In the fall of 2014, the association board asked biologists from Progressive AE to review Lake Chemung water quality data that has been collected by association volunteers through the Cooperative Lake Monitoring Program (CLMP) since 1980, and to provide a write-up for the newsletter. Data that has been collected includes phosphorus from the lake surface, Secchi transparency, chlorophyll-*a*, temperature, and dissolved oxygen. Phosphorus is the nutrient that most often controls aquatic plant growth. A Secchi disk is used to estimate water clarity. Chlorophyll-*a* is measured in order to get a rough estimate of the quantity of algae present in lake water. A statistical summary of the Lake Chemung phosphorus, Secchi transparency and chlorophyll-*a* data is provided in Table 1 and is summarized in Figures 1 through 3.

TABLE 1
LAKE CHEMUNG SUMMARY STATISTICS

	Total Phosphorus (µg/L)[1]	Secchi Transparency (feet)	Chlorophyll-*a* (µg/L)[1]
Average	16	12	3
Standard deviation	6	3	2
Median	15	12	3
Minimum	9	6	1
Maximum	37	23	9
Number of samples	31	337	51
Data collected since (year)	1995	1980	2003

Lakes are commonly classified as oligotrophic, mesotrophic, or eutrophic (Figure 4). Oligotrophic lakes are generally deep and clear with little aquatic plant growth. These lakes maintain sufficient dissolved oxygen in the cool, deep bottom waters during late summer to support cold water fish such as trout and whitefish. By contrast, eutrophic lakes are generally shallow, turbid, and support abundant aquatic plant growth. In deep eutrophic lakes, the cool bottom waters usually contain little or no dissolved oxygen. Therefore, these lakes can only support warm water fish such as bass and pike. Lakes that fall between these two extremes are called mesotrophic lakes. A summary of lake classification criteria developed by the Michigan Department of Natural Resources is shown in Table 2.

TABLE 2
LAKE CLASSIFICATION CRITERIA

Lake Classification	Total Phosphorus (µg/L)[1]	Chlorophyll-*a* (µg/L)[1]	Secchi Transparency (feet)
Oligotrophic	Less than 10	Less than 2.2	Greater than 15.0
Mesotrophic	10 to 20	2.2 to 6.0	7.5 to 15.0
Eutrophic	Greater than 20	Greater than 6.0	Less than 7.5

Based on the CLMP data collected to date, Lake Chemung would be classified as mesotrophic. Surface phosphorus and chlorophyll-*a* concentrations, and Secchi transparency measurements are all moderate. In order to maintain Lake Chemung's good water quality, it will be important for lake residents to limit the amount of phosphorus that drains into the lake from the surrounding land area. Lake residents should be sure to abide by the state's phosphorus fertilizer ban which prohibits the application of lawn fertilizers containing phosphorus unless a new lawn is being established or if a soil test indicates a soil phosphorus deficiency.

1 µg/L = micrograms per liter = parts per billion.

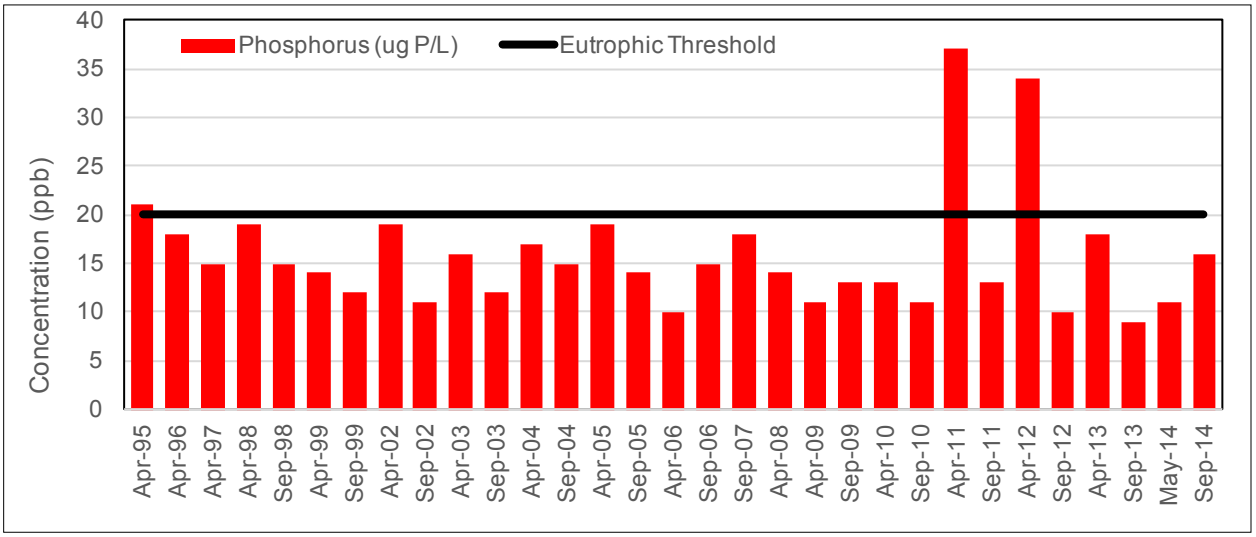

Figure 1. Surface total phosphorus concentrations, 1995 - 2014.

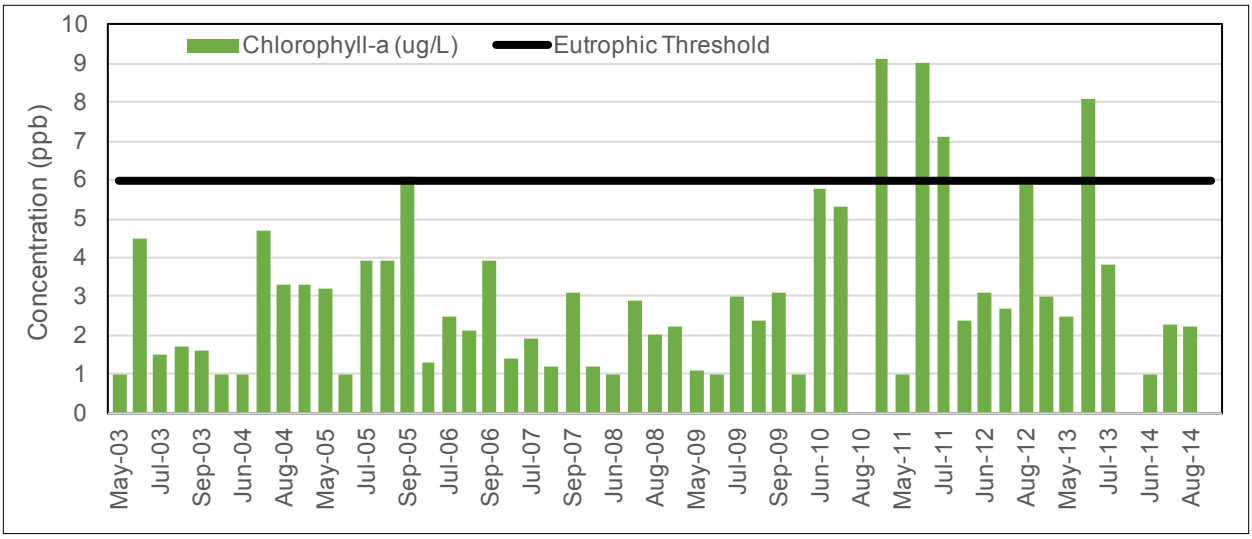

Figure 2. Chlorophyll-*a* concentrations, 2003 - 2014.

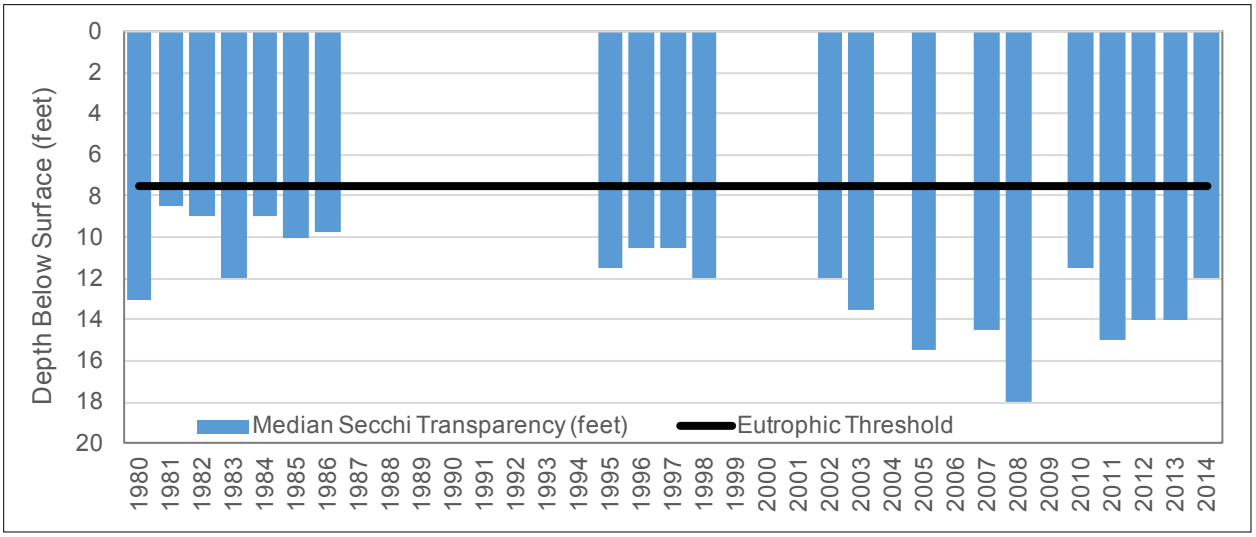

Figure 3. Median Secchi transparency measurements, 1980 - 2014.

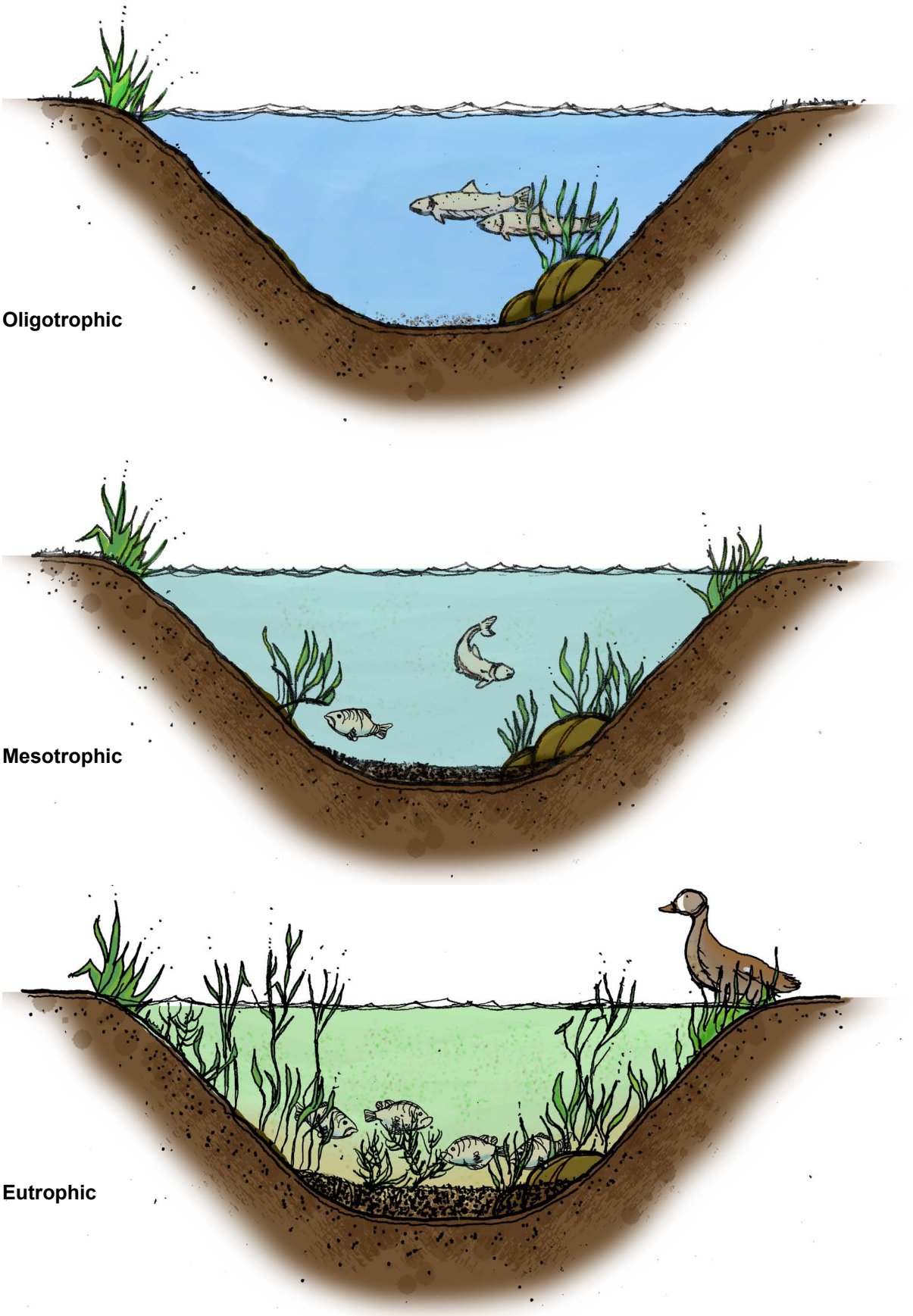

Figure 4. Lake classification. Lake Chemung is a mesotrophic.

In addition to phosphorus, chlorophyll-*a*, and Secchi transparency measurements, lake residents also collected temperature and dissolved oxygen data from the top to the bottom of the lake from 2002 through 2005. These measurements indicate Lake Chemung is well-mixed in spring with cool, well-oxygenated water throughout the lake. In summer, the lake forms a warm layer in the top 20 feet, called the epilimnion, and a cool layer beneath it, called the hypolimnion. The transition from warm layer to cool layer is called the thermocline. Above the thermocline, the lake is well-oxygenated; below the thermocline, oxygen becomes rapidly depleted (Figure 5). As such, Lake Chemung cannot support cold-water fish like trout. The cool deep bottom water does not have enough dissolved oxygen to sustain fish during the warm summer months. However, Lake Chemung supports a thriving warm-water fishery.

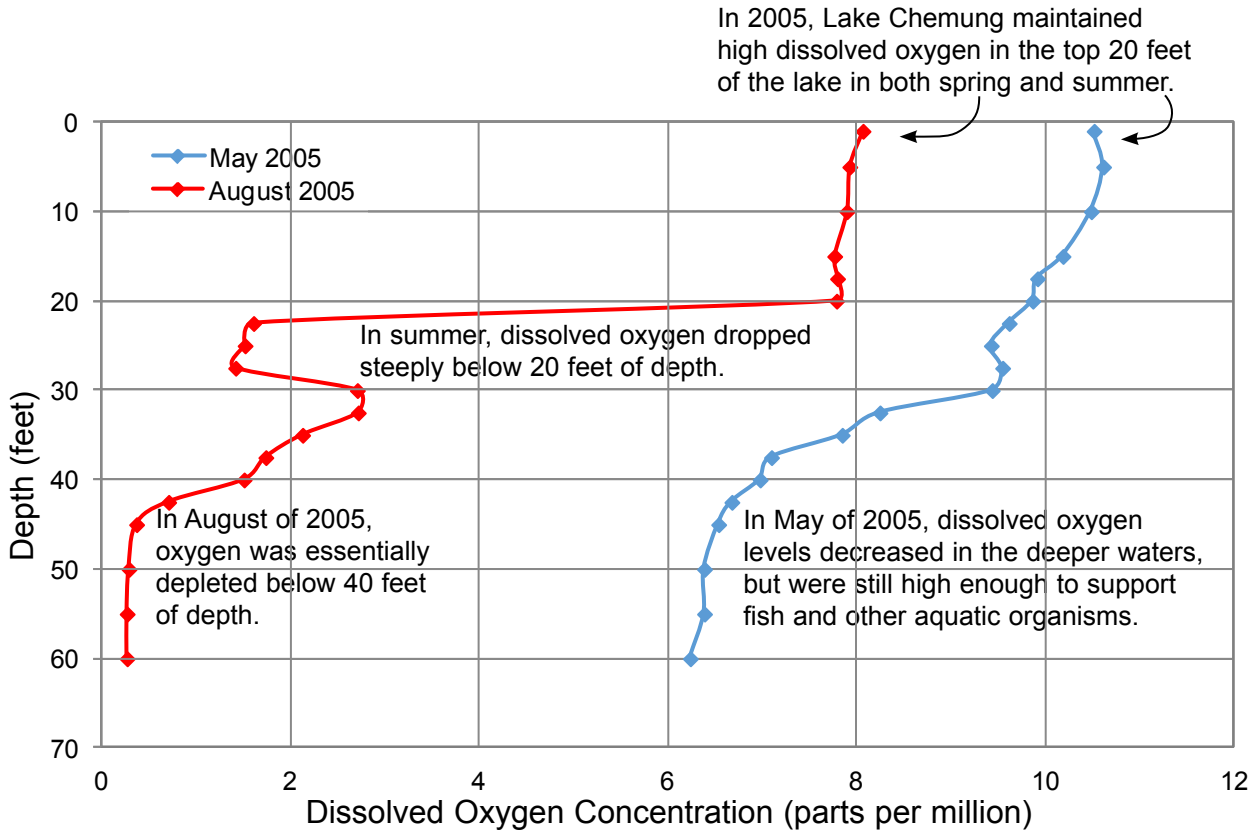

Figure 5. Lake Chemung dissolved oxygen profile, May and August, 2005.

Bottom-water oxygen depletion occurs because bacteria in the lake sediments use up oxygen while they work to decompose organic matter, such as dead plants and other aquatic organisms. This is a common occurrence in deep lakes with substantial biological activity, in particular, plant growth. Typically, when oxygen is depleted near the lake bottom, phosphorus in the sediments will be released into the overlying water resulting in a build-up of deep-water phosphorus levels. If the lake undergoes mixing, the deep-water phosphorus can then become available to stimulate plant or algae growth. CLMP phosphorus monitoring does not include deep-water phosphorus sampling so it is unknown whether sediment phosphorus release is occurring in Lake Chemung. It may be worthwhile for the association to undertake deep-water phosphorus sampling in the future.

The CLMP monitoring data has yielded a treasure trove of useful information, and it's all due to the diligent efforts of association volunteers. Are you looking for a way to give back to Lake Chemung, or would like to get more information about CLMP monitoring? Contact Patty Jacobs Warner at 517-281-2567.