WALPA The Washington State Lake Protection Association Newsletter

WATERLINE

March 2007

In This Issue

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Volunteers Monitor Their Watershed at Newman Lake

by Linda Pool, Newman Lake volunteer coordinator

Background

Newman Lake is a shallow 1,200 acre lake about 20 miles northeast of Spokane, Washington. The lake's watershed covers about 18,500 acres.

In the late 1970's and early 1980's, citizens became concerned about lake water quality due to algae blooms caused by high phosphorous levels. After an initial study, a grant from Washington Department of Ecology (DOE) was obtained. With these funds a whole lake alum treatment was done, a hypolimnetic aeration system was installed and a "Lake Book" written by local residents was published to educate residents about best management practices. Later the Newman Lake Flood Control Zone District also installed a Micro-Floc alum injection system.

These efforts helped reduce phosphorus levels, but Newman Lake continued to be on the federal Clean Water Act's 303 (D) list for impaired waters due to high phosphorus content. We needed to look more closely at the surrounding watershed.

In the fall of 2002, Marianne Barrentine of Spokane County Engineering got a WA DOE grant for watershed monitoring and education at Newman Lake. The grant included monitoring by Barry Moore's lab at WSU, by volunteers and by Mountain View Middle School students.

One of Newman Lake's volunteer monitors braves the elements

Volunteer Monitoring

About 30 volunteers signed up to help. Barry Moore's graduate students came to Newman Lake in April of 2003 to give us some initial training in measuring stream flow, dissolved oxygen (DO), water temperature, taking water samples and creating stream profiles. I gave more specific training as we began monitoring. Each volunteer was given a handbook created by WSU students and me.

Volunteers divided into four teams and began monitoring 12 stream sites every other week. We monitored all year, wading through deep snow and breaking ice in the winter, and during storm events when some of our highest flows occurred. At first we used tennis balls to help measure flow but soon

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Focus on Lake Roosevelt

By Carla Milesi

Lake Roosevelt, named for President Franklin D. Roosevelt, is in scenic northeast Washington, surrounded by a stunningly deep basalt canyon, rock outcrops, grassland and ponderosa pine terraces, and the mixed-forest mountains of the Kettle River Range. The reservoir was created by the construction of the Grand Coulee Dam on the Columbia River. Initially built to provide irrigation to the surrounding farmland, today the dam irrigates more than half a million acres of the Columbia basin and provides flood control to the basin and recreation for almost 1.5 million people. The dam also generates hydroelectric power for the Northwest -- 6480 megawatts, in fact, making it the largest producer of hydroelectric power in the United States and third largest in the world.

When the dam gates closed in 1942, the waters of the Columbia rose 380 feet behind it, creating a 150-mile lake that extends from the dam to nearly the Canadian border. Lake Roosevelt has more than 500 miles of shoreline, contains almost 9 million acre-feet of water, and varies from about half a mile to a mile and a half wide. The Columbia River provides almost 90 percent of annual flow into Lake Roosevelt. The thirty-mile Spokane River and fifteen-mile Kettle River contribute the rest.

For more than 9,000 years, people inhabited the banks of the Columbia, fishing and trading. The rising waters that created Lake Roosevelt inundated these communities, flooding the riverbanks where homes, farms, and businesses had thrived. Within the flooded area were eleven towns, some of which were relocated to higher ground. In all, some three thousand people had to leave their homes. Hundreds of year-round villages and seasonal campsites of the Colville Confederated Tribes and Spokane Tribe of Indians were lost as well as established towns.

The damming of the Columbia drastically affected salmon runs as well. Forty miles south of the Canadian border, Kettle Falls was an ancestral fishing ground for Native Americans, said to be so thick with salmon during spawning season that you couldn't throw a stick into the water without hitting a fish. The creation of Lake Roosevelt buried Kettle Falls beneath hundreds of feet of water and, since the dam was built without fish passage, closed the upper Columbia and its tributaries to migrating salmon.

Bradbury Beach on Lake Roosevelt. Photo provided by Spokane Tribe.

While Lake Roosevelt is not home to any anadromous salmon, it does support a thriving fish population, making it a favorite destination for anglers and bringing an estimated $5.3 to $20.7 million to the local economy annually. There are more than thirty species of fish in the lake including the native white sturgeon, peamouth, northern pikeminnow, sucker, redside shiner, kokanee and rainbow trout. To help maintain fish populations, the Lake Roosevelt Hatcheries Coordination Team produces over 1,500,000 kokanee and 750,000 rainbow trout annually using hatcheries and net pens. A variety of non-native fish have also been introduced, many illegally, including carp, smallmouth bass, lake whitefish, brook trout, walleye and bullhead. The walleye, illegally stocked into Lake Roosevelt in the 1950's, pose a particular problem. Along with smallmouth bass, these opportunistic fish-eaters have decimated the lake's peamouth and redside shiners, important forage fish for other species.

The Washington State Department of Ecology has classified Lake Roosevelt as a Class AA (extraordinary) waterbody. In the mid-1980's, though, the U.S. Environmental Protection Agency (EPA) and other agencies detected high levels of lead, cadmium, arsenic and zinc in tissues of fish from the reservoir. Investigations determined that a lead and zinc smelter in British Columbia had discharged slag material into the Columbia River for decades. Between 1920 and 1995, when the practice ceased, an estimated 9.8 million tons were released into the river. In 2006, the EPA announced that the company has agreed to fund an assessment for Superfund cleanup.

There are several Total Maximum Daily Load standards (TMDL's) that have been or are being developed for Lake Roosevelt, including one for Total Dissolved Gas (TDG) and one for temperature. Elevated TDG, often the result of spillover from dams, can cause gas bubble trauma in fish. Fish confined to shallow water are most affected, so the rainbow trout in the net pens are particularly vulnerable.

Because the reservoir's waters are slow-moving, summer temperatures often exceed the state water quality standard of 16°C. The lake's average August temperature is 21°C, and temperatures

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Lake Roosevelt

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An aerial photo of Lake Roosevelt taken near Keller Ferry. Photo provided by the Spokane Tribe.

on the Spokane Arm have reached 24°C. Addressing the temperature issue is a challenge since the amount of water allowed to flow through the dam depends not only on fishery needs, but on flood control, power generation, recreation and irrigation. Currently the EPA is working on the DRAFT TMDL as well as a DRAFT Summary Implementation Strategy for temperature.

While the water quality issues are a concern for fish health, the EPA has deemed the reservoir safe for recreational use. Every year millions of visitors enjoy boating, fishing, waterskiing, swimming and camping in the dry and sunny climate of Lake Roosevelt.

Note: WALPA makes no guarantee as to the accuracy of this information.

Sources for this article:

- Ben Scofield, Limnologist, Lake Roosevelt Fisheries Evaluation Program, Spokane Tribe – Dept. of Natural Resources (personal communication)
- USGS Water Science Center; Lake Roosevelt-Upper Columbia River; http://wa.water.usgs.gov/projects/roosevelt/index.htm
- Lake Roosevelt Forum website, www.lrf.org
- Lake Roosevelt National Recreation Area, Washington: Water Resources Scoping Report by Jon L. Riedel; Technical Report NPS/NRWRD/NRTR-97/107; National Park Service, Department of the Interior, Water Resources Division
- Currents and Undercurrents: An Administrative History of Lake Roosevelt National Recreation Area by Kathryn L. McKay and Nancy F. Renk, 2002; National Park Service, Department of Interior
- Concentrations and Distribution of Slag-Related Trace Elements and Mercury in Fine-Grained Beach and Bed Sediments of Lake Roosevelt, Washington, April-May 2001. by Michael S. Majewski, Sue C. Kahle, James C. Ebbert, and Edward G. Josberger; U.S. Geological Survey Water-Resource Investigation Report 03-4170 version 1.0

Septic Systems and Pollutants of Concern

By Peter Burgoon

Septic systems can be cost-effective at treating wastewater and protecting public health. The Washington State Department of Health (WA DOH) regulates design requirements for septic systems and focuses on protecting the public health. The primary public health concerns from septic systems around surface and groundwater are human pathogens and nitrogen. But protecting public health is not always the same as protecting environmental health. Phosphorus, for example, is a key parameter for environmental protection, but is not currently regulated by WA DOH.

Fecal coliform

Human pathogens are indicated by the presence of fecal coliform bacteria. But freshwaters are home to many mammals and birds and fecal bacteria are found in all warm-blooded animals. Thus fecal coliform concentrations in waterbodies may exceed Washington's water quality standards without necessarily indicating the presence of human pathogens. If septic systems have been designed, installed and maintained per county and state requirements, the public is likely safe from human pathogens. Additional sources like septic systems, stormwater systems, wildlife, and other animals in the watershed need to be assessed to determine whether fecal coliform levels indicate a threat to human health.

Nitrogen

Nitrogen is both an environmental pollutant and public health concern. It is a nutrient required by all plants for growth and thus can stimulate excess algae growth. Nitrate - nitrogen (NO_3-N) concentrations greater than 10 mg/L in drinking water are a public health concern since they can cause methemoglobinemia, commonly known as "blue baby syndrome." As an environmental pollutant, nitrogen is of greatest concern when discharged into marine waters, but it should also be controlled around freshwater bodies.

Since nitrogen is a public health concern, WA DOH has established septic system design criteria that should protect drinking water wells, lakes, and streams. Groundwater and surface waters are most susceptible to nitrogen pollution if the septic effluent is disposed of in sandy or gravelly soil. If a septic system is more than 20 years old or is installed in a coarse-grained or gravelly soil, the septic system should be evaluated by a professional or an environmental health specialist from

the County Health Department to insure that the system meets current design guidelines.

Washington State has proven technologies for removing nitrogen from septic systems, similar in principle to the treatment used in wastewater plants. Because of their increased complexity, though, these systems cost more and require more maintenance than other systems. To install a nitrogen removal system, the homeowner should hire an experienced professional to help select one with the simplest operations and maintenance that can be effective.

Phosphorus

Since phosphorus presents no known public health issues, WA DOH does not require that septic systems reduce phosphorus. Yet reducing phosphorus loads to a lake is the most important step in controlling lake eutrophication.

This is becoming a significant problem around the state because numerous watersheds have elevated concentrations of phosphorus. Washington Department of Ecology requires planners and residents in those watersheds to reduce the daily amounts of phosphorus entering a lake ("loads"). Sources of phosphorus could be "point" sources like wastewater treatment plant discharges, or more diffuse, "non-point" sources, like farms, stormwater runoff and septic systems generally in the watershed.

Septic systems are almost always a major target for reducing phosphorus loads in a watershed. A review of ten mature septic systems in Ontario observed that phosphorus removal was substantial and variable, ranging from 23 – 99% depending on site conditions (Lombardo 2006). In the Lake Chelan area, studies determined that ten feet of soil below a drain field could protect the lake. However, in the absence of adequate soil, the recommended setback for a septic system from the lake was 0.62 miles (WA DOE 1989). Quite often large sewer systems and a centralized treatment facility are offered as the only solution for reducing phosphorus loads.

Phosphorus removal in soils is a very complicated chemical process which is complicated even further by the natural variability of soils. In general a fine-grained non-calcareous soil with iron will result in the lowest phosphorus concentrations (Lombardo 2006).

Several areas in Washington, though, have very gravelly soils laid down during glacial activity and are unlikely to have significant removal capacity. If finer grained soils are present it may be worth assessing the phosphorus sorption capacity of the local soils and monitoring a few established septic systems to see if phosphorus is leaching into a lake. This will help determine the extent of the septic system problem, if any, and provide information about how native soils may be best used to protect the lake.

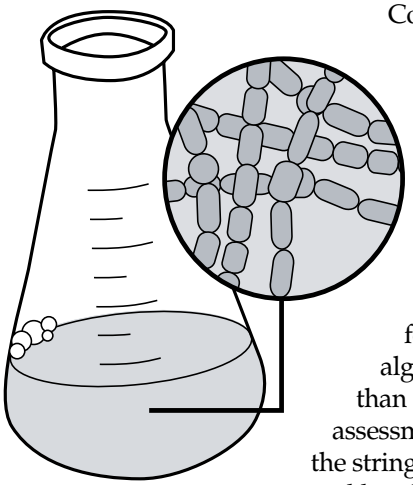
A second option is to pursue planning, design, and construction of a centralized sewer collection and treatment system. This can be relatively expensive and sometimes a source of contention but it does minimize concerns with septic systems.

A third option would be to install phosphorus removal components in septic systems. There are good solutions available after decades of research around the world. More than a decade ago, Norway researched and implemented widespread use of a system for protecting their fjords. These systems are available to lake residents but none are approved by the State of Washington. Interested residents should consult a professional with specific expertise in phosphorus removal. Currently, the local County health office may not be able to help much with phosphorus concerns, but some believe that the State Department of Health will address the issue in the next few years.

WA DOE 1989. Lake Chelan Water Quality Assessment. Washington State Department of Ecology.

Lombardo, P. 2006. Geochemistry in septic tanks, soil absorptions systems, and groundwater. Prepared by Lombardo and Associates Inc. Newton, MA.

Ecology offers blue-green algae ID and testing



Washington residents and County health districts can now take advantage of the Washington Department of Ecology's expertise to help identify potentially toxic cyanobacteria (blue-green algae). Ecology is offering a freshwater algal identification and toxicity-testing service, intended for cyanobacteria (blue-green algae) bloom identification, rather than routine lake phytoplankton assessment. Filamentous green algae, the stringy kind that can be picked up and handled, is not the focus of this testing service.

If your lake is experiencing an algae bloom, and you would like more information about Ecology's algae program, please contact Tricia Shoblom at **425.649.7288** or **tsho461@ecy.wa.gov**

Newman Lake Volunteers

Continued from front page

learned to use a Pygmy Meter and an electronic Mini Meter. We measured DO and temperature with a hand held YSI 550 meter and took stream profiles with a sight level and measuring rod. Water samples were sent to Barry Moore's lab for analysis.

Volunteers installed staff gauges and crest gauges and created a flow curve based on our data to go with them. Eleven residents kept daily precipitation and temperature logs at their homes using Tenite rain gauges and Taylor thermometers. Volunteers also helped with the middle school field trips to the watershed.

We acquainted ourselves with benthic macroinvertebrates, riparian vegetation, woody debris and pools and ripples in our streams and got a good idea of the condition of our inlets.

Volunteers also conducted a watershed survey. Using digital photography and GPS points we surveyed the entire lake shoreline and documented an extensive list of erosion hazards. A land use survey determined the percentages of land in forestry, agriculture, residential and open water. We learned how many people live in our watershed, how many miles of roads exist and how many acres of forest were logged.

Results

Part of my job was to compile data and get it out to agencies and most importantly, to the volunteers and residents of Newman Lake. Some of our data is being used now to help shape decisions during the Total Maximum Daily Load (TMDL) process to reduce the phosphorus entering the lake. TMDLs are mandated by the federal government for waterbodies on the 303 (D) list and are carried out by DOE.

We continued monitoring through September 2006. Volunteers really stayed with the program and were very conscientious, producing credible data and contributing about 3,500 hours of their time. Most importantly, volunteers took ownership of the project and the data we collected. It was important to us because this is our home and we want to do what is right for our watershed.

2007 Conference Slated for Lake Chelan

Lakes – bringing community and science together

Once again, WALPA leaders are busy planning the annual WALPA conference, to be held this year at Campbell's Resort in Lake Chelan on October 18th and 19th. Over the years, the conference has been an ideal place for scientists, government agencies, managers, and lake associations to exchange ideas and compare notes on lake challenges and how to approach them (milfoil, anyone?).

Recently, though, conference organizers have noticed that a group critical to the success of any lakeside project -- lakeside communities and shoreline residents -- has been less present. While the conference will continue to provide a forum for new techniques and scientific advances, WALPA's Board wants to make sure that lakeside communities and associations know that the annual conference is also a wonderful place to learn about community involvement, emerging invasive species to monitor, and new policy initiatives to help protect our lakes.

Our mission is to provide timely and important information about lakes in our region to the people who need it, including lakeside residents. That's why this year's conference theme is "Lakes – bringing community and science together." Working together, we have a much better chance to protect the lakes in Washington and Idaho.

The Chelan conference is starting to take shape. Topics to be covered will include: Total Maximum Daily Loads, Phosphorus and Lakes, Volunteer Programs, and everyone's favorite, Blue-green Algae. Please visit our new website at **www.walpa.org** for more information as plans progreses, or contact Beth Cullen at **206.263.6242**. We look forward to seeing you in Chelan in 2007!

Lake services directory planned

Beginning this year, WALPA plans to publish a directory of businesses that offer water-related services and products. Each listing will include the business name, a contact person, phone number, email or website address, and geographic area served. Categories will include consulting and engineering, plant and algae management, and products and supplies; listings will cost a small fee to offset printing charges.

Please contact Sally Abella at **206.296.8382** or **sally.abella@metrokc.gov** if you would like to list your business or to suggest a business we should contact about the directory.

New rates offered for lake association members

To encourage lake associations and lakeshore communities to join WALPA, a new low rate for individual membership–only $10!–has been added for those who belong to lake associations that are WALPA members. Membership forms are available on the WALPA website, **www.walpa.org**. Lake association members will also be able to attend the annual conference at a discount — watch the website for more about that as the conference approaches (see related article to the left). We're eager to provide pertinent information and news to lakeshore communities through our newsletter and conference, so please join us and let us know your concerns.

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Be on the lookout for zebra mussels! By Beth Cullen

On January 7th of this year, quagga mussels, cousins of the infamous zebra mussel, were found in Lake Mead, which straddles the Arizona/Nevada border. This is 1,000 miles west of the closest quagga or zebra mussel infestation previously documented. As of January 29, the alien mussels have also been found in Lake Havasu in California and the Colorado River Basin.

This westward movement is cause for concern because the mussels are highly invasive and clog intake pipes at power plants, water treatment facilities and dams. Control can cost thousands, if not millions, of dollars.

Here's how to identify them:

- Zebra mussels look like small clams, with a yellow or brownish D-shaped shell, often with dark and light-colored stripes.
- Quagga Mussels have a rounder shape and ususally have dark concentric rings on the shell becoming paler in color near the hinge.

Zebra Mussel - Actual Size 15mm

- They can be up to two inches long, but usually are under an inch. They grow in clusters in shallow water (6-30 feet).
- Zebra mussels are the only freshwater mollusk that can attach itself firmly to solid objects like submerged rocks, dock pilings, boat hulls and intake pipes.

Quagga Mussel - Actual Size 20mm

Check out **http://www.protectyourwaters.net** for more information.

Here's how to keep aquatic invaders away:

- Wash all aquatic equipment with a 5% bleach solution and let it soak for 20 minutes, or run hot (at least 140 degrees F) water over gear, including boat engines.
- Clean and dry anything (boats, trailers, equipment, clothing, dogs) that comes in contact with waterbodies.
- Never release plants, fish or animals into a body of water unless they came from that particular body, as in catch-and-release fishing.

If you suspect you have a zebra or quagga mussel in your lake, take a digital picture of the animal and contact Pamela Meacham at the Washington State Department of Fish and Wildlife at **meachpmm@dfw.wa.gov**.

'Crawdaddy' Lament

Continued from back page

In another set of trials, I tethered interspecific pairs of crayfish outside 32 PVC shelters staked to the lake bottom. Again, I mixed the pairs by size and sex to evaluate these factors. The tether experiments also helped me evaluate differences in predation on signal crayfish and red swamp crayfish.

My underwater methods were a novel way to investigate shelter competition dynamics in crayfish, and the WALPA Nancy Weller Scholarship offset some of my field expenses. By awarding me the scholarship, WALPA also recognized the importance of crayfish in our lakes and ponds – and their keystone position in freshwater ecosystems generally. I look forward to presenting the results of my work at the October WALPA conference in Lake Chelan. Keep up the good work WALPA, and thank you!

Bioturbation by fish

By Karl W. Mueller, Certified Fisheries Professional, AFS, Chimaera Endeavors

In the last two issues of Waterline, Bruce Bolding of the Washington Department of Fish and Wildlife (WDFW) shared his experience studying common carp at Green Lake in Seattle and removing them per WDFW's management plan. Did you know that benthivorous fish, like common carp, can resuspend up to five times their body weight in sediments daily? In fact, the concentration of inorganic suspended solids increases linearly with increasing biomass of benthivorous fish (think about the effect of a 30-lb common carp). The resuspension of sediments considerably increases turbidity, which affects algal biomass and plant growth. Aquatic plants can be 'smothered' as suspended sediments settle on them. Furthermore, as benthivorous fish root on lake bottoms, existing vegetation is disturbed and new aquatic plants find it harder to grow. In the end (pun intended), benthivorous fish stimulate algal blooms by acting as a nutrient pump between the sediment and the water column (increasing levels of total phosphorous and chlorophyll-a) and by occasionally feeding on Daphnia that would otherwise eat algae. Little wonder that Green Lake lives up to its name. Good luck, Bruce!

Source: Scheffer, M. 1998. Ecology of Shallow Water Lakes. Chapman and Hall, London.

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In This Issue

Gimme Shelter: The 'Crawdaddy' Lament

By Karl W. Mueller, Certified Fisheries Professional, AFS, Chimaera Endeavors

Sheltering is a critical component of crayfish life history. After spending their nighttime hours foraging and moving about, most crayfish seek refuge in an excavated burrow or crevice when daylight comes.

Native signal crayfish occupying PVC shelter during tether experiment at Pine Lake, King County

As we learned in the June 2006 *WATERLINE* (see "Red swamp crayfish impacts freshwater ecosystems"), competing over shelter is one way invasive species of crayfish displace native ones. Much of the experimental work on these interactions has been done in the lab, but as the 2006 recipient of the WALPA Nancy Weller Scholarship, I had the privilege of investigating shelter competition between our native signal crayfish *Pacifastacus leniusculus* and the invasive red swamp crayfish *Procambarus clarkii* in the field.

Last summer, I spent my vacation 10 to 12 feet underwater, for 3 to 6 hours a day, conducting experiments in Pine Lake on King County's Sammamish Plateau. The work was completed in partial fulfillment of the requirements for my MS degree in Environmental Science from Western Washington University. In one set of trials, I paired signal crayfish and red swamp crayfish inside 16 enclosures on the bottom of the lake (one pair per enclosure). Within each enclosure, the contestants vied for a single PVC shelter. To make it interesting, I mixed up the crayfish pairs by size and sex to see if these factors played a role in shelter competition.

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