State of Flathead Lake 2007

by Bonnie Ellis, Research Scientist

The Flathead Lake Biological Station (FLBS) has monitored water quality in Flathead Lake continuously since 1977. These studies have been the technical background for development of a Total Maximum Daily Load (TMDL) allocation for the purpose of managing nutrient loads reaching Flathead Lake.

Based on Station research, the Flathead Basin Commission (FBC) recommended the following interim targets for the protection of water quality in Flathead Lake:

1) Annual primary production (primary productivity) will not exceed 80 gC m^{-2} yr^{-1} (80 grams of carbon per square meter per year).
2) Annual average chlorophyll *a* concentration shall not exceed 1 µg/L (1 microgram per liter).
3) No declining trend in oxygen concentrations in the bottom waters of the Lake.
4) No measurable blooms of *Anabaena flos-aquae* (or other pollution algae).
5) No increase in the biomass of lakeshore periphyton.

The Station tracks primary productivity in Flathead Lake because it is a robust indicator of long-term changes taking place in water quality. Primary productivity measures Flathead Lake's ability to grow algae and increases in algal production reflect decreases in water quality.

During the 2006 water year reported in 2007, the Flathead Lake Biological Station was able to assess all of the five interim TMDL targets established for the protection of water quality in Flathead Lake:

1) Primary production at midlake deep exceeded the target value by 24%.
2) The mean chlorophyll *a* concentration in WY 2006 was slightly below the target value.
3) Oxygen in the hypolimnion declined below 90% saturation in 2006 and recent analysis of the long-term data (1978–2004) revealed a statistically significant trend of declining oxygen in the bottom waters of Flathead Lake.
4) A small, localized bloom of *Anabaena flos-aquae* was observed at the midlake deep site but has not yet been quantified.
5) Periphyton biomass was statistically significantly higher than that measured in 1987. Continued monitoring of periphyton biomass will be necessary in order to assess a trend in that target parameter.

Five nutrient variables recommended by the FBC TMDL Technical Committee as targets, total phosphorus, total nitrogen, nitrate + nitrite, ammonium and soluble reactive phosphorus were measured and all were at or slightly above the targets. Numerous studies have shown that both phosphorus and nitrogen stimulate growth of algae in Flathead Lake.

Nutrients are transported into the lake via tributaries, atmospheric dryfall and wetfall, groundwater seeps, point source discharges (sewage treatment plants) and nonpoint sources (old or poorly designed septic systems). Runoff reaching the lake from inadequately buffered land disturbances such as roads, agricultural activities, forest harvest, homes, driveways or other impervious surfaces also contributes nutrients. Under certain conditions, food web changes may also influence primary production by altering the density and dominant size of organisms cycling these nutrients within the lake.

It is very important to examine possible factors that cause *Anabaena* to flourish in Flathead Lake, to gain insight into conditions favoring the growth of this noxious species. Unfortunately, the continued shortfall in monitoring funds has not allowed us to extend our examination to those physical and food web factors driving algal blooms. Citizen contributions to endowing the Research and Monitoring Fund are gratefully accepted, please call 406-982-3301 for more information.

In conclusion, of the 189 largest freshwater lakes of the world, Flathead Lake is one of the cleanest, but there are several water quality concerns that warrant continued monitoring.