*Michigan Department of Natural Resources*
*Status of the Fishery Resource Report* **97-1, 1997**

# Tobico Marsh

*Bay County (T15N, R 4E & 5E, Sections 13, 19, and 24)*
*Surveyed May 20-23, 1996*

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## Environment

Tobico Marsh contains the largest inland lake in Bay County, Michigan. It is located in the Tobico Marsh State Game Area, near the western shore of Lake Huron's Saginaw Bay, about 5 miles north of Bay City (Figure 1). This large area, encompassing 1848 acres of Kawkawlin and Bangor townships, contains over 1300 acres of wetland including wet prairie, shrub, cattail marsh, and forested types. The amount of open water in Tobico Marsh fluctuates with the water levels of the Great Lakes, the changing seasons, precipitation events, and the activity of the animals such as beavers and muskrats. Recently, the administration of the State Game Area was combined with that of the adjacent Bay City State Park to form what is now called the Bay City State Recreation Area.

Thousands of years ago, after the glaciers melted, this area was inundated by lakes Nippissing and Algoma. After the lake levels receded Tobico Marsh was exposed as a shallow embayment of Saginaw Bay. It became isolated when coastal processes deposited a sand spit between the marsh and bay (Resource Management Group 1995).

Consequently, all the soils in the Tobico watershed were originally wet and poorly drained with little slope. Predominate soil types are Tappan loam, Pipestone/Tobico fine sands, and Belleville loamy sand. The gentle slopes cause slow runoff and ponding of surface water. Easterly flow into the open-water portion of the marsh is hindered by a sandy ridge along it's west shore (Resource Management Group 1995). Presently, the watershed drains 4,148 acres through its outlet into Saginaw Bay.

Vegetation and land-use practices in the watershed have changed considerably from presettlement times to the present. During presettlement times the watershed was primarily forested, with mixed upland hardwoods, conifer dominated wetlands, ash/aspen dominated wetlands, and mixed hardwood wetlands. Today, the upland portions of the watershed are primarily used for agriculture and residential/commercial development, and have fragmented stands of scrub/shrub vegetation. Of the 4,148 acres in the watershed, 1,742 are in active agriculture. The boundaries of the marsh have also changed somewhat from presettlement times due to constructed drains and roads. These have altered the surface flow and water input patterns to the marsh (Resource Management Group 1995). The marsh proper presently has open water rimmed with dense floating cattail mats. There are also a few floating islands. The marsh is bordered by a scrub/shrub community along the western edge. Oak, aspen, and white pine still predominate on the ancient beach ridges further west of the marsh.

The depth and size of the open water portion of the marsh has varied over the years. Changes were largely due to fluctuations of Saginaw Bay water levels, the installation of a weir, and the installation of a flap-gate structure. Some lesser impacts were re-routing of drains, irrigation, precipitation events, and animal activity. Presently, the open water area within the marsh varies from 2.5 to 5.5 feet deep, and averages approximate 4 feet in depth. Dense mats of floating cattails

extend out from the shoreline over water 3-4 feet deep. Acreage estimates during 1950, 1963, 1969, 1978, and 1993 were 136, 98, 261, 243, and 338 acres, respectively (Resource Management Group 1995). These estimates include only the area above the weir.

Below the weir, the channel heads southeasterly as it passes through a culvert beneath Killarney Beach Road and the railroad/ hiking trail (Figure 1). There is another culvert at Euclid Avenue (M247) which has the flap-gate installation. Below the flap-gate the channel widens into Tobico Lagoon , which is bordered by the developed portion of Bay City State Park (now he Bay City Recreation Area). The channel narrows again before it fans out into the surf of Saginaw Bay.

Marsh water levels have been a concern for many years. In 1965, the Michigan Department of Natural Resources (MDNR) constructed a water level control weir near the southern end of the marsh. The purpose was to maintain water levels during periods of low water and produce better habitat and food for diving ducks. Consequently, the influence of Lake Huron's water level was somewhat controlled. High water levels drew just as much attention because private property owners were threatened by flooding. The US Army Corps of Engineers installed a flap-gate box culvert at Euclid Road in 1974. The flap gate prevents water from backing up into the marsh when water levels in Saginaw Bay increase. Both the weir and the flap gate alter the hydrology of the marsh and impede fish passage. At present, the stop logs have been removed from the weir and it is being operated at sill level. The flap gate is now being operated manually and is essentially open at all times, but it can be shut to prevent large surges from Saginaw Bay. In the future, the gate should be automated to close during emergencies.

Following the designation of Michigan as the 26th state of the union in 1837, settlement of the land began. The first private ownership of Tobico Marsh and its surrounding watershed was by logging interests. As logging diminished, the land was sold to several individuals who formed the Tobico Hunting and Fishing Club. In 1956, Guy Garber and Frank Andersen, the only surviving members, realized the value of the area as a wildlife refuge was more important than the quality of hunting. Andersen donated the property to the State of Michigan in 1957 and it became the Tobico State Wildlife Refuge. Later, the State obtained adjacent land and formed the Tobico Marsh State Game Area with the wildlife refuge as its nucleus. Recently, the refuge and game area were merged with the adjacent park, forming the Bay City State Recreation Area. The original property of the hunting and fishing club is still being managed as a protected wildlife refuge. Limited access to the refuge for outdoor education programs, wildlife viewing, walking, and fishing is provided by the Jennison Nature Center.

## Fishery Resource

Although it is not strongly encouraged, there is some shore fishing in the marsh near the weir and along some of the trails. Limited ice fishing also occurs. Fishing is a more important activity at the readily accessible lagoon. Although the Tobico Marsh receives little fishing activity, it is important from a fisheries standpoint as a nursery and spawning area for fish migrating from Saginaw Bay.

The first fish survey of Tobico Marsh was not conducted until 1996. Prior to that, sources of information were limited to the following observations. In early spring, in years of normal to high water levels, adult pike are known to migrate into the outlet and spawn in the marsh. Thus, the marsh is potentially an important spawning and nursery area for Saginaw Bay northern pike. The fishery in the shallow lagoon is generally poor. There anglers catch a few panfish, carp, bullhead, bowfin, and suckers. However, a substantial winterkill in 1984 indicated that valuable fish winter in the marsh above (MDNR files). An estimated 4,000 northern pike (12-32 inches), 500 bullhead (4-10 inches), 100 yellow perch (6-12 inches), 100 carp (4-12 inches), and 300 minnows were killed.

A Master Plan, written when the Bay City State Recreation Area was formed, discussed ways to enhance the fishery. It called for dredging the lagoon and constructing a floating pier to provide

better access to deeper water. Concerns were expressed regarding water levels in the marsh and the ability for northern pike to access the marsh from the bay via the outlet. This prompted a hydrologic study conducted in 1994 by a private consultant, Resource Management Group, Inc. (1995).

The hydrologic study found that the greatest factor affecting the hydrology of the marsh was not the re-routing of drains nor agricultural practices, rather it was the weir and the flap-gate. These structures have artificially maintained the water level and sometimes block fish passage. During high water, northern pike can access the marsh from Saginaw Bay. But access is denied to pike in low water. The outlet is shallow and broad where it enters the bay and is affected by bay currents, wind, precipitation, and Great Lakes water levels. Northern pike have been stranded on the sandy shallows in some years.

In 1996, priorities for fisheries management were to evaluate the importance of the pike spawning run and to evaluate the fish populations residing in the marsh. However, nets could not be set in the outlet or Tobico Lagoon due to shallow water levels and extensive muck. Later that year the lagoon was dredged, making it feasible to net there sometime in the future. We were able to survey fish in the marsh above the weir during May 20-23, 1996.

During the survey we collected nine species of fish with trap and fyke nets. Generally, brown bullhead, black crappie, carp, and northern pike were the most numerous species in the combined catch (Table 1). Brown bullhead, carp, and pike predominated on a weight basis. However, there were considerable differences in the catches by the two types of nets. Fyke nets, with smaller mesh (3/8-inch bar), caught large numbers of bullheads (Table 2). Trap nets, with larger mesh (3/4-inch bar), caught more carp and pike (Table 3). Few yellow perch, largemouth bass, and sunfish were caught in either net type, indicating that few of those fish occurred in the marsh at that time.

Captured fish ranged from small to large in size, an indication that all sizes of fish live in the marsh (Table 1) Northern pike were impressive, ranging from 17 to 34 inches in length. Black crappie were also large (4-12 inches) and could likewise support a good fishery.

Scale samples were collected from northern pike and black crappie for age and growth analysis. Ten year-classes of northern pike were present in the survey catch, indicating the population was experiencing good recruitment and longevity (Table 4 ). In addition, the pike were growing at a rate 0.4 inches faster than the Michigan average (Table 5). Similarly, black crappie had even recruitment, lived long (up to 9 years), and were growing 0.4 inches above the State average rate.

Additional observations were made in spring 1997. An experimental trap was installed in Tobico outlet to monitor the pike spawning run. Only 12 pike (7 males and 5 females) were collected. This suggests the pike run is very small; however the low catch could have been due to bad timing on our part or to pike avoiding the leads and trap. A small outlet channel was maintained by a bulldozer to improve fish access. In spring 1998, we plan to evaluate pike movements into the marsh, water temperature and, if possible, the production of small pike.

## Management Direction

Tobico Marsh should continue to be managed for fish species now present. In addition, access for species which migrate from Saginaw Bay should be improved if possible, especially to enhance northern pike populations in Saginaw Bay. The water level of the marsh should be allowed to fluctuate more naturally. For this to happen, modifications need to be made to the spillway of the weir which will allow more complete drawdowns of the marsh yet allow stop logs to be inserted in case of an emergency. The flap gate also needs to be replaced or modified to improve fish passage and allow the marsh to fluctuate naturally with the level of Lake Huron, yet still provide flood protection to private property within the marsh. Finally, the marsh's outlet to Lake Huron needs to be monitored to determine if there is adequate depth and flow to prevent fish stranding most of the

time. Periodic dredging is probably necessary to assure fish access.

If the above steps are taken, water levels will be naturally maintained and fish access will be assured. This should result in a better fish population in the marsh proper, and the marsh will become a better spawning and nursery area for Saginaw Bay.

For the fishery improvements to occur, legitimate concerns by private property owners about flood control must be addressed. Owners believe that protection is needed during emergency situations. Issues about the maintenance and operation of the flap gate need to be resolved. Past operation has been haphazard, with the gate being shut for long periods. A plan for managing the marsh needs to be developed cooperatively by all concerned partiesFisheries Division, Wildlife Division, Bay City State Recreation Area, Kawkawlin and Bangor townships, and property owners.

## References

Resource Management Group. 1995. Tobico Marsh Hydrologic Study. Prepared for Bay County, Michigan, by the Resource Management Group, Inc., Big Rapids, Escanaba and Grand Haven, Michigan.

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**Table 1**. Number, weight, and length indices of fish collected from Tobico Marsch with fyke and trap nets, May 20-23, 1996.

| Species | Number | Percent by number | Weight (pounds) | Percent by weight | Length range inches[1] | Average length (inches) | Percent legal size[2] |
|---|---|---|---|---|---|---|---|
| Brown bullhead | 1,202 | 62.6 | 737.4 | 33.1 | 3-12 | 8.7 | 71 |
| Black crappie | 243 | 12.7 | 97.8 | 4.4 | 4-12 | 8.9 | 72 |
| Common carp | 231 | 12.1 | 808.5 | 36.2 | 12-24 | 17.5 | 100 |
| Northern pike | 185 | 9.6 | 468.7 | 21.0 | 17-34 | 22.1 | 58 |
| Bowfin | 30 | 1.6 | 112.6 | 5.0 | 12-28 | 22.8 | 100 |
| Yellow perch | 15 | 0.8 | 2.4 | 0.1 | 4-9 | 7.1 | 50 |
| Pumpkinseed | 11 | 0.6 | 1.2 | 0.1 | 3-6 | 4.6 | 25 |
| Largemouth bass | 1 | 0.1 | 1.5 | 0.1 | -- | 14.5 | 100 |
| Sunfish sp. | 1 | 0.1 | 0.1 | 0.0 | -- | 5.5 | 0 |
| Total | 1,849 | 100.0 | 2,230.2 | 100.0 | | | |

[1]Note some fish may be measured to 0.1 inch, others to inch group: e.g., "5" = 5.0 to 5.9 inches; "12" = 12.0 to 12.9 inches; etc.

[2]Percent legal size or acceptable size for angling.

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**Table 2.**-Number, weight, and length indices of fish collected from Tobico Marsh with three fyke

net (3/8-inch bar mesh), May 20-23, 1996.

| Species | Number | Percent by number | Weight (pounds) | Percent by weight | Length range inches[1] | Average length (inches) | Percent legal size[2] |
|---|---|---|---|---|---|---|---|
| Brown bullhead | 1,102 | 78.5 | 593.0 | 67.0 | 3-12 | 8.7 | 71 |
| Black crappie | 203 | 14.5 | 70.9 | 8.0 | 4-12 | 8.6 | 67 |
| Common carp | 28 | 2.0 | 76.7 | 8.7 | 12-20 | 16.7 | 100 |
| Bowfin | 26 | 1.9 | 92.7 | 10.5 | 12-27 | 22.6 | 100 |
| Northern pike | 18 | 1.3 | 46.8 | 5.3 | 19-29 | 23.3 | 44 |
| Yellow perch | 15 | 1.1 | 2.4 | 0.3 | 4-9 | 7.1 | 50 |
| Pumpkinseed | 9 | 0.6 | 1.0 | 0.1 | 3-6 | 4.6 | 25 |
| Largemouth bass | 1 | 0.1 | 1.5 | 0.2 | -- | 14.5 | 100 |
| Sunfish sp. | 1 | 0.1 | 0.1 | 0.0 | -- | 5.5 | 100 |
| Total | 1,403 | 100.0 | 885.1 | 100.0 | -- | -- | -- |

[1]Note some fish may be measured to 0.1 inch, others to inch group: e.g., "5" = 5.0 to 5.9 inches; "12" = 12.0 to 12.9 inches; etc.

[2]Percent legal size or acceptable size for angling.

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**Table 3.**-Number, weight, and length indices of fish collected from Tobico Marsh with two trap nets (3/4-inch bar mesh), May 20-23, 1996.

| Species | Number | Percent by number | Weight (pounds) | Percent by weight | Length range inches[1] | Average length (inches) | Percent legal size[2] |
|---|---|---|---|---|---|---|---|
| Common carp | 203 | 39.4 | 731.8 | 54.4 | 12-24 | 17.6 | 100 |
| Northern pike | 167 | 32.4 | 421.9 | 31.4 | 17-34 | 22.0 | 59 |
| Black crappie | 40 | 7.8 | 26.9 | 2.0 | 7-12 | 10.4 | 100 |
| Brown bullhead | 100 | 19.4 | 144.0 | 10.7 | -- | -- | -- |
| Bowfin | 4 | 0.8 | 19.9 | 1.5 | 20-28 | 23.8 | 100 |
| Pumpkinseed | 2 | 0.4 | 0.2 | 0.01 | 4-5 | 5.0 | 0 |
| Total | 516 | 100.0 | 1,217.7 | 100.0 | -- | -- | -- |

[1]Note some fish may be measured to 0.1 inch, others to inch group: e.g., "5" = 5.0 to 5.9 inches; "12" = 12.0 to 12.9 inches; etc.

[2]Percent legal size or acceptable size for angling.

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**Table 4**.-Estimated age frequency (percent) of black crappie and northern pike in Tobico Marsh with fyke and trap nets, May 20-23, 1996.

| | Age | | | | | | | | | | Number |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Species | I | II | III | IV | V | VI | VII | VIII | IX | X | aged |
| Black Crappie | 1 | 19 | 16 | 18 | 10 | 19 | 13 | 4 | 1 | -- | 80 |
| Northern pike | -- | 24 | 30 | 15 | 9 | 15 | 2 | 1 | 1 | 2 | 92 |

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**Table 5**.-Average total length (inches) at age, and growth relative to the state average, for black crappie and northern pike in Tobico Marsh, May 20-23, 1996. Number of fish aged is in parentheses.

| | Age | | | | | | | | | | Mean growth |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Species | I | II | III | IV | V | VI | VII | VIII | IX | X | index[a] |
| Black crappie | 5.5 (1) | 5.5 (15) | 7.7 (13) | 8.6 (14) | 9.7 (8) | 11.3 (15) | 11.8 (10) | 11.2 (3) | 12.2 (1) | -- | 0.4 |
| Northern pike | -- | 19.3 (22) | 21.0 (28) | 23.9 (14) | 25.8 (8) | 26.8 (14) | 27.4 (2) | 29.2 (1) | 29.1 (1) | 31.1 (2) | 0.4 |

[a]Mean growth index is the average deviation from the state average length at age.

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**Questions, comments and suggestions are always welcome! Send them to**
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