively wide channel widths in the Pine River occur below areas with excessive field tiling and high concentrations of county drain systems. Both field tiling and county drains contribute to extreme peak flow events that cause the stream to adjust channel shape through bank erosion.

There are 143 dams registered with MDEQ in the Tittabawassee River watershed. There are 6 listed for hydroelectric generation, 3 are retired hydroelectric dams, 86 for recreation, and the remainder for farm ponds, irrigation, or water supply. Dams in the Tittabawassee River watershed have altered historical fish communities by blocking migration routes, elevating stream temperatures, and inundating high quality, steep-gradient habitats.

Water quality in the Tittabawassee River watershed is influenced by human uses of land and water including agriculture, industry, and suburban development. Aquatic habitat and water quality varies throughout the watershed, with some areas being quite healthy, while other areas are seriously degraded and incapable of supporting designated uses. The Tittabawassee River watershed has historically suffered from poor water quality due to unregulated discharges by industries and municipalities. Although there are three superfund sites in the Tittabawassee River watershed, water quality in the watershed is improving, and virtually all point source discharges are regulated. Major effects on water quality continue to be dioxins, contaminated sediments, nonpoint source pollution, and adjacent sites of contamination. Along the lower Tittabawassee River, elevated levels of dioxins and furans have been found in the sediments of the Tittabawassee River beginning downstream of Midland. The levels of dioxins found at these location exceeds Michigan's generic residential direct-contact clean-up criteria and may exceed the action level of 1,000 parts per trillion (ppt) established by the Centers for Disease Control's Agency for Toxic Substances and Disease Registry.

The present day fish fauna of the Tittabawassee River watershed is composed of 75 native species, 14 introduced or colonized species, and 4 additional species where the status of distribution is unknown. Cisco and lake whitefish were formerly indigenous, but are believed to be extirpated. Lake sturgeon

were historically very common and are now a threatened and rare species. The pugnose shiner is the only fish listed as a species of special concern. Most of the upper stream reaches in the northern and western portions of the Tittabawassee River watershed support coldwater fish communities dominated by trout and sculpin. Further downstream waters transition into cool- and warm-water habitats supporting a mixture of esocids (e.g., northern pike), percids (e.g., walleye, yellow perch, and darters), centrarcids (e.g., smallmouth bass, largemouth bass, and sunfishes), and cyprinids (minnows). In addition to water temperature, fish distributions are influenced by dams, water quality, streamflows, and proximity to Lake Huron.

Fisheries management in the Tittabawassee River watershed dates back to 1927. Management to improve the recreational fishery has been vigorous at times, generally concentrating on isolated areas or tributaries. Early fish stocking in rivers and lakes included a variety of species such as brook and brown trout, yellow perch, bluegills, northern pike, largemouth bass, smallmouth bass, and walleye. Most of these early stocking locations, and the species stocked there, have been discontinued or modified. These changes in stocking are the result of advancing fisheries and management methods. Current management focuses on the compatibility of a given species, the water type, and potential of that system (e.g., trout stocking in coldwater streams where reproduction is limited).

In headwater systems water quality is generally good with temperatures cool to cold and many are classified as Type 1 trout streams. Management actions include monitoring of naturally reproducing trout populations. Stocking in recent years has been minimal and occurs at limited locations. Riverine waters in middle sections are typically cool or warm water. Here management consists of monitoring current populations with limited stocking. The middle segment of the main stem is almost completely impounded. Management has been focused on requiring run of the river operation of hydroelectric dams that fragment this section. This requires frequent monitoring to minimize negative effects of dams. Walleye and northern muskellunge are currently stocked in Secord, Smallwood, Wixom, and Sanford impoundments. Runs of potamodromous species are blocked by these impoundment dams as well as the Dow Dam. Thus, additional appropriate management actions are eliminated for the Tittabawassee River system, and sport fishing opportunities are lost. Lower river sections are warm water and management consists of monitoring existing stocks. Both the middle and lower river sections are negatively influenced by agricultural practices. Many river and stream sections are designated drains and field tiling is common. Management here is in the form of educating citizens to minimize land and river practices that negatively affect the watershed.

The Tittabawassee River watershed offers a variety of water-based recreational use. Opportunities for hunting, fishing, swimming, camping, picnicking, boating, and wildlife viewing exist at various locations. Limited public access and the public's awareness and perception of polluted waters and sediments hinder potential recreational use, particularly on the Pine River downstream from Alma and the Tittabawassee River downstream from Midland.

Citizen involvement in management of the Tittabawassee River and its tributaries occurs through interactions with government and citizen organizations to: manage water flows, water quality, animal populations, land use, and recreation. Continued cooperative and focused efforts between governmental and citizen agencies are necessary to maintain viable resources and to rehabilitate those resources which have been severely degraded.