NEWSLETTER OF THE LAKES OF MISSOURI VOLUNTEER PROGRAM

The Water Line

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Table Rock Lake's NO BOAT SEWAGE PROGRAM

The Table Rock Lake Marina Association has implemented a program designed to protect water quality and quell public fears over boat sewage dumping. The plan of the *No Boat Sewage Program* is to inspect all boats in marinas that are equipped with on-board toilets. The inspection process can be conducted during routine maintenance procedures (such as winterizing) to reduce the inconvenience to boat owners.

What are the inspectors looking for? They are making sure that boats with installed toilets have sewage holding tanks and don't have plumbing that would allow for overboard sewage discharge. Any boats that are equipped to dump sewage into the lake must be modified or their owners will lose their boat slip lease.

Phil Cox, co-owner of the Table Rock State Park Marina said that "there is no evidence that indicates boat sewage discharge is a common occurrence on our lake. However, our efforts are to be proactive on the issue to eliminate the potential for sewage discharge as well as to combat public perception that boats frequently dump sewage into the lake."

The operative word here is "proactive". The Table Rock Lake Marina Association has taken the initiative to reduce potential inputs of nutrients (that's a nicer word!). As boat traffic increases on Table Rock Lake, and it certainly will, the issue of sewage dumping becomes less of a possibility and more of a likelihood. By dealing with the issue now, the Marina Association is heading off a potential threat to water quality and projecting a greener image of boat owners.

Mr. Cox says that only a small percentage of large boats come equipped to pump sewage overboard, and that most of the owners of those boats are responsible enough not to do so. He states, "As marina owners and operators, we are implementing an idiot-proof solution which is to inspect boats within our harbors to ensure that they are not equipped to dump sewage" "It a boat is equipped to dump sewage, that toilet system must be modified or face eviction from the marina."

Tony Thorpe

ATTENTION VOLUNTEERS

We will be conducting the numerous, smaller data reviews this year rather than the single large conference. At this point it looks like we'll be having formal data reviews in North Kansas City, Lake of the Ozarks, Springfield, and Kimberling City.

I have a couple of requests for you:

1.) If you live around the Lake of the Ozarks or Table Rock Lake and you know of any local events that may conflict with a data review, please let me know either by phone or by email (tony@lmvp.org). Examples: Dogwood Days, lake cleanup days, etc.

2.) Also, if you would prefer a weekday data review over a weekend data review, let me know. We'll try to make as many people happy as possible.

3.) If you have any leftover TSS filters (the ones in the little plastic box), throw them away. But please KEEP the boxes and return them to us. We will make sure you get more filters, bottles and data sheets.

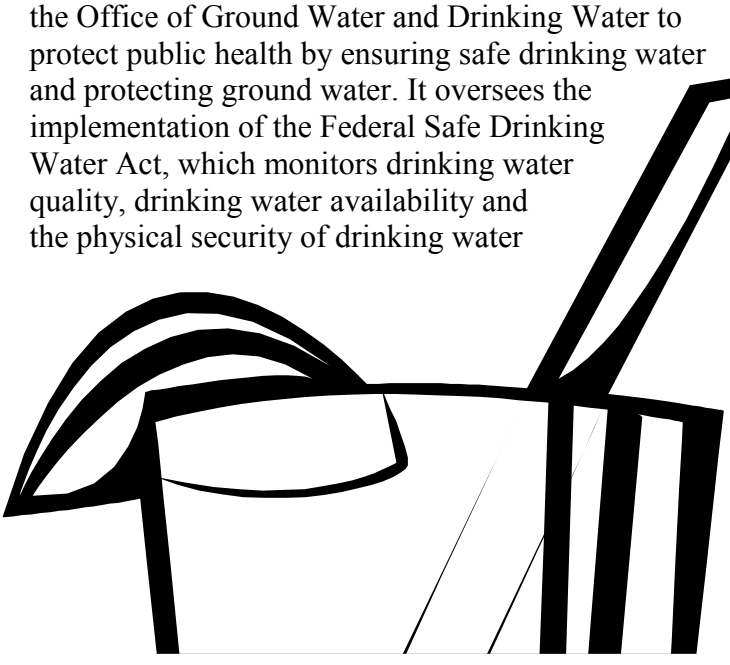
nonpoint source pollution and DRINKING WATER QUALITY

Most public water supply systems in Missouri obtain water from groundwater sources (well water) however, most *people*, more than 3 million in Missouri, drink water obtained from a surface water supply (stream, river, lake or reservoir). Missouri has over 150 surface water supply systems including several large reservoirs like Mark Twain Lake and Harry S. Truman Reservoir. Numerous smaller reservoirs are also utilized for drinking water throughout the state, especially in Northern Missouri.

The quality of reservoir water directly impacts the quality of the finished drinking water and source water pollution can lead to critical supply shortages and degraded drinking water quality. In extreme cases, contamination can lead to serious health threats. However, reservoir conditions such as algal blooms or high turbidity levels that cause aesthetic problems such as taste and odor issues are more common. This can be the result of both point and non-point source pollution.

Who protects our drinking water?

The U. S. Environmental Protection Agency operates the Office of Ground Water and Drinking Water to protect public health by ensuring safe drinking water and protecting ground water. It oversees the implementation of the Federal Safe Drinking Water Act, which monitors drinking water quality, drinking water availability and the physical security of drinking water supplies. The public drinking water systems regulated by the Federal Safe Drinking Water Act provide drinking water to more than 90 percent of Missourians (4.7 million people). In Missouri, The Department of Natural Resources operates the Public Drinking Water Program, monitoring over 100 potential contaminants in 2,700 public drinking water systems. Drinking water systems that supply water to fewer than 25 people are not regulated since they are not considered public water supplies.



How does the Safe Drinking Water Act protect source waters?

In addition to testing for contaminants in drinking water, The Safe Drinking Water Act Amendments of 1996 require states to implement Source Water Assessment Plans to better protect public drinking water from future contamination from both point and non-point source pollution. A Source Water Assessment includes four major elements:

1. Delineation of the Source Water Area

For surface water from a stream, river, lake or reservoir, the land area in the watershed upstream of the intake (the point where the drinking water treatment plant draws the water out) is identified. The areas closest to the intake can impact the water supply as well as more distant areas in the watershed. The watershed is particularly important because human activity throughout the watershed can impact the water supply via non-point source pollution, which is difficult to identify and remedy. For groundwater supplies, the flow of underground water is determined. Depending on the flow, pollutants can filter down from the land surface and enter the supply.

2. Inventory of Potential Sources of Contamination

The second step involves the identification of potential pollution sources. A list of facilities within the area that may release point source contaminants is generated, but non-point sources are harder to identify. Community groups and individuals can be key sources of

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information in this part of the assessment. Generally, non-point sources are more easily identified by those familiar with the area and the land use. Many types of potential pollutant sources exist including gas stations, septic systems, mining Toperations, forestry operations, feed lots, industrial plants and residential areas.

3. Evaluation of Susceptibility to Contamination

At this step, the state compiles all of the information to decide how likely a water supply is to become contaminated. This helps local communities decide how to best protect their drinking water supplies from the point and non-point pollution threats that exist. Treatment plant operators can also use the information to choose between different management practices and treatment processes.

4. Public Release of Results

After completion, the assessment must be summarized and made available to the public. Some states post these assessments on the Internet (Missouri's Source Water Assessment Plan can be found at http://drinkingwater.missouri.edu/swap/index.html) while other states have copies available in public libraries or government offices.

Where is my local drinking water supply source?

Interactive maps of every public water supply are available through the Center for Agricultural, Resource and Environmental Systems (CARES) on the Internet at http://maps.cares.missouri.edu.

How does my local drinking water supply measure up?

The Department of Natural Resources issues Annual Compliance Reports, the most recent of which can be viewed on the Internet at http://www.dnr.state.mo.us/wpscd/pdwp/fyreports/2002acr.htm. You can also request a copy by calling 1-800-361-4827 or (573) 751-5331. Drinking water suppliers now provide reports (sometimes called consumer confidence reports) that tell where drinking water comes from and what contaminants may be in it. Water quality reports for many Missouri suppliers can be located through the following EPA web site http://www.epa.gov/safewater/dwinfo/mo.htm or you can contact your water supplier directly to get a copy.

How can my community get involved?

Individuals and community groups can do a lot to impact source water quality. They can cooperate with government agencies to identify potential point and non-point contamination sources. Community groups can contribute information about watershed activities that may not be on state databases or maps, especially non-point sources that are hard to identify. They can also help prevent new contaminant threats from arising in the source water area. Groups can work to establish or revise zoning regulations for land use and development in the watershed to mitigate non-point pollution or they can work to set aside watershed land as a protected conservation zone. Community groups can also hold public meetings to help educate the public about pollution and the impacts of household chemicals and lawn fertilizers, etc. on water quality. There are many ways for community groups to become involved in protecting the source of their drinking water. For more ideas and information, visit the EPA web site Facts for Community Involvement in Drinking Water Source Assessments: http://www.epa.gov/safewater/protect/factsh4.html. The EPA's Safe Drinking Water Hotline phone number (800-426-4791).

Kristen Veum

Drinking Water Reservoirs Active in the LMVP

The following is a list of the drinking water reservoirs scheduled for sampling by LMVP volunteers in 2004

Bowling Green
Breckenridge
Butler
Cameron
Hamilton
Lamar
Longbranch
Mark Twain
Smithville
Stockton
Sugar Creek
Unionville
Vandalia

In the LAB

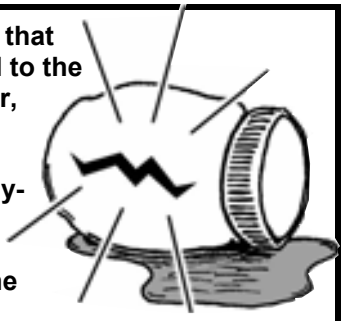
Part 3: Nitrogen and Phosphorus

IT is late June and Tony has just shown up at your door to do the mid-season sample pick-up. While chatting about the lake, you start digging through your freezer looking for the nutrient bottles. You know that there are five of them in here somewhere. Under the bag of mixed vegetables? Hiding out behind the chocolate ice cream? You finally find them under the bag of tater-tots. Tony takes them and puts them in a cooler with all of the other nutrient bottles he has collected this trip. Once he gets back to the University, he stores all of those bottles in one of four freezers that we have just for this purpose.

When it is time to analyze the samples, they are placed into a sink with warm water to speed up the thawing process. Because the bottles are placed into water, it is very important to be sure that any information written on them is in permanent marker, and that any paper labels are covered with tape (paper labels don't hold up so well when wet!). Once the bottles are defrosted, we will set up two tubes for Total Nitrogen (TN) analysis and two tubes for Total Phosphorus (TP).

After all of the tubes have been set-up, they go through a digestion step. A chemical is added to the tubes and they are then placed into an autoclave (scientific word meaning pressure cooker) where they cook (I mean autoclave!) at 250 °F for an hour. This process takes all of the nitrogen or phosphorus that is in the tube and turns it into a measurable form. In undigested lake water the nutrients are present in many different forms that include: dissolved in the water, attached to soil material, as well as incorporated into algal cells and zooplankton bodies. Without the digestion step we would greatly underestimate the amount of nutrients that are in the lake water.

It is very important that the bottles be filled to the shoulder with water, because we sometimes have to go back and redo analyses (don't overfill them though, or they will burst in the freezer).



Once the tubes are cooked and cooled, they are ready for analysis. At this point the process for TN and TP differs. TN samples are acidified and then analyzed. TP analysis differs in that we add a color reagent to the tubes. This reagent reacts with the phosphorus in the sample to create a blue color. The more phosphorus in the sample, the darker the blue color in the tube. The actual analysis takes place on a machine known as a spectrophotometer. The simplified version of how it works is some sample is placed into a cuvette (see picture) and this is placed inside the machine. Light of a precise wavelength is passed through the sample and the machine determines how much of that light is absorbed by the sample. For TN the machine actually does readings at three different wavelengths. TP samples are analyzed at a single wavelength.

Along with tubes that contain lake water, each run of TN and TP contains tubes that have known amounts of nitrogen or phosphorus

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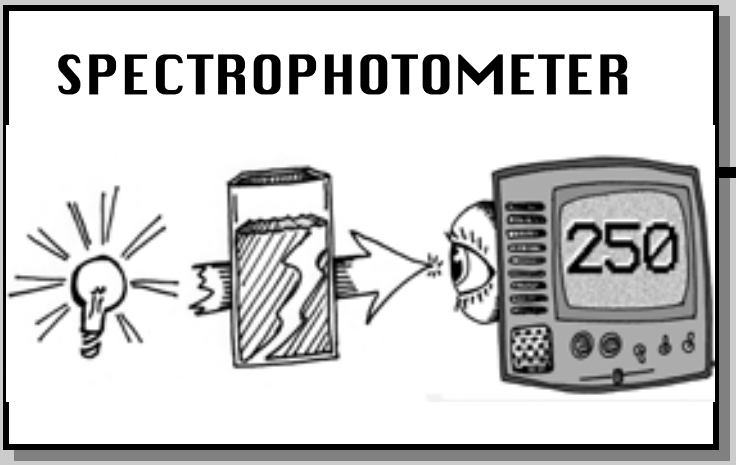
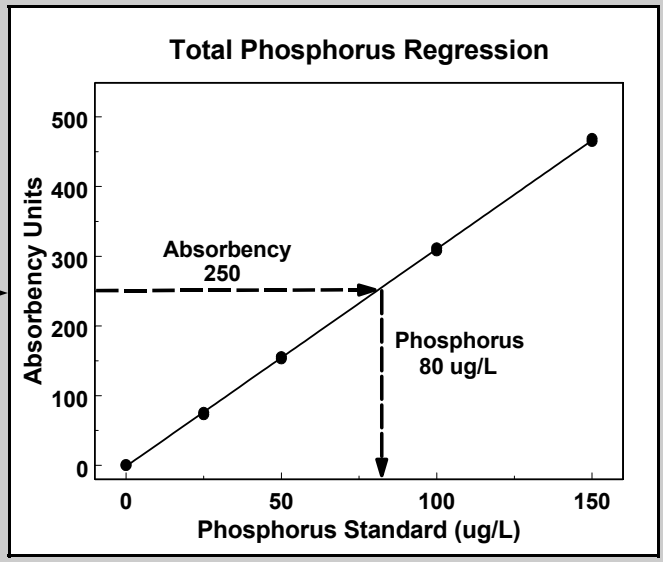
Because we have so many little plastic bottles of frozen water, it is important that <u>all</u> of the required information is on each bottle. The machine is the spectrophotometer. The cuvette is in the foreground.

Inside a spectrophotometer, light is passed through a processed water sample producing an absorbance unit that can be translated into a nutrient value using a regression equation.





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(referred to as standards). We use information generated by analyzing the standards to help us determine the amount of nutrients in the lake samples.

After all the analyses are done we end up with a number associated with each standard and each sample. We then use the standards to create what is known as a regression. Figure 1 shows an example of the phosphorus regression. The known standards are scaled on the bottom of graph and the absorbency values on the left side. The points within the graph show the absorbency values for our standards (0, 25, 50, 100 and 150 ug/L) and the solid line indicates the relationship between phosphorus concentration and absorbency value. We take this information and can use it to turn the absorbency value of an unknown sample (for example, 250) into a phosphorus concentration (80 ug/L). Nitrogen works the pretty much the same way.

Once TN and TP values have been determined for your samples, we quality check them to make sure that there is good agreement (remember, we run two of each). If the numbers aren't within 5% of each other, we start the process over with the water that is left in the nutrient bottle. The data are then entered into a computer file where we can use them to calculate statistics and create graphs.

Total Nitrogen and Total Phosphorus play a large role in determining water quality in our lakes. These nutrients determine how much algae a lake can support, which in turn impacts our use and enjoyment of the lake. The data generated from these samples also helps the state meet Clean Water Standards...not bad for a sample that was hanging out with tater-tots.

Dan Obrecht

ANNOUNCEMENTS

- **The Data Report will be complete sometime in late March**
- **Data Review sessions will begin in April**
- **New volunteers will be trained in April and May**

We still need volunteers for Lake of the Ozarks, particularly at Bagnell Dam