August 2003

LAKE WISE

A Voice for Quiet Waters

The Oregon Lakes Association Newsletter

O L A ANNUAL MEETING
AT LAKESIDE ON TENMILE LAKE
OCTOBER 10-11, 2003
WHO'S RESPONSIBLE FOR OREGON'S LAKES?

President's Perspective

Lori Campbell, Lincoln City: OLA is finalizing plans for the annual meeting. Scheduled for October 10th in Lakeside, OR the meeting will take a look at watershed councils and the role they play with lake and reservoir related issues. OLA will highlight several examples of how watershed councils address management and other problems in lakes. Other topics will cover the responsibility for management of Oregon's lakes, and ongoing restoration efforts throughout the state. Saturday, October 11th will be an opportunity to learn about further development of the Oregon Lake Atlas, or enjoy a boat tour on Tenmile Lake. Take a look at the agenda in this issue for details. For those arriving early, the OLA board will hold a business meeting the evening of October 9th, and welcome those interested in attending.

July witnessed local activities around Lake Awareness month. On the coast presentations on Devils Lake were given to local organizations, as well as invasive weed pulling activities and native plant gardening with volunteers. Here in the middle of August, as is occurring elsewhere, water levels have already reached late summer values. Warm sunny days have brought water temperatures in the lake to above normal conditions. The district has coordinated for a second year with the local watershed council to initiate additional water quality monitoring in the watershed. This effort has proven to be a great educational opportunity for the community.

CONTENTS

Consulting the Experts on Diamond Lake's Future

Richard Petersen, Portland State University, Portland: Diamond Lake was the focus of a meeting at the US Forest Supervisor's Office in Roseburg July 22 and 23. Sherri Chambers of the US Forest Service, North Umpqua Ranger District, led the meeting (officially titled "Expert Assisted Alternative Development Meeting"). Attendees included representatives from the US Forest Service, Oregon Fish and Wildlife, Oregon Marine Board, U.S. Fish and Wildlife, NOAA, US Environmental Protection Agency, Douglas County, invited experts (R. Petersen, J. Eilers, R. Breeden and J. Kann) and members of the general public. Roger Edwards represented the Oregon Lakes Association at the meeting.

The purpose of the meeting was to evaluate possible alternative remedies and any other issues related to a proposed treatment of Diamond Lake. (See Federal Register, vol 68:80, pg 20367). The proposed treatment of the lake is in response to the serious environmental problems that have developed as a consequence of the illegal introduction of tui chub into the lake sometime in the late 1980s or early 1990's. Diamond Lake has been listed by DEQ for violation of state water quality standards because of high pH and dense algal populations. A consideration of alternatives is a required component of the federal Environmental Impact Statement (EIS) procedure, hence the Roseburg meeting. A draw-down of 8 feet followed by rotenone treatment has been identified as the "preferred alternative" for returning the lake to a healthy ecology and a productive fishery.

Lake Ecology Joe Eilers of MaxDepth Aquatics, Inc. began the meeting with a report on the ecological conditions in the lake and how they have been altered by the presence of the tui chub. The recent introduction of tui chub represents the second time chub have appeared in Diamond Lake. Joe reported on the extensive studies he and others have conducted that have documented the impact of the chub on the ecology of the lake and that have identified the causal mechanisms involved in producing the dramatic changes. Through paleolimnological (i.e. sediment core) analysis, Joe has been able to document that the recent sequence of changes has repeated the pattern that occurred after the earlier introduction in the 1940's.

Eilers' investigations have shown that the chub invasion of Diamond Lake has caused serious problems.

- ***Changes in zooplankton***: Chub are unusually efficient at cropping down larger zooplankton. With the removal of larger zooplankton, the algae in the lake are released from control by their natural grazers.
- ***Nutrient loading***: Fed by the unusually high but natural concentrations of phosphorus in the streams draining into the lake, the algae are able to grow to very high levels. Furthermore, because of the shortage of available nitrogen in the inflowing water (or very low N/P ratio), conditions are ideal for the explosive growth of the only algae capable of fixing their own nitrogen from the atmosphere, the cyanophytes, commonly known as blue-green algae. In Diamond Lake, the cyanophyte that dominates is a species of *Anabaena* that produces a dangerous toxin. By mid summer, the lake is dominated by very dense blooms of *Anabaena*, forcing the Forest Service to close the lake to recreation because of the risk of exposure to the toxin.
- ***Water chemistry***: The dense populations of algae also drive up the pH of the water and contribute to the complete depletion of oxygen in the deeper (hypolimnion) portion of the lake by late summer (through their decomposition via settlement from epilimnion to

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Consulting the Experts (cont.)

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hypolimnion).

- ***Nutrient loading increased by chub***: It appears likely that the chub contribute to the very high populations of algae by accelerating the rate of recycling of nutrients within the lake.

In short, the presence of the chub has changed the nature of the lake. What was once a productive food chain producing rapid growth of planted trout and with algae controlled by a healthy zooplankton population has been changed to a lake dominated by dense blooms of blue green algae inhospitable to trout and unsuitable for popular activities such as swimming. The degradation of the ecological conditions in Diamond Lake is dramatic testimony of the catastrophic effects that can be brought about by the introduction of exotic non-native species.

Proposed and alternate treatments

***Preferred alternative*:** The preferred treatment is to use the existing canal, left from the prior treatment of the lake in 1954, to draw the lake down 8 feet during late summer 2004. Subsequent to draw-down, the lake is to be treated with rotenone to eradicate all chub in the lake. The 8 foot draw-down is preferred because it will be sufficient to drop the surface level of the lake below most of the beds of macrophytes that grow in the shallows and will reduce the volume of water that must be treated. At the same time, the modest draw-down will produce minimum interruption of flow from the lake but allow the treatment to be isolated to the lake until the rotenone has been neutralized. After the eradication of the chub, the lake is to be restocked with salmonid varieties selected to support a productive fishery and to be effective predators should chub again be illegally introduced to the lake. A troubling aspect of the "preferred alternative" is that the entire effort could be sabotaged by the reintroduction of the chub. Accordingly, a public education effort will be included in the project to deter yet another introduction of chub.

> Rotenone is extracted from the roots of the tropical plant, *Derris elliptica*. Rotenone affects all gill-breathing animals because of exposure through the gills. The chemical has been used for centuries to kill fish, and has been the preferred alternative for eradicating unwanted populations of fish in lakes and streams. In contrast to fish, the toxicity of rotenone to birds and mammals is much lower. (For more information on Rotenone, see the website http://www.fisheries.org/ rotenone/ maintained by the American Fisheries Society.)

Other Alternative Treatments:

Discarded alternatives: Several alternative treatments were considered at the meeting but eliminated from further study because they were judged to be ineffective or inappropriate. Discarded proposals included:

- Macrophyte removal to disrupt chub spawning.
- Exploiting natural oxygen depletion events to suffocate the chub.
- Application of heat, electroshock or explosions to kill chub directly.
- Addition of alum to remove phosphorus from the water.
- Lake aeration or algaecide treatment to control *Anabaena*.

The introduction of exotic predators such as largemouth bass, pike or walleye has been ruled out by the Oregon Department of Fish and Wildlife because of the likelihood that it would produce even greater problems in the lake and downstream.

Alternatives that will receive further study: Some other proposals were deemed worthy of additional evaluation. These include:

- Antimycin A in lieu of rotenone. Antimycin

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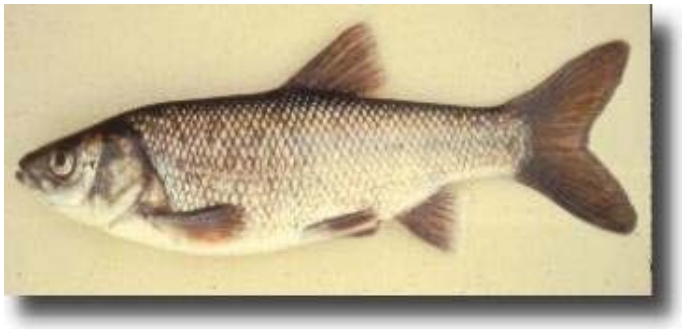
is considered a possible alternative because it is more selective (targets fish only) and can be used in lower concentration. However, Antimycin has never been used in a lake as big as Diamond Lake.

- Drawdown. The alternative of a "complete" draw-down of the lake will also get further consideration. A larger draw-down would allow the use of much less rotenone but would produce more serious downstream effects because of the larger volume of water to be disposed of initially and a long delay before the lake is again at full pool.
- Chub controls. Mechanical harvest of chub and stocking of more effective salmonid predators is an alternative. However, any mechanical harvest would have to be repeated each year and, as yet, no salmonid has been identified that is an effective predator on chub. A related alternative would be to change the management objective of the lake. Current ODFW directives specify that the natural productivity of the lake be utilized by planting fingerling trout that grow rapidly to harvestable size. An alternative management objective would be to accept the degraded conditions of the lake and plant trophy size trout or "featured species" of salmonids to attract anglers.

Publication of EIS The draft EIS is expected to be available for comment in February 2004. Whichever alternative is finally adopted promises to be very expensive. Even with the successful elimination of the chub, the lake will require

The Diamond Lake Bandit



The Tui chub (*Gila bicolor*) is a western minnow found in the Columbia, Klamath, and Sacramento Rivers, and in several other interior river basins of CA, NV, OR and WN. This chub is a schooling species inhabiting shallow weedy areas of lakes or quiet waters of slow-moving streams. Spawning occurs in late spring/early summer. Eggs are scattered in shallow water and adhere to the bottom substrate, especially leaves of aquatic plants. Females produce 5,000 to 10,000 eggs, depending on size. This species is an omnivore, feeding on phytoplankton, a variety of aquatic invertebrates, and even fish fry. Tui chubs range in size from 8 to 12 inches in length. In some parts of their range, this species can become overpopulated to the detriment of game fish populations. They are reported to serve as prey for larger predaceous fishes.

Description and photo from American Fisheries Society web site (www.fisheries.org/idaho/tui_chub.htm)

Editors Note For a different perspective on Diamond Lake see Commentary by Doug Larson in *Oregonian* July 30, 2003: "Poisoning Diamond Lake probably won't restore its blue grandeur". Also note response to Doug's comments August 11: "Facts and fish at Diamond Lake". Joe's comment is provided in its entirety on the *Oregonian* web site, along with Doug's. Search the *Oregonian* web site for "Diamond Lake".

Muddled Decision Framework May Force Degrading Alternatives to Herbicide Application

R. Edwards, Gresham: The judicial decision in 2001 (9th Circuit Court), which stated that all applications of pesticides into waters of the US require National Pollutant Discharge Elimination System permits, has brought tremendous attention to the *Headwaters, Inc. et al v. Talent Irrigation District* lawsuit. The websites with links to this decision include pesticide applicators, golf courses, irrigation districts, mosquito control agencies, and regulatory bureaus from all around the country. This on-going discussion was amended in early July with the EPA's Interim Statement and Guidance on Application of Pesticides to Waters of the United States in Compliance with FIFRA, which describes conditions where pesticides can be applied without NPDES permits.

A Summary of the Principal Events (1996 – 2003)

May 1996 – Talent Irrigation District (TID) applies the herbicide acrolein to a canal within its system as a routine maintenance operation. The waste gate separating the canal from Bear Ck. has a 1 cfs leak that leads to the poisoning of an estimated 92,000 juvenile salmonids. ODFW and ODEQ investigations of this incident bring mitigation and civil penalties of over $400,000 against TID. A similar incident had occurred in 1983.

January 1998 – Headwaters, Inc. and the Oregon Natural Resources Council file a lawsuit in US District Court, alleging TID's application of herbicides without an NPDES permit is a violation of the Clean Water Act.

February 1999 – The US District Court rules that while herbicides are pollutants, and irrigation canals are waters of the U.S., TID does not need an NPDES permit so long as the herbicide they are applying is registered under FIFRA and the EPA approved label does not require the user to obtain a permit.

March 2001 – The US Court of Appeals for the 9th Circuit reverses the finding of the lower court, saying FIFRA and the NPDES do not overlap. FIFRA sets national standards for the use of pesticides while the NPDES considers the local impact of pollutant discharges. The decision cites a 1995 EPA ruling that states, "a label's failure to include the possible need for a NPDES permit does not relieve a user of such products from the requirements of the CWA" (Pesticide Regulation 95-1).

March 2002 – ODEQ institutes a procedure to grant a Mutual Agreement and Order for petitioners seeking to treat aquatic weeds with herbicides. An MAO is a remedy described in the Oregon Administrative Rules for instances that don't lend themselves to normal permitting processes.

– EPA releases a Regional Directors Guidance Memo stating herbicides can be applied in an irrigation canal without a NPDES permit if the application is consistent with the FIFRA label, and the application's purpose was to ensure the return flow of water in the canal to waters of the US. Under these specific conditions, canals are not waters of the US, and waters flowing from these canals are not point sources of pollution, so the provisions of the CWA are not relevant. In issuing this interpretation, EPA sought consistency with established practices and Congressional intent in crafting the CWA. EPA noted the significant burden to regulatory agencies should permits be required for all irrigation return flows. The observation was also made that TID could not avail itself of this ruling because they had not contained the acrolein treated water for 6 days as required by the application instructions.

August 2002 – ODEQ issues an NPDES permit to the Klamath Irrigation District for herbicide application and is subsequently threatened with a lawsuit from ONRC on the basis that processing of the permit was faulty.

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Muddled Decision Framework (cont.)

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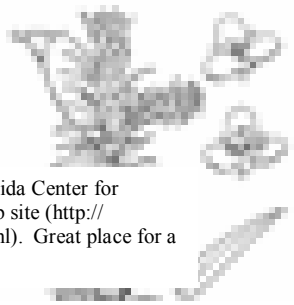
July 2003 – EPA issues an Interim Statement and Guidance document in response to a 1998 request from US Court of Appeals for the 2nd Circuit for a clear interpretation of whether NPDES permits are required for applications of pesticides that comply with FIFRA. This response states that the proper application of pesticides does not require permits if the purpose is to control pests that are in or over waters of the US. Adult or larval mosquitoes and aquatic weeds are cited as specific examples. The justification for this ruling considers the "discharge of a pollutant" within the meaning of the CWA. Pesticides are excluded from the CWA definition of pollutants because when applied in a manner consistent with FIFRA, they are not unwanted materials being discarded as no longer useful. The statement does not address the February 1999 District Court opinion that it is not the herbicide discharged into the canal, but the chemical residue remaining in the water after the application that is a chemical waste pollutant. Nevertheless, EPA considers this interpretation applicable to both the *Talent* case, and the case of *Altman v. Town of Amherst* from the 2nd Circuit. It will be published in the Federal Register and all public comment will be considered before a final interpretation and guidance is issued.

Implications for Those Thinking about Applying Aquatic Herbicides

The scrutiny provided by this continuing litigation presents a wealth of discussion topics. Everyone should be able to agree that fish kills are wasteful and the application of pesticides requires due diligence to protect non-target entities. The fines levied against TID for their breach of diligence were substantial and were intended to prevent future incidents of a similar nature. Headwaters, Inc. and ONRC evidently felt the need to pursue larger questions in their lawsuit. Both organizations have a constituency that agrees with the critical focus they apply to management decisions for Oregon's natural resources. Certainly, their lawsuit has emphasized their point. TID has somehow managed to deliver irrigation water without regular treatments of herbicide in their canals, giving them a better understanding of the efficacy of those treatments. Public health officials concerned with the spread of West Nile virus have missed the availability of a mosquito control measure that they relied on. Alternative pest control measures of all kinds have been given an opportunity to prove their worth, and the no action alternative has commanded serious reconsideration. The increased interest in grass carp to control aquatic weeds is due in part to the questions about herbicide use raised in the lawsuit.

As the debate continues, ODEQ has indicated they will not require NPDES permits for pesticide applications in or over waters of the US. The latest EPA ruling does not provide absolute protection from third party suits, so requests for permits will be honored, but must



Graphic from University of Florida Center for Aquatic and Invasive Plants web site (http://aquat1.ifas.ufl.edu/welcome.html). Great place for a lot of very useful information.

HOT LINE

OREGON
INVASIVE SPECIES
1-866-INVADER

Call Toll Free (1-866-2337)
To report sightings of invasive species

O L A ANNUAL MEETING

October 10, 11, 2003
OREGON LAKES ASSOCIATION
Lakeside, Oregon on Tenmile Lake

THURSDAY, October 9, 2003

8:00 PM OLA Board Meeting (Open to all OLA Members)

FRIDAY, October 10, 2003

8:30 – 9:30 *Registration, Refreshments*

9:30 – 12:00

- ***Focus of this Year's Annual Meeting***: **Lori Campbell**, OLA President
- ***Clarifying Responsibility for Management of Oregon's Lakes****: The Role of the Watershed Enhancement Board and Watershed Councils (***Ken Bierly**, Deptuty Director WEB*); ODEQ Monitoring and Managing through TMDL's for Lake Improvement (***Andy Schaedel**, Manager of the Water Quality Technical Assistance Section, NW Region*); Lake Bottom Ownership by Oregon Division of State Lands and Implications for Management Responsibility (***John Lilly**, Assistant Director, Wetlands Program*)*; *Status of Aquatic Herbicide Applications in Oregon* (**Janet Fults**, Pesticide Registration and Certification Program Manager, ODA).
- ***Bottom-Up Watershed Analyses to Complement Top-Down Restoration Strategies*** (**Richard Petersen**, PSU)

12:15 – 1:15 Luncheon and OLA Annual Meeting

Election of Officers and Board Members

1:30 – 4:30

- ***Case Study Number One****: Upper Klamath Lake Watershed Council and its Watershed Working Groups: ProgressTowards Improvement of UKL (***Ruth Mirth***, Watershed Council Coordinator,* with assistance of others from the KB Watershed Council*);*
- ***Case Study Number Two****: Tenmile Lake: Process and Progress (***Mike Mader***, Watershed Council Coordinator;* **Joe Eilers, Jake Kann, John Lilly***)*
- ***Case Study Number Three****: Lake and Reservoir Water Quality Issues and the Role of Local Conservation Groups (***Jason Dedrick***, Watershed Council Coordinator*)

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O L A ANNUAL MEETING

FRIDAY, October 10, 2003 (continued)

4:30 – 6:00 Hosted Refreshments (Private Sector Lake Consultants)
Poster Board Displays (Watershed Councils, Lakeside Homeowners Associations, Lake studies by OLA member scientists)

7:00 Barbecue

SATURDAY, October 11, 2003

NOTE: Registration required for following events

8:30 – 10:30 *Pontoon Boat Guided Tour of Tenmile Lake (*M. Mader*)*

9:30 – 12:00 Working Group Meeting to Revise ***Oregon Lake Atlas*** (Hosted by Portland State University, Center for Lakes and Reservoirs, Mark Sytsma and Richard Petersen Facilitators)

10:30 – 12:30 *Pontoon Boat Guided Tour of Tenmile Lake* (M. Mader)

8:30 – 10:30 *Luring the Lunkers at Tenmile (B.A.S.S.)*

! ! SEE ENCLOSED SEPARATE REGISTRATION FORM IN THIS ISSUE FOR FEES, LODGING OPTIONS, ETC.

Tenmile Lake from Lake Shore Lodge Restaurant overlook (photo courtesy John Kelsley, OLA Board Member and lakeside resident)

NEUSTON NEWS BITS

Two-day short course on aquatic plant management at PSU/CLR. This workshop provides best-practice information to help you make informed and effective decisions for preventing and managing invasive aquatic weeds. The workshop will focus on submersed aquatic weeds of lakes, ponds, streams, and canals. PSU Center for Lakes and Reservoirs, in collaboration with the University of California, Davis and the Multnomah County Drainage District will offer a two-day short course on aquatic plant management on September 11 and 12, 2003. Instructors will include nationally recognized experts on the biology and management of aquatic plants. Continuing education credit for pesticide applicators will be available. Further information can be obtained at the PSU/CLR web site (www..clr.pdx.edu) bottom of first page, by contacting Mark Sytsma, at sytsmam@pdx.edu or 503-725-3833

Kulongoski proclaims July Lake Appreciation Month. In response to OLA's request, Governor Kulongoski did in fact proclaim July the month to appreciate Oregon's lakes. He didn't commit to next year, or year's thereafter so OLA has a precedent at least when next spring comes around. See Proclamation on OLA web site.

Crater Wins the Clarity Competition. Secchi disk (20 cm d.) readings in Oregon known to ***Lake Wise*** made during the nationwide Secchi Dip-In (June 28-July 13, 2003) were: ***Crater Lake*** (32.5 m, July 10); ***Waldo Lake*** (25.5 m [10:40 AM], 30.5 m [noon], July 19), ***Upper Klamath Lake*** (0.5 m, July 16); ***Diamond Lake*** (1.4 m, July 10 13:48); ***Lake Oswego*** (0.85m, July 8), ***Devils Lake*** (1.04 m, July 2); ***Lake of the Woods*** (7.54 m, July 11); ***Woahink Lake*** (6.83 m, July 1); ***Cullaby Lake*** (0.56 m, July 11); ***Fairview Lake*** (0.15 m, July 4).

Inventory of AIS education/outreach materials and programs. The Oregon Invasive Species Council (OISC) is developing a strategy and implementation plan for education/outreach on invasive species in Oregon. As part of that project, the Council has conducted an inventory of education/ outreach materials that address aquatic invasive species (AIS) in Oregon and the Western states. The deadline for submittals was June 2, 2003. The Council intends to share the results with the Western Regional Panel on Aquatic Nuisance Species and other organizations concerned about invasive species. For more information on the OISC project, please see: www.clr.pdx.edu/ projects/oisc/oisc.htm. PSU CLR contact: Diane Kightlinger

Crater Lake Research. Reports on recent research on Crater Lake will be coming out in 2004 special issue of *Hydrobiologia*. Mark Buktenica, Crater Lake Park Aquatic Ecologist, noted there will be 20 papers in this special issue. A National Science Foundation funded workshop has been scheduled for this winter, with Bob Collier of OSU providing facilitation for the meeting.

Habitat Division of ODFW No More. The *Oregonian* reported (D3) July 26, 2003 that a decision had been made to eliminate this Division for a one-time savings of $240,000. The staff of this Division had been responsible for commenting on various pending permits (e.g. wetland fill) providing basis for permit conditions for use by Division of State Lands and Corps of Engineers. Since many of these permits have related to lakeshore "improvements" such as docks, boat ramps, walls, etc. one wonders where the excellent critiques from this Division will now originate.

Oregon Lakes Association reregisterd as non-profit. As of July 7, 2003 OLA is reregistered with the State of Oregon Corporation Division as a Domestic Nonprofit Corporation (registry number 159434-91). The non-profit type is specified as a "public benefit with members". Is that a two-headed challenge or what? Could you have a "public

New Grass Carp Rules, Opposed by OLA, May Damage Oregon's Lakes

Stan Geiger, Portland: Despite overwhelming testimony against it, the Oregon Fish and Wildlife Commission voted at their July 11 meeting to approve the proposed amendments to the grass carp rules (see past issue of ***Lake Wise*** for discussion). One of the interesting comments from their legal council was that they might not have legal authority to require integrated management plans. OLA's opinion is that Oregon Administrative Rules require preparation of integrated management plans. More on this in the next ***Lake Wise***.

It would appear that if the Commission is going to be making aquatic weed management decisions that they need to be educated about lakes and weeds. OLA's board intends to draft a letter to the chair of the commission, with a copy to the director, expressing its disappointment in the decision and offering to set up a tour of lakes with weed problems to discuss the issue.

One of the reasons for this push for grass carp is the lack of clearly sanctioned and economical alternative solutions to the problem (see article by Edwards in this issue of ***Lake Wise***, *Muddled Decision Framework*). It is the OLA board opinion that ODEQ needs to develop a general permit for aquatic herbicide applications. This may be the beginning of long term impacts on Oregon lakes by grass carp that are likely to be much more long lasting and more poorly understood than any chemical application.

As Mark Sytsma, Director of the PSU Center for Lakes and Reservoirs noted after the meeting, "Lakes really don't receive the kind of thoughtful management that we all think they deserve in this state."

North Coastal Plain Lakes on Way to IPM's

Rowena Price, Smith Lake, Clatsop County: The Smith Lake Neighborhood Association met at the Warrenton Community Center in June 2003. Guest speaker was Ms. Erin Harwood, a Portland State University graduate student who is writing her thesis titled Clatsop Plains Lakes Project. Ms. Harwood is studying the problems caused by invasive aquatic weeds and their effects on Smith, Cullaby, Coffenbury and Sunset Lakes, located in Oregon's north coastal area. Three of these lakes (not Coffenbury) are on the state's 303d list for impaired water quality.

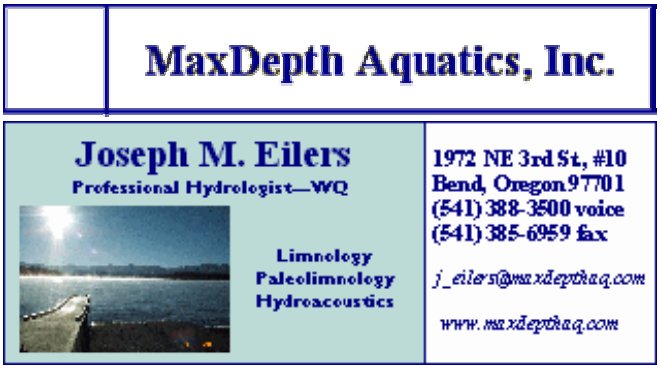
Ms. Harwood requested citizen participation. She explained the need to create an integrated aquatic vegetation management plan for each of the three lakes. A plan is also being prepared for Coffenbury Lake, which is not currently invaded by invasive aquatic weeds. The management plans will detail the types, abundance and location of plants present, and management options for the control of these plants.

A Steering Committee was formed at this meeting and met in July. A survey has been sent out to all Smith Lake residents, requesting their opinions on the issues of invasive weeds, best uses of the lake and future health of the lake. These responses will be added to Ms. Harwood's study and assist the Steering Committee to define the ongoing management plan for Smith Lake.

Lake Wise Feature: MaxDepth Aquatics, Inc.

Joseph Eilers, MaxDepth Aquatics, Inc., Bend, OR

MaxDepth Aquatics, Inc. is a corporation formed this year to provide high quality field applications and interpretative support for public and private organizations in areas of aquatic resources. We focus on three areas: limnology, paleolimnology, and hydroacoustic applications. Our limnological capabilities range from routine monitoring to specialized investigations in difficult lake and river environments. We have an extensive inventory of field equipment ranging from multiple vessels, water quality meters, and a shop and mechanical engineer for constructing custom equipment as needed. Our paleolimnology and sediment sampling capabilities include multiple coring gear for shallow and deepwater applications. The paleolimnological component provides critical information for reconstructing past changes in lake water quality and trajectories for likely near-term projections. Our hydroacoustic/DGPS capabilities allow us to construct high quality bathymetry maps, along with maps of substrate composition, macrophytes, and fish distribution and population characteristics.



Experience and Credentials

I have 28 years of experience in water resources investigations at regional, state, and federal facilities and for the last 15 years I have operated as a private consultant. I am a registered professional hydrologist (water quality), and also have certifications as a lake manager and a fisheries biologist (again, in water quality). I have nearly 40 peer-reviewed publications and approximately 100 professional reports in limnology. Our engineer is a recent graduate of Oregon State University and I also currently have an engineering intern on staff. I am pleased to announce that Randall Breeden, a senior geohydrologist, has joined MaxDepth Aquatics as an associate. Randy has 22 years experience in both field and modeling applications of ground water flow-paths needed for lake, river, and wetland applications. He joins us from Denver where he served as a project manager with EPA in charge of ground water monitoring and remediation at 45 facilities across the country.

Recent Projects

Some of our major projects for this year revolve around Diamond Lake, its hydrology, nutrient and major ion chemistry, and the biological consequences of introduced fish species. Our studies include preparing hydroacoustic maps of the bathymetry, sediment, macrophytes, and fish distributions. In the process of conducting the hydroacoustics, we discovered depressions scattered about the lake that were discharging gas. A related area of major importance is the surface-ground water connection and its influence on water quality. We are currently conducting extensive monitoring and detailed modeling to forecast how the lake might change as a consequence of removal of the invasive tui chub and a change in future fish stocking programs. The goal of our efforts is to provide the management agencies with a path for making decisions that improve water quality while maintaining other beneficial uses of the

LAKE WISE

The Oregon Lakes Association Newsletter

P. O. Box 345
Portland, OR 97207-0345

Email: membership@oregonlakes.org
Email: events@oregonlakes.org

OLA Mission: The Oregon Lakes Association, a nonprofit organization founded in 1988, promotes understanding, protection, and thoughtful management of lake and watershed ecosystems in Oregon. For additional information on OLA, to get involved, or to obtain a membership application write to: OLA, PO Box 345, Portland, OR 97207-0345

We are also on the web in color! www.oregonlakes.org

Lake Wise Editorial Policy and Notes on Authors

Opinions of those who contributed to articles in this Newsletter are judged by the Oregon Lakes Association Board Editorial Committee (S. Geiger-Chair, Mark Sytsma, and R. Edwards) to be typical of the diversity of opinions of those who have a scientific, economic and political interest in the lakes of Oregon. Comments praising or disparaging articles in this newsletter are welcome and representative comments will be considered for presentation in the next issue of *Lake Wise*. Advertisement in *Lake Wise* does not constitute OLA endorsement.

Lori Campbell (*President's Perspective).* Lori is Manager of the Devils Lake Water Improvement District, Lincoln City, Oregon. She is beginning her stint as President of OLA.

Roger Edwards (*Muddled Decision Framework*). Roger, current Secretary of OLA, monitored the water quality of the City of Portland Bull Run Reservoir for the past 27 years.

Joe Eilers (article on *MaxDepth Aquatics, Inc.*). Joe has been board member and past President of OLA. He has been a principal of E & S Environmental Chemistry of Corvallis. He has recently conducted limnological studies at Diamond and Upper Klamath Lakes.

Stan Geiger (*OLA Annual Meeting, Grass Carp Decisions*) Stan has worked as limnologist and phycologist for Beak Consultants, Inc., Scientific Resources, Inc. and as wetland ecologist for Shapiro and Associates, Inc.

Richard Petersen (*Consulting the Experts on Diamond Lake's Future*). Richard has been OLA Board member and past President. He is a professor at Portland State University working with graduate students and offering courses in limnology and water chemistry. He is also one of the authors of the *Oregon Lake Atlas.*

Rowena Price. *(North Coastal Lakes Head for IPM's)* Rowena is a lakeside homeowner at Smith Lake on