Aquatic Ecosystem

Fish

Methods
George Merovich surveyed fish populations of Asylum Lake and Little Asylum Lake during the study period. Seven species of fish were found.

<table>
<thead>
<tr>
<th>Common name</th>
<th>Scientific name</th>
<th>Abundance, Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bluegill</td>
<td>Lepomis macrochirus</td>
<td>very common, littoral zone</td>
</tr>
<tr>
<td>Pumpkinseed</td>
<td>Lepomis gibbosus</td>
<td>very common, littoral zone</td>
</tr>
<tr>
<td>Largemouth Bass</td>
<td>Micropterus salmoides</td>
<td>abundant, juveniles, between lakes</td>
</tr>
<tr>
<td>Yellow Perch</td>
<td>Perca flavescens</td>
<td>abundant, juveniles, between lakes</td>
</tr>
<tr>
<td>Golden Shiner</td>
<td>Notemigonus crysoleucas</td>
<td>scarce (1)</td>
</tr>
<tr>
<td>Pike sp.</td>
<td>Esox sp.</td>
<td>scarce (1), juvenile, in weeds along shore</td>
</tr>
<tr>
<td>Yellow Bullhead</td>
<td>Ameiurus natalis</td>
<td>scarce (1), juvenile, in mud along shore</td>
</tr>
</tbody>
</table>

Results and Discussion
Fish Disease and Parasites
No evidence of fish disease or parasites was reported during the inventory period. However, further examination of game and non-game fish from the preserve would be useful in ruling out the presence of viral or other diseases in Asylum Lake and Little Asylum Lake populations.

Lake Eutrophication and Fish Kills
Eutrophication is a process that occurs naturally over time, but the process can be artificially accelerated through nutrient inputs from human activities. The growth of algae and aquatic plants in freshwater ecosystems is usually limited by the availability of the nutrient phosphorus. Phosphorus and nitrogen, another important nutrient, enter waterways from non-point sources, including run-off from septic fields, fertilized lawns and farm fields, livestock operations, atmospheric deposition and waterfowl populations. In some cases, phosphorus may also enter water systems from point sources such as effluents from sewage treatment or manufacturing plants. The result of these nutrient influxes is increased plant and algae growth (and eventual decomposition) and the subsequent depletion of lake oxygen levels. If this trend continues the lake eventually will be overrun by plant growth, water levels will drop, oxygen in the water will continue to decrease, fish populations will be extirpated and the lake will “die,” eventually turning into a wetland area and then possibly dry land.

Lakes with elevated plant growth and dangerously low oxygen levels are prone to periodic fish kills especially in the summer and winter months. These lakes often can be identified by the composition of their fish populations. Species of fish vary in their tolerance of low oxygen. Trout (undocumented in either lake) are highly sensitive; bass
and bluegill have intermediate sensitivity; and pike, yellow perch and pumpkinseed are relatively tolerant. Bullheads and certain minnows are considered very tolerant. In lakes with lower oxygen levels, tolerant species predominate, sensitive species are rare, and prey greatly out number predators. The species most prone to summer kills are pike, perch, suckers, bass and bluegill living in shallow, productive lakes or bays with excessive amounts of algae or rooted aquatic vegetation.

The presence of a pike species and the occurrence of the relatively tolerant species yellow perch (documented as abundant) and pumpkinseed (documented as very common) suggest that Asylum Lake and Little Asylum Lake have reasonably high oxygen levels and may have a relatively low risk of fish kills. However, the absence of the most sensitive species may indicate that Asylum Lake and Little Asylum Lake are at some risk, whether due to lower than optimal oxygen levels, lake eutrophication or another factor.

Oxygen levels, vegetative cover, prey abundance and even the levels of some pollutants may be deduced by monitoring fish species. Future surveys of the property should include a thorough examination of the fish species present, including onshore surveys, seining, dip-netting and angling. The species found during these and future inventories will provide insight to the health and productivity of the lakes themselves.

As a preventive measure, the risk of water quality problems can be reduced by identifying and controlling artificial input of nutrients as much as possible. This would in turn reduce aquatic plant productivity, lower decomposition rates and prevent oxygen depletion to critical levels. Further discussions of lake contaminants and pollutions can be found in the wetland and lake discussion sections.

Wetlands

Methods
Much of the documentation, mapping and characterization of the tributaries, inlets, wetlands and lakes in and around the Asylum Lake Preserve comes from Soil and Materials Engineers, Inc.’s 1992 Environmental Site Assessment for Western Michigan University and the water quality evaluation of Willow Lake and adjoining waters by Kieser and Associates in 2000 for the Parkview Hills Community Association.
Results and Discussion
According to a 1991 United States Fish and Wildlife Service Wetland Status and Trends report, over 50% of Michigan’s original wetlands have been drained or filled, thereby making the protection of remaining wetlands that much more important.

Michigan's wetland statute, Part 303, Wetlands Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended, defines a wetland as "land characterized by the presence of water at a frequency and duration sufficient to support, and that under normal circumstances does support, wetland vegetation or aquatic life, and is commonly referred to as a bog, swamp, or marsh." Surface water does not need to be present on a wetland year-round in order define an area as a wetland.

Wetlands serve a number of important purposes including flood and storm water control due to their absorption abilities. They provide wildlife, including amphibians, reptiles, waterfowl and some rare, threatened, or endangered wildlife species, with cover and breeding, nesting, and feeding habitat. Wetlands are recharge areas for groundwater supplies, treat pollution by serving as biological and chemical oxidation basins, control erosion by serving as sedimentation and filtering basins and absorb silt and organic matter. They act as sources of nutrients in aquatic food cycles and serve as nursery grounds and sanctuaries for fish.

On the Asylum Lake property, there are large areas of emergent and forested wetlands along the shores of the lakes. The emergent wetlands on the preserve are dominated by cattails (Typha sp.), sedges (family Cyperaceae) and bulrushes (Scirpus sp.), while the forested wetlands are dominated by poplars (Populus sp.), willows (Salix sp.) and boxelders (Acer negundo), all often present in wetland conditions.

The wetlands at Asylum Lake separate the open water of the lakes from the slopes and upland areas and in many cases provide the final line of protection and filtration of pollutants in storm water run-off moving toward Asylum Lake and Little Asylum Lake. Future construction on or near Parkview Avenue and development of areas adjacent to
any part of the preserve could potentially disrupt surface and sub-surface water flow, affecting the wetlands surrounding the lakes first. Wetland plant and animal populations should be monitored. Monitoring wells, both at the developing sites and within the bounds of the preserve, could be used for continuing observation of these changes.

Asylum Lake and Little Asylum Lake

Results and Discussion
For many preserve users, concerned citizens and land managers, the lakes of the Asylum Lake property are the focal point of the entire conservation effort. Therefore, citizens and managers have voiced their opinions and concerns in many venues including Haven, A treatise on Asylum Lake, which presents a partial summary of the many scientific studies conducted on the Asylum Lake Preserve, as well as personal reflections and concerns on the future of the preserve.

The lakes are indeed a significant, sensitive and visible symbol of the health, solitude and wildness valued by many at the preserve. Unfortunately appearances can be deceiving, and the presence of water pollutants or unhealthy floral and faunal populations are not always evident to park users. Continued research, detailed inventories and monitoring will be necessary to ensure the health and prolonged enjoyment of this fragile lake system.

![Asylum Lake](image1)

![Asylum Lake Drainage](image2)

![Mixed flock of ducks wintering on Asylum Lake](image3)

Lake Morphometry
Asylum Lake has a maximum depth of 15.8 meters (52 feet), mean depth of 7.2 meters (23.5 feet), maximum length of 930 meters (3,050 feet), maximum width of 290 meters (950 feet), mean width of 214 meters (702 feet), surface area of 19.9 hectares (49 acres) and volume of 1.4 million cubic meters (1,157 acre feet) (Engemann, 1977).

Lake Disturbance

The Asylum Lake Preserve has had a long history of disturbances, both natural and human-caused. These disturbances include development, agriculture, pesticide use and pollutant and sewage influxes, some fully documented, some not. Surveys and investigations completed in the last decade reflect the possibility of past and continued entry of contaminants into the system.

The 1992 Environmental Site Assessment conducted by Soils and Materials Engineers, Inc., found “several areas of potential and confirmed environmental concern.” These concerns included elevated levels of lead barium, copper and zinc in near-surface samples collected from the perimeter of the former power plant area in Parcel A.

Engemann, in a winter lake study conducted in 1977, discovered stratified concentrations of calcium chloride in the lake, indicating a recent influx of salts. This influx caused an abnormal “uniform temperature gradient within the lake due to the effects of both temperature and dissolved salts on density.” A comparison of the effects of salt levels on similar lakes in the state demonstrates that, at high levels, the natural phenomenon of lake mixing, also known as fall turnover, can be impeded. At the time of the survey, Asylum Lake’s salt levels had not reached these levels, but significant changes have occurred within the watershed over the last 25 years.

Also documented at the time of the Engemann survey was the flushing time of the lake, estimated at about one year, at three cubic meters per minute. However, it was also noted that up to 2/3 of the lake would not be flushed while water was trapped in the identified thermocline and hypolimnion. This discovery may be important in predicting the fate of contaminants entering the lake over time.

Studies on nearby Willow Lake, prepared by Kieser and Associates, included analysis of Asylum and Little Asylum lakes and concluded that the lakes are acting as sinks for TSS (total suspended solids) and TP (total phosphorus). The study supports the idea that the pollutants entering the headwater lake system tend to stay within these lakes; i.e., high concentrations are entering Asylum Lake from the roads, while lower concentrations are observed leaving Little Asylum Lake and entering Cherry Creek.

Like many wetlands and water systems, Asylum Lake receives much of its water from precipitation falling on the areas immediately adjacent to it. The lakes and wetlands
now surrounded by commercial and residential development have suffered a long history of documented and undocumented contamination. Soils naturally remEDIATE rainwater as it infiltrates the ground and reacts with minerals that neutralize and buffer it before it reaches the lake. Concrete and paved surfaces increase runoff and introduce contaminants present in rainwater and other pollutants present on roadways and parking areas into the lake.

In addition, run-off from residential and commercial areas eventually makes its way toward the Asylum Lake Preserve directly through storm sewers, surface flows, or by percolating slowly through the soil. Analysis of natural water ridges, major and minor drainage flows and stormwater run-off gives some idea of expected water direction pending further development of the lands surrounding Asylum Lake and Little Asylum Lake.

Future developments, paved areas and buildings will increase the amount of runoff and erosion, altering the hydrology of the area. Land modifications invariably will affect the lake; any changes proposed by development will require considerable evaluation and monitoring. Programs should be agreed upon by Parkview Hills residents and other concerned citizens and stewards of the Asylum Lake Preserve.

Algae growth on Asylum Lake