Lake Steward

The newsletter of the WLR Lake Stewardship program Vol. 5, No. 4 Fall 1998

What are critters around your lake doing this fall?

Foraging in the foliage

Autumn is a time of preparation in the animal kingdom. Cooling temperatures and shorter days are signs that winter is coming, bringing cold, darkness, and food scarcity.

Animals have a number of strategies to prepare for winter—gathering food is foremost for many. In early summer animals gather food to feed their young. In fall the focus shifts to winter survival.

Some animals store food to eat through winter, and others simply eat more to build up fat reserves for the leaner months. Beavers sink branches into the soft mud near the lodge where they will spend the winter. Chipmunks build burrows with complex tunnels leading to nest areas and food storage, which they fill in the summer and autumn. Squirrels bury food. Occasionally a squirrel will forget where it stashed nuts or cones and a tree will sprout from that spot in the spring. Bears, deer, and raccoons all build up their fat reserves to keep from starving when food is scarce.

Some animals retreat completely from the cold and dark: in endotherms (warm blooded animals) this is called hibernation, in ectotherms (cold blooded animals) it is called brumation. The big brown bat, a common sight over lakes in the summer, is known for hibernating in buildings, but will also use caves and mines.

Amphibians brumate in existing holes created by roots or small mammals. These animals are well adapted for the cold: chemicals in their blood induce a drop in their body temperature, heart rate, and metabolism, allowing them to survive for

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Weaving the web for lake stewardship

Celebrating its fifth year of protecting King County's small lakes, the Lake Stewardship Program has published itself on the web!

Our Internet site offers information about the Lake Stewardsbip program, educational information about lakeside landscaping, caring for septic systems, dealing with weeds and many other topics. Web surfers will also find links to our County lake monitoring programs and other agencies and organizations involved in lake management. Check us out!

http://splash.metrokc.gov/wlr/waterres/lakes/kc_lakes.htm

What's inside...

Lake monitors report

Gleaning meaning from green gook

We measure chlorophyll a in our lakes for two reasons: to determine how much algae is present, and understand overall lake health.

The chemical chlorophyll a is the green pigment in plants that allows them to create energy from light—to photosynthesize. Lab analysis actually extracts chlorophyll a directly from the algal cells present in a water sample. By measuring chlorophyll we know how much algae was at a specific depth at a specific time.

Chlorophyll a, when combined with Secchi disk transparency and total phosphorus can be used in a mathematical model (called a trophic state index) to give a picture of overall lake health. By analyzing the eutrophication of a lake, resource managers learn valuable information about lake fertility, nutrients and algal growth.

Interpreting data

Using chlorophyll a data can be complicated. An individual sample can only be viewed as a "snap shot in time" at a given depth. Levels of chlorophyll a (and amounts of algae) vary in response to temperature and nutrient inputs. They can also change in response to light conditions (e.g. photo trophic response) currents, and buoyancy mechanisms.

Healthy algae constantly try to maintain chlorophyll a concentrations for maximum photosynthetic efficiency—they decrease chlorophyll concentrations during high light conditions and increase it during night or low light conditions.

To make matters more complicated, different algal species have different concentrations of chlorophyll a. Two lakes can have identical chlorophyll a concentrations, yet have significantly different algal densities because the lakes are dominated by different species. Despite these complexities, the ease of sampling and relatively low cost of analysis makes chlorophyll a a great parameter for characterizing algal conditions in a lake.

This season's numbers

Figure 1 shows summer chlorophyll a concentrations at 40 lakes taken on three summer sampling dates. Most of the concentrations range from 1 to 12 ug/l (micrograms per liter). The graph shows changes during the season in individual lakes and variability between lakes. In 16 lakes, the August sample had the highest levels of chlorophyll, yet in some lakes, the concentrations didn't follow a discrete (or seasonal) pattern due to variable influences in light, nutrients and temperature.

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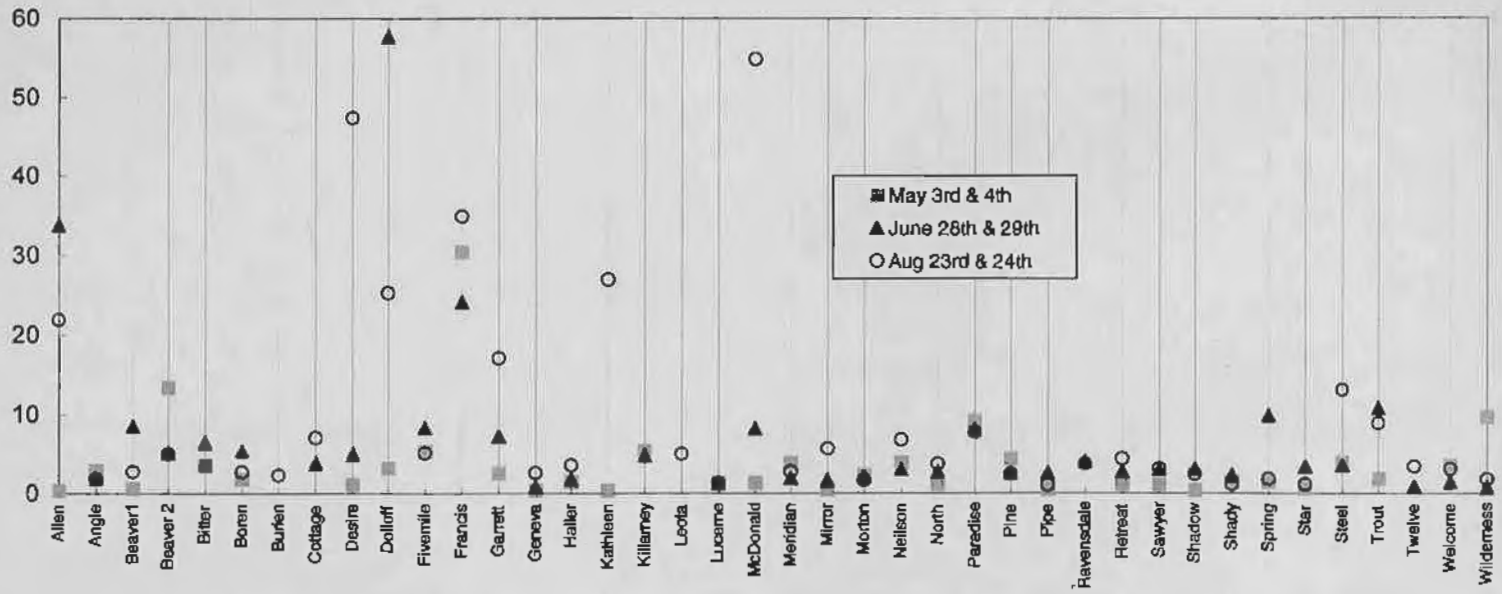
Figure 1. Three Level II Summer Chlorophyll a in ug/liter)



Gleaning meaning. . .

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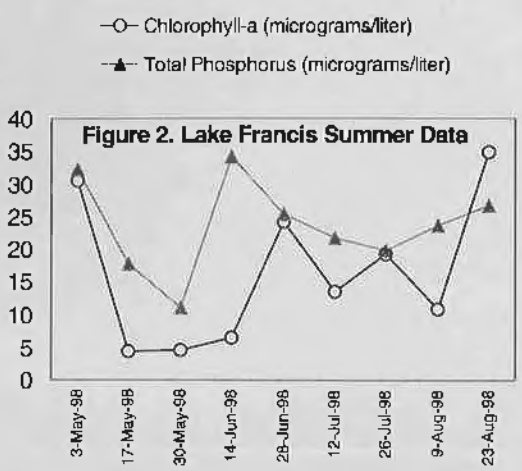
Chlorophyll a seasonal average concentrations above 10 are indicative of a eutrophic lake, a lake that has high biological productivity. The graph shows that many of our lakes could be characterized as mesotrophic or eutrophic, indicating a medium or high level of biological productively, respectively. This is consistent with our annual analysis of trophic state which has indicated that the majority of monitored lakes in King County are mesotrophic or eutrophic.

Figures 2 shows Lake Francis chlorophyll a and total phosphorus from May through August. It appears that chlorophyll a concentrations are related to phosphorus levels, which is a key algal growth nutrient.

Hopefully, seeing the varibility in data helps to demonstrate why it is important to sample frequently over the summer growing season, rather than trying to characterize a lake based on one sample at one depth. As always, we thank our volunteers for their con- tributions to quality sampling!



Think you know it all?

Take the chlorophyll quiz!

1. ***If it's called chlorophyll a, are there chlorophylls b, c and d?*** You bet! Chlorophyll a is the primary photosynthetic pigment in algae, but there are other minor pigments in algae and other plants. Chlorophyll a appears as a blue green color and chlorophyll b is a yellow green color. Other pigments in combination with chlorophyll make up the overall color we see in plants around us.

2. ***What human substance most closely resembles chlorophyll?*** Hemoglobin! The chemical structure of the chlorophyll molecule is identical to the hemoglobin molecule which is found in human blood— with the exception of their center elements. Chlorophyll has magnesium at it's center. Hemoglobin has iron at it's center – the iron gives hemoglobin its red color!

Foraging. . .

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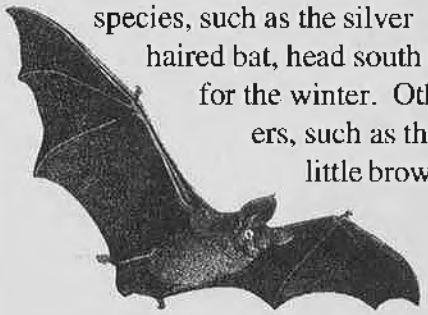
and fat stored by these animals has a low melting temperature to avoid stiffness in the cold.

Due to our mild winter weather many animals in the Pacific Northwest, such as squirrels and bears, do not technically hibernate, but become inactive in their dens or burrows, and sleep for extended lengths of time. Some animals overwinter in different forms from their summer appearance. Many butterfly species, for example, overwinter as eggs or pupae. The adults only appear during the milder summer months when nectar producing flowers are plentiful.

Other animals migrate to warmer climates. Insects provide food for birds during the warmer part of the year, but in the absence of these insects that are dependent on light and heat, insectivorous birds fly south for food.



Many of our common bat species, such as the silver haired bat, head south for the winter. Others, such as the little brown myotis, migrate hundreds of miles to communal hibernating sites.

People employ many of these same strategies for preparing for and surviving the winter months. Which one works best for you?

Thanks to Beth Mulligan, an intern with our Resource Lands Section, for this article.

Report from the shoreline

Getting a new angle on Angle Lake

Angle Lake is a 100 acre dog leg shaped lake located just south east of Sea Tac airport. The lake is about 53 feet deep, and is clear, with Secci readings of 3 to 4 meters in the spring, up to 7.5 meters in the summer.

The lake frontage is completely developed and has a public park and a boat ramp. The park swimming area is used a lot but the remaining part of the lake is not used much for recreation. The lake level changes about 3 feet a year as it fills from springs and surface runoff. It has no natural outlet — what goes in stays in if it doesn't evaporate!

In spite of the development with tidy yards and beaches, the lake provides satisfactory habitat for a variety of waterfowl. The geese and ducks are plentiful year around–of course.

In fall, winter and spring coots, mergansers, cormorants, and 2 or 3 bald eagles move in. This last summer one eagle stayed around. We also had the privilege of hosting two osprey for a couple of weeks.

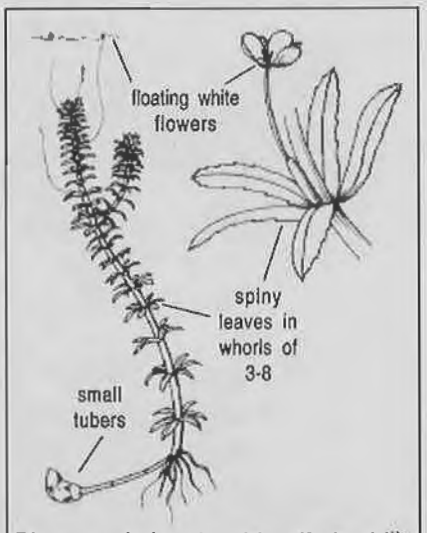
Urban Angle Lake returned to the Lake Monitoring Program this year.

Last year we heard about the volunteer lake monitoring program and thought it would be interesting to get involved and it might provide an opportunity to play a small role in maintaining and possibly improving our lake water quality. The information provided to us through the program has made us more aware of small lake environments! Collecting water sample, temperature and secci information is not difficult or time consuming.

In addition to the lake monitoring program, we volunteered for the noxious weed monitoring program. We recently completed a survey of the lake and did not uncover any really bad weeds, except a dozen patches of reed canary grass around the lake.

We plan to continue supporting these programs and inform others of these activities and what we learn!

Thanks to Ed and Jeannie Montry for this article, and for their hard work as Lake Monitors!



Characteristics that identify hydrilla

You think your garden is bad?

Surveying noxious weeds

Volunteers from 14 lakes participated in our new aquatic plant survey program this summer. A day long workshop taught how to distinguish the good native plants in lakes from the eight peskiest weeds. After the classroom session, an "on site" training was provided for each volunteer.

During August weed monitoring volunteers combed over all the plants in their lake, mapping any noxious weeds if present. Follow-up surveys will happen again next year. By keeping track of lake weeds and watching out for new infestations, spread might be controlled or prevented.

If you would like to learn more about the green things in your lake, call **Sharon Walton** at **(206) 296-8382** for more information.

Limnology for the layperson

Where do all the pondweeds go?

Patterns of growth

Lake plants have growth patterns that cycle seasonally, just like upland plants. Beginning in the spring, new plants spront (germinate) from seeds, tubers, or other reproductive structures created in the previous year. Spring is generally a time of quick plant growth, corresponding with warmer air temperatures and longer day lengths. In areas of dense plant growth, shade is created which limits the development of additional plants. Thus, plants that become established during the spring tend to dominate their area for the rest of the growing season (Figure 1).

Maximum plant growth, which is generally measured in terms of actual plant volume or weight, peaks in mid to late summer. This period is generally characterized by the completion of seed production in flowering plants (Figure 1). After reproduction is complete, plants begin to languish and eventually start to decay. As the plant's degenerate, nutrients previously bound by the plant are released to the water.

Recycling nutrients

Most aquatic plants get their nutrients from the lake sediment and are not dependent upon water column concentrations for supporting growth. During the spring and summer, plants bind up nutrients from the sediment in their cells. During late summer and into the fall, as aquatic plants die back, a large release of nutrients and organic matter can occnr. This organic matter is returned fairly quickly to the lake sediments where bacteria continue to break it down into elements which will be nsed again by germinating and growing plants next spring.

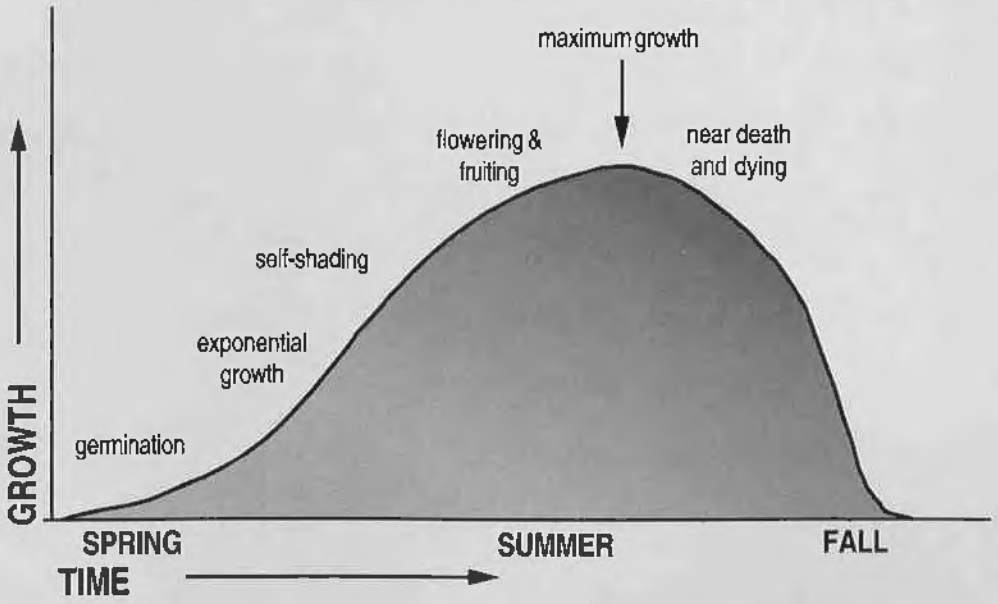
Depending upon when these nutrients are released into the water column and how they've been modified by the aquatic organisms associated with the decaying plants, an increase in algal growth may occur in open water areas of the lake. Plant decay may also result in the release of chemicals that actually inhibit the growth of algae. Most lake studies have been inconclusive or have not demonstrated a significant increase in overall nutrient loading with plant decay.

Hitchhiker's paradise

Aqnatic plants function as homes for bacteria, attached algae, and various aqnatic animals. These attached organisms are much more dependent upon the water column for their dinner. They play an important role in shoreline water chemistry, filtering out various chemical elements thereby reducing nutrient availability for open water algal growth.

So next time yon're on the lake, take a look at those plants as more than jnst weeds. Closer inspection of leaf and stem surfaces will show a variety of insects and microorganisms at work. Aquatic plants and their hitchhikers play an important role in the lakes health and natural nutrient cycling which supports larger animals including fish and waterfowl.

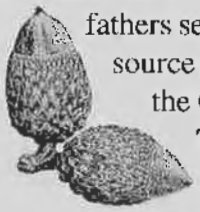
Figure 1. Seasonal cycle of plant growth and death



Touring a regional treasure

In an effort to thank Lake Monitors for their hard work, the Lake Stewardship Program hosted a field trip to explore a regional treasure...the Cedar River Watershed! Twenty-five monitors gathered in August to learn about the history and management of the watershed.

Since the area is closed to public access, opportunities to explore the watershed are limited to guided tours. Celese Brune, Seattle Public Utilities naturalist, guided the group and told how Seattle's founding fathers secured the water source partly in response to the Great Fire of 1889. The 64-acre Seattle business district burned to the ground because there was no water pressure to fight the flames!



Since then, Seattle Public Utilities acquired and has managed the land around Chester Morse Lake. Celese explained that a large native plant buffer surrounds the lake to filter surface water runoff. The area is maintained as a preserve to minimize contamination of the water source. Our monitors learned about the timber harvest controversy and discussed the effects of water supply on the salmon downstream. They talked about the towns that used to exist within the watershed, and the wildlife that still roam there. Volunteers even followed a black bear (without seeing it... only its "sign").

If you are interested in a tour of the Cedar River Watershed for your group, call **Seattle Public Utilities** at **(206) 233-1515**. Our Monitors highly recommend it!

If you have other ideas of educational programs about water quality or watershed systems for our volunteers please call **Jessica Anderson (206) 296-8008.**

King County
Department of Natural Resources

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