Countless Ways to Use LAKEWATCH Data

Using Lake "Trophic State" to Predict Mercury in Fish

In recent years, LAKEWATCH volunteers have heard much ado about the **trophic state classification system**, which is essentially a way of categorizing lakes based on biological productivity (i.e., a lake's ability to support algae, aquatic plants, fish and other wildlife).

Before reading any further, see the four trophic state definitions in the sidebar.

Within lake management circles, this classification system has proven to be useful in a number of ways:

- It's a handy short-cut for communicating about lakes. For example, if you were to use the term "oligotrophic" to describe your lake to a water management professional, he or she would immediately know that you are talking about a clear-water lake with few aquatic plants, a rock or sand bottom, and a limited amount of fish and wildlife. Although some people might debate the details (e.g., chlorophyll or nutrient concentrations, etc.), the description is close enough to provide a general picture.

- Trophic state categories can also serve as important water chemistry benchmarks. For instance, if a lake begins to shift from one trophic state to another (i.e., from a mesotrophic to a eutrophic lake), it might be an indication that the lake is changing significantly from its historical condition, in which case, further study may be warranted.

LAKEWATCH determines lake trophic state largely based on chlorophyll concentrations and/or the abundance of aquatic plants found within the waterbody. Using the trophic classification system, lakes are classified into four categories:

Oligotrophic (oh-lig-oh-TROH-fic) lakes experience the lowest biological productivity. They typically have clear water, few aquatic plants, few fish, not much wildlife and a rock or sand bottom. Total chlorophyll measurements are less than 3 micrograms per liter (µg/L).

Mesotrophic (mees-oh-TROH-fic) lakes support a moderate level of biological productivity; the water will be moderately clear and contain a moderate amount of plants, fish and wildlife. Total chlorophyll measurements are between 3 and 7 µg/L.

Eutrophic (you-TROH-fic) lakes support a high level of productivity; they tend to have either lots of aquatic plants and clear water or few aquatic plants and less clear water. It also has the potential to support a lot of fish and wildlife. Total chlorophyll measurements are between 7 and 40 µg/L.

Hypereutrophic (hyper-you-TROH-fic) lakes have the highest level of biological productivity. They typically have very low water clarity and the potential for lots of fish and wildlife. They may also have an abundance of aquatic plants. Total chlorophyll measurements are greater than 40 µg/L.

And now, yet another useful application has emerged:

Using fish mercury data and LAKEWATCH water chemistry data from 80 lakes, the Florida Department of Environmental Protection (DEP) and the Fish and Wildlife Conservation Commission (FWC) have found a correlation between lake trophic state and the presence of mercury in freshwater fish. And the relationship is a bit surprising. As it turns out, lakes with the clearest water (i.e., oligotrophic) produced fish with higher mercury levels whereas lakes with more algae and/or aquatic plants (i.e., eutrophic lakes) had lower levels of mercury.

Using this information, Ted Lange, a Fisheries Biologist with the FWC, is currently working to develop a statistical model or formula that can be used to predict whether a lake should be considered low risk or high risk for mercury.

When you consider that Florida has more than 7,800 lakes and thousands of small ponds, the model could potentially provide a huge savings in both time and money. Even under the best of funding circumstances, it is simply not feasible to collect and analyze fish and water samples from every lake in the state. This is also one of the main reasons why scientists develop mathematical models: If you can't sample everything, one can gain a general idea of patterns or trends by sampling a percentage of lakes. (The approach is similar to the use of public opinion polls; by interviewing a cross-section of people within a community, one can at least gain a general idea of what people are thinking about an issue.)

Once the model is complete, state wildlife officials are hoping to use it as a general screening tool for advising people on the risks of eating fish from various types of lakes, based on trophic state classifications.


Kirk Hill

Large bass like this 8.5-pounder, caught by Don Missett in the Tsala Apopka Chain-of-lakes, are top predators. Because of their size and age, these fish tend to accumulate higher amounts of mercury than smaller fish.

Editor's Note: There will always be lakes that fall outside this type of statistical model. Even though models can't *guarantee* predictions about mercury, they can at least provide a framework to start with.

For more details about the trophic state classification system, see our informational pamphlet on-line: *http://lakewatch.ifas.ufl.edu/circpdf folder/trophic2.pdf*