PORTLAND STATE UNIVERSITY

LAKE WISE

SEPTEMBER 1996

NEWSLETTER OF THE PSU LAKES AND RESERVOIRS PROGRAM AND THE OREGON LAKES ASSOCIATION

True Travel Tales

by Stephanie Weise

Participation in the Citizen Lake Watch Program, which is coordinated by Portland State University with funding from the Oregon Department of Environmental Quality, has increased this summer at a record rate. We have almost doubled the number of volunteers since last year, and have added lakes in Eastern, Central and Southern Oregon. A few lakes in the Mt. Hood National Forest are being monitored by Portland State student volunteers who hike many miles into areas accessible only by foot.

We nearly met our goal of visiting every volunteer in the program this year. Since I have never traveled to many of the lakes in the program, Mark Sytsma supplied

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Toxic Algae Bloom in Oregon

The Oregon Health Division and Klamath County Health Department posted an advisory warning on September 13, on the hazard posed by a toxic algae bloom in Klamath and Agency Lakes, near Klamath Falls.

A bloom of *Microcystis aeruginosa* resulted in microcystin concentrations that could cause acute illness or death to humans and animals if the water were ingested, even in small amounts. Microcystin is a highly potent liver toxin that destroys liver cells and may be fatal. The toxin is released when the blue-green algae cells are broken open; either through natural senescence or in water treatment. *Microcystis aeruginosa* is found in many lakes and reservoirs (including drinking water reservoirs) in Oregon, however, toxic blooms of the organism are not well documented.

Symptoms of acute microcystis poisoning include abdominal pain, nausea, vomiting, diarrhea, headache, cough, throat irritation, and blistering of mouth tissues. Little is known of the effects of long-term exposure to sublethal microcystin concentrations. For additional information contact Ken Kauffman at the Oregon Health Division (503,731-4015), or call for PSU Lake and Reservoir Program Publication 96-2, *Freshwater Cyanobacterial Toxins.*

Coastal Lakes Toured

Oregon Lakes Association (OLA) and SePRO Corporation hosted a tour of weed problems in Oregon coastal lakes on September 4, that included stops at the Tenmile Lakes and Rock Creek Reservoirs. Representatives of Senator Wyden, Governor Kitzhaber, and the Oregon Water Resources Congress participated in the tour. Mark Sytsma guided the tour.

Tour participants were flown from Salem to North Bend where they were escorted from the airport to the lake by members of the Tenmile Lakefront

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OLA Annual Meeting Scheduled

The Oregon Lakes Association will hold its annual meeting on October 19, 1996 in Lincoln City at the Community Center. Everyone interested in Oregon lakes and reservoirs is invited to attend. The agenda will include:

- Discussion of Devils Lake, OR as a case study of lake management - what went right and what went wrong.
- Pros and cons of grass carp for aquatic weed control.

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Lake Wise is available in alternate format (e.g., large type or braille) by contacting PSU Environmental Sciences and Resources.

Lake Watch Volunteers

Citizen Lake Watch depends on dedicated volunteers, who measure basic water quality characteristics in Oregon lakes and reservoirs. Lake Watch provides training to measure water temperature, Secchi transparency, and dissolved oxygen. Volunteers in the Corps of Engineers, Fern Ridge monitoring program perform additional measurements. Volunteers also assist in the early detection of *Hydrilla*. Prospective volunteers may contact Mark Sytsma (503)725-3833.

Big Creek Reservoirs: Susan Gage

Blue Lake : Koren Marthaller

Clear Lake: Elmer Waite

Cullaby Lake: Janette Goolsby

Devils Lake: Barbara Hagerman, Al Rice, Bill and Lorretta Vaughan

Diamond Lake: Ross Roberts, Chris Strahl

Fern Ridge Lake: Clarebeth Loprinzi Kassel, Joseph Kassel, Natasha Okonoji, Richard Locke, Cindy Thieman, James Bruvold, Marnee Comer, Lee Eggers, Randy Wilson

Fishhawk Lake: Jack Jenkins

Garrison Lake: Don Martin

H. Hagg Reservoir: Wally Otto

Hosmer Lake: Chuck Munson, Max Peel

Jubilee Lake: Paul Doucett

Lake of the Woods: Catherine Hayes, Katherine Kelly

Loon Lake: Richard Kaufmann, Steve Kaufmann

Mercer Lake: Ron Boehi

Morgan Lake: Yuji Matsumoto, Melinda McKibben, Dara Decker

Mt. Hood Lakes: Roy Iwai, Matthew Wood (PSU students)

Munsel Lake: Al Burhans, Roy Fisher

N. Tenmile Lake: Frank Gray, Dan Jordan, John Kelsey

Odell Lake: John Milandin and family

Penland Lake: Lee Bogle

Sunset (Neacoxie) Lake: Lee Smith

Tenmile Lake: Dean Anderson, Diane and John Barrett

Thornton Lake: Philip McFaden, Henry Pollak, Jack White

Timothy Lake: Jon Honea, Steve Mrazik (PSU students)

Woahink Lake: Bob Anderson

Program notes continued from page 1.

me with an oversize Atlas of Oregon and a note that read..."so you don't get lost." Well, he will never know just how lost I got at times; like the time that I found myself on Highway. 126 at 8:00 PM wondering why the sun was going down on the east side of the road, when I was sure I was traveling west.

Another time I was diligently looking for the wooden Girl Scout sign that marked the turnoff to Catherine Hayes' house at Lake of the Woods. As I drove along the seemingly endless, unmarked road with my eyes peeled for signs of any kind, I thought about how fun it would have been to spend the summer as a child in the wild West beside a lake in southern Oregon. As I approached a small hand-painted camp sign at the entrance of a gravel road, irrational thoughts took over. Something told me that I'd better find Catherine's house soon because it was getting dark, and well, quite frankly, I began to get real concerned. I wanted to believe the sign, which said "west camp" really meant "Girl Scouts". I proceeded down, and I mean down, a narrow, windy gravel road. The dust got thicker and the road thinner. After about a mile I decided that I couldn't possibly be on the right rode. (Catherine would have mentioned the road condition, right?) So I put the car in reverse, and backed out. To demonstrate my dexterity, I single-handedly dialed Catherine's number on my cell phone and described to her in detail what I was doing. Since I had absolutely no idea of where I had gone I couldn't tell her in any detail where I was. She kindly offered to walk up to the road and wait for me, because you can't see the lake from the road anyway.

Finally, I made it back to blacktop (I vividly remember being thankful for the blessing of blacktop), but, unfortunately, by that time I had lost my bearings altogether. The directions Catherine gave me were exacting and complete. Feeling relieved that Catherine would be waiting up at the road, I drove off with renewed confidence. After a few miles, something felt wrong. After a few more, I knew it was, and I soon found out I was headed in quite the wrong direction. Fearing that poor Catherine was waiting patiently at the road, but in desperation, I called her again. Thank goodness, she answered the phone! Her reply was sweet and concerned. "Where on earth are you girl?" When I explained the lay of the road and

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Program Notes continued from page 2

described the area, she told me in a soft and calm voice that I was on my way to California and that I'd better turn around.

Later, I gleefully drove past the Girl Scout sign and turned down the driveway my new-found friend has so clearly described to me earlier that day. Lesson learned: "Signs are not always what they seem, it depends on your perspective."

As Al and Fran Rice can testify, it wasn't the only adventure this summer. Al "taxied" me by phone, right into their driveway. They showed me a video of their resident wood ducklings hatching and hopping out of the nest that Al built. The little ones simply jump out and hope for the best!

Looking for Don and Clara Martin at Garrison Lake, I went into the local real estate office to ask about a particular road. The salesperson not only knew the address, but was the agent that sold the Martin's their home. After our visit, Clara Martin sent me on my way with a generous bag of goodies, fruit and a warm hug.

Meeting Bob and Joyce Anderson was by far the most straightforward. I simply met Bob at the dock on Woahink Lake at 9 AM sharp. Through the early morning mist that gently swept over the sleepy lake, a boater looking full of energy, wearing a soft-brim hat and heavy cotton shirt, was headed for the dock. Bob's grand smile and hand shake greeted me as I boarded his boat and we headed out to the locations where he monitors Secchi transparency, temperature, and dissolved oxygen regularly.

At the Tenmile Lakes, Dan Jordan pointed out the problem they are having with the weeds in the narrowing channel between North Tenmile and Tenmile lakes. We toured both lakes and stopped at the home of Diane and John Barrett for a cup of Diane's great coffee and a tour of their lakefront home. I'm sorry that I didn't get to meet the other dedicated volunteers on the Tenmile lakes, but hope to meet everyone at the OLA meeting in October (information on the meeting can be found in this issue of Lake Wise, and you will be getting more in the mail).

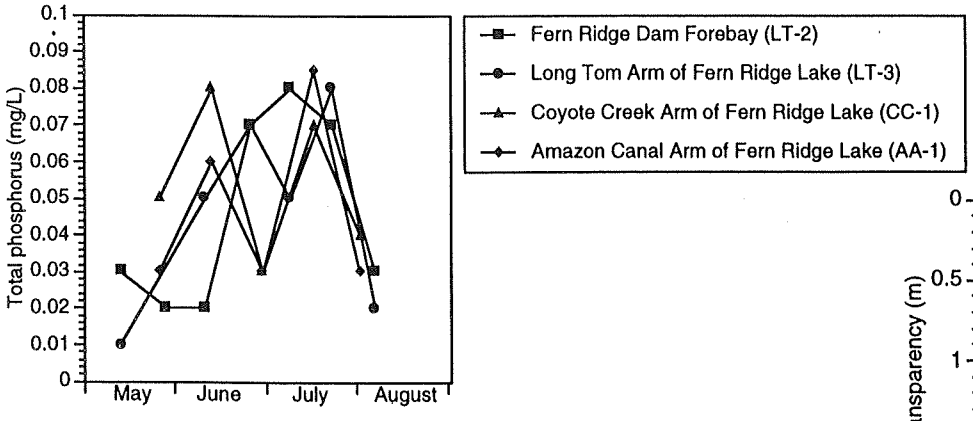
Up the coast a bit, Elmer Waite took me to the center of Clear Lake and pointed out the undisturbed surrounding watershed. He explained his concerns for the lake water quality, especially with respect to plans for future growth in the area.

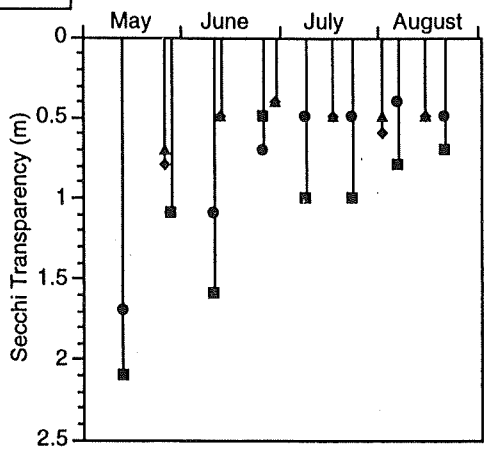
I met so many interesting people this summer, and I can't begin to cover them all. I would like to thank everyone for the warm welcome extended to me this summer. Volunteers are a special kind of people.

Please make the weekend of October 19th a Lake Watch Weekend and come to the Annual Meeting of the Oregon Lakes Association at Devils Lake. We have a lunch reserved for every volunteer and a special thank you gift. See you then.◆

Fern Ridge Monitoring

Volunteers in the Army Corps of Engineers' Fern Ridge lake monitoring program this summer have collected dissolved oxygen, pH, suspended solids, and total phosphorus data as well as the standard Lake Watch Secchi and water temperature information. Fern Ridge is a productive lake. Water transparency and total phosphorus concentration in the lake varied with location and time of year (see figures below). Data collected by volunteers at Fern Ridge will provide baseline information on the health of the lake and help the Corps manage water quality. For more information about the Corps' voluntary lake monitoring program call Jim Beal (541-688-8147).◆





PLANTS & ANIMALS

All about algae

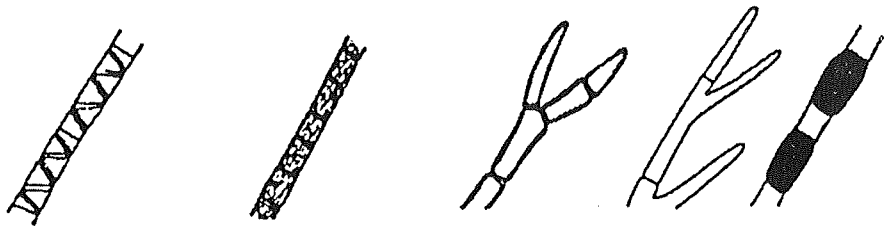
This is the second part of a two-part article based on "Identifying Algae" by Carole A. Lembi, Ph.D., Professor of Botany and Plant Pathology, Purdue University. Dr. Lembi's article appeared in the May 1996 issue of The Michigan Riparian. *Part 1 of this*

Green algae (*Chlorophyta*)

Green algae vary significantly in size and shape, though all are green, true to their name. Many species are microscopic single cells or small colonies. Although these may cause planktonic "blooms," they are considered less troublesome than the blue-green algal "blooms." Green algae most commonly considered to be weeds are the mat-forming and charoid forms.

Mat-forming greens. Mats of green algae may be attached or free-floating, and are usually conspicuous, turning yellow-green as the mats age The four major genera--*Spirogyra, Oedogonium, Cladophora,* and *Pithophora* --can be distinguished by texture. *Spirogyra* is extremely slimy, *Cladophor* is cottony, and *Oedogonium's* texture is somewhere between them. *Pithophora* is stiff and course.

Mats result from their filaments becoming intertwined. Additional characteristics of these green algae are shown in the table below.



Spirogyra *Oedogonium* *Cladophora* *Pithophora*

Mat-forming Green Algae

Charoid greens. Charoids are the most structurally complex of all the freshwater algae (including blue-green *cyanobacteria*), resembling flowering plants in their overall appearance. They have minute rhizoids that anchor them into the sediments, and appendages that look like stems and leaves but are not. Like all other algae, charoids have no conducting tissue.

The two charoid genera are *Chara* and *Nitella*. *Chara* is a more frequent problem in lakes than is *Nitella* because *Chara* can tolerate alkalinity (pH above 7.5), typical of so many lakes.

The majority of *Nitella* species are found in waters of pH 5 to 7 and with calcium concentrations of less than 100 milligrams per liter (mg/l). The apparent reason for this is that *Nitella* requires carbon dioxide (CO_2) as its carbon source for photosynthesis. As pH and water hardness increase, CO_2 concentrations decrease and bicarbonate becomes the most abundant from of carbon.

In waters of pH 7 to 9 and with calcium concentrations of 100 mg/l *Chara* apparently can switch to bicarbonate as its carbon source when CO_2 becomes limiting; *Nitella* can not.

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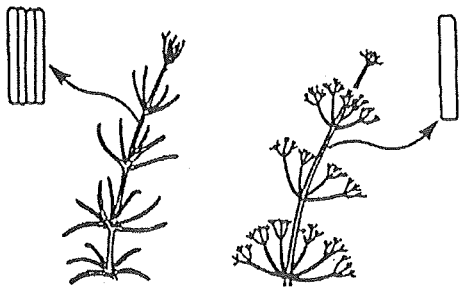
Characteristics of Four Common Filamentous (Mat-forming) Green Algae

	Spirogyra	*Oedogonium*	*Cladophora*	*Pithophora*
Habitat	free-floating	free-floating, often clinging to macrophytes	attached or free-floating	free-floating
Seasonality (Northwest)	spring & summer	all year	spring & summer	summer & fall
Texture	slimy	slimy-cottony (intermediate)	cottony	coarse
Visible features	bright green	yellowish green	branched	branched with akinetes
Microscopic features	unbranched long cells	unbranched short cells	branched long cells	branched long cells

Algae continued from page 4



Chara *Nitella*

Charoid Green Algae

However, *Nitella* is sometimes found in alkaline waters. It can attach to seawalls where wave action ensures its exposure to atmospheric CO_2, for example. In areas with acidic to neutral waters where both genara are found, *Chara* tends to grow taller than *Nitella*.

Euglenoid Algae (*Euglenophyta*)

All Euglenoids are unicellular and microscopic. They have a single flagellum, so they can move to or away from various stimuli, in an indirect fashion. Although most are green, they are known for the brick-red to brown colored water commonly caused by some species. Euglenoids are very commonly found in organically polluted water such as runoff from feed lots. This is because they can derive energy from organic compounds when not using photosynthesis. Many zoologists consider them to be animals rather than plants.

Golden-brown Algae (*Chrysophyta*)

This group of algae is very diverse, with three major subdivisions. These are the yellow-greens, the true golden-browns, and the diatoms.

Yellow-greens. *Vaucheria* is the only yellow-green of interest as an aquatic weed. This is due to its mat-forming filamentous nature. It appears to be extremely resistant to algicides. Heavy applications of the pesticide diuron have apparently resulted in selection of resistant strains in some parts of Europe, where it has become a serious problem. In the United States *Vaucheria* is present throughout the Midwest, but has not yet become a problem. Because *Vaucheria* mats are green in color they may be difficult to distinguish from mats of green algae. One way to distinguish them is to expose some filaments to iodine, which turns blue-black in the presence of starch. If they turn light-brown, the mat is probably *Vaucheria* ; if the filaments turn black, the mat is probably a type of green algae, which stores starch. The yellow-green algae do not store starch.

True golden-browns. The true golden-browns are microscopic. They can be unicellular or colonial. They can bloom in the plankton and are one of the three algae known to cause foul taste and odor. (The other two are blue greens and diatoms.) The color of true golden browns is... golden brown. They do swim.

Diatoms. The diatoms are one of the most abundant life forms, in numbers and in diversity. They live in both marine and freshwater. Although they are essential to life as we know it, providing about 40 percent of the world's carbon fixation into organic materials (and the base of the marine food chain), diatoms are often considered a nuisance. They cause brown algal blooms, taste and odor problems, and they clog filters. In lakes they tend to bloom primarily in the spring, when temperatures are cool and silica is plentiful from runoff for their silicaceous cell walls.

Except for *Melosira*, a common late summer and fall bloomer, diatoms tend not to persist into the summer, and are considered less noxious than blue-greens. However, they often have a longer season of growth in cold water lakes where an abundance of silica and other nutrients are available.

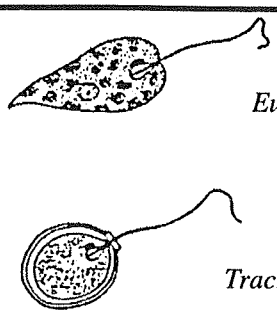
Guides to Identifying Algae

Paperback books on the identification of algae, that include keys and diagrams, are:

Whitford, L.A. and G.J. Schumacher. 1973. *A Manual of Fresh-Water Algae*. Sparks Press, Raleigh, North Carolina.

Pentecost, A. 1984. *Introduction to Freshwater Algae*. Richmond Publishing Co., Orchard Road, Richmond, Surrey, England.

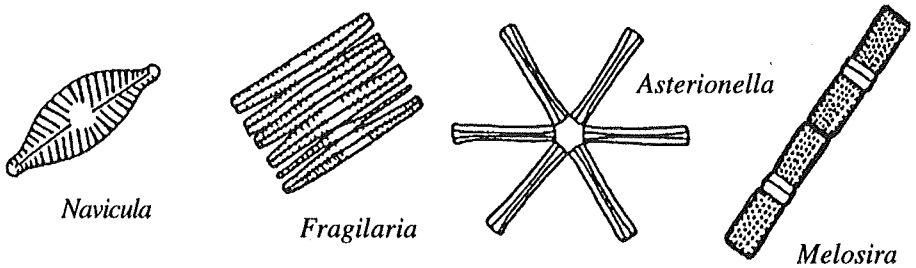
The Pentecost book is available from the Mad River Press; Rt.2, Box 151-B/141 Carter Lane; Eureka, CA 95501. The Whitford and Schumacher book is generally more detailed, especially on planktonic algae.◆



Euglena

Trachelomonas

Euglenoid Algae



Navicula *Fragilaria* *Asterionella* *Melosira*

Diatoms (Golden Brown Algae)

Mercury in Ten Mile Lakes

Elevated concentrations of mercury were found in Bluegill and Largemouth Bass collected from the Ten Mile Lakes, near Lakeside, Oregon, according to a preliminary study recently completed by the Oregon Departments of Environmental Quality (DEQ) and Fish and Wildlife (ODFW), and the Oregon Health Division.

Mercury Measurements in Fish

This spring, ODFW collected 10 bass and 10 Bluegill from each lake. In August, 1995, the Department of Environmental Quality caught 9 Largemouth Bass. The fish fillets were analyzed for total mercury content. The mercury concentration was lower in the Bluegill than in the bass. The Bluegill caught ranged in size from 5 to 6 inches in length, and had tissue mercury concentrations that ranged from 0.08 to 0.15 parts per million (ppm). The Bass caught ranged in size from 7.5 to 18 inches, and had concentrations of mercury in their fillets from 0.2 to 1 ppm. Nine bass, that weighed more than two pounds, however, did have elevated (greater than 0.4 ppm) mercury concentration in their tissues. The Department of Environmental Quality plans to sample more bass from the lakes this fall, in order to increase the sample size of larger fish.

At this time, the Health Division has no plans to post an advisory for the Ten Mile Lakes because the average concentration of all fish tested was below the Health Division's screening value. The Health Division uses guidelines developed by the Environmental Protection Agency to determine whether tissue levels of mercury are hazardous. If the average tissue concentration of mercury for all fish tested from a lake is greater than 0.35 ppm, the Health Division will post an advisory, that recommends consumption of a limited number of fish from that lake. Children and fetuses are most sensitive to the effects of mercury, so children under six, and pregnant women are advised to be more conservative about their fish consumption.

For perspective, the Federal Food and Drug Administration restricts interstate commerce of fish that have mercury concentrations of one ppm or higher. The tuna in yesterday's sandwich might indeed have a higher mercury concentration than a medium sized bass from Ten Mile Lake. If you are concerned about the mercury concentrations in Ten Mile bass, you may want to limit the number of meals of large bass that you eat. Small bass and bluegills should not pose a hazard.

Mercury Bioaccumulation

In general, fish are relatively tolerant to mercury compared to other species. They concentrate mercury from the food in their diet, so predatory fish have higher mercury concentrations than non-predatory fish. Because fish concentrate mercury in their tissue, and do not readily excrete it, larger fish generally have higher mercury concentrations than smaller fish. Fish at the top of the food chain, which eat a diet of larger fish, have the highest mercury concentration in their tissues. These generalities were demonstrated in the fish from Ten Mile lakes; the Bluegill tissue concentrations were lower than the Largemouth Bass, and the larger the bass, the higher the mercury concentration. Because the mercury is stored in the fillet or muscle tissue, no particular cleaning or cooking techniques will decrease the mercury eaten.

Sources of Mercury

Several lakes in Oregon have fish with elevated mercury levels. Mercury is naturally present in the rocks in some areas of Oregon, and is often found with gold and silver deposits. In some places, mercury is present in high enough concentrations that mercury mining was economically feasible until the early 1960s. High mercury content in the watershed has led to high tissue mercury concentration in fish from several Oregon Reservoirs, such as Cottage Grove, Dorena, and Owyhee. Volcanic history and thermal vents are thought to be the source of elevated mercury concentrations in fish from East Lake, in the Newberry Crater; however, these factors alone are not the sole determinants of mercury content. Fish from Paulina Lake, which is beside East Lake in the Newberry Crater, have very low mercury levels. The geology of the Ten Mile Lakes system differs from regions in Oregon with high mercury conten., The somewhat elevated fish tissue concentrations in the Ten Mile Lakes were not expected and cannot be readily explained.

Samples from a sediment core obtained in the recent Ten Mile Lake sedimentation study were also analyzed for mercury. The sediment concentration of mercury was below the detection limit for the analysis (0.04 ppm). The results were from a single core, taken at a single site, so mercury may be present at higher concentrations at other sites in the lake. Mercury may also be present only at very low concentrations in the Ten Mile watershed. Levels that are too low to measure may still lead to bioaccumulation and result in high mercury concentration in fish tissues.

If you would like more information about mercury in Oregon's lakes, contact Avis Newell, at the Department of Environmental Quality ((503-229-6018). For more information about the health effects of mercury, or about consumption advisories posted on Oregon lakes, contact Ken Kauffman at the Oregon Health Division (503-731-4015).◆

Devils Lake Manager Hired

The Devils Lake Water Improvement District (DLWID) has hired Bob Storer as Manager. Storer replaces Dave Wagner who was with the DLWID for five years.

Originally from Wisconsin, Storer has a degree in both Water Resources and Fisheries Management. For the past seven years he has been a Senior Water Quality Specialist for King County Surface Water Management, in Seattle. In that position, Storer managed lake and watershed restoration projects, integrated aquatic plant management plans, and co-led a lake stewardship program. While in Washington he was also an active member of the Washington State Lake Protection Association.

Storer is excited to play a role in carrying out lake improvement measures in the unique Devils Lake watershed. He said he was drawn to the DLWID Manager position by the location and by the opportunity to focus his work on one lake watershed. The lake is important to Lincoln City and Storer was impressed with the priority the lake has received.

Devils Lake appears to be in transition and increased attention is needed to the watershed and the impacts associated with growth and development. One of the big challenges Storer sees is to develop a targeted public involvement and education program that will 1) inform residents and lake users of the impacts their daily activities have on the lake; 2) provide alternative best management practices to reduce and control nutrient and sediment loads to the lake; and 3) motivate changes in behavior.

Storer's other priorities will be monitoring changes in lake quality and the aquatic plant community, isolating and controlling nonpoint sources of pollution, and managing the district. Storer said he also wants to establish a watershed management committee (WMC) to provide a mechanism for coordination and a forum for communication among stakeholders, as various problems and potential solutions involving the protection and management of Devils Lake and its watershed are considered. Committee members could include local interest groups, major landowners, and public agencies.

Storer said he believes every lake is a reflection of its watershed and is unique. Aquatic plants play an important role in the health and balance of a lake. Too few can lead to an unproductive fishery and algal blooms. Too many plants can also degrade beneficial uses. The challenge is to maintain that delicate balance. Lake management must involve everyone in the watershed and requires a long term commitment and investment.

Storer, his wife Beverly, and their two cats are very excited about moving to the Oregon coast. They are expected to arrive in mid-September. Storer said he is also looking forward to meeting and working with more Oregon Lakes Association members.

Bob Storer can be reached at the Devils Lake Water Improvement District at 503-994-5330.◆

Crater Lake Featured

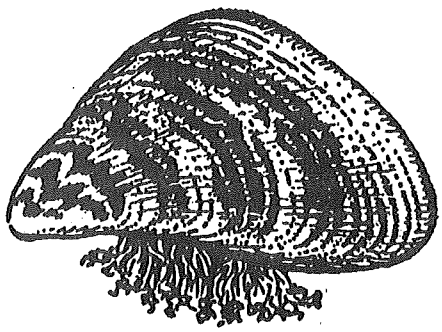
Oregon's Crater Lake was the focus of a series of papers published in Lake and Reservoir Management, the journal of the North American Lake Management Society. The papers cover the results of a 10-year limnological study of the lake coordinated by Dr. Gary Larson. The papers include discussion of the optical properties, physical and chemical characteristics, phytoplankton, zooplankton, and fish populations of Crater Lake. For further information consult volume 12, No. 2 of the journal, published in July, or contact Dr. Larson (541-737-1498).◆

Zebras In Oregon

Zebra mussels were found on a boat leaving Oregon at the Hornbrook, CA border inspection station on June 19. The 20-ft boat was in transit across Oregon. It originated in Gabrolter, Michigan and was in route to Dana Point, California.

The boat had been out of the water through the winter, and all 100 zebra mussels on the boat were dead.

Zebra mussels are an nonnative, freshwater mussel, which unlike native mussels grows attached to surfaces – boat hulls, fish screens, insides of pipes to irrigation systems, municipal water treatment plants, powerplants, and hydroelectric facilities.



Zebra Mussel

Zebras mussels have caused millions of dollars of damage to water systems in the Midwest and eastern United States. If mussels are found attached to surfaces, call Al Smith at the Oregon Department of Fish and Wildlife (503-872-5252 ext. 5426).◆

DEQ Lists Water Quality Limited Lakes and Reservoirs

The Department of Environmental Quality recently released the final 1994/96 303(d) List. This list contains approximately 870 waters which do not meet water quality standards for which further action is needed to restore their water quality. This list included 30 lakes and reservoirs. In addition, 66 lakes and reservoirs were identified as being of potential concern for which further data is needed. Four (4) lakes (Clear Lake, Collard Lake, Garrison Lake and Lake Oswego) have Total Maximum Daily Loads for phosphorus established and approved by the U.S. Environmental Protection Agency and are in the process of being implemented. A summary of the lakes and lake concerns is provided below.

This list is to be updated on a two year cycle (April of even numbered years) and is to serve as the basis for the Department to set priorities for developing Total Maximum Daily Loads (TMDLs) or management strategies to bring waters back into compliance with water quality standards. Priority waters that are being targeted over the next two years (4/96 - 4/98) for TMDLs do not include any lakes. Waters targeted for TMDLs are: Columbia Slough, Grande Ronde River, Klamath River, South Umpqua River, and Umatilla River. Several lakes have been prioritized for further study pending availability of funding and include: Klamath Lake, Devils Lake, Tenmile Lakes and Clatsop County Lakes.

In developing the list, several major concerns relative to lakes were identified. A major concern is the lack of recent data to assess conditions and trends on most lakes and reservoirs in Oregon. In developing the list, the Department relied on studies conducted on Clean Lake Program funding (which has been eliminated in recent federal budgets) such as lake restoration studies, lake inventories and monitoring conducted under the Citizen Lake Watch Program and those conducted through funding of federal agencies (U.S. Forest Service, Army Corp of Engineers).

Major concerns identified for lakes on the 303(d) list or for those lakes where TMDLs have been developed include: nuisance aquatic growth (algae, weeds, high pH, high nutrients, low dissolved oxygen (DO) which was listed for 28 of 34 lakes (82%); elevated mercury which was listed for 4 of 34 lakes (12%); and habitat and/or flow modification, sedimentation or elevated turbidity which was listed for 4 of 34 lakes (12%).

The list is currently reopened for comment until November 1, 1996. Given the amount of public interest and the volume of previous comment (the Department received over 400 comments), the Department has decided to reopen the list for further public comment from August 14 through November 1, 1996. The Department is interested in receiving additional water quality data on waters within Oregon and information that will assist in identifying water quality limited waterbodies. Contact Andy Schaedel for additional information (503-229-6121).◆

303(d)-listed Lakes and Reservoirs

BASIN LAKE	303(D) LISTED PARAMETER	OTHER CONCERNS IDENTIFIED[1]
Deschutes Basin:		
Antelope Flat Reservoir		Nutrients, Temperature, Turbidity
Billy Chinook Reservoir		Algae, Bacteria, pH Nutrients
Crane Prairie Reservoir		Aquatic Growth, Flow Modification, pH
East Lake	Mercury	
Haystack Reservoir		Nutrients
Ochoco Reservoir		Algae, Nutrients, Mercury, Turbidity
Odell Lake	pH	Chlorophyll a
Prineville Reservoir		Habitat Modification, Sediment, Temperature, Turbidity
Simtustus Reservoir		Algae, Bacteria, Nutrients, pH
Suttle Lake		Chlorophyll a, Nutrients, pH
Wickiup Reservoir		Flow Modification, pH
Goose and Summer Lake Basin:		
Cottonwood Meadow Reservoir		Aquatic Growth, Nutrients, pH
Crump Lake		Algae, Nutrients
Dog Lake		Algae, DO Nutrients
Drew Valley Reservoir		Algae, DO, Nutrients, Temperature
Hart Lake		Nutrients

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303(d)-listed Lakes and Reservoirs (continued)

BASIN LAKE	303(D) LISTED PARAMETER	OTHER CONCERNS IDENTIFIED[1]
Thompson Reservoir		DO, Nutrients, Temperature
Grande Ronde Basin:		
La Grande Reservoir		Algae, Temperature
Morgan Reservoir		DO, Nutrients
John Day Basin:		
Magone Lake		Algae, DO, pH
Klamath Basin:		
Agency Lake	Chlorophyll a, DO,	Nutrients, Sediment, pH
Bumphead Reservoir		Algae
Devil Lake		Algae, Nutrients
Gerber Reservoir		Algae, Nutrients
Klamath Lake	Chlorophyll a, DO,	Nutrients, Sediment, pH, Temperature
Lake of the Woods		Aquatic Growth, Bacteria, Nutrients
Lost River Reservoir	Chlorophyll a, DO, pH	Nutrients
Hyatt Reservoir		Algae, Nutrients
J.C. Boyle Reservoir	Chlorophyll a, DO, pH	Nutrients
Obenchain Reservoir		Algae, DO, Nutrients
Round Valley Reservoir		Algae, Nutrients
Spring Lake		Algae, Nutrients
Willow Valley Reservoir		Algae, Nutrients
Malheur Lake Basin:		
Chickahominy Reservoir		Algae, Nutrients
Delintment Lake		DO
Mann Lake		Algae, DO, Nutrients
Rock Creek Reservoir		Algae, Nutrients
Malheur River Basin:		
Beulah Reservoir		Nutrients
Bully Creek Reservoir		Algae, DO, Nutrients, pH, Turbidity
Cottonwood Reservoir		Nutrients
Malheur Reservoir		Algae, DO, Nutrients, pH
Warm Springs Reservoir		Nutrients, Turbidity
Mid Coast Basin:		
Clear Lake		Phosphorus[2]
Collard Lake		Aquatic Weeds, Algae, DO, Phosphorus[ii]
Devils Lake	Chlorophyll a, pH	Nutrients
Eckman Lake		Algae, DO, Nutrients, pH, Sediment
Mercer Lake	Aquatic Weeds, Algae	DO, Nutrients, pH
Siltcoos Lake	Aquatic Weeds, Algae	
Sutton Lake		Aquatic Weeds, DO, Nutrients
Tahkenitch Lake	Aquatic Weeds	
North Coast Basin:		
Cape Meares Lake		Aquatic Weeds
Cullaby Lake	Aquatic Weeds	Nutrients
Lytle Lake	Aquatic Weeds	
Smith Lake	Aquatic Weeds	Nutrients
Sunset Lake	Aquatic Weeds	Bacteria, Nutrients
Owyhee Basin:		
Antelope Reservoir	Mercury	Algae, Nutrients
Owyhee Reservoir	Mercury	Algae, DO, Nutrients, Temperature, Toxics
Upper Cow Lake		Algae, Nutrients
Powder Basin:		
Thief Valley Reservoir		Algae, DO, Flow, Modification, Nutrients, Sediment, Temperature

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303(d)-listed Lakes and Reservoirs (continued)

BASIN LAKE	303(D) LISTED PARAMETER	OTHER CONCERNS IDENTIFIED[i]
Unity Reservoir		Algae, DO, Nutrients, pH, Sediment
Rogue Basin:		
Agate Reservoir		Algae, DO, Nutrients
Emigrant Reservoir		Nutrients, Sediment, Turbidity
Fish Lake	Chlorophyll a, pH	
Reeder Reservoir	Sediment	
Willow Creek Reservoir		Algae, DO, Nutrients
South Coast Basin:		
Beale Lake		Habitat Modification
Bluebill Lake		Habitat Modification
Eel Lake	pH	Turbidity
Floras Lake	Aquatic Weeds	
Garrison Lake		Aquatic Weeds, Algae, pH, Phosphorus[ii]
Horsefall Lake		Algae, Nutrients, Sediment
Sandpoint Lake		Habitat Modification, Nutrients
Snag Lake		Habitat Modification
Spirit Lake		Habitat Modification, Algae, Nutrients
Tenmile Lake	Aquatic Weeds, Algae	DO, Nutrients, Temperature
Tenmile Lake (North)	Aquatic Weeds, Algae	DO, Nutrients
Umatilla Basin:		
Cold Springs Reservoir		Nutrients
McKay Reservoir		Algae, pH
Willow Creek Reservoir		Algae, Nutrients, pH
Umpqua Basin:		
Diamond Lake	Algae, pH	Nutrients
Lemolo Reservoir	Algae, pH	
Willamette Basin:		
Blue Lake	Algae, Weeds, pH	DO, Nutrients
Blue River Reservoir		Sediment
Bybee Lake	Flow and Habitat Modification, Algae, Weeds, pH, Biological Criteria	Nutrients, DO, Toxics
Cottage Grove Reservoir	Mercury	Sediment
Cougar Reservoir		Sediment, Temperature
Detroit Reservoir		Algae, Bacteria, Sediment, Temperature
Dexter Reservoir		Nutrients, Sediment, Temperature
Dorena Reservoir		Mercury, Sediment
Fairview Lake	Phosphorus	Turbidity
Fall Creek Reservoir		Sediment
Fern Ridge Reservoir	Bacteria, Turbidity	Algae, Habitat Modification, Nutrients, Sediment, Temperature, Toxics
Hills Creek Reservoir		Sediment
Lookout Point Reservoir		Nutrients, Sediment, Temperature
Oswego Lake		Algae, DO, pH, Phosphorus[ii], Bacteria
Skookum Lake		Bacteria, Sediment
Smith Lake	Flow and Habitat Modification, Algae, Weeds, pH, Biological Criteria	Nutrients, DO, Toxics
Sturgeon Lake		Algae, Bacteria, Flow, Modification, Nutrients, Sediment, Temperature
Timothy Lake		Bacteria, Nutrients, Sediment

[i]Based on information contained in "1988 Oregon Statewide Assessment of Nonpoint Sources of Water Pollution" (DEQ, 1988)
[ii]Total Maximum Daily Load (TMDL) has been established, approved by USEPA and is in the process of being implemented

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Lake Tour continued from page 1

Owners Association (TLOA). Tenmile Lake aquatic weed problems were explained by members of TLOA and the Tenmile Lakes Basin Partnership, the local watershed council.

The tourists then flew to Newport where they met with Newport Public Works Department officials to discuss problems with weed and algae growth in the City's water supply reservoirs.

Despite threats of rain, skies were clear during the flight, and the participants got a bird's-eye view of Eel, Tahkenitch, Siltcoos, Woahink, Munsel, Clear, Mercer, and numerous other lakes along the coast.

After returning to Salem, SePRO hosted a lunch. Terry McNabb, Immediate Past-president of the Aquatic Plant Management Society, gave a presentation on integrated aquatic plant management techniques.

During the discussion that followed it became very clear that state funds available for lake and aquatic weed management are extremely limited. Targeted fees (such as additional fees on boat registration, fishing, and boat trailer licences) were discussed as a method of raising the funds needed to begin to deal with aquatic weed and algae problems in Oregon's lakes and reservoirs.

Implementation of this approach will clearly require a major effort by everyone interested in better lake and reservoir management in Oregon. Anyone interested in development of a lake and aquatic weed management program in Oregon can contact Mark Sytsma [at 503-725-3833 (days) 638-7045 (eves)].◆

OLA Meeting continued from page 1

- Lake association presentations on problems, and a panel of state agency representatives to answer questions.
- Options for lake management program development in Oregon.
- Post-meeting picnic on the shores of Dvils Lake.

Registration costs are $30, which includes lunch and Individual membership dues in OLA.

For additional information and registration forms contact: Andy Schaedel (503-229-6121/ Andrew.L.SCHAEDEL@state.or.us) or Mark Sytsma (503-725-3833/ mark@sbii.sb2.pdx.edu).◆

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Stan Geiger (503) 274-9000

Oregon Lakes Association

The Oregon Lakes Association is nonprofit organization dedicated lake protection and management in Oregon. As a chapter of the North American Lake Management Society, OLA provides a link to an international network of individuals and groups with an interest in lake management. For additional information on OLA, to get involved, or to obtain a membership application form contact one of the people listed or write to:

OLA
PO Box 345
Portland, OR 97207

A voice for quiet waters

CALENDER

September 26-28, 1996
Washington Lake Protection Association. Technical and nontechnical sessions for lake residents and managers. Spokane, WA. Contact Dave Lamb (509)536-9676.

October 7-8,1996
2nd Annual Pacific Northwest Water Issues Conference. Portland, OR. Contact Oregon Water Resources Institute (541)737-4022; owrri@css.orst.edu.

October 19, 1996
Oregon Lakes Association. Lincoln City, OR. Contact Andy Schaedel (503)229-6121.

October 23-25, 1996
Oregon Vegetation Management Association Convention. Westside Story. Newport, OR. Contact OVMA, 421 E 7th, Courthouse Annex B, Rm 218, The Dalles, OR 97058

November 13-16, 1996
North American Lake Management Society. People, Lakes & Land: Puzzling Relationships. Bloomington, MN. Contact NALMS, POB 101294, Denver, CO 80250.

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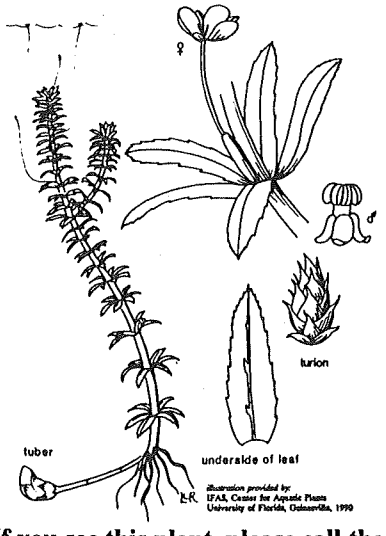

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