NEWSLETTER OF THE LAKES OF MISSOURI VOLUNTEER PROGRAM

The Water Line

Fall 2003 Volume 7
Number 3

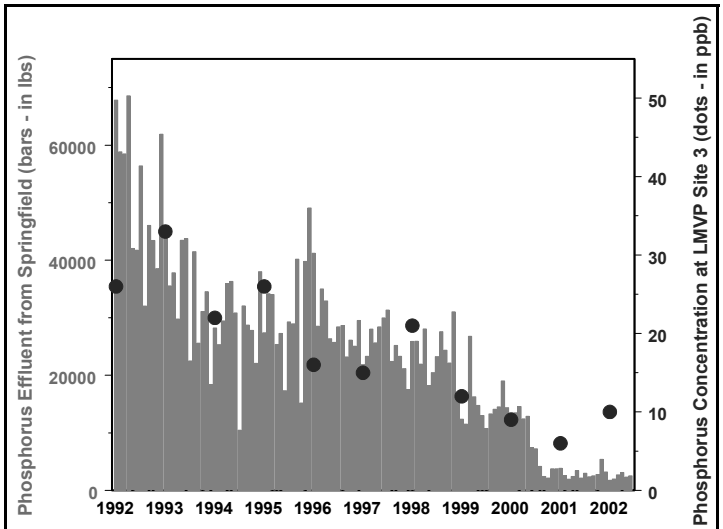
LMVP Data Presented to House of Representatives Interim Committee

LMVP data was at the center of a presentation I gave to the House of Representatives Interim Committee on Water Quality Issues on October 24th in Branson. Thanks to David Casaletto of Table Rock Lake Water Quality Inc. (and a fellow LMVP volunteer!), we were invited to testify. The 14 member committee is chaired by Rep. Dennis Wood of Kimberling City and is charged with examining water quality issues as they relate to economic development. The committee spent several days learning about water quality issues around Missouri and hearing testimony. Several groups and citizens who are involved with (or concerned about) water quality gave testimony at the Branson meeting.

This was a great opportunity to get YOUR data in the spotlight. In my presentation I showed a graph that related James River phosphorus concentrations to effluent from the Springfield Southwest Wastewater Treatment Plant. It seems that as Springfield has been removing more phosphorus from their sewage effluent, phosphorus levels at Table Rock Lake, site 3 have also decreased. Site 3 on Table Rock Lake is at the confluence of the James River with the main lake. This is a good sign and we will be keeping an eye on this site.

Medicine bottles and a syringe found on the King's River arm of Table Rock Lake

D. Mulkey Photo



There is a direct relation between pounds of phosphorus released monthly from Springfield's Southwest Wastewater Treatment Plant (bars) and mean phosphorus concentrations measured at Table Rock Lake site 3 (dots) in ug/L or parts per billion.

Other data presented was from Flat Creek, on the northern end of the James River arm, otherwise known as Table Rock Lake site 12. In mid-June, a volunteer at this site had difficulty getting water through a chlorophyll filter. It took 20 minutes for water to pass through the first chlorophyll filter, as opposed to the usual 10 seconds. A look through site 12 data from previous years revealed something interesting.

For both 1998 and 2000, the mid-June chlorophyll concentration was 40 times higher than it was in late May at this site. In 1999, the mid June concentration was **100 times** that of late May. It seems this has happened again in 2003. I'll let you know more when the 2003 Data Report is complete.

The Interim Committee was also treated to a couple of photos taken by LMVP volunteers.

Continued on Page 2

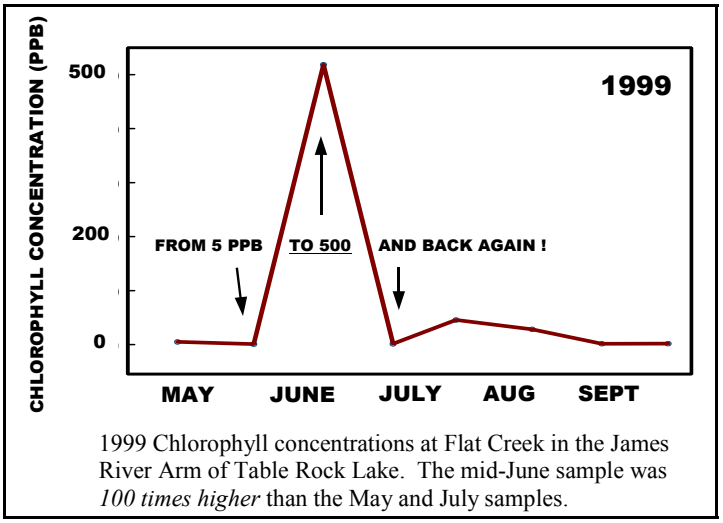
House Committee—continued from Page 1

One photograph was of debris found along the shoreline behind a volunteer's house on the King's River arm of Table Rock Lake. This debris included several syringes and medicine bottles, such as those that used to administer medications to animals. This stuff probably came from an illegal waste dumping site somewhere in the watershed. These same volunteers frequently pick up multiple bags of trash after a storm event.

Another photo was of an orange/brown stream that collects runoff from a suspected illegal dumping site at the Lake of the Ozarks. This stream runs into the cove where several LMVP volunteers live.

Another point I stressed to the Committee was that volunteer data, YOUR data, is **quality** data. LMVP data is regarded quite highly by the DNR. This is largely because your samples and filters are analyzed here at the very same University of Missouri lab used for many research and monitoring projects. This ensures that your data will be comparable to other data.

Even lake data that don't produce exciting graphs are valuable. We use these data to establish baseline conditions. Having baseline data allows us to know what conditions to expect from a lake and allows us to detect water quality changes if they occur.



1999 Chlorophyll concentrations at Flat Creek in the James River Arm of Table Rock Lake. The mid-June sample was *100 times higher* than the May and July samples.

Without YOUR sampling, YOUR comments and YOUR involvement, this might all go unrecorded. All of the LMVP's volunteers should be proud of themselves for their commitment to water quality. Your efforts are noticed and appreciated.

Tony Thorpe

Volunteer data, <u>your</u> data, is quality data

87 million U.S. homes have dishwashers.

My current dishwashing detergent is 4.5% phosphorus, which translates to 0.72 grams of phosphorus per tablespoon. My dishwasher at home requires approximately 4 tablespoons of detergent to fill its reservoir. That means I'm adding 2.9 grams of phosphorus to the environment with each load of dishes I do.

If the 87 million dishwashers in the U.S. were filled with the same detergent as mine and were run at the same time, just once, it would equal approximately **338 TONS of phosphorus**. That is an awful lot of phosphorus.

How often do you run your dishwasher? I run mine almost every day! The detergent I'm using has the lowest phosphorus content of any I could find at my grocery store. Brands with zero phosphorus content exist, but I'll have to hunt around to find them. I might even have to purchase my detergent via mail-order. That's a lot of work to find a phosphorus-free detergent, but after looking at these numbers, it'll be worth the effort.

Tony Thorpe

Phosphorus Content of Major Dishwashing Detergents	
Palmolive Tablets	8.7%
Electra-Sol Tablets	8.7%
Sunlight Tablets	8.7%
Cascade Complete Tablets	8.7%
Spot-Free Powder (Wal-Mart)	7.0%
Electra-Sol Powder	6.1%
All	5.1%
Electra-Sol Gel	4.9%
Sunlight Powder	4.5%
Cascade PureRinse	4.4%
Cascade Complete (liquid)	4.0%
Palmolive Gel	1.6%

Your fill of CHLOROPHYLL

If you are a volunteer for the program, you've seen these instructions before: measure out 250 mL of lake water in the graduated cylinder, place filter rough side up...pour water into filter funnel, work hand-pump to create vacuum in receiving flask...place filter house with folded filter into desiccant and store in freezer. You turn in a can of filters in the fall and in the spring you receive numbers that represent the chlorophyll concentration from those filters. You may ask yourself - *How do the little white filters become numbers*? Hopefully this article will answer that question and more.

Chlorophyll filters are placed in a tube, ethanol is added, then the tubes are heated to extract the chlorophyll.

In the LAB

The ethanol-chlorophyll mixture is fed into a fluorometer and the readings are recorded for data entry.

Chlorophyll analysis is a two step process. The first step involves extracting the chlorophyll from the filter before the actual analysis takes place. Extraction involves placing each dried chlorophyll filter into a test tube with 8 mL of ethanol (that's 190 proof grain alcohol!). The tubes then go into a hot-water bath for 20 minutes, so the ethanol can heat up to around 160 °F. The heated ethanol extracts the chlorophyll from the filters. Simply put, the algal cells that were caught on the filter burst open and the chlorophyll pigment that was inside of the algae is released into the ethanol. What we end up with is a tube of ethanol that has a green tint.

Chlorophyll analysis is completed using a fluorometer. Each sample is sipped into the machine where it enters a glass tube. The fluorometer sends light at a wavelength of 430 nanometers into the chlorophyll sample. This wavelength of light causes the chlorophyll molecules to fluoresce, or give off light. This *fluorescence* is then measured at a different wavelength (663 nanometers). The more chlorophyll in the tube, the more light that is given off at 663 nanometers.

Prior to analyzing the samples, the fluorometer is calibrated with standards that contain a known amount of chlorophyll. The machine is able to use information about the fluorescence of the standards to calculate the amount of chlorophyll associated with the fluorescence of the unknown samples.

The chlorophyll value is then adjusted for the volume of water that was passed through the filter. This allows us to report all values in terms of the amount of chlorophyll that would be found in a liter of lake water. Each sample has two chlorophyll filters (hopefully!). We take the two values and average them to get the one number that we will use for that given sample from the given day.

Now some of you may be asking "*Why chlorophyll*?" Is this really the best method for determining the amount of algae that is in the lake? The simple fact is no, it is not the absolute best method. A better method would be to preserve the actual water (any where from 100 mL to 1000mL) and use a microscope to count, identify, and measure the algae that are actually there in the water. The problem with this method is that is extremely time-consuming and much more costly than doing chlorophyll filters (not to mention I develop a sort of motion sickness if I stare into a microscope for too long). The time required to analyze two sites worth of filters (32 filters) is about an hour for the set-up, and maybe another hour and a half for the analysis and clean-up. I couldn't

Though not very exciting, data entry is important, and accuracy is essential.

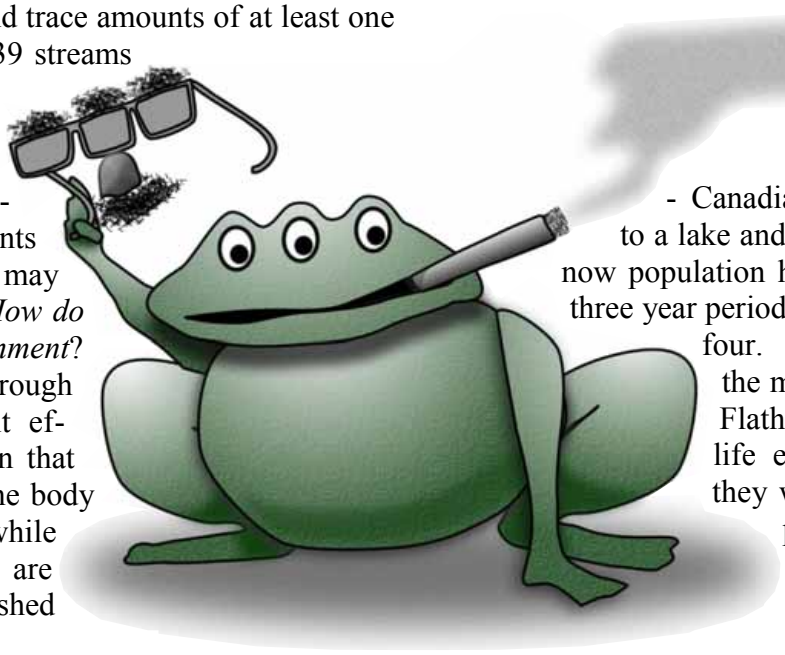
Continued on Page 5

The Changing Face of Water Pollution

If asked to name types of water pollution, the average person would probably mention things like bacteria, pesticides, trash and oil. More knowledgeable lake users would also include nutrients and sediment on the list. The aforementioned categories have made up much of what we know of as water pollution, but there are new types of contaminants that are making headlines; pharmaceuticals and personal-care products! These contaminants, along with cleaning products, make up what is known as Organic Wastewater Contaminants (OWC's).

Pharmaceuticals include antibiotics, estrogen (natural and synthetic), steroids, and prescription drugs. The personal-care products are items such as sun-block, perfumes and insect repellents. In a way these items are not really "new" pollutants, as they have probably existed in the environment ever since we started to use them. What has changed is our ability to measure them in small concentrations (also, an increased population means more of these materials are making their way into our environment).

How prevalent are they? A recent study by the U.S. Geological Survey found trace amounts of at least one OWC in 80% of the 139 streams monitored. The streams were located throughout the country and the findings suggest that these pollutants are widespread. This may lead to the question - *How do they get into the environment*? Often the answer is through sewage treatment plant effluent. Any medication that is not totally used by the body is past out as waste, while personal-care products are constantly being washed down the drain when we bathe. Treatment plants are not set up to remove pharmaceuticals and personal-care products from the effluent. These contaminants may also move through septic systems or come from improperly disposed of chemicals (cleaners dumped down storm drains). Humans may not be the only source of OWC's. Antibiotic and hormones used on livestock may also contribute to the problem.



Right now these materials do not occur in the environment in concentrations that are deemed harmful to humans (though knowledge of affects due to long-term, low dose exposure is not always known). A greater worry is what impact these contaminants may have on the aquatic life which live in constant contact with OWC's. Some recent findings are cause for concern.

- Scientist at the Battelle Marine Sciences Laboratory in Washington state have found that synthetic estrogen can negatively impact the reproductive ability of male rainbow trout. This may mean more obstacles for already struggling native salmon (a cousin to the rainbow trout).

- Canadian scientists added estrogen to a lake and found that the flathead minnow population had greatly decreased over a three year period and would disappear in year four. The estrogen interfered with the minnows ability to reproduce. Flathead minnows only have a life expectancy of 2-3 years, so they were the first species to display a drastic reduction in population. Three other species of fish that take

longer to reach sexual maturity are being monitored.

- Baylor University toxicologist have found fluoxetine, the active ingredient in Prozac, in the tissue of bluegill. The repercussions of this are still under investigation, but it does bring up the question of chemicals building up in fish tissue and causing the need for advisories against consumption.

Another issue of concern is the number of OWC's that are making their way into the environment. In the U.S.G.S. study, stream samples were analyzed for 95 different OWC's. All told, 82 different contaminants showed up at least once, with a full third of the streams containing at least 10 different OWC's. It should be noted that the streams chosen for the study were all considered susceptible to contamination based on their location near intense urbanization or livestock production (Because little is known about OWC's in the environment, the goal of this study was to determine if they were out there in measurable levels).
As the study of OWC's continues we will hear more about these types of contamination. Hopefully future studies will give us both a better idea of how much is already in the environment as well as some idea of what the negatives impacts of these contaminants might be.

Until we know more, the only thing that we can do is try to limit our personal contribution to the problem. Some of the things we can do with pharmaceuticals includes: taking all of our prescriptions so there won't be a need to flush any down the toilet, check to see if the pharmacy will take back and destroy any leftover medications or see if local household hazardous-waste collection programs will accept expired medicines. Household cleaners should be used as directed and disposed of, if need be, through hazardous -waste programs. Personal care products can be used, but we need to be aware of more natural alternatives and use them when possible (e.g. citronella instead of DEET in bug repellant).

We have come a long way in the battle against water pollution, but we still have more work to do. It is up to each of us to educate ourselves on how we, as individuals, contribute to the polluting of our environment. And more importantly, educate ourselves on how we can minimize our impacts. Technological advances will continue to improve our abilities to monitor what is in the environment and we must stay alert to the changing face of water pollution.

Dan Obrecht

Chlorophyll—continued from Page 3

even begin to get through one sample in that time if I were using the microscope.

Knowing the amount of algae in a lake is important because it is a way of monitoring the lake's relative health. Algae are required for a healthy lake, as the algae are the base of the food chain and a source of dissolved oxygen. Just as a little algae are good, too much can be bad. Problems associated with excessive algae include: changes to the aquatic ecosystem that can affect the fishery, taste and odor problems, decreased recreational value, and loss of aesthetic value. Using filters to measure the chlorophyll concentration is a simple, relatively inexpensive and reliable way to gauge the amount of algae within the lake. With the help of volunteers, we are able to efficiently monitor this important component of lake ecosystem just by collecting a couple of little white filters.

Dan Obrecht

Close up of the ethanol-chlorophyll mixture being sipped into the fluorometer. The fluorometer quantifies the amount of light given off at a given wavelength.

LAKES OF MISSOURI VOLUNTEER PROGRAM
302 A.B. Natural Resources Building
University of Missouri
Columbia, MO 65211
Phone: 573-882-5430
800-895-2260
Fax: 573-884-5070

Coordinators
Tony Thorpe TONY@LMVP.ORG
Dan Obrecht DAN@LMVP.ORG

WWW.LMVP.ORG

The Lakes of Missouri Volunteer Program
302 ABNR—University of Missouri, Columbia
Columbia, MO 65211-7240

NEWSLETTER OF THE LAKES OF MISSOURI VOLUNTEER PROGRAM

The Water Line

In This Issue