Florida
LAKEWATCH

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UF/IFAS Graduate Student Studies Bacteria in Lakes

After years of working with LAKEWATCH volunteers, we've come to the conclusion that bacterial contamination is one of the biggest concerns for people who live on lakes. This is certainly understandable as waterborne diseases have ravaged human populations worldwide for centuries. Even today, problems exist in many countries. Fortunately, in United States, advances have been made in the treatment of human waste that have greatly reduced incidences of disease from contaminated water.

However, we are not totally immune from bacteria-related problems. Leaky sewer lines and septic tanks combined with rainwater runoff occasionally result in high bacteria counts in lakes and coastal waters. While our program is primarily about monitoring the biological productivity of lakes (i.e., nutrients, algae, water clarity, etc.) we have been involved in a small amount of bacterial monitoring — mostly because volunteers have had a hard time gaining assistance from state agencies that are struggling from funding shortages.

Joe Richard

Bacterial contamination continues to be one of the greatest concerns for lake users.

Amy Richard

Jennifer Donze places bacteria samples into an incubator where they will "bake" for 24 hours. Afterwards, bacteria colonies are counted from each sample. For her research project, Jennifer sampled and analyzed total coliform counts and *E. coli counts* for 30 lakes in Hillsborough County.

Much of our sampling has been done by Jennifer Donze, a UF/IFAS fisheries student who has spent the past two years monitoring lakes in Hillsborough County as part of her graduate thesis.* For her project, Jennifer collected samples, on a regular basis, from 30 lakes and then analyzed them for total coliforms and also *Escherichia coli (E.coli),* an organism that is increasingly being used as an indicator of bacterial contamination. (See the sidebar on page 2 for more about the use of total coliform counts, fecal coliform counts and *E. coli* counts as bacterial indicators.)

***** *Donze, Jennifer. 2004. Factors Affecting Total Coliform and* Escherichia coli *Bacterial Counts at 30 Lakes in Hillsborough County, Florida.*

Jennifer's research revealed some interesting results:

- Out of the 3,530 ***E. coli*** samples, only 1.4 percent of them exceeded the Florida Administrative Code Standards for fecal coliform. (Note: *E. coli* are part of the fecal coliform family; both originate from warm-blooded animals — including humans.)
- 24 percent of the **total coliform** counts exceeded state standards. (This bacteria group is generally related to skin rashes and ear infections.)
- Aquatic plant abundance didn't seem to affect **total coliform** or ***E. coli*** counts

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significantly, nor did road densities or the use of septic tanks and/or sewer systems.

• Total coliforms were higher during wet weather periods while *E. coli* counts showed very little correlation to wet or dry conditions.

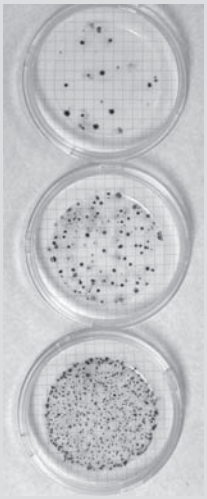
• Lake size and shape (lake morphometry) did show a correlation to total coliform and *E. coli* counts. For example, lakes with the highest mean *E. coli* counts all happened to be small in size. (Editor's note: While it didn't happen in this study, larger lakes do have the potential for high *E. coli* counts.)

• Aquatic bird abundance had the strongest relationship to bacteria counts, especially *E. coli* counts.

While it may be difficult to draw any major conclusions from just 30 lakes (i.e., compared with 7,800 found throughout the state), it does tell us that, in Hillsborough County, bacterial contamination doesn't appear to be a major problem. It also offers new paths to follow for future study. Many thanks to Ms. Donze for taking that first step!

For more about bacteria in Florida lakes, see Information Circular 106: A Beginner's Guide to Water Management — Bacteria.

Using Indicator Organisms for Bacteria Monitoring



Total coliform samples

Detecting disease-causing agents (pathogens) in water can be challenging; some types are rarely found in large enough numbers for detection while others are nearly impossible to cultivate in a laboratory (i.e., for counting purposes).

That's why nearly all bacteria monitoring programs test for the presence of non-pathogenic bacteria that are far more numerous and easier to detect. This approach is based on the idea that if certain non-harmful indicator organisms are present in a water sample (i.e., from the waste of warm-blooded animals, including humans), then pathogenic agents may also be present. Introduced in 1892, this practice continues to be the basis for monitoring today. Total coliforms and fecal coliforms have been the main indicator groups used for water quality standards. However, in recent years *E.coli* counts have been added to the regimen.

Total coliform counts include many different species and strains of coliform bacteria, originating from a variety of sources, including both plants and animals (i.e., fecal and non-fecal).

Fecal coliform counts include bacteria that usually originate from fecal matter (i.e., animal or human waste).

Escherichia coli (E. coli) counts identify just one of the many types of bacteria found within the fecal coliform group. It has recently surfaced as a particularly useful indicator organism.

LAKEWATCH Assists in Formation of Water Resources Council

Florida's newly created water resources council is seen by many as a good omen for water monitoring programs. The idea has been considered since early 2002 when The Ocean Conservancy assembled leaders from various water quality monitoring programs and agencies throughout the state to discuss the need for more collaboration and cooperation among groups. However, things really began to take shape this summer at a retreat meeting in Cocoa Beach.

Florida LAKEWATCH Assistant Director Mark Hoyer attended the event to help in the organization of the fledgling council and to ensure that our volunteers will continue to have a voice in future monitoring. According to Hoyer, it was very evident at the meeting that LAKEWATCH was one of the major contributors to the state's water quality database; our reputation was one of the reasons we were invited to participate in the ground breaking process to begin with.

The Council's stated mission is to "promote and facilitate the coordination, collaboration, and communication of water monitoring programs throughout Florida." This means that participating organizations will be trying harder to decrease overlaps in monitoring activities around the state as well as fill in the gaps for waterbodies that are in need of baseline water chemistry data. The organization will also help to create a statewide forum where new technologies and techniques can be introduced to both researchers and citizens. By working together, it is hoped that the value of water monitoring will gain greater respect throughout the scientific community and the general public and, in turn, increase everyone's ability to leverage much-needed funding.

These goals are based on the many "challenges" that were discussed at the retreat. Funding seems to be one of the largest hurdles followed by frustrations with poor accessibility to data and weak communications between monitoring groups. Participants also voiced concerns about the disconnect that exists between scientific findings and subsequent actions taken by communities and/or water managers. Education was another major topic of discussion, along with difficulties that are experienced when transforming data into usable knowledge for the management of Florida's unique ecosystems.

Nearly a dozen other states, including Colorado, Michigan, Maryland, Oklahoma, Texas, and Virginia have organized similar organizations as part a National Monitoring Council. Florida will be added to the list and will help combine energies into a coordinated national effort.

Participation in this new council is open to any person, organization or agency with an interest in water monitoring in Florida.

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