

Mott Lake

Genesee County, T8N, R7E, Sections 10, 11, 12, 15, 16, 21
Flint River Watershed

Joseph M. Leonardi

Environment

Mott Lake is a 684 acre impoundment of the Flint River located in northeast Genesee County. It is one mile northeast of the City of Flint and is approximately 7 miles downstream of Holloway Reservoir (Figure 1). The impoundment is approximately 3.5 miles in length with the upper boundary generally accepted at the Vassar Road ending. Mott Lake was created in 1972 with the construction of C.S. Mott Dam and was intended to provide recreational opportunities for the area.

General soil types along this section of the Flint River are categorized as Boyer-Spinks-Cresco-Cohoctah association (Holcomb 1972). Boyer-Spinks-Cresco-Cohoctah association is described as level to gently sloping well-drained loamy sands that have a dominantly sand to sandy loam subsoil on outwash plains and level, somewhat poorly drained, fine sandy loams underlain by fine sandy loams to sand on bottom lands. This association includes the most coarse-textured soils in Genesee County and is conducive to groundwater inflow. The Darcy Groundwater Model indicates groundwater inflow to Mott Lake is moderate and above the Lower Michigan mean (P. Seelbach, Michigan Department of Natural Resources, Fisheries Division, personal communication).

The Genesee County Parks and Recreation Commission owns C.S. Mott Dam and is responsible for its operation and maintenance. C.S. Mott Dam is a gravity fed earthen and concrete structure which spans 1,772 feet and has a designed discharge of 11,000 cubic feet per second. The dam has a hydraulic head potential of 16.1 ft. but normal head is maintained at 13 feet. Water level is maintained at a fixed crest (720 ft. above mean sea level) with top water spill. Spill is directed to the concrete portion of the dam which has been modified as a series of steps known as Stepping Stone Falls. Although Stepping Stone Falls provides a physical attraction to Mott Lake, the falls do not allow upstream passage of fish.

Much of the original land inundated by C.S. Mott Dam was farmland and mixed forest. Numerous trees were cleared and the landscape re-shaped to fit the topography and form the existing impoundment boundaries. The catchment basin is estimated to be 612 square miles and includes drainages from the Flint River, Butternut Creek, Bear Swamp Ditch, and Clark, Kurtz, Carpenter, Parker-Scothan, Hillier, Cornwell, and Powers-Cullen drains.

Development of the Mott Lake shoreline is considered light. In 2008, eight dwellings were counted in 11.6 miles of shoreline. Genesee County Parks and Recreation Commission (GCPRC) is the majority landowner and administers their property for lightly developed recreational purposes. On the north shore, the GCPRC operates Bluebell Beach and Crossroads Village. Crossroads Village is community attraction which provides visitors retrospective of the local history of the area. In addition to hosting the Huckleberry Railroad, Crossroads Village also ports a paddle boat known as the "Genesee Belle" which gives weekly tours of Mott Lake during the summer months. The historic Mott Farm is also located within Crossroads Village but most of its livestock have been re-located away from the shore edge. On the south shore, the GCPRC operates Stepping Stone Falls near the dam and the Bluegill

Boat Launch between Coldwater and Genesee roads. Bluegill Boat Launch is a paved and barrier-free facility capable of launching moderated sized boats with parking for approximately 75 vehicles and trailers. However, no-wake boating rules are in effect for Mott Lake. Genesee Road dissects the impoundment in half but allows for navigation of most vessels under the bridge. Headquarters for the GCPRC are located on the south shore adjacent to the Genesee Road Bridge. Several shore fishing sites are located along the lake perimeter including developed sites at Branch Road and Genesee Road.

Mott Lake, although fairly regular and elongated in shape, can be divided into upper and lower basins at the Genesee Road crossing. For both basins, most of the immediate shoreline is preserved in a semi-natural state. No-wake boating restrictions have effectively reduced shore erosion. The shoreline of the lower basin is characterized as having gently sloped sand banks which are well vegetated with grasses, forbs, and deciduous trees. The upper basin takes on marshy characteristics often associated with impoundment tail waters. Several meanders and small islands occur in the upper basin and emergent vegetation is common.

In general, Mott Lake is a medium size, shallow, warmwater impoundment that is classified as eutrophic in nature. Average water depth is approximately 8 ft. and an estimated 95% of the total surface acreage is considered littoral (< 15 ft.). Bottom contours are gradual with greatest water depths of 12-18 ft. following the historic river channel. As with many impoundments in southern Michigan, eutrophication is accelerated from nutrient and sediment loading. Generally, most nutrients and sediments are transported into Mott Lake via inlets draining the upper Flint River watershed. As a result, Mott Lake is often turbid from algae growth or from sediments. Sediment turbidity is particularly high in spring and fall and following heavy precipitation. Limnological parameters were measured in September, 2008 and included temperature, oxygen, and pH (Table 1). Thermal stratification did not occur in the water column with temperature holding constant at 71°F. Oxygen concentrations were excellent with values above 7 ppm while pH values ranged from 8.0 at the surface to 7.3 at the bottom. These limnological values are typical of other waters in the region and are sufficient to support most life forms.

Detailed chemical analysis of Mott Lake was conducted by the United States Geological Survey (USGS) in May and August of 2008 (Table 2). Measurements of secchi disk, chlorophyll a, and total phosphorus allow for calculating trophic status using the Carlson Trophic State Index (TSI) (Carlson 1977). The TSI scale ranges from 0 to 100 with lowest values reflecting oligotrophic conditions and highest values reflecting hypereutrophic conditions. Using data provided from USGS in 2008, the TSI value for Mott Lake was 60 indicating a mildly eutrophic state. Other parameters measured in 2003 fall within expected values for impounded waters in this region of the State.

Overall, general water quality of Mott Lake is fair and meets Michigan Department of Environmental Quality (MDEQ) standards for human body contact. Occasionally, bacterial counts of *Escherichia coli* spike following heavy precipitation resulting in temporary closures of the Bluebell Beach for health concerns.

In 1996, the MDEQ Fish Contaminant Monitoring Program analyzed the edible portions of carp and walleye from Mott Lake. Results did not warrant consumption restrictions beyond the Statewide recommendations for mercury. The Statewide mercury advisory recommends no one eat more than one meal a week of rock bass, yellow perch, or crappie over 9 inches and no one eat more than one

meal a week of any size largemouth bass, smallmouth bass, walleye, northern pike, or muskellunge. In addition, child bearing women and children under the age of 15 should restrict meals of the above mentioned species to once a month.

Aquatic vegetation serves primary ecosystem production by providing important habitat for zooplankton, macroinvertebrates, fish, and other aquatic species such as frogs and turtles. Algae blooms are a common occurrence throughout the summer in Mott Lake. Rooted aquatic vegetation is not abundant due to low sunlight penetration but can be found in isolated areas. cursory observations made by Michigan Department of Natural Resources (MDNR) Fisheries Division personnel in September, 2008 indicated isolated pockets of Eurasian milfoil (*Myriophyllum spicatum*), large leaf pondweed (*Potamogeton* sp.), and yellow water lily (*Nuphar lutea*). Emergent vegetation including cattail (*Typha latifolia*), arrowhead (*Sagittaria* sp.) and bulrush (*Scirpus americanus*) were common in the upper basin of the lake. In addition to aquatic vegetation, a limited amount of submerged wood structure in the form of downed trees and root wads provided additional fish habitat.

History

Mott Lake has an extensive history of fisheries management by MDNR. Historic management objectives sought to provide and maintain a diverse warmwater fish community with particular emphasis on bluegill, black crappie, channel catfish, largemouth and smallmouth bass, northern pike, tiger muskellunge, and walleye. The earliest MDNR, Fisheries Division assessment occurred in 1974 and bluegill, black crappie, black bullhead, northern pike, channel catfish, and walleye were identified as common species. Since no fish stocking had occurred prior to 1974, the existing fishery developed from migrations from upstream and through Mott Dam during the construction phase. A 1976 assessment found an over abundance of common carp and Mott Lake was included in a major chemical reclamation of fish in the upper Flint River drainage. An estimated 113 tons of carp were removed from Mott Lake. Post-reclamation fish stocking included the introduction of rainbow trout for an interim fishery as well as bluegill, channel catfish, largemouth bass, pumpkinseed sunfish, tiger muskellunge, and walleye (Table 3). Benefits from the 1976 fish reclamation were short lived as carp re-established themselves in high abundance within a few years. Management through fish stocking continued for channel catfish and largemouth bass until 1978; for tiger muskellunge until 1991; and for walleye until 1992 (Table 3). Tiger muskellunge stocking was discontinued due to poor survival. Bluegill, pumpkinseed sunfish, largemouth bass, channel catfish, and walleye stocking were discontinued when self-sustaining populations developed. No fish have been stocked into Mott Lake since 1992.

Fish community assessments have been conducted on Mott Lake in 1974, 1976, 1979, 1982, 1983, 1988, 1995, 2001, and 2008. Those assessments document the presence of 24 fish species (Table 4). Three species stocked by MDNR during this period are now extirpated. Rainbow trout were introduced to Mott Lake to provide an interim fishery after the 1976 reclamation and were not expected to survive long term. As mentioned previously, tiger muskellunge experienced poor survival leading to the cessation of stocking. A one time stocking of white bass occurred in 1981 but subsequent surveys failed to document survival.

Recent survey results suggest that there have been significant changes in the Mott Lake fish community (Table 5). An increase in channel catfish abundance and decrease in black crappie

abundance occurred between 1988 and 1995. Gizzard shad, first observed in Mott Lake in 1986, were in high abundance until 1995 but have since declined dramatically. Another population change not depicted in trap net catches but verified with seine sampling in 2008 showed a new presence round gobies. The exotic round goby was first documented in Holloway Reservoir in 1996 and appears to have migrated to Mott Lake and is now considered a colonized species. The exotic zebra mussel, detected in 1995, has also colonized in the lake. These subtle changes in the fish community mimic those observed in Holloway Reservoir (Leonardi 2009).

Walleye management in Mott Lake has been Fisheries Division's primary focus since the late 1970's. Management has typically paralleled actions implemented on Holloway Reservoir and to a large extent the two fisheries are similar. Holloway Reservoir has likely contributed to the Mott Lake walleye fishery through emigration during annual reservoir drawdowns. Assessments specifically targeting walleye reproduction in Mott Lake occurred in 1984 and 1993. A 1984 electro-fishing survey documented good survival of the 1983 and 1984 stockings and anglers were reporting good catches of harvestable fish. Significant natural reproduction was observed in 1993 (a non-stocking year) when 72 young of the year (yoy) walleye were captured in 3 one-quarter mile electro-fishing stations. Spawning walleye from Mott Lake are known to congregate at the face of Holloway Dam each spring. Fish community assessments in 1995 and 2001 also yielded good catches of both young and adult walleye and the fishery had gained notoriety with anglers as being one of the areas finest.

Bluegill, largemouth and smallmouth bass, and northern pike have also been integral components of the Mott Lake recreational fisheries. Past assessments show these species have sustained themselves in consistent abundance and they are targeted by selective anglers.

Current Status

In May, 2008, Fisheries Division conducted a fisheries assessment using trap nets, seine, and electro-fishing gear. Four inland trap nets were fished for 3 nights at 4 different locations. Five 25 ft. seine pulls were made at 5 different locations and three 10-minute electro-fishing stations were sampled after dark. Gill nets were not used due to a known presence of channel catfish which have a tendency to damage the gear. All fish were measured to the nearest inch group and scale or spine samples were collected on common sport fish for age and growth analysis.

A total of 2,293 fish representing 20 species were collected with combined efforts (Table 6). Channel catfish, round goby, bluegill, and walleye were the most abundant species comprising 87% of the total catch by number. Channel catfish and common carp accounted for 82% of the total biomass. Trap nets comprised 59% of the total catch by number while seine and electro-fishing efforts comprised 30% and 11%, respectively.

A total of 863 channel catfish averaging 16.8 inches comprised 38% of the total catch by number (Table 6). Trap nets accounted for 99% of the total catch with an average catch per lift equaling 86 fish. Channel catfish ranged from 10-29 inches with 99% of the fish meeting or exceeding the minimum harvest size of 12 inches. Age and growth data indicated channel catfish were growing significantly below State average having a mean growth index of -3.0 inches (Table 7). Recruitment into the harvestable fishery appeared to occur at age 5. Age distribution indicated the harvestable

fishery is comprised of multiple age groups with strongest representation of fish between the ages of 6 and 8 (Table 8).

A total of 684 round goby averaging 1.6 inches comprised 30% of the total catch by number (Table 6). Seining accounted for 99% of the total round goby catch. Round gobies were well dispersed in Mott Lake and were found in all 5 seine tows. Although age data was not collected, most round gobies were in the 1 inch group suggesting they were born in spring of 2008.

A total of 333 bluegill averaging 6.4 inches comprised 15% of the total catch by number (Table 6). Trap nets accounted for 80% of the total catch with an average catch per lift of 27 fish. Bluegill ranged from 1-9 inches with 71% of the fish meeting or exceeding the acceptable harvest size of 6 inches. Age and growth analysis indicated bluegill were growing above State average having a mean growth index of +1.1 inches (Table 7). Recruitment to the harvestable fishery appeared to occur at age 3. Age distribution indicated this fishery is dominated by three and four year old fish (Table 8). Bluegill longevity appeared to peak at age 6 and older fish are either harvested or die of natural causes.

A total of 104 walleye averaging 13.6 inches comprised 5% of the total catch by number (Table 6). Electro-fishing comprised 78% of the catch with a catch per hour of 159 fish. Average size of walleye collected with electro-fishing gear was 12.4 inches compared to 17.8 inches from trap net gear. Thirty-five percent of all walleye collected met or exceeded the minimum harvest size of 15 inches. Age and growth analysis indicated walleye are growing above State average having a mean growth index of +0.9 inches (Table 7). Walleye growth was particularly good for age 1 fish which averaged 9.2 inches compared to the State average of 7.1 inches. Subsequent growth appears to balance toward State average and recruitment to the harvestable fishery occurred at age 4. Age distribution indicated the walleye fishery is dominated by fish younger than 5 years (Table 8). The 2007 year class appeared relatively strong; the 2006 year class a bit weaker; followed by reasonably strong year classes in 2005, and 2004. Although longevity appeared to peak at age 6, older walleye were present in low abundance.

Although collected in low numbers, smallmouth and largemouth bass showed up as an important component of the sport fishery. A total of 48 smallmouth bass averaging 11.7 inches comprised 2% of the total catch by number (Table 6). Smallmouth bass ranged from 5-16 inches with 19% of the catch meeting or exceeding the legal harvest size of 14 inches. Age and growth analysis indicated smallmouth bass were growing above State average having a mean growth index of +1.1 inches (Table 7). A total of 31 largemouth bass averaging 12.7 inches comprised 2% of the total catch by number (Table 6). Largemouth bass ranged from 7-16 inches with 19% meeting or exceeding the legal harvest size of 14 inches. Age and growth analysis indicated largemouth bass were growing above State average having a mean growth index of +2.9 inches (Table 7). For both species of bass, recruitment into the harvestable fishery appeared to occur between the ages of 5 and 6. Both species exhibited an age distribution dominated by fish younger than 4 years (Table 8). Longevity of smallmouth and largemouth bass appeared to peak at age 5.

Other important sport fish collected in low abundance included pumpkinseed sunfish, yellow perch, black crappie, rock bass, and northern pike (Table 6). Eighteen pumpkinseed sunfish averaging 4.4 inches, 18 yellow perch averaging 5.3 inches, 15 black crappie averaging 10.0 inches, 11 rock bass averaging 6.9 inches, and 4 northern pike averaging 24.0 inches were collected. Although there were

insufficient numbers of these species for meaningful growth interpretation, the few specimens collected were growing above State average.

Although only 66 common carp averaging 23.2 inches were collected, their abundance is still considered high. Common carp are notoriously wary of trap net gear and abundance is difficult to estimate. Only four common carp were collected with electro-fishing but numerous specimens were observed. The roiling behavior of carp and bottom foraging characteristics undoubtedly contributes to high turbidity in the reservoir. Other non-sport fish species observed in low numbers included bowfin, golden and shorthead redhorse, common white sucker, and yellow bullhead. Forage minnows observed in low abundance included bluntnose minnows, brook silversides, and golden shiners.

Analysis and Discussion

The fish community of Mott Lake has gone through significant changes over the past twenty years. One of the primary changes has been a shift in forage fish composition and abundance. In 1995, gizzard shad were abundant and believed to be the primary forage for most predator fish. Netting efforts in 2001 and 2008 failed to capture any gizzard shad suggesting a dramatic decline in abundance. Leonardi (2009) found a similar occurrence in Holloway Reservoir but contends a smaller base population of adult gizzard shad exists and, due to their prolificacy, are able to annually produce substantial numbers of young. The decline in gizzard shad is believed to be associated with the high abundance of channel catfish and to a lesser degree walleye and other predatory species. Round gobies showed up as a new species in the 2008 assessment and are suspected to have emigrated downstream from Holloway Reservoir. During seining operations in 2008, fisheries personnel observed a particularly high abundance of young of the year round gobies. The primary forage base of Mott Lake now appears to be diversified between young of the year gizzard shad and round gobies. Brook silverside and bluntnose minnows are present in lower abundance but also provide forage benefit.

Another primary change in the Mott Lake fish community has been a significant increase in channel catfish. Channel catfish were first observed in high abundance in 1995 and they have remained in high abundance since. Numbers of channel catfish collected with trap nets in 1995, 2001, and 2008 were 435, 600, and 859, respectively. Catch per lift has steadily increased from 27 fish in 1995, 38 fish in 2001, to 86 fish in 2008. Average size of channel catfish from trap net catches was 14.8 inches in 1995, 21.2 inches in 2001, and 16.8 inches in 2008. Assessment data shows an inverse relationship in abundance between channel catfish and gizzard shad and black crappie. In the presence of high channel catfish abundance, both gizzard shad and black crappie populations appear suppressed.

A collapse of the black crappie fishery appears to have occurred between 1988 and 1995. To an unknown extent, black crappie decline may be attributed to the habitat restrictions of Mott Lake. Black crappie typically favor clear, warm water bodies and are almost always associated with abundant growths of aquatic vegetation (Becker 1983, Scott and Crossman 1973). Currently, this type of habitat is limited in Mott Lake which is often turbid and has relatively low abundance of aquatic vegetation. Data is not available describing conditions in the 1970's and 1980's but it is possible habitat was more favorable for black crappie when eutrophication was less progressed. However, the decline in black crappie abundance appears to correspond with the increase in channel catfish abundance. It is unlikely black crappie will ever achieve abundance levels experienced in the 1980's and early 1990's without a

drastic reduction of channel catfish abundance. Currently, due to their low abundance, black crappie provide only a limited recreational fishery.

Assessments targeting walleye in Mott Lake have not occurred with the same diligence as those performed on Holloway Reservoir but available data indicates similar trends in the fishery. In 1993, age and abundance data indicated natural reproduction was occurring at sufficient level to warrant discontinued stocking. Subsequent assessments in 1995 and 2001 indicated a respectable walleye fishery was present in Mott Lake. The 2008 assessment provides further support of a very good and self-sustaining fishery. Overall abundance appears slightly less than Holloway Reservoir but size structure and growth is slightly better. A strong 2007 year class should recruit to the harvestable fishery in 2-3 years. Mott Lake continues to produce one of Michigan's finest inland walleye fisheries. Anecdotal angler reports often indicate most harvested walleye are in the 15-19 inch range with an abundance of sub-legal fish.

Bluegill catches in Mott Lake have fluctuated in recent assessments. Bluegill have never been, nor are they considered now, to be large component of the fish community. Typically, bluegill favor clear water bodies with moderate levels of aquatic vegetation which is limited in Mott Lake. However, opportunities to catch harvestable fish exist for anglers willing to target them. The overall bluegill size structure observed in 2008 was good with 35% of the total catch being in the 7-8 inch range.

Smallmouth and largemouth bass have been a small but consistent component of the Mott Lake fish community. Data specifically targeting Mott Lake bass abundance is generally lacking in MDNR files. Bass are most effectively sampled at night with electro-fishing gear and only the 2001 and 2008 assessments provide insight into the fishery. In 2001 and 2008, smallmouth bass appear slightly more prevalent than largemouth bass. In the 2008 assessment, both species exhibited similar size structure, size range, and both exhibited good growth compared to State average. The overall size structure for both species appeared to be sufficiently represented by larger fish (> 14 inches). However, more detailed analysis is tenuous due to the relatively small sample size. MDNR, Fisheries Division is aware that Mott Lake is popular with bass anglers and several tournaments are held each year. On the last day of the 2008 net survey effort, a bass tournament was beginning. Fisheries Division personnel observed approximately 50 boats participating in the event.

Other important sport fish including northern pike, yellow perch, rock bass, and pumpkinseed sunfish were collected in low abundance in the 2008 assessment and do not allow for detailed analysis of their current status. For each of these species, the few specimens collected and aged all showed above State average growth. Low abundance of these species dictates that only a marginal recreational fishery exists.

Management Direction

Eutrophication is a primary driving force determining species diversity and abundance in Mott Lake and must be considered in management of the fishery. Current conditions favor species tolerant of habitat degradation associated with accelerated nutrient and sediment loading. High fertility, turbidity, and sedimentation are common characteristics for impoundments which function as traps within the river ecosystem. Improvements to slow the eutrophication process are long term and rely on implementation of Best Management Practices (MDNR 1992) throughout the upper watershed.

Habitat management is best served through riparian education and through MDNR, Fisheries Division review of MDEQ permit applications which request shoreline modification and other aquatic habitat alterations. Shoreline erosion, which is greatly exacerbated by the sandy soil and wave action, has been identified as a concern for the GCPRC. Corrective actions should implement strategies which consider accumulative ecosystem affect. The current no-wake boating restrictions on Mott Lake have protected the shoreline and should remain in place. O'Neal and Soulliere (2006) provide additional conservation guidelines which should be considered. Fisheries managers should continue to maintain a strong working relationship with the GCPRC to promote best management practices and conservation guidelines.

Current operating procedures for maintaining water levels in Mott Lake have been generally accepted by the public and appear to have minimal impact on the fish community. Maintaining a fixed crest water level is sufficient providing outflow is maintained at run of the river to protect the stream environment downstream of C.S. Mott Dam. Long term dam maintenance should be cognizant of potential impacts to the fish community.

Fisheries management of Mott Lake should continue to focus on walleye as the primary sport fish. The walleye fishery is extremely popular and receives considerable angler effort which contributes significantly to the local economy. Since the walleye population appears self-sustaining, no specific management actions are warranted.

An over abundant channel catfish population is a problem for Mott Lake. Data suggest channel catfish are suppressing gizzard shad and black crappie populations. Reduction or control of the population is problematic for fisheries managers. Channel catfish have few natural predators and conventional management practices involving chemical reclamation or manual removal are probably not economically justified, sociologically acceptable, or realistically attainable. Promoting recreational harvest has been attempted with newspaper articles but their value as food fare remains low in this area of the State. Currently, no management actions appear viable to manipulate their abundance artificially. Mott Lake could be considered as a donor lake for future channel catfish introductions into other waters.

Significant changes in the bass, bluegill, and black crappie fisheries are not expected in the presence of the large channel catfish population. These species will likely maintain their current abundance and size structure into the future and specific management actions are not justified. Future assessments should place more emphasis on data collection of largemouth and smallmouth bass. Collection of bass data could easily coincide with walleye indexing efforts and would provide much needed information on their status.

Carp appear in high abundance and biomass but do not seem to be as problematic as channel catfish. Common carp are omnivores consuming algae and small insects and rely less upon fish for dietary needs. Their biggest affect on Mott Lake appears to be the increased turbidity due to their roiling behavior. The previous attempt to reduce carp numbers by chemical reclamation met with little success and it appears little can be done to effectively control their numbers.

Fisheries Division personnel should continue to monitor the Mott Lake fish community with some regularity. Changes in the forage base may trigger responses from other fish species and understanding these changes will be valuable with future management. Although channel catfish appear to be responding to a suppressed gizzard shad population with declined growth, other sport fish have not shown the same reaction. The exact role round gobies will play as alternative forage remains unclear. Should funding become available, a creel census would provide additional insight into angler harvest and attitude and is highly recommended.

References

Becker, G. C. 1983. *Fishes of Wisconsin*. University of Wisconsin Press. Madison, Wisconsin.

Carlson, R.E. 1977. A trophic state index for lakes. *Limnology and Oceanography* 22:361-369.

Holcomb, S. 1972. *Soil survey, Genesee County, Michigan*. United States Department of Agriculture, Soil Conservation Service. Washington, D.C.

Leonardi, J.M. 2009. *Holloway Reservoir. Status of the Fishery Report (draft)*. Michigan Department of Natural Resources, Fisheries Division, Lansing, Michigan.

MDNR (Michigan Department of Natural Resources) 1992. *Guidebook of best management practices for Michigan watersheds*. Michigan Department of Natural Resources (now MDEQ), Surface Water Quality Division, Lansing, Michigan.

O'Neal, R.P., and G.J. Soulliere. 2006. *Conservation guidelines for Michigan lakes and associated natural resources*. Michigan Department of Natural Resources, Fisheries Special Report 38, Ann Arbor.

Scott, W.B. and E.J. Crossman. 1973. *Freshwater fishes of Canada*. Bulletin 184. Fisheries Research Board of Canada, Ottawa, Canada.

Figure 1. Location of Mott Lake, Genesee County.

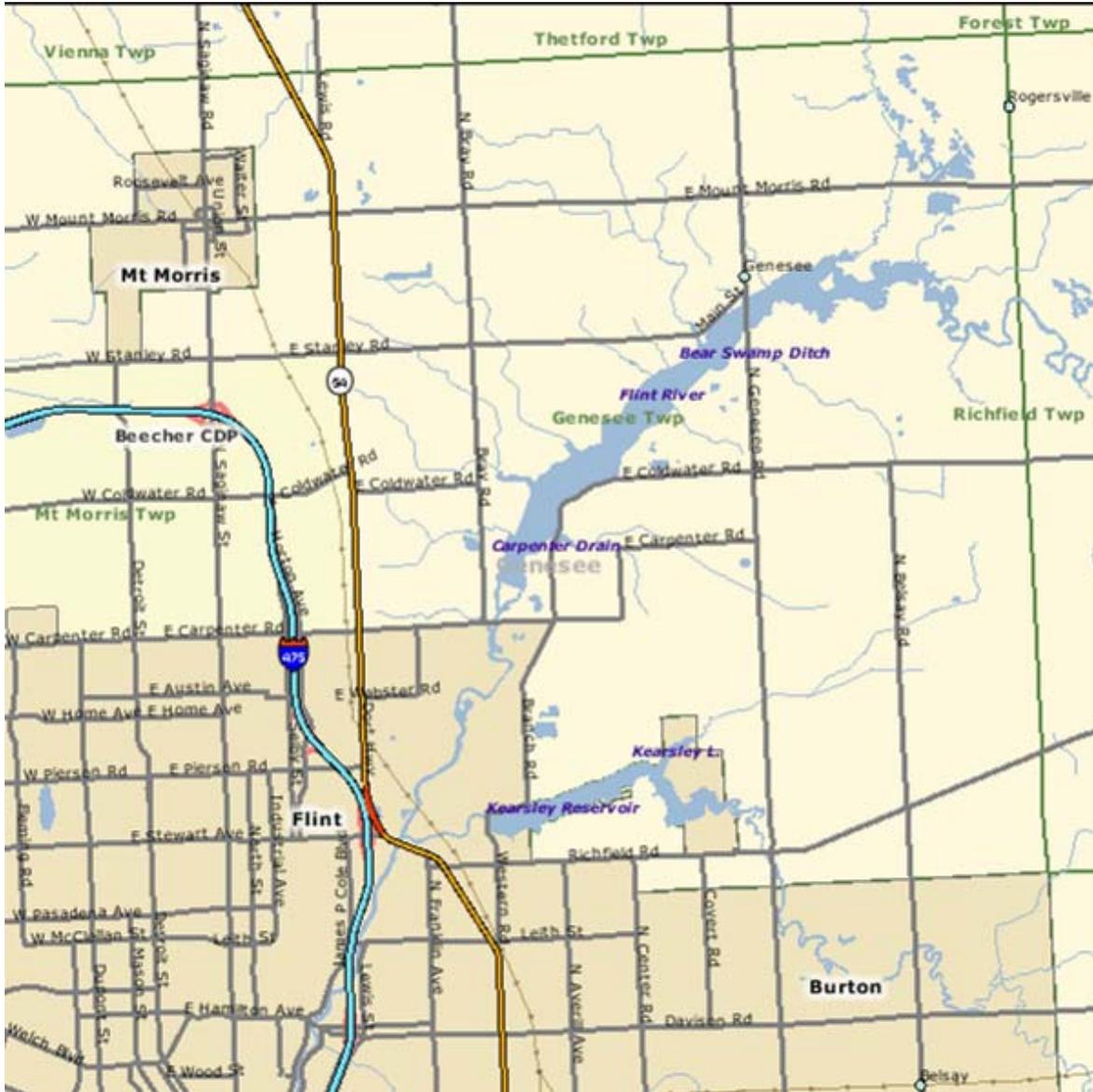


Table 1. Temperature, oxygen, and pH profile from Mott Lake, Genesee County. Data collected September 8, 2008 by MDNR, Fisheries Division.

| Depth (ft) | Temperature (F) | Oxygen (ppm) | pH |
|-----------------------|----------------------------|-------------------------|-----------|
| 0 | 71 | 10.8 | 8.01 |
| 1 | 71 | 10.5 | 7.99 |
| 2 | 71 | 10.3 | 7.96 |
| 3 | 71 | 10.3 | 7.93 |
| 4 | 71 | 10.2 | 7.90 |
| 5 | 71 | 10.2 | 7.88 |
| 6 | 71 | 10.1 | 7.86 |
| 7 | 71 | 10.0 | 7.85 |
| 8 | 71 | 10.0 | 7.84 |
| 9 | 71 | 9.9 | 7.84 |
| 10 | 71 | 9.9 | 7.83 |
| 11 | 71 | 9.9 | 7.82 |
| 12 | 71 | 9.2 | 7.53 |
| 13 | 71 | 7.1 | 7.30 |

Table 2. Water chemistry parameters from Mott Lake. Data collected by United States Geological Survey.

| Parameter | Surface | Mid-depth | Bottom | Sample date |
|-----------------------------|----------------|------------------|---------------|--------------------|
| Ammonia, total | | 0.038 mg/l | | 4/15/08 |
| Ammonia, total | | 0.008 mg/l | | 8/19/08 |
| Ammonia + organic N | | 0.78 mg/l | | 4/15/08 |
| Ammonia + organic N | | 1.1 mg/l | | 8/19/08 |
| Ammonia, as NH ₄ | | 0.05 mg/l | | 4/15/08 |
| Ammonia, as NH ₄ | | 0.01 mg/l | | 8/19/08 |
| Calcium, total | | 63.7 mg/l | | 4/15/08 |
| Chlorophyll a | | 11 ug/l | | 4/15/08 |
| Conductivity | 0.5620 mS/cm | 0.5610 mS/cm | 0.3890 mS/cm | 9/08/08 |
| Hardness, carbonate | | 240 mg/l | | 4/15/08 |
| Hardness, non-carbonate | | 68 mg/l | | 4/15/08 |
| Nitrogen, nitrate + nitrite | | 1.17 mg/l | | 4/15/08 |
| Nitrogen, nitrate + nitrite | | 0.0003 mg/l | | 8/19/08 |
| Nitrogen, total as nitrate | | 8.6 mg/l | | 4/15/08 |
| Nitrogen, total as nitrate | | 4.7 mg/l | | 8/19/08 |
| Nitrogen, total | | 1.9 mg/l | | 4/15/08 |
| Nitrogen, organic | | 0.74 mg/l | | 4/15/08 |
| pH | 8.7 | 8.7 | 8.7 | 4/15/08 |
| Phosphorus, total | | 0.057 mg/l | | 4/15/08 |
| Phosphorus, total | | 0.085 mg/l | | 8/19/08 |
| Secchi | 2.5 ft. | | | 9/08/08 |
| Sulfate | | 31 mg/l | | 4/15/08 |

Table 3. Fish stocking in Mott Lake, Genesee County, 1976 to present. Data from MDNR, Fisheries.

| Year | Species | Number | Size Range (inches) |
|-------------|---------------------------|---------------|----------------------------|
| 1976 | Bluegill | 108,796 | 1-2 |
| | Channel catfish | 21,406 | 1-2 |
| | Largemouth bass | 14,012 | 5-6 |
| | Largemouth bass | 51,900 | 2-3 |
| | Pumpkinseed sunfish | 15,816 | 1-2 |
| | Rainbow trout (steelhead) | 75,000 | 3-6 |
| | Rainbow trout (steelhead) | 75,000 | 2-3 |
| 1977 | Black crappie | 2,500 | 6 |
| | Bluegill | 150 | 5 |
| | Channel catfish | 30,000 | 3 |
| | Largemouth bass | 34,035 | 3 |
| | Pumpkinseed sunfish | 100 | 5 |
| | Tiger muskellunge | 3,888 | 6-7 |
| | Walleye | 1,225,000 | < 1 |
| | Yellow perch | 150 | 6 |
| 1978 | Channel catfish | 30,000 | 1-2 |
| | Largemouth bass | 21,033 | 2-3 |
| | Tiger muskellunge | 2,000 | 6-7 |
| 1979 | Tiger muskellunge | 2,000 | 5-6 |
| 1980 | Tigermuskellunge | 2,000 | 6-7 |
| 1981 | Tiger muskellunge | 1,500 | 6-7 |
| | White bass | 83 | 5-8 |
| 1982 | Tiger muskellunge | 1,500 | 6-7 |
| | Walleye (New York) | 1,500,000 | < 1 |
| 1983 | Tiger muskellunge | 1,300 | 7-8 |
| | Walleye (Muskegon) | 17,002 | 1-2 |
| 1984 | Walleye (Muskegon) | 19,085 | 2-3 |
| 1985 | Walleye | 1,800,000 | < 1 |
| | Tiger muskellunge | 910 | 10-11 |
| 1987 | Tiger muskellunge | 1,550 | 10-11 |
| 1990 | Walleye | 6,188 | 4-5 |
| 1991 | Tiger muskellunge | 2,600 | 9-10 |
| | Walleye (Muskegon) | 562 | 3-4 |
| 1992 | Walleye (Muskegon) | 26,000 | 1 |

Table 4. List of fishes in Mott Lake, Genesee County. Origin: N= native, I= introduced, C= colonized. Status: P= recent observations. E=extirpated. Data from: Michigan Department of Natural Resources, Fisheries Division records.

| Common name | Scientific name | Origin | Status |
|--------------------|---------------------------------------|---------------|---------------|
| Black crappie | <i>Pomoxis nigromaculatus</i> | N | P |
| Bluegill | <i>Lepomis macrochirus</i> | N | P |
| Bluntnose minnow | <i>Pimephales notatus</i> | N | P |
| Bowfin | <i>Amia calva</i> | N | P |
| Brook silverside | <i>Labidesthes sicculus</i> | N | P |
| Brown bullhead | <i>Ameiurus nebulosus</i> | N | P |
| Channel catfish | <i>Ictalurus punctatus</i> | N,I | P |
| Common carp | <i>Cyprinus carpio</i> | C | P |
| Golden redhorse | <i>Moxostoma erythrurum</i> | N | P |
| Gizzard shad | <i>Dorosoma cepedianum</i> | N,I | P |
| Golden shiner | <i>Notemigonus crysoleucas</i> | N | P |
| Green sunfish | <i>Lepomis cyanellus</i> | N | P |
| Largemouth bass | <i>Micropterus salmoides</i> | N | P |
| Northern pike | <i>Esox lucius</i> | N | P |
| Pumpkinseed | <i>Lepomis gibbosus</i> | N | P |
| Rainbow trout | <i>Oncorhynchus mykiss</i> | I | E |
| Rock bass | <i>Ambloplites rupestris</i> | N | P |
| Round goby | <i>Neogobius melanostomus</i> | C | P |
| Shorthead redhorse | <i>Moxostoma macrolepidotum</i> | N | P |
| Smallmouth bass | <i>Micropterus dolomieu</i> | N | P |
| Spotfin shiner | <i>Cyprinella spiloptera</i> | N | P |
| Tiger muskellunge | <i>Esox lucius x Esox masquinongy</i> | I | E |
| Walleye | <i>Sander vitreus</i> | N,I | P |
| White bass | <i>Morone Chrysops</i> | I | E |
| White sucker | <i>Catostomus commersoni</i> | N | P |
| Yellow bullhead | <i>Ameiurus natalis</i> | N | P |
| Yellow perch | <i>Perca flavescens</i> | N | P |

Table 5. Comparison of trap net catches (percent of catch) from five Mott Lake surveys, 1983 - 2008. Data from MDNR, Fisheries Division files.

| Species | 1983 | 1988 | 1995 | 2001 | 2008 |
|---------------------|-------------|-------------|-------------|-------------|-------------|
| Black crappie | 50 | 40 | 7 | 7 | 1 |
| Bluegill | 7 | 14 | 1 | 4 | 20 |
| Bowfin | <1 | <1 | | <1 | <1 |
| Bullhead sp. | <1 | <1 | 1 | 1 | <1 |
| Channel catfish | 1 | 3 | 68 | 61 | 64 |
| Common carp | 3 | 1 | 13 | 8 | 5 |
| Gizzard shad | | 35 | * | | |
| Golden shiner | 1 | <1 | | | |
| Green sunfish | | | | <1 | |
| Largemouth bass | 2 | <1 | | 1 | <1 |
| Northern pike | 4 | <1 | <1 | 1 | <1 |
| Pumpkinseed | <1 | <1 | | <1 | <1 |
| Redhorse sp. | | | | <1 | <1 |
| Rock bass | | <1 | <1 | <1 | <1 |
| Smallmouth bass | | | | 2 | 3 |
| Walleye | | <1 | 5 | 3 | 2 |
| White bass | <1 | | | | |
| White sucker | <1 | 3 | 2 | 10 | 5 |
| Yellow perch | 32 | 3 | 5 | | |
| Total fish captured | 897 | 3,400 | 644 | 978 | 2,293 |

* Gizzard shad not counted. Observed in abundance.

Table 6. Number, weight, and length range of fishes collected with trap net, seine, and electro-fishing gear from Mott Lake, Genesee County, May, 2008. Data from MDNR, Fisheries Division records.

| Common name | Number | Weight (lb) | Percent by number | Percent by weight | Length range (in) | Average size (in) | Percent legal size |
|--------------------|---------------|--------------------|--------------------------|--------------------------|--------------------------|--------------------------|---------------------------|
| Black crappie | 15 | 9.1 | <1 | <1 | 6-12 | 10.0 | 93 |
| Bluegill | 333 | 67.7 | <1 | 3 | 1-9 | 6.4 | 71 |
| Bluntnose minnow | 18 | 0.1 | <1 | <1 | 2 | 2.5 | |
| Bowfin | 1 | 4.6 | <1 | <1 | 23 | 23.5 | |
| Brook silverside | 4 | | <1 | <1 | 2-3 | 3.3 | |
| Channel catfish | 863 | 1468.1 | 38 | 64 | 10-29 | 16.8 | 99 |
| Common carp | 67 | 401.5 | 3 | 18 | 18-30 | 23.2 | |
| Golden redhorse | 2 | 2.9 | <1 | <1 | 12-18 | 15.5 | |
| Golden shiner | 2 | 0.1 | <1 | <1 | 1-6 | 5.0 | |
| Largemouth bass | 31 | 35.0 | 1 | 2 | 7-16 | 12.7 | 19 |
| Northern pike | 4 | 12.4 | <1 | <1 | 21-25 | 24.0 | 50 |
| Pumpkinseed | 18 | 1.7 | <1 | <1 | 2-6 | 4.4 | 22 |
| Rock bass | 11 | 2.8 | <1 | <1 | 4-8 | 6.9 | 9 |
| Round goby | 684 | 3.5 | 30 | <1 | 1-3 | 1.6 | |
| Shorthead redhorse | 1 | 1.8 | <1 | <1 | 16.5 | 16.5 | |
| Smallmouth bass | 48 | 45.9 | 2 | 2 | 5-16 | 11.7 | 19 |
| Walleye | 104 | 116.1 | 5 | 5 | 8-27 | 13.6 | 35 |
| White sucker | 66 | 108.6 | 3 | 5 | 7-17 | 16.0 | |
| Yellow bullhead | 3 | 1.5 | <1 | <1 | 7-11 | 9.8 | 100 |
| Yellow perch | 18 | 1.5 | <1 | <1 | 3-9 | 5.3 | 2 |
| Total | 2,293 | 2,284.9 | | | | | |

Table 7. Weighted mean length (in inches) at age, and growth relative to the State average for fish sampled from Mott Lake with trap nets and electro-fishing gear, May, 2008. Number of fish aged is in parentheses. Data from MDNR, Fisheries Division records.

| Species | Age/Length | | | | | | | | | | | | | Mean growth index ¹ |
|-----------------|-------------|-------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|-------------|-------------|-------------|--------------------------------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | |
| Black crappie | | 6.3 (1) | 9.0 (7) | 11.2 (1) | 11.1 (5) | 12.0 (2) | | | | | | | | +1.6 |
| Bluegill | 1.5 (1) | 4.6 (14) | 6.3 (21) | 7.0 (10) | 7.7 (7) | 8.4 (5) | | | | | | | | +1.1 |
| Channel catfish | | | | 12.7 (2) | 14.6 (11) | 15.2 (23) | 15.2 (31) | 17.4 (44) | 22.1 (34) | 24.3 (12) | 26.8 (5) | 26.3 (1) | 29.7 (1) | -3.0 |
| Largemouth bass | 7.7 (1) | 9.2 (3) | 12.3 (19) | 13.6 (4) | 15.3 (2) | | 16.4 (1) | | | | | | | +2.9 |
| Northern pike | | | 22.6 (2) | 25.2 (2) | | | | | | | | | | |
| Pumpkinseed | 2.5 (2) | 4.2 (6) | 5.9 (7) | | | | | | | | | | | +0.7 |
| Rock bass | | 4.3 (1) | 6.9 (11) | 8.0 (1) | 7.2 (1) | | | | | | | | | +1.8 |
| Smallmouth bass | 5.5 (4) | 9.0 (8) | 11.8 (27) | 13.4 (4) | 15.1 (7) | 16.9 (1) | 16.3 (1) | | | | | | | +1.1 |
| Walleye | 9.2 (21) | 9.6 (3) | 14.2 (14) | 15.2 (17) | 17.6 (12) | 21.0 (7) | 23.3 (2) | | 23.3 (2) | 23.2 (1) | 27 (1) | | | +0.9 |
| Yellow perch | 3.7 (8) | 5.9 (8) | 8.6 (1) | 9.2 (1) | | | | | | | | | | +0.6 |

¹ Mean growth index is the average deviation from the state average length at age.

* State average growth rate based on mid-year season average.

