Otsego Lake Water Quality Data

September 17, 2009

OTSEGO COUNTY CONSERVATION ASSOCIATION

SEPTEMBER 17, 2009

Data were collected using a Eureka Manta Multi-probe.

Depth m	Depth ft	Temp °C	Temp °F	Dissolved Oxygen mg/L
0	0	19.58	67.2	9.05
2	6.5	19.58	67.2	9.03
4	13.1	19.57	67.2	8.99
6	19.7	19.57	67.2	8.96
8	26.2	19.53	67.2	8.9
10	32.8	16.3	61.3	7.13
12	39.4	11.42	52.6	6.3
14	45.9	9.32	48.8	6.04
16	52.5	8.11	46.6	6.34
18	59	7.63	45.7	6.07
20	65.6	7.28	45.1	6.5
25	82	6.76	44.2	6.9
30	98.4	6.28	43.3	7.15
35	114.8	5.93	42.7	6.75
40	131.2	5.53	42.0	4.72
42	137.8	5.48	41.9	3.27
44	144.4	5.4	41.7	3
46	150.9	5.35	41.6	2.08
48	157.5	5.32	41.6	1.34

Epilimnion

- "upper" or "outer" layer
-Warm water
-Oxygen is continually replenished via atmosphere & produced via photosynthesis in daylight hours

Thermocline

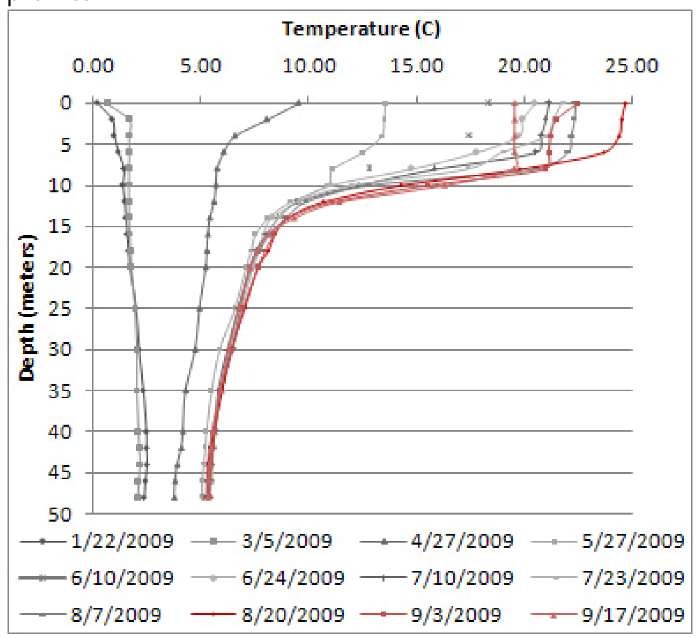
This zone of rapid temperature change serves as the boundary between warm surface waters and the dense, cold water of the hypolimnion.

Hypolimnion

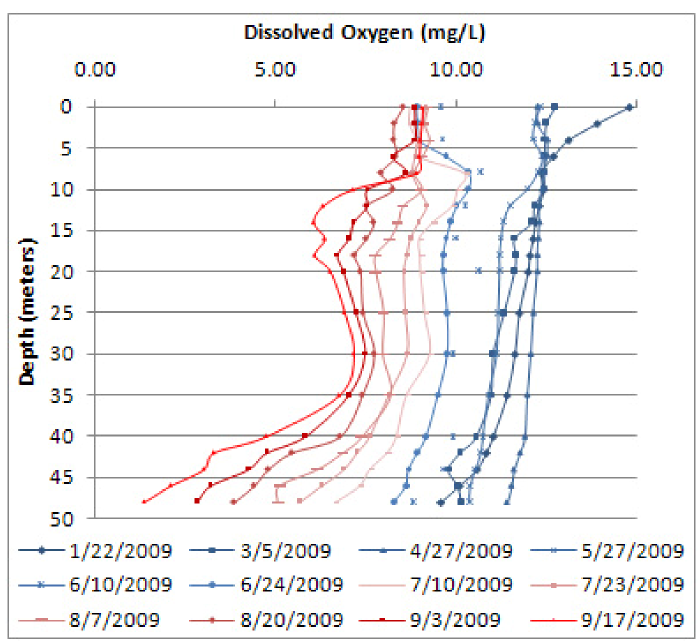
- "below" lake layer
- Cold water
- Oxygen cannot be replenished while stratification is in place

TEMPERATURE & DISSOLVED OXYGEN PROFILES

Temperature profiles over the course of the year show transitions between seasonal thermal stratification regimes. Layers develop through the spring and summer as the surface waters are warmed and mixed by sun and wind, while the water below remains cold and therefore is more dense. These layers provide different habitat conditions in the open water (off-shore) areas of the lake. As over-night air temperatures drop and daylight periods decrease, the surface waters begin to cool, as seen in the 9/3 and 9/17 profiles.



Dissolved oxygen: the concentration of oxygen dissolved in water. Colder water can dissolve a greater amount of oxygen than warm water.



Dissolved oxygen concentrations also follow a predictable progression throughout the year. During spring and fall turnover, when temperatures are constant from the surface to bottom, oxygen is distributed throughout the water column. Once thermal stratification is in place, oxygen in the bottom waters cannot be replenished via atmospheric interactions. In late summer and early fall, as temperatures begin to drop in the epilimnion, oxygen concentrations in this layer increase because water can "hold" more oxygen at colder temperatures.

As the growing season progresses, oxygen is consumed primarily by bacterial decomposition of dead algal cells and to a small degree by organisms living in the bottom waters. When algal production is excessive, usually due to high phosphorus levels , oxygen can fall to levels approaching those needed by sensitive, cold water fish such as lake trout and salmon.

The dissolved oxygen profile seen at this point in the growing season varies greatly from year to year, as differences in the timing and severity of algal blooms largely determine oxygen consumption in the hypolimnion. Dissolved oxygen concentrations below 40 meters have reached stressful levels for sensitive species.

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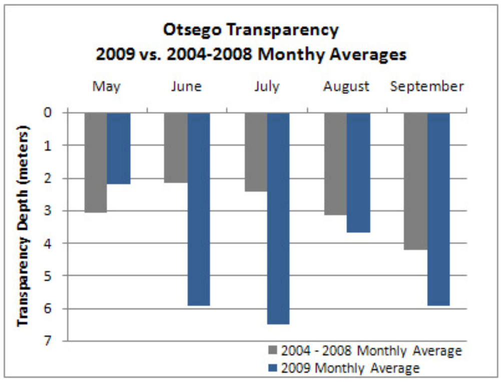
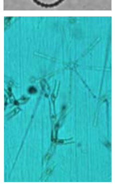
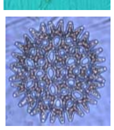
ALGAE, TRANSPARENCY & THE FOOD WEB

Algae are primary producers, serving as the base of the lake food web. The amount of algae in a system determines the amount of energy available to the ecosystem, and thus the amount living mass that it will produce. The algal population is routinely assessed with 2 common methods: *transparency*, which is an indirect assessment of algal density based on water clarity, and *chlorophyll a* concentration, which is a pigment common to all plants. Chlorophyll *a* concentration can be used to estimate the amount of algae in a volume of water.

2009 transparency readings have shown a marked increase compared to the monthly average over the past 5 years; this increase likely results from the establishment of zebra mussels, which are efficient filter-feeders of algae.







A more detailed assessment of the algal community is also under way. Samples were collected on a number of dates during June and July, the algal cells were identified, and the relative abundance of each taxonomic group was determined. This information is useful for interpreting nutrient impacts on population dynamics, energy and nutrient cycling dynamics, and the impacts of zebra mussel filtration on the algal community. Zebra mussels generally reject blue-green algae while feeding and as a result can cause large blue-green blooms, which can be highly toxic. A full report of this research will be available in the 2009 BFS Annual Report.

ZOOPLANKTON COMMUNITY & ALEWIFE

Zooplankton are near-microscopic crustaceans, rotifers, and mussel larvae that graze upon algae in the open waters of aquatic environments. Zooplankton are a vital source of food for juvenile fish and planktivores such as Cisco, Alewife, and Lake Whitefish.

The zooplankton community is the main link in the food web between photosynthetic producers and the consuming fish populations, and thus changes in the zooplankton community can have cascading impacts on the rest of the food chain. Alewife are an invasive exotic (not native) fish that efficiently feeds on large-bodied zooplankton. Following the establishment of alewife in Otsego, populations of large zooplankton decreased substantially. Monitoring this important group of organisms will allow us to gauge the success of efforts to manage the alewife population with walleye predation.

DETERMINING AVAILABLE FISH HABITAT

All cold-water organisms have both temperature and oxygen requirements; when considered together, they determine the available habitat, or volume of water, that is suitable for different species. For example, lake trout prefer temperatures up to 10°C (50° F) and may be stressed when dissolved oxygen is less than 6 mg/L. Current profiles for Otsego Lake show that oxygen levels in the cold bottom waters are in decline as oxygen is consumed by decomposition of dead algal cells. Compared to profiles collected early in the growing season, available habitat has decreased, as would be expected in a normal seasonal fluctuation. Oxygen levels will continue to decline until fall overturn, usually occurring in December. Blue shading indicates suitable habitat available to lake trout.

Though it may appear that lake management efforts target conditions specific to the lake trout population, ideal management programs consider the most sensitive organisms for end results and management goals.