



Lake Steward

The newsletter of the WLR Lake Stewardship program Vol. 6, No. 4 Fall 1999

The King County Drainage Services Program

Drainage services available to help

Need assistance with a drainage problem? Start with King County's Drainage Services Section. This group can assist lake residents with several of its programs including Complaint Investigation, Facility Maintenance, Neighborhood Drainage Assistance Program, and Water Quality Compliance.

For answers to questions about stormwater, drainage requirements, flooding and water quality, just call (206) 296-1900. If the Drainage Services staff is unable to answer your question, you will be referred to someone who can assist you further.

Complaint Investigation

When a surface water flooding or water quality problem arises, the complaint investigation staff will investigate the cause and determine whether there is a program available to address the problem.

When needed, Drainage Services technicians will visit the site, meet with residents, and investigate the problem. When the investigation reveals that a more detailed analysis is required, the problem may be referred to Drainage Services engineers for review. If the problem is related to a drainage facility maintained



by Drainage Services, a work authorization correction order will be referred to the appropriate maintenance staff. In cases where there is a code violation, the problem will be referred to the appropriate enforcement group.

(continued on page 3)

1999 fecal sweep results

In August, the Lake Stewardship staff collected water samples for our second annual Fecal Sweep. The lab results are back and summer water quality was good.

Most of the King County lakes sampled had fecal coliform counts below 200 cfu/100 ml, the standard used by most park managers to assess public safety. **Angle, Killarney, Star and Trout** lakes had much lower counts in August 1999 than August 1998. **Echo Lake** was the

only lake which had high counts in both years sampled. At **Echo Lake**, substantial waterfowl use was evident at the beach during the sampling for 1998 and 1999. Therefore, waterfowl are suspected as the source of high fecal counts at the lake. For more information regarding the fecal coliform sampling event or to get specific counts for your lake, contact **Debra Bouchard** at (206) 296-1989 or debra.bouchard@metrokc.gov.

What's Inside...

- Toxic algae in my lake?2
- Pining for water quality4
- Oil and water: a recipe for pollution.5
- Upcoming events.6

Toxic algae in my lake?

This summer, the toxic algal bloom at Green Lake was reported in the news and resulted in many calls from concerned residents wondering whether something similar could happen at their lake. The bloom at Green Lake primarily consisted of the cyanobacteria called *Anabaena*.

Cyanobacteria Defined

Cyanobacteria, formerly known as blue-green algae, are closely related to bacteria. These organisms are similar in size to algae, and like algae, photosynthesize light, converting it to cellular energy and food. Additionally, cyanobacteria have a special pigment which gives them their characteristic blue-green coloration.

Blooming Algae

Algal blooms occur when favorable temperature, light, and nutrient conditions allow rapid population growth in a short period of time. Most blooms die back within a week or two, but overlapping blooms of different species may appear as one "continuous" bloom. Favorable conditions for blue-green algal blooms include water temperatures between 72-80°F, long hours of sunlight, and excess phosphorus and nitrogen in the water. These conditions typically occur in nutrient-rich lakes during the late summer or fall.

Local Lakes Bloom

Volunteer lake monitors collected water samples biweekly on

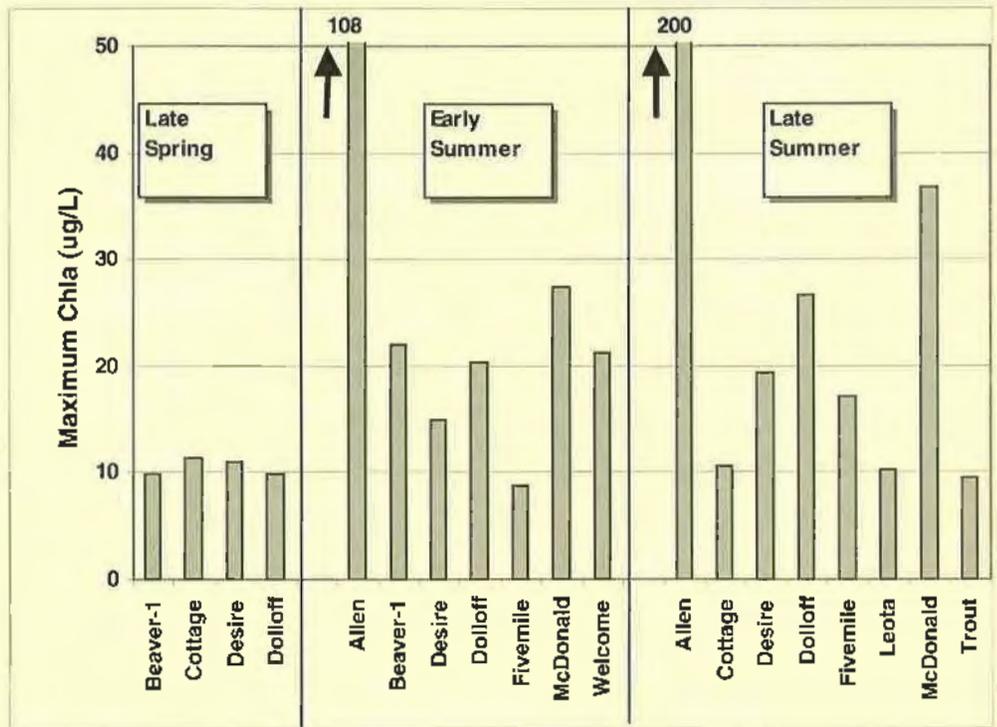


Figure 1. Bloom Conditions by Seasons at Select Lakes

40 King County lakes from May through October. These samples are analyzed for nutrients, chlorophyll *a* (chl *a*), and algae. The chl *a* and algae data are used to assess bloom conditions.

Bloom conditions are generally characterized by chl *a* concentrations greater than 8.0 µg/L and by the dominance of blue-greens over other types of algae. As illustrated in Figure 1, nine lakes exhibited these conditions. For most blooms, the cyanobacteria, *Aphanizomenon*, was dominant.

Testing for Toxicity

Anabaena, *Aphanizomenon*, or *Microcystis* (fondly referred to as "Annie," "Fanny," and "Mike") are

the most common blue-greens. These species can produce liver or neurological toxins that affect animals. These toxins can remain in the water a few days to a week after a bloom disappears.

Testing for toxicity typically involves injecting crushed algal cells into a mouse and observing the mouse for signs of poisoning. Signs of liver toxins include jaundice, shock, abdominal pain, severe thirst, and sometimes death while signs of neurological toxins include staggering, paralysis, and involuntary muscle movement.

Both types of toxins have been known to kill fish, waterfowl, or animals. No confirmed human (continued on page 6)

Drainage services. . .

(continued from page 1)

Facility Maintenance

Drainage Services staff are responsible for checking flow control and drainage facilities to ensure that standards are met and proper function is occurring. These facilities are typically ponds and underground tanks (which store and treat stormwater) or off-road ditch and culvert systems. Technicians periodically visit these facilities and assess maintenance needs. When maintenance or repairs are needed, the work is authorized by Drainage Services staff. In addition, some older facilities are retrofitted to improve performance or address identified problems.

The Neighborhood Drainage Assistance Program

Drainage problems that affect private property may be eligible for

assistance through the Neighborhood Drainage Assistance Program (NDAP). Each year funds are available through this program to fix drainage problems affecting residents in the Service Area who pay an annual surface water fee to King County.

Through the program, trouble spots are investigated and impacts are assessed. Solutions to problems are determined and costs are estimated. Then, all problems are ranked according to their severity and cost to resolve. Funding is allocated to the highest ranking projects. Over the last six years, numerous small capital projects have been constructed under the NDAP and dozens of "quick-fix" projects have been completed.

Water Quality Compliance

Drainage Services water quality engineers are available to investigate surface water quality problems.

These problems may include accidental spills, unusual concentrations of natural materials, absence of Best Management Practices (BMPs) at commercial properties, and non-point source pollution.

Water quality engineers make site visits, collect samples and investigate pollutant sources. The engineers provide advice for solving problems, make referrals to appropriate agencies, and pursue enforcement actions.

Other Drainage Services Section Programs

The Engineering Studies and Standards group at Drainage Services provides specialized technical services, including training and technical assistance for users of the King County Surface Water Design Manual. The manual sets the standards for stormwater controls that are applied to all new development in the county which exceeds minimum size thresholds. Engineers in this group also provide technical assistance to the Department of Development and Environmental Services and other County agencies.

For more information about the drainage services available to you, call (206) 296-1900 or visit King County's website at splash.metrokc.gov/wlr/lids.



Drainage Services staff regularly check flow controls are functioning properly.

Report from the shoreline

Pining for water quality

At 88 acres, Pine Lake is the largest of the glacier-formed kettle lakes atop the Sammamish Plateau. The lake is fed mainly by springs and precipitation, with one outlet stream flowing from the west side of the lake. The outlet cuts across a meadow and through a wetland, eventually dropping to Lake Sammamish.

The land surrounding the lake was logged in the early 1900s and all the remaining timber is second growth. In years past, river otters were seen in the lake, and coho, sockeye, and kokanee (a landlocked relative of the sockeye) spawned in Pine Lake Creek.

In the 1960s, native fish were killed to allow annual stocking with rainbow and German brown trout, even though the warm summer lake temperatures are not ideal for these fish. Today, fishermen frequently catch small-mouth bass.

Motorboats are allowed on the

lake. However, the 12-mph speed limit precludes water skiing.

In 1998, a brief closure of the park occurred in the summer because of high fecal coliform counts. The 1998 closure precipitated a sharp drop in both fishing and swimming, even though the Canadian geese population has been halved (in the past two years) and the coliform problem has not recurred.

Over the years, the timing of algal blooms has been erratic. Some years blooms occurred in the spring and then, after some inflow was diverted, blooms began occurring in the winter months. Spring algal blooms and a high phosphorus content in the water prompted the construction of a wetland diversion pipe in the fall of 1988. With the pipe, high phosphorus wetland inflow was diverted directly to the lake outflow. As a result of the diversion, the water level was a foot lower in

1989 than it had normally been and algal blooms eroded staff and installed a weir at the outlet stream. Lake levels rose and algal blooms were reduced.

Since 1976, the sedimentation rate in the lake has more than doubled because of intense development in the watershed, and non-wetland phosphorus inputs have increased by 2/3 in the past 10 years. A cove on the southeast arm of the lake has decreased in depth from a reported 10 feet only a few years ago to less than 3 feet now. This filling has been exacerbated by a 1988 shopping center development whose runoff enters the lake.

Waterweed surveys in 1994, 1998, and 1999 indicated that Reed Canary grass and Purple Loosestrife are gradually spreading around the perimeter of the lake.

In August 1998, an association named Friends of Pine Lake was formed for purposes of education and lake protection. Close to 150 residents have become association members. Because residents of the Sammamish Plateau voted in November 1998 to incorporate and become the City of Sammamish, King County will be turning over its responsibility for the park to the new city. Changes, both political and physical, are occurring rapidly. Residents who love this lake need to ensure that the changes do not destroy the beauty that attracted them to this place. 🐾

Thanks to Kate Bradley and Ilene Stahl for this article.



Located on the Sammamish Plateau, Pine Lake is a favorite spot for deer, fish, and people.

Limnology for the layperson

Oil and water: a recipe for pollution

As the lengthy “wet weather” season nears, it becomes timely for a discussion of the chemical make-up of stormwater running towards your lake. As rain falls through the sky, it collects dust particles from the atmosphere and pollutants from the multitude of surfaces leading to your stream, river, or lake.

Pollution Defined

What is a pollutant? A pollutant is any substance that can render water harmful to people, fish, or wildlife or impair recreation or other beneficial uses of water. The broad range of pollutants includes: metals, sediments, nutrients, toxic organic compounds, bacteria, and the focus of this article—oil and grease.

Sources of Oil and Grease

Oils and greases are common components of stormwater runoff. They can be petroleum-based or food-related (such as cooking oils). Motor vehicles are responsible for substantial amounts of the petroleum-based oils and greases.

People often think that oil and grease find their way into stormwater runoff only when people dump oil waste directly down a storm drain. While storm drain dumping is a serious problem, the petroleum found in stormwater largely originates from road surfaces (Table 1). The greater the street traffic, the higher the hydrocarbon concentrations in stormwater.

A study conducted in Rhode Island found that the oil and grease found in stormwater was primarily comprised of used crankcase oil. This oil can be deposited onto the road (creating the black line down the middle of the road) or dripped by parked cars unbeknownst to vehicle owners. When rain flows over a road or parking lot, oil and grease are washed into the storm drains or ditches, eventually finding its way to a stream or lake.

Problems with Oil and Grease

Oils and grease are known to be toxic to aquatic organisms at relatively low concentrations; they can coat fish gills, prevent oxygen from entering the water, and clog drainage facilities. Small amounts of oil or grease can have a large pollution effect. A single gallon of motor oil from an oil change can contaminate a million gallons of fresh water. A single gallon of oil dumped into a stream or river can produce an eight-acre slick. 🐸



Table 1
Mean concentrations of petroleum hydrocarbons from common sources

Source	ug/L
Parking lot	75.6
High traffic street	15.2
Med. traffic street	11.4
Low traffic street	1.72
Commercial rooftop	2.1
Residential rooftop	0.6
Residential driveway	1.8
Residential lawn	na

A Check List

What can you do to minimize pollution from oil and grease and protect your neighborhood lake?

- Fix all engine leaks promptly.
- Keep all automotive fluids off the street and your driveway.
- Recycle your used motor oil and antifreeze.

Contact **King County Household Hazardous Waste** at (206) 689-3051 or www.metrokc.gov/hazwaste, for the drop-off location nearest you.

Toxic . . .

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deaths from contact with a toxic bloom have been reported, but skin irritation and gastroenteritis have occurred in connection with toxic bloom conditions.

The mere presence of a cyanobacteria does not mean toxic conditions are present: a toxicity test must be completed to make this determination. Because of the expense, toxicity testing is usually limited to lakes where other signs of toxicity have been observed. Presently, scientists are working to better understand the

environmental conditions that cause the algae to produce toxins.

Spotting Blooms

Blue-green algae blooms can look like green, blue-green, or brown-green paint spilled across the surface of the water. Often they can be blown by the wind and will accumulate along a leeward shoreline. If you suspect a blue-green bloom is toxic, stay out of the water, keep animals and livestock from drinking the water, and contact the **Lake Stewardship Program Staff at (206) 296-6519.**

Upcoming events:

Learn Naturescaping

Saturday, November 13

Learn how to attract wildlife and protect water quality by landscaping with native plants. For more information and details on this fun and interesting workshop, please call **Greg Rabourn at (206) 296-1923.**

Native Plant Salvage

Saturday, December 4

Dig up native plants from a site slated for construction and salvage them for later use in stream restoration projects. For times and locations, please call **Greg Rabourn at (206) 296-1923.**



KING COUNTY

Department of Natural Resources

Water and Land Resources Division

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