PORTLAND STATE UNIVERSITY

LAKE WISE

December 1997

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

Toxic Bloom in Tenmile Lakes

A bloom of toxic algae, *Microcystis aeruginosa*, occurred in the Tenmile Lakes, located between Reedsport and Coos Bay, this fall. The bloom was first reported by Jennifer Hampel, the Watershed Coordinator for the Tenmile Basin Partnership, who sent a sample to Michael Crayton at Pacific Lutheran University for bioassay. The toxicity of the bloom prompted the Oregon Health Division and the Coos County Health Department to issue an advisory to lake users to avoid contact and drinking water from the lake.

Blooms of cyanobacteria (*Microcystis* and other "blue-green algae" are really photosynthetic bacteria and not true algae) are a function of a number of environmental and biological factors. A warm and stable water column, and specific ratios of nitrogen to phosphorus in the lake all contribute to bloom formation.

Microcystis produces a potent hepatotoxin, microcystin, that causes liver damage. Toxicity testing on pigs found that concentrations as low as 0.28 ug/kg/day cause liver damage. This level of consumption for a 10-kg child, drinking 1 L/day, equates to a water concentration of 2.8 ug/L. Currently, there is no drinking water standard for microcystin in the U.S. Other countries have adopted a guideline of 1 ug/L. Maximum concentration measured in the Tenmile Lakes was 1.65 ug/L. Microcystin is also a carcinogenic, but the "no-effect-level" for carcinogenicity has not been determined.

Continued on page 4

New Zealand Mudsnail Invades Columbia River

A new snail species has been found in Youngs Bay at the mouth of the Columbia River. As it's name implies, the New Zealand mudsnail (*Potamopyrgus antipodarum*) originated in New Zealand but has spread throughout Australia, Asia and Europe.

The NZ mudsnail is a fecund, live-bearing species, that was formerly only known to infest the Madison River above Hebgen Lake in Montana and the Snake River between Shoshone Falls and the C.J. Strike

Continued on page 3

Lake Watch News

by Jody Oliver

The 1997 data collection season is winding down. Though some CLW volunteers continue to collect data year round, many prefer to stay inside and off the lake during the cold, winter months. Current numbers for 1997 show that the volunteers have donated over 465 hours, collecting temperature, Secchi, turbidity, and pH data; a few volunteers have also collected special water samples for analysis.

I hope by now all the Citizen Lake Watch Volunteers have received your hats and certificates. We wanted you to know that the data you collect is an important and valuable tool in determining the status of Oregon's lakes. Your time and dedication are appreciated. If you have not yet received your gifts, they will be arriving as soon as we get the next batch from our distributor.

I am currently working on the 1997 Citizen Lake Watch Report. We hope to have your data back to you

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Inside this issue

Oregon Lakes Association
POB 345, Portland OR 97207
http://www.esr.pdx.edu/pub/ola/

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.

Blue Lake : Koren Marthaller

Clear Lake: Elmer Waite

Cullaby Lake: Janette Goolsby

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

Fern Ridge Lake: Natasha Okonoji, Richard Locke, James Bruvold, Randy Wilson, Todd Yokum, Lee Kincaid, Alycia McCord, Clover Wood, Ken Cluck

Fishhawk Lake: Jack Jenkins

Garrison Lake: Don Martin

H. Hagg Reservoir: Wally Otto

Hosmer Lake: Max Peel

Lake of the Woods: Catherine Hayes, Katherine Wallis

Loon Lake: Richard Kaufmann, Steve Kaufmann

Mercer Lake: Ron Boehi

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

Siltcoos Lake: Elizabeth and Dean Kelly, Dave and Linda Lauck, Paul Cornett, John and Julia Carlson

Sunset (Neacoxie) Lake: Lee Smith

Tenmile Lake: William Emblen

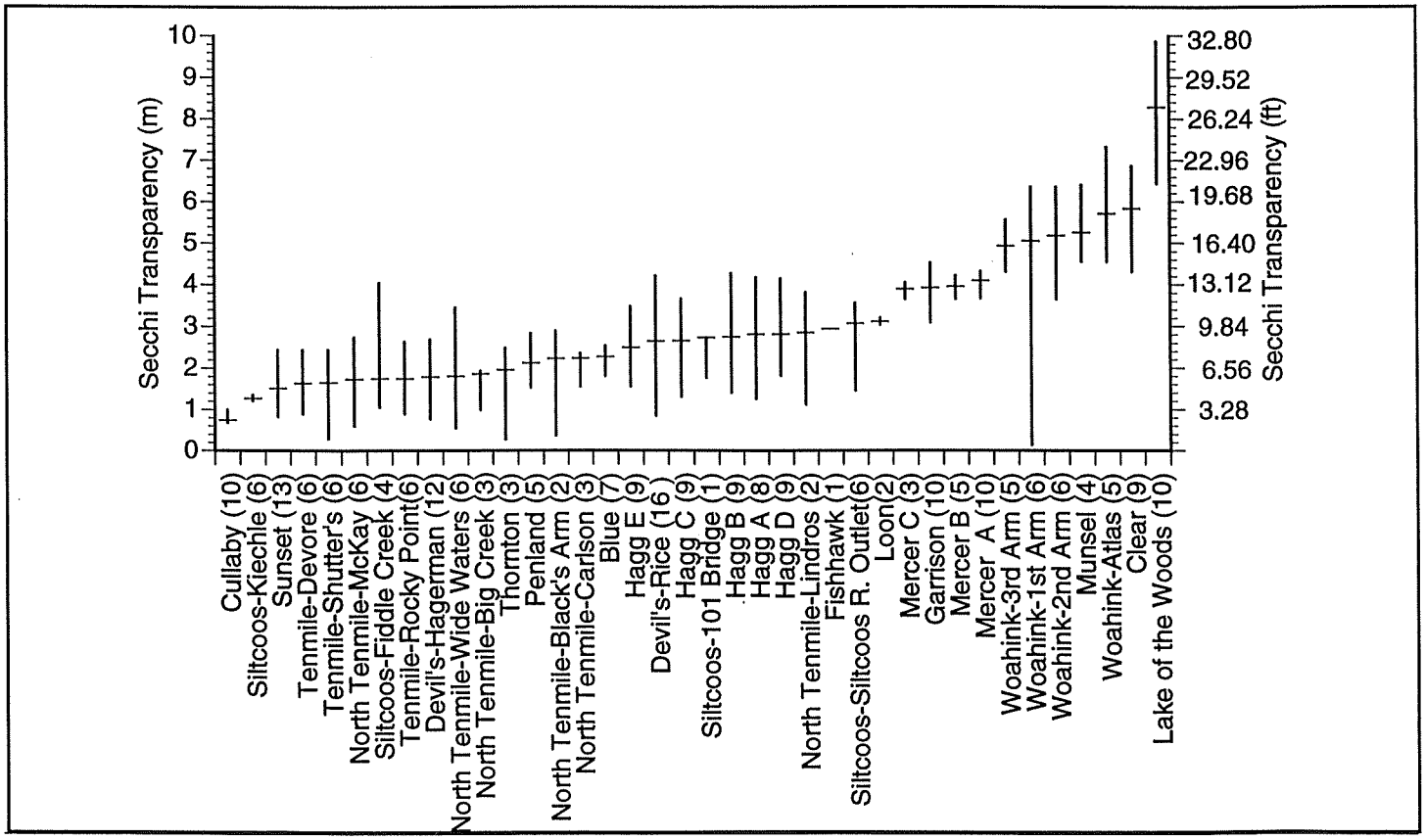
Thornton Lake: Henry Pollak, Jack White

Woahink Lake: Bob Anderson

Lake Watch continued from page 1

early in the new year. As a hint of things to come, the figure below shows all the sampling stations in the program this year (except the Fern Ridge stations) ranked by average summer Secchi. The vertical bars illustrate the annual range in Secchi transparency.

Everyone at Citizen Lake Watch World Headquarters wish you a happy holiday season. Thanks again for your good work.



Snails continued from page 1

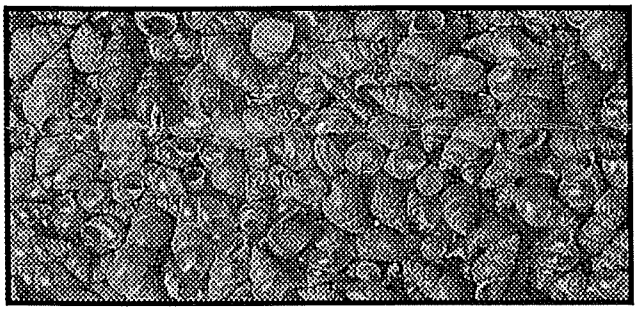
Dam. In the Madison, population levels may exceed 100,000 per square meter, nearly a solid layer of the snails! It is reported to pass through the digestive tracks of fish alive and then give birth.

The New Zealand Mudsnail occupies wide microhabitat conditions and tolerates some pollution. In the Madison River, it is most abundant in shoreline areas in moderate current on solid substrates. Overhanging grasses might be covered nearly solid with the snails. Lower densities occur on rocks in the mid channel and upon silty sand bars. Substantial impacts on the native Madison River invertebrates and then fish and birds seem likely, but cannot be well predicted. Common pulmonate snails were abundant in the Madison in 1995, but the only native prosobranch in the river, *Valvata humeralis,* is already very rare.

The snail has a tough shell and is just millimeters long. They're all female and reproduce live young without mating (parthenogenic). The snails adhere tightly to the rocks and eat the algae that mayflies normally eat. When the mayflies can't eat, they die. The fish lose a food source and also die. With fish numbers down, the bird and mammal populations decline.

Little is known about the environmental requirements of the NZ mudsnail or how far and where it will spread, but it seems clear that it is yet another threat to Oregon's water resources and salmon populations. For additional information see: http://rivers.oscs.montana.edu/dlg/aim/mollusca/potant.html; http://rivers.oscs.montana.edu/dlg/aim/annelid/r/mad/mad2.html; http://www.montana.edu/wwwrc/docs/news/alien.html. Pictures and text adopted from these web pages.

Colony of New Zealand Mudsnails



Approximately life-size

Storer Elected to NALMS Board

Bob Storer, Manager of the Devils Lake Water Improvement District and OLA member, was recently elected Region X Director of the North American Lake Management Society. Congratulations Bob!

Sytsma Named Associate Editor

Mark Sytsma , Lake Wise editor and OLA Past-president, has been named Associate Editor of the *Journal of Aquatic Plant Management*, an international journal dealing with the biology, ecology and control of aquatic vegetation.

Waldo Lake Meeting

A meeting will be held on 17 January from 1 to 5 PM to discuss protection of Waldo Lake (Univesity of Oregon, Willamette Hall, Room 100). Contact Deigh Bates for info (541-465-6934).

Toxic Tenmile continued from page 4

Since it is very difficult to manipulate the temperature of lakes, the most practical method of preventing future toxic blooms in the Tenmile lakes is to reduce nutrient loading to the lakes. Efficient nutrient loading reduction requires an understanding of the relative importance of various nutrient sources, which is best accomplished through a detailed assessment and construction of a nutrient budget for the lakes.

OLA News continued from page 7

Waters and Develop a State Lake Management Program. This "polling" while not perfect or scientific will provide input to the Board in developing the 1998 work plan.

Additionally, the afternoon session served as an opportunity to gain membership input for the newsletter, OLA web site, next annual conference and membership directory.

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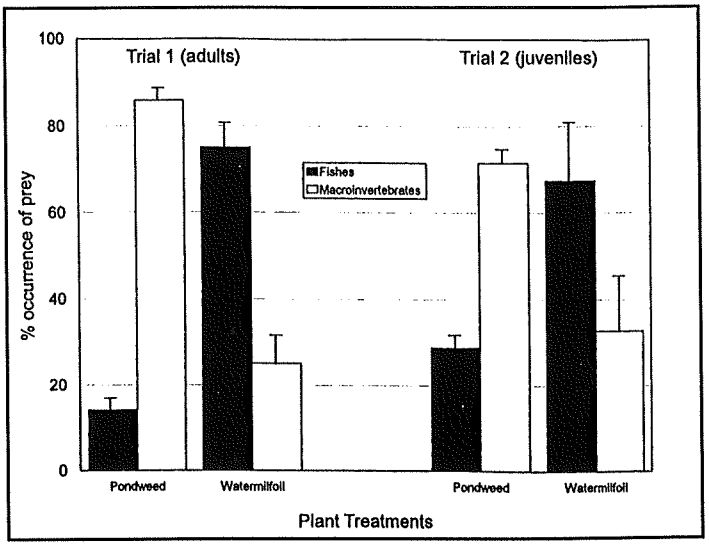
Not All Aquatic Plants Are Created Equal

A recently published study indicated that introduced, non-native aquatic plants can alter the feeding habits of largemouth bass (*Microterus salmonoides*).

The study found that the diet of bass contained significantly more fish when the bass inhabited beds of Eurasian watermilfoil (*Myriophyllum spicatum*, a non-native, invasive aquatic plant) than when the bass were in native pondweed (*Potamogeton*) beds (see figure at right).

Largemouth bass predation has been implicated as one factor in the decline of Coho salmon in some Oregon coastal lakes. Most of Oregon's lakes contain dense stands of non-native aquatic plants, including Eurasian watermilfoil. This study suggests that predation on Coho fry may be increased by aquatic weed infestation, and that Coho restoration efforts could be enhanced if non-native plants were managed more effectively. An examination of the relationship between introduced aquatic plants and largemouth bass predation on salmon fry could provide valuable information for salmon recovery efforts.

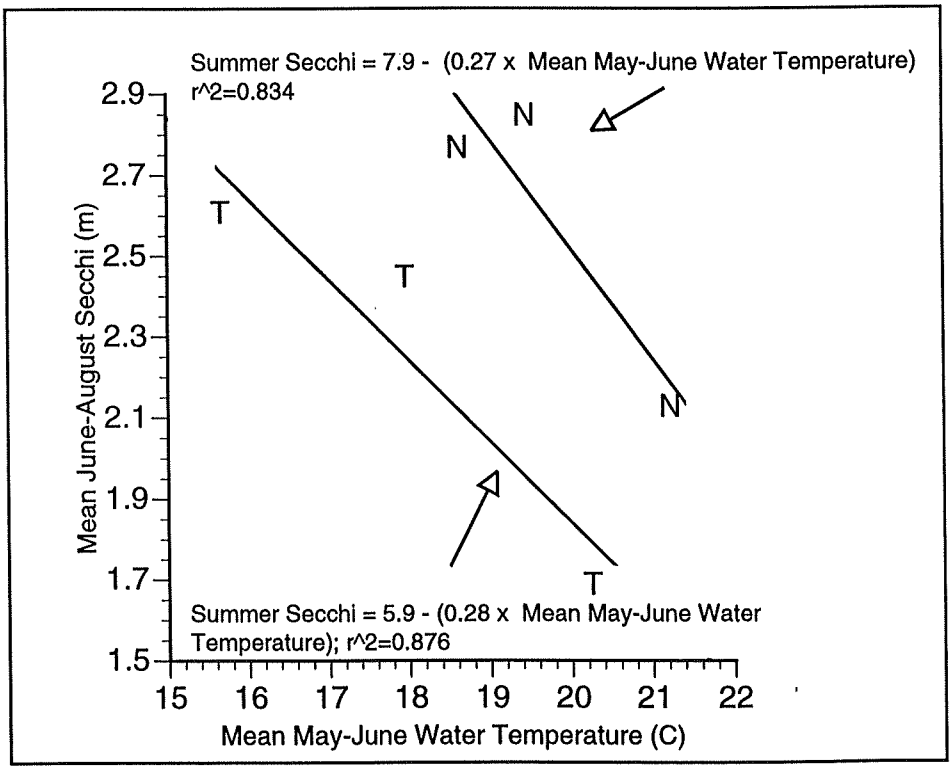


Difference in occurrence of total macroinvertebrates and prey fish measured in diets of the adult and juvenile largemouth bass among 3 replicated treatments containing common pondweed (Potamogeton nodosus) and Eurasian watermilfoil (Myriophyllum spicatum). Bars indicate mean+one standard error.

For additional information see: Dibble, E.D. and S.L. Harrel. 1997. Largemouth bass diets in two aquatic plant communities. *Journal of Aquatic Plant Management* 35: 74-78.

Toxic Tenmile continued from page 1

Data collected by Citizen Lake Watch volunteers on the Tenmile Lakes indicated that water temperatures in the lakes during spring and summer were higher than in previous years, which may have contributed to bloom formation. Spring water temperature explained over 80 percent of the variation in summer Secchi transparency in the lakes over the past three years (indicated by the "r^2" value of the regression lines shown in figure to the right). In nutrient rich lakes, like the Tenmile lakes, some physical factor, such as temperature and/or light is likely to determine the productivity of the system. The occurrence of a bloom in the lakes this year, and not in previous years (although their are no reliable data on blooms in previous years), also suggests that some physical factor may have been important in this year's bloom.



Relationship between mean spring water temperature and summer Secchi transparency in North Tenmile (N) and Tenmile (T) Lakes in 1995, 1996, and 1997. Data from the Citizen Lake Watch Program.

Continued on page 3

A New Approach to Understanding Phytoplankton Succession in Lakes

Phytoplankton, free-floating microscopic plants, are the first link in the lake food chain. A single lake may contain many different phytoplankton species. The abundance of individual species changes throughout the year, as populations bloom and die back. There are seasonal characteristics to this change in abundance that are evident in many lakes. Diatoms, for example, often dominate the phytoplankton in the spring.

Understanding, or modelling, how phytoplankton communities change throughout the year (succession) is a major area of study in Limnology. This understanding is important to lake management because the type and abundance of phytoplankton is often a major concern. Cyanobacteria blooms, for example, can be toxic and cause severe human health problems (see related article on page 1).

At a recent meeting of the International Association of Theoretical and Applied Limnology, Colin Reynolds outlined a novel approach to understanding how phytoplankton communities change in lakes. Reynolds applied well-developed theory from terrestrial plant ecology, proposed by J.P. Grime, to phytoplankton.

Reynolds' model of phytoplankton succession integrates consideration of cell morphology and specialized biological characteristics of phytoplankton species with mixing and nutrient dynamics to explain changes in species composition in lakes.

Specialization or "strategies" can be recognized in phytoplankton species that are determined by how growth rates change in relation to energy (light) and resource (nutrient) availability. Identified "strategies" include ruderal (R) species that are adapted to low (or variable) light and high nutrient environments, competitive (C) species that are adapted to high (or constant) light and high nutrient environments, and stress tolerating (S) species that are adapted to low nutrient environments. No phytoplankton have developed biological characteristics that permit a strategy that exploits a low nutrient and a variable light environment (Figure A).

Reynolds considered how typical events in a temperate-zone, thermally stratified lake that influence light and nutrient availability would interact with these strategies to develop his model of phytoplankton succession (Figure B). In Spring, when the lake is well mixed, ruderal species adapted to variable light (a fully mixed water column) and high nutrients dominate the plankton. As stratification develops, and the water column stabilizes, competitive species adapted to high nutrients and a more constant light environment (cells are not mixed deep into the lake, but remain in the upper, well-lit epilimnion) dominate the phytoplankton community. As nutrients are depleted in the epiliminion during the summer, stress (low nutrient) adapted species become more abundant. Finally, when turnover of the lake occurs in the fall, the community shifts to the more ruderal species again.

Although other models of phytoplankton succession have been proposed, Reynolds' approach ties together terrestrial plant ecology models of succession with phytoplankton succession in a way that strengthens the theoretical underpinnings of both. The plankton and terrestrial succession models parallel each other in many ways, with one major exception: succession occurs much more rapidly in lakes. Once recognized, however, phytoplankton succession is perfect scale model of terrestrial succession.

For additional information see: *Verh. Internat. Verein. Limnol.* 26: 97-113.

Figure A.

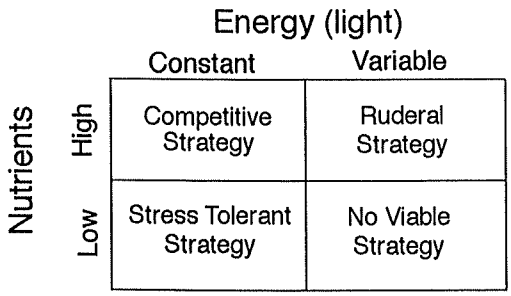
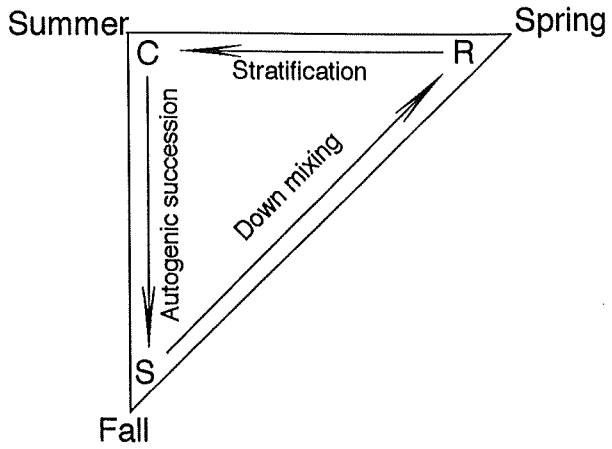


Figure B.



Lake and Reservoir Restoration Schedule

The Oregon Plan for salmon restoration and Healthy Streams Initiative, for water quality improvement, were major accomplishments of the last legislative session and have dominated the headlines for the past year. Development of these programs was instigated by the threat of endangered species listing of coastal Coho salmon and by failure of over 870 waterbodies in Oregon to meet water quality standards. One hundred of Oregon's lakes and reservoirs are on DEQ's list of water quality limited waterbodies, or are listed as "waterbodies of potential concern".

These damaged lakes and reservoirs represent about one-third of the lake and reservoir surface area in the state. Fifty-eight percent of the listed lakes and reservoirs are listed because of aquatic weed growth. Other causes of listing include: mercury, pH, chlorophyll a concentration, turbidity, algae, flow modification, and bacteria.

The Departments of Environmental Quality and Agriculture are charged with developing management plans for all the waterbodies on the 303-d list. The Department of Agriculture priorities for doing Agricultural Water Quality Management Plans are:

Tier I (1997/1998) - Rogue, Umpqua, Tillamook watersheds.

Tier II (1999/2000) -Klamath, Grande Ronde, Umatilla, and other coastal watersheds.

Tier III (2001/2002) - Remaining areas on 303-d list.

DEQ is developing a 10-year schedule which will be out for public review and comment in January.

The Governor, Senate President Adams, and Speaker of the House Lundquist have established an Independent Science Team and the Healthy Streams Partnership to oversee development of management plans that will restore salmon populations and solve the water quality problems in our streams and lakes.

Members of the Independent Science Team are:

John Buckhouse, OSU Dept. Rangeland Resources
Wayne Elmore, US Bureau of Reclamation
Stan Gregory, OSU Dept. Fish and Wildlife
Kathleen Kavanagh, OSU Dept. Forest Resources
Jim Lichatowich, Alder Fork Consulting
Logan Norris, OSU Dept. Forest Sciences
William Pearcy, OSU Dept. Oceanic and Atmosph. Sciences

Members of the Healthy Streams Partnership are:

Rich Angstrom, Jr., OR Concrete & Aggregate Producers
Bill Arsenault, OR Small Woodland Assoc.
Leroy Fish, Mid-coast Watershed Council
Patricia Gainsforth, Soil and Water Conservation
Todd Heidgerken, Water for Life
Paul Ketcham, Audubon Society
John Ledger, Assoc OR Indust.
Bob McPheeters, Tillamook Mayor
Jim Myron, OR Trout
Fred Otley, OR Cattleman's Assoc.
Joe Rohleder, Northwest Sportfishing Indust. Assoc.
Jack Shipley, Applegate Partnership
Pete Test, OR Farm Bureau
Ray Wilkeson, OR Forest Indust Council
Terry Witt, Oregonians for Food and Shelter

These individuals, along with the staff of the Oregon Departments of Environmental Quality and Agriculture, are responsible for ensuring that problems in 303-d listed waterbodies, including listed lakes and reservoirs, are solved expeditiously.

303-d listed lakes and reservoirs

(**Lake or Reservoir** - listing criteria)
Haystack Res. - mercury
Odell Lake - pH
Agency Lake - dissolved oxygen, pH, chlorophyll a
J.C. Boyle Res. - dissolved oxygen, pH, chlorophyll a
Lost River Res. - dissolved oxygen, pH, chlorophyll a
Upper Klamath Lake - dissolved oxygen, pH, chlorophyll a
Devils Lake - pH, chlorophyll a
Mercer Lake - weeds, algae
Siltcoos Lake - weeds, algae
Tahkenitch Lake - weeds
Cullaby Lake - weeds
Lytle Lake - weeds
Smith Lake - weeds
Sunset Lake - weeds
Antelope Res. - mercury
Owyhee Res. - mercury
Fish Res. - pH chlorophyll a
Reeder Res. - sediment
Eel Lake - pH
Floras Lake - weeds
N. Tenmile Lake - weeds, algae
Tenmile Lake - weeds, algae
Diamond Lake - pH, chlorophyll a
Lemolo Res. - pH, Chlorophyll a
Blue Lake (Mult. Cty) - pH, weeds, algae
Bybee Lake - pH, weeds, algae, flow mod., bio criteria
Cottage Grove Res. - mercury
Fairview Lake - phosphorus
Fern Ridge Res. - turbidity, bacteria
Smith Lake - pH, weeds, flow mod., bi criteria

OREGON LAKES ASSOCIATION NEWS

OLA Meeting News

by Andy Schaedel, OLA President

On October 25, about 50 OLA members attended the Annual Conference held in Florence. Bob and Joyce Anderson did an excellent job in handling local arrangements. I would like to thank those that worked on putting together conference including: Avis Newell, Bob Storer and Ian Sinks; Ken Bierley from the Governor's Watershed Enhancement Board (GWEB) and Jean Jacoby, Regional Director of the North American Lake Management Society for speaking at the conference; and all the participants that made it worthwhile and informative conference. I would also like to thank the following Corporate Sponsors who provided financial support for the meeting: Aquarius Systems, Hydrolab Corporation, Perry Lake Management, SePRO Corporation; as well as our other Corporate Members: Cell Tech, Envirovision Corporation, and WATER Environmental Services.

A summary of the morning session can be found on page 8. In the afternoon, we devoted time to Charting the Future of OLA. Changes to the By-laws were approved which allow the Board to appoint new directors. We will also be having elections in early 1998 for the Secretary and President-elect positions. Roger Edwards expressed interest in serving as the Secretary. Others who may be interested in running for one of these two positions or serving as a Director should contact Andy Schaedel (503-229-6121). Several members expressed interest in being considered as a volunteer. A format for making appointments is currently being developed by the Board.

The members present participated in "polling" session that ranked a variety of issues that affect lakes in Oregon (see below). It is interesting to note that the following issues received the highest number of votes (based on the relative importance to OLA): Enhanced Lake Monitoring, Promote Active Citizen Involvement/ Education, Encourage Enforcement of Local, State and Federal Programs, Enhance Nuisance Weed Program, Encourage Protection of High Quality

Continued on page 3

Issue	Importance to Individual	Importance to OLA High	Low	Rank
Enhance Lake Monitoring	10	13	1	12
Promote Active Citizen Involvement/Education	2	10	1	9
Encourage Enforcement of Local, State and Federal Programs	11	10	4	6
Enhance Nuisance Weed Program	8	10	4	6
Encourage Protection of High Quality Waters	4	6	0	6
Develop State Lake Management Program	10	9	5	4
Encourage Formation of Lake Associations	2	3	1	2
Protect Biodiversity in Lakes	8	9	8	1
Encourage better water quality standards and identification of nutrient limits	7	5	4	1
Address Human Health Concerns - Mercury, Microcystis	5	0	6	-6
Address Growth Pressures	3	0	8	-8
Recognize Economic Opportunities for Protecting Lakes	4	0	8	-8
Address Fish Stocking & Recreational Pressures	6	0	11	-11
Address lake & lake bottom ownership issues	0	2	13	-11

News from member associations

Preservation Association for Devils Lake (PADL)

PADL continues its battle for sewering and erosion control to protect Devils Lake. Accordng to the PADL newsletter, the City of Lincoln City is not interested in pursuing the sewering because citizens are not interested in having their property taxes increased. Other avenues that PADL is pursuing include: working with the city to fix sewage pump stations (sewage pump station failure allowed raw sewage to flow into the lake for 12 hours), and neighborhood collection systems with drainfields away from the lake.

PADL has given tentative approval of a planned phased reduction of grass carp in the lake, if ODFW agrees that they can be restocked if too many are removed. 60-70% of those attending the PADL annual meeting approved the phased reduction. PADL has 200 members.

GWEB Grant Program Described

by Avis Newell

As part of the Healthy Streams Partnership, the 1997 legislature allocated $20 million dollars to the Governor's Watershed Enhancement Board. Some of the funding will be used for research, and some for state agencies to improve water quality management, but the bulk of the funding will be available through grants to watershed councils and other local communities for water quality improvement projects.

Ken Bierly, from the Governor's Natural Resource Office, described some of the criteria for a successful GWEB grant application at the OLA Annual Meeting. Bierly said that projects should be watershed-based. If a project does not address watershed sources of the problem in it's proposal, it is likely to fail. This is based on the premise that treatment of only part of a watershed or problem will be unlikely to solve the problem. Successful GWEB proposals will address water quality and/or fishery (especially salmonid) issues and problems-that is where the legislature targeted these funds. GWEB grant recipients must provide at least 25% of total project costs as match from other sources, including in-kind contributions. Applicants must also demonstrate accountability for the funds, both as a demonstrated mechanism to accept funds, and with a year-later follow-up report. Finally, a strong grass roots effort must be demonstrated. Endorsement by the local watershed council, if it exists, is essential. If no council has been developed, then a citizen group should show that the project has widespread local support. If you would like to know more about this grant program, contact Vivienne Torgeson of the Governor's Watershed Enhancement Board Office at (503) 378-3589x827 for applications or for grant writing workshop dates.

So what do all these characteristics mean for lake projects? Grant funds can be available for problem assessment; for instance, it is reasonable to apply for a basin-wide nutrient assessment study, or sediment source study. Similarly, projects that address problem sources will be considered, such as implementing erosion control practices, or nutrient management practices. However, practices that reflect ongoing management activities, such as aquatic macrophyte control, are much less likely to succeed, especially without addressing the basic causes of the problem.

WALPA Call for Presentations and Posters

The Washington Lake Protection Association (WALPA) will meet in Issaquah on April 3 and 4, 1998. Lake Sammamish, and its toxic algae bloom will be the focus of the meeting,, however, a broad agenda is planned. For more information contact Rob Zisette (206-441-9080; hec@halcyon.com)

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