University of Nebraska Lincoln

EXTENSION
INSTITUTE OF AGRICULTURE AND NATURAL RESOURCES
School of Natural Resources

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Chuck Norris
230 Mallard Circle
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Dear Chuck,

I am writing to inform you of the results of the water samples taken as a part of my visit to Big Sandy on 7/29/08. First I would like to thank you for arranging the meeting with you, Monte, Dan and myself. There is no better method for me to fully understand a lakes dynamics than with an informal meeting and casual discussion. The University of Nebraska water quality extension program aims to increase awareness in lake and pond water quality by involving the lake owners/users in the field sampling process, as well as provide general recommendations based on the collected results. It is important to note the samples collected on 7/29/08 will give us a general indication of water quality at a particular time within the summer season. So keep in mind the best lake sampling program would implement at least one sample taken per month at multiple sites throughout the lake.

To begin, I would like to provide some background information on the leading cause of decreased water quality, what can happen as a result of poor water quality conditions and then finish by comparing and contrasting the results from Big Sandy.

What is Phosphorus? Phosphorus is the key nutrient controlling the algal community in lakes and dictates lake productivity. The higher the phosphorus concentration the increased chances the lake will turn green. A comparison: Lawn fertilizers commonly contain three nutrients; potassium phosphorus, and nitrogen. Phosphorus (the middle number on the bag) is the major nutrient for the lawn, and when properly applied the lawn will turn green. Phosphorus that enters a lake has the same effect, causing growth, of the microscopic plant material know as algae. It has long been understood in the scientific and somewhat in the general community, that there is a direct relationship between levels of phosphorous within a lake and water clarity/quality. In other words, lakes with lower phosphorus levels generally have increased water clarity, and lakes with elevated phosphorus levels generally have decreased water clarity.

Where does the phosphorus come from? Many lake water quality problems are not limited to but typically stem from one or all of the following: 1) Nutrients or fertilizers washing into the lake from adjacent lawns, 2) Storm sewer or street runoff, 3) Occasional or even a one time flood event. i.e. Water entering from nearby rivers can carry very high loads of nutrients (Phosphorus >1000 µg/l). 4) Leaking septic systems, 5) Organic material (leaves from trees, dying algae, dead fish, waterfowl droppings, etc.) enter the lake and upon its decomposition becomes the source of nutrients. Most of these sources contribute a small fraction of phosphorus

annually that leads to a gradual increase of in-lake total phosphorus levels over time, that may take years or decades to become problematic. Floodwater however, is by far and away the largest contributor of rapid increases of phosphorus levels to a lake. Rivers and streams are primarily fed by overland runoff and carry exceedingly high about of phosphorus rich sediments and organic debris. When river or flood waters enter a lake, the overall lake phosphorus levels will in most cases increase immediately. Once nutrients enter the lake they remain within the system and continue to cycle with the two annual turnover events (Spring and Fall), explaining why algae levels increase and water clarity are very poor at the time of turnover. Although it is impossible to keep all phosphorus out of a system, proper management can at least slow down the additions and reduce the chances of blue-green or toxic algae blooms.

What is toxic algae? Algae is defined as "a microscopic plant that grows in water in direct proportion to the amount of nutrients (phosphorus) available." Thus, as phosphorus increases so does the chance for the appearance of "toxic algae" or "blue-green algae". The toxin produced by algae can cause human and animal health problems ranging from skin irritation, diarrhea, and vomiting, to death from liver or respiratory failure. Toxic algae thrives in stagnant water, during warm weather with drought or near drought conditions.

What should I look for to avoid toxic algae? Areas of algae bloom where poisonings occur usually have heavy surface growths of green scum with a disagreeable odor and taste. It can have a thickness similar to motor oil and looks like "John Deere" green colored paint. Algae blooms usually accumulate near the shoreline where pets and toddlers have easy access and the water is shallow and more stagnant. It is important to keep a watchful eye on children and pets so that they do not enter the water. Aspects to watch out for include:

- Water that has a neon green, pea green, blue-green or reddish-brown color;
- Water that has a bad odor;
- Foam, scum or a thick mat on the water surface; and/or,
- Green or blue-green streaks on the surface, or accumulations in bays and along shorelines.

What were the results from Big Sandy Lake? Total phosphorus at a depth of 0.5m in the main lake and west sites were 52.8 µg/l and 52.9µg/l, respectively. The nutrient conditions at the time of sampling indicate that the lake is moderately productive and can be classified as "eutrophic", in other words phosphorus levels are between 30-100µg/l conditions where an occasional algal bloom may appear, however long lasting scums are infrequent. These algal blooms can form surface scum's and greatly decrease water clarity and overall recreational use. In addition, these blooms can indirectly lower dissolved oxygen concentrations and increase the possibility of fish stress or kills. It is also important to point out that once these nutrients enter a lake they will recycle and again become available to the algae during the spring and fall turnover events.

While visiting each site I also collected water in the "hypolimnion" or bottom waters. The hypolimnion is an area where all the organic material within the lake (algae, fish, leaves, etc.) settle and decompose and phosphorus concentrations are highest. The purpose of this sample is to determine how much of the nutrients are leaching out of the bottom sediments and into the overlying waters. In sandpits, this "internal loading of nutrients" is generally one of the greatest sources of phosphorus. Total phosphorus from the bottom waters in the east and west lake sites were 72.5 µg/l and 75.5 µg/l, respectively. These values are on the lower end for Nebraska sandpits which may help explain the relatively good water quality, however these values are more than adequate for algae growth.

At the time of sampling, your lake appears above average from a water quality perspective. The current phosphorus concentrations indicate that the lake may be conductive to short term algal blooms. It is important to note that most lakes in Nebraska will see some short term algal blooms in the summer months that should disappear after a week or so. Since nutrient levels naturally increase to some degree as a lake ages, any efforts to control phosphorus inputs will maintain and prolong the recreational life to the lake. To remain proactive about water quality, I would recommend a nutrient monitoring program annually at minimum, 3-5 samplings per summer would be ideal.

I am looking forward to working with your lake association in the future, if you have any questions or concerns please do not hesitate to contact me. Thank you again for your interest in water quality.

Sincerely,

Tadd M Barrow

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