



Colorado Lake and Reservoir Management Association
P.O. Box 9504 Denver, CO 80209
www.clrma.org

President's Doc

By Shelley Stanley



Maybe it is my age, perhaps the holiday season, the advent of a new year, or all of the above, but I got to reminiscing on memories where water was the central theme. This is a water memory from Asia. Some background information for

setting; I am a Department of Defense "child" that is to say a military brat. As such, I have had the pleasure of living in several foreign countries and one state that felt like a foreign country. Our family lived on Clark AFB, which was near Manila in the Philippines. One day dad got a wild hair and took me out of school so the two of us could visit Bangkok, Thailand. Mom and my brother stayed home. Bruce never got the hint that there are advantages to being a good student.

I have many fond memories of our visit. Taking part in a Buddhist ceremony in the Emerald Buddha Temple was a highlight. I think we managed to not insult the monks that were chanting and playing instruments behind us. We bowed when everyone else did, that was good. We did not attempt the chant, another good call. I am certain we blended. And if we did stick out a bit, the monks smiled at us anyway. A side note, it is easy to find men's size thirteen and women's size nine in a pile of shoes as these sizes are not common in Thailand. But this is a *Clarion* article so let's talk water.

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CLRMA President, Shelley Stanley, visited the Emerald Buddha Temple in Bangkok, Thailand.

Bangkok was, and still is, a sprawling city. It seemed to have no end, at least not to a Westerner on foot. Transected by the Chao Phraya River, canals or khlongs, further dissected the land. The khlongs served as floating markets and as a sewer collection system. Homes on stilts lined the canals, floating docks display the fruits and vegetable wares for sale. Chickens were common and the occasional pig was available, footing is an obvious limitation for larger animals. Monks in saffron robes plied the water. Business was brisk, bartering voices rose and fell, the smell was organic. *Article continued on page 2.*

President's Doc, Continued from Page 1



Khlongs are canals that served as floating markets and sewer collection systems. Today, they have succumbed to sedimentation and have been paved over.

Wanting to insert a photo of the khlongs, I looked on line for a stock photo. Sadly, it is reported that they have succumbed to natural and anthropogenically assisted sedimentation. So I dug up faded photos from our visit. Terra firma now, the former khlongs have been paved over and are supporting a different kind of business and housing. All this reminiscing got me thinking, what are some of your water memories?

CLRMA is an organization that is all about water. Our mission statement is:

To promote understanding and comprehensive management of lakes, reservoirs, and watersheds by providing a forum for sharing of information and experiences on scientific, administrative, legal and financial aspects of lake, reservoir, and watershed management.

The Association fosters cooperation and interaction of public and private individuals, agencies, organizations and units of government involved in lake, reservoir, and watershed management. CLRMA assists in the development of local, state and national lake and reservoir programs consistent with appropriate management strategies and techniques. If any of these goals sound like something you can support with your time, talent, or financially, feel free to contact me or any board member (email address' are available on our web site: www.clrma.org). We would be happy to answer any questions you may have about the organization or how you can get involved.

Everyone has a story or two to tell about how water has touched their life, join CLRMA and leave a legacy for future generations.

Join CLRMA!
Visit www.clrma.org for a 2010 membership form.

2009 Year in Review

By Elizabeth Brown



2009 was full of excitement for CLRMA members! CLRMA hosted two conferences in 2009, along with acting as Chair of the Joint Watershed Conference Steering Committee.

We began the year with the Spring Conference, held on April 21st at the Thornton Recreation Center. The workshop began at 11:00 am and adjourned at 4:30 pm. The workshop had two focus points: water quality and storage projects, and aquatic nuisance species (ANS). On the first topic point, we heard talks from NCWCD regarding the Windy Gap Firming Project and Glad Reservoir, CDPHE about the clarity standards for Grand Lake and from Thornton on the biological nitrate removal pilot project. On the second topic, ANS, we learned about the state program and the status of zebra/quagga mussels from CDOW, about the noxious weed drawdown from NCWCD and two talks from Westminster about Eurasian watermilfoil and using the FlowCAM to detect mussels veligers in the water. Feedback from members was positive, especially when it came to reviewing the great BBQ lunch!

CLRMA successfully Chaired the Joint Watershed Conference which was held October 7-9 at Vail Cascade Resort and Spa. The title of this year's event was "Thriving in Challenging Times" and was co-sponsored by Colorado Watershed Assembly, Colorado Foundation for Water Education, Colorado Riparian Association, and AWARE Colorado. People attended to hear a large variety of presentation and panel discussions. To review conference presentations, visit the Colorado Watershed Assembly website at <http://www.coloradowater.org/conference.php>.

CLRMA also hosted its 2nd Member Appreciation Night at the Rockies Game in September, and was lucky enough to do it on fireworks night. Looks like this fun event is becoming a member favorite! Thanks to Steve Lundt for being our ballpark party planner for a 3rd year in 2010! Go Rockies!

The Fall Conference and Annual Awards Luncheon concluded the 2009 events for CLRMA. The Conference was held on November 10, 2009 at the Thornton Recreation Center from 9:00 am - 4:00 pm. Participants were given an overview of several aeration systems and speece cone, in addition to an introduction to alum and the clean marinas program. Participants also received an update on the State ANS Program from CDOW, and learned about the new biological control agent for zebra and quagga mussels from the Bureau of Reclamation. An overview of natural causes of fish kills was also presented by CDOW. Once again, along with our presenters, the food got rave reviews!



The Annual Awards Luncheon had time dedicated to member discussion about events, topics, themes, locations, lengths of meetings and other activities that CLRMA is involved in. If you have any feedback about past events, or topics you'd like to learn about at future events, please contact our Conference Chair, Elizabeth Brown, at elizabeth.brown@state.co.us. *Article continued on page 4.*

2009 Year in Review, Continued from Page 3

CLRMA has another great year of events planned for 2010! We begin the year with our first ever Introductory Algal Workshop on February 22nd. The workshop will be held at the Division of Wildlife's Hunter Education Building at 6060 Broadway, Denver, Co, from 9:30 am – 3:30 pm. Register now!

Stay tuned for more information 2010 events such as our Rockies Game outing April 24 or 25, and Alum Workshop in conjunction in with the National Water Quality Monitoring Workshop on April 29th. Lakes Appreciation Month will host the main event on Grand Lake the weekend of July 16–18. The Fall Conference and Annual Awards Banquet details are forthcoming.

Hope to see you at another great CLRMA event in 2010!

A special THANKS to all our 2009 speakers:

Pam Benskin (Aurora Water), Blake Beyea (CDPHE), Elizabeth Brown (CDOW), Kelly Cline (Westminster), Paul Clukies (Clean Marinas), Sarah Dominick (Denver Water), Mary Fabisiak (Westminster), Chris Knud-Hansen (SolarBee), Steve Lundt (Metropolitan), Vic Lucero (Thornton), Fred Nibling (Bureau of Reclamation), Esther Vincent (NCWCD), Peter Walker (CDOW), and Brian Werner (NCWCD).

REGISTER NOW FOR CLRMA'S INTRODUCTORY ALGAL WORKSHOP!

What: *Introductory Algal Training Workshop*

When: *February 22nd, 2010*

Where: *At the Colorado Division of Wildlife Headquarters, Hunter Education Building*

Cost: *\$65.00 (including lunch)*

Microscopes will be provided

Brief Outline for the day:

1. General talk about Algae and why we treat water to remove them and what is their importance in the environment.
2. Discussion about Algae and general descriptions: unicellular, colonial, filamentaceous, tubular, strands, and membrane.
3. Slide show and general discussion
4. Measurements– microscope set-up and calibration.
5. Microscope time with samples

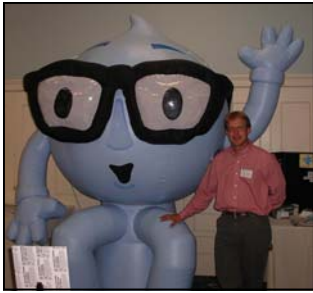
Visit www.clrma.org for more information and a registration form.

2010 CLRMA Events Calendar

January <ul style="list-style-type: none"> • Board Meeting (1/5) 	February <ul style="list-style-type: none"> • Algal Workshop (2/22) 	March <ul style="list-style-type: none"> • Board Meeting (3/2) 	April <ul style="list-style-type: none"> • NWQMC in Denver (4/26-29)
May <ul style="list-style-type: none"> • Board Meeting (5/4) 	June	July <ul style="list-style-type: none"> • Lake Appreciation Month • Day on the Res - Grand Lake • Board Meeting (7/6) 	August <ul style="list-style-type: none"> • Board Meeting (8/3)
September <ul style="list-style-type: none"> • Board Meeting (9/7) • Rockies Game (TBD) 	October <ul style="list-style-type: none"> • Watershed Conference (10/5-10/8) 	November <ul style="list-style-type: none"> • Board Meeting (11/2) • Fall Business Meeting (11/10) 	December <ul style="list-style-type: none"> • Board Meeting (12/7)

CLRMA Representatives attend the 29th Annual NALMS Symposium

By Steve Lundt



The 29th International Symposium of the North American Lake Management Society was held in Hartford, Connecticut on October 27 - 31, 2008. The theme of the symposium

- *Ensuring Our Lakes' Future* - was nicely carried throughout the Symposium's sessions, workshops, and social activities.

There were two half-day workshops and five full-day workshops that were well attended. These workshops covered a variety of lake management topics. Workshops included: nitrogen control, alum use, internal phosphorus loading, remote sensing, tools for lake and watershed

management, nuisance algae, and aquatic plant identification.

As always, the Symposium was defined by the people and the setting. Just over 500 people attended the Symposium, and the Connecticut Convention Center,

overlooking the fall foliage along the Connecticut River, was a great location to focus everyone's attention on how to ensure the future of our lakes. Five concurrent sessions occurred throughout the Symposium covering such topics as modeling, fisheries management, aquatic plants, management approaches, and volunteer monitoring. Great food and company was enjoyed amongst the 48 exhibitors throughout each day.

Poster presentations provided thought-provoking conversations as well during the breaks and in between over events.

Seemingly as important, the social events during the Symposium put many smiles on old friend's faces and provided a chance to exchange new business cards. Each night, attendees were encouraged to find their way to the Hospitality Room to solve world lake problems and argue about the Yankees in the World Series. The Exhibitor's Reception followed the NALMS Annual Membership Meeting and provided a great opportunity to visit the different booths. The Annual Awards and Recognition Banquet on Thursday night was enjoyed by all. Prior to the banquet, the Connecticut Science Center opened their doors after hours for a private reception just for NALMS.

Overall, it was a wonderful week of social connections and professional enrichment that was enhanced by the charming fall atmosphere of Connecticut. Oklahoma City is next on the list for fall of 2010, and preparations are already being made to make it a spectacular 30th annual Symposium event.

"Overall, it was a wonderful week of social connections and professional enrichment that was enhanced by the charming fall atmosphere of Connecticut."



CDOW's State Invasive Species Program by the Numbers...

By Elizabeth Brown



2009 was a banner year for the State Invasive Species Program in CDOW! Since its inception, the program has been focused on managing the threat from aquatic nuisance species, primarily zebra/quagga mussels, New Zealand mudsnails and Eurasian watermilfoil. However, our mission remains the same – to stop the spread of all invasive species and to prevent new invasives from entering our state waters and lands. We couldn't be more proud of our accomplishments in the last year, so we've tallied them up for you...

Countless	Partners
385,000+	Boat Inspections
14,630	Milliliters of Tow Sample Read with Cross-Polarized Microscopy
2,700+	Boats Decontaminated
1,463	Plankton Tow Samples Taken
1,012	Individuals Certified as Watercraft Inspectors and Decontaminators
508	ANS Submissions from Inspection Stations
350	Signs Posted
209	Certified Locations for Watercraft Inspection and Decontamination
153	Standing Water Bodies Sampled
132	Temporary Workers
125	Sampling Kits Distributed
91	Coolers Mailed
66	Quality Assurance Evaluations
63	Trainings for Watercraft Inspection/Decontamination or Sampling/Monitoring
56	PowerPoint Presentations
48	Crayfish Sampling Sites
29	Watermilfoil Sites Sampled
22	Site-Specific Mussel Management Plans Written
16	Zebra/Quagga Mussel Encrusted Boats Intercepted Before Entering Co Waters
15	Positive Sites for Eurasian watermilfoil
13	Tow Net Cod Ends Used
11	Regional or National Invasive Species Committees
10	Avis Rental Trucks (driven.....and driven.....and driven)
9	Expos and Trade Shows
8	Displays with Encrusted Mussels Attached
7	Research Projects
6	Crews
5	Boats
4	DOW Office Locations for Boat Inspections
3	New Zealand Mudsnail Locations (no new ones)
2	State Standard Manuals/Handbooks
2	Hybrid populations of Eurasian x Northern Watermilfoil found
2	Other States Trained
1	Set of ANS Regulations Passed
1	Annual ANS Workshop
1	Zebra/Quagga Mussel Veliger Found (Pueblo)
0	No New Mussel Populations Found!

I hope you had as much fun as we did in 2009! Looking forward to another productive year protecting Colorado from the harmful impacts of invasive species in 2010!

Spotlight: H2O Jo

Age: I am ageless. So far, I do not have a white hair or a wrinkle. In fact, my color is as vibrant as it was at my inception.

Yrs w/ CLRMA/NALMS: I have been an honorary member of CLRMA for quite some time. I don't actually work for money so CLRMA takes my membership out in trade. Perhaps you have seen me at the Day at the Res event?

Yrs in CO: Around 10, age is not that important to me. I must say that I am a native Coloradoan, so is Flo.

What do you do: I am the ambassador for the non-point source, conservation, and water quality communities. It is a position that I am uniquely suited for. My listening skills are unmatched, I never tire of smiling and waving in fact, I am often called the life of the party.

Family: Curry Rosato, mother, and Flo, partner

When I'm not working I am... Relaxing in my home, going with the flow.

Your idea of happiness: A world of clean, abundant water.

Not many people know that... I like to canoe and kayak.

What do I like to do most: Be hugged by kids, followed closely by waving and smiling.

If I won the lottery: I would still continue working to get the message out about clean water. People need to realize that it all starts with the individual....You Can Make a Difference.

Last book I read: Beyond the Hundredth Meridian: John Wesley Powell and the Second Opening of the West by Wallace Stegner, a classic that everyone should read.



"I would love to meet the Goodyear Blimp"

What political office: United Nations Ambassador

Toughest aspect of my job: The down time, I would much rather be working, rain, snow, sunshine doesn't bother me. Wind is an issue at times. You can put me to work by going to <http://npcolorado.com/h2ojo.htm> and contacting the caretakers list on the left hand side of the web page.

What famous person would you like to meet most: I would like to meet the Goodyear blimp, how cool would it be to fly and the scrolling advertisement board on its side, awesome. If Mr. Goodyear is not available, I would love to meet Underdog from the Macy's Parade.



H₂O Jo makes a guest appearance at the 2009 Lake Appreciation Day at Ridgway Reservoir

Reflections

Biological Control of Eurasian Watermilfoil in Standley Lake

By Kelly Cline



Eurasian Watermilfoil is a non-native aquatic plant that was first identified in Standley Lake in 1995. It grows in dense mats and chokes out beneficial native species of aquatic vegetation. During the summer of 2002 dense mats of Eurasian Watermilfoil (EWM) were prevalent along 60% of the shoreline of Standley Lake. EWM mats create areas where blooms of blue-green algae can occur. Blue-green algae blooms can cause major taste and odor issues for drinking water. Additionally, vegetation in mats will interfere with recreation activities.

In 2001 the Standley Lake Cities (Northglenn, Thornton, and Westminster) investigated several methods of control including mechanical, chemical and biological, and selected biological control as the most appropriate method for Standley Lake. During 2002-2003 the Standley Lake Cities pilot tested a biological treatment method, which is a proprietary treatment termed the MiddFoil Process. The Middfoil process uses aquatic weevils to control the growth of EWM. The success of the pilot project was mixed because of the extreme lake conditions of 2002 - 2003, which included a record setting drought with extremely low water levels in the lake, and then a rapid re-filling of the lake in the spring of 2003. In 2004, the cities decided to go ahead with the project and stocked 46,000 eggs and larvae into Standley Lake. In 2005, after assessing that a weevil population had successfully over-wintered, an additional 46,000 eggs and larvae were stocked. The last scheduled stocking of 46,000 eggs and larvae occurred in 2006. This is a follow up report of the Middfoil process, and how it is working in Standley Lake.

EWM Weevil Life Cycle

How do weevils control the growth of milfoil? To answer this question we have to understand the life cycle of the EWM weevil. Female weevils begin laying about 1 egg a day, when water temperatures reach 15 degree C. The egg is layed on the top portion of the milfoil plant called the meristem. The egg stage lasts about 3-6 days at temperatures of 20-25 degrees C. It's been reported that about 65-100% of the eggs will hatch. After hatching, weevil larvae will tunnel inside plant stems, feeding on the EWM plant. Stems that have been hollowed-out by weevil larvae are less buoyant, and will sink. The larvae stage lasts about 8-15 days. Adult weevils live on the surface of the milfoil, and feed on the leaves and stems. Adult weevils live about 192 days. When decreasing water temperatures reach about 15 degrees C, adult weevils migrate to the shoreline, where they hibernate for the winter. Adult weevils prefer wild grasses, herbs and organic matter near shore. In the spring, adult weevils return to the water and start the whole cycle again. *Article continued on page 9.*



Standley, the weevil.

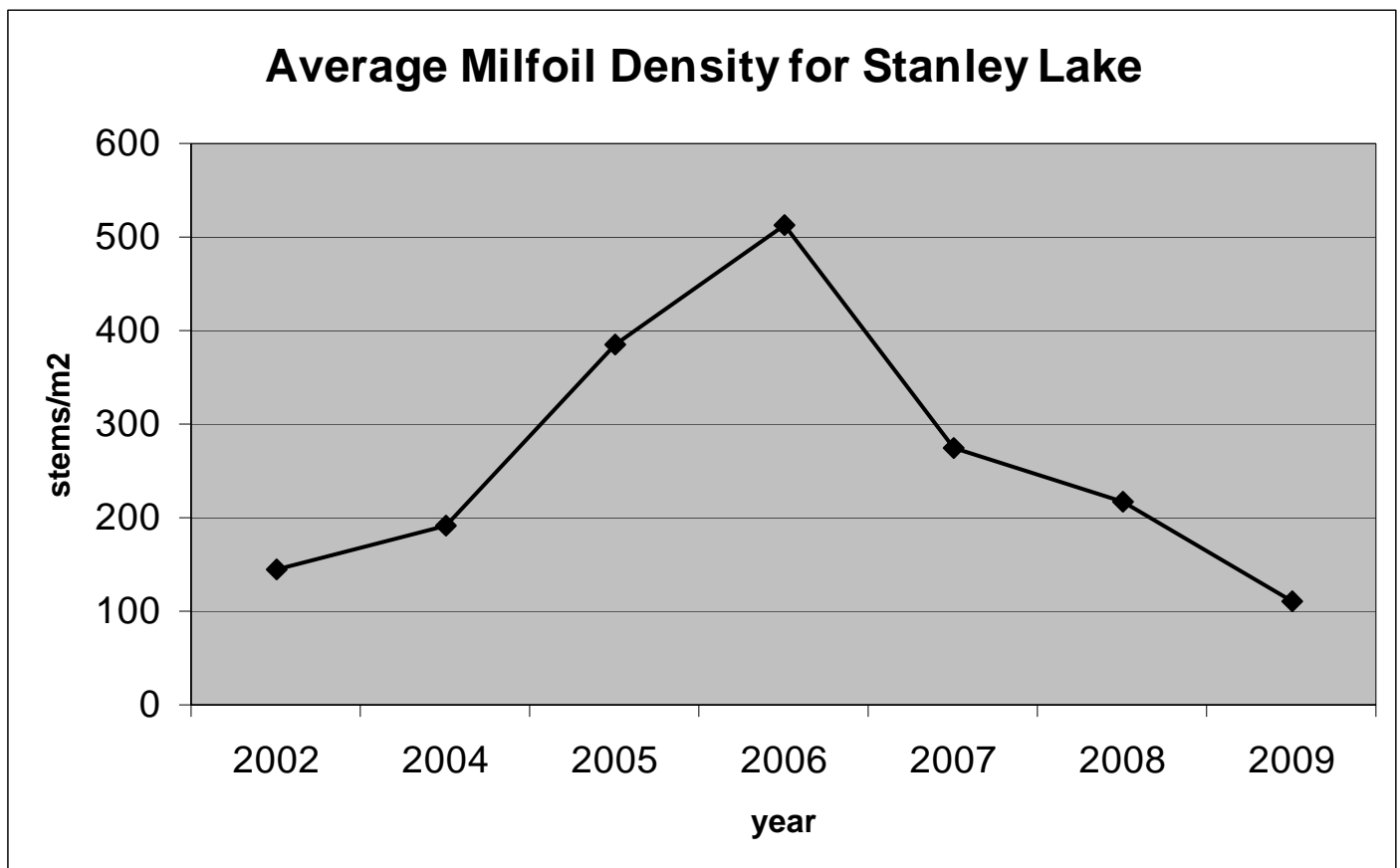
Middfoil Process

EnviroScience Inc. has patented their stocking process, and termed it the Middfoil Process. Weevils are collected in the spring from the wild by scuba divers and brought back to the lab for processing. The weevils are counted and then shipped on milfoil plants to their destination. Divers from EnviroScience take the plants, which have the weevils on them, and attached the lab milfoil to the milfoil in the lake. From the introduced milfoil the weevils spread out and begin their life cycle. The reason wild weevils are used is because no one has come up with a good process for culturing weevils in a laboratory environment. Apparently, weevils are hard to grow in captivity. Not enough ambiance!

Standley Lake Results

As mentioned, weevils were collected from Standley Lake in the spring of 2005, which

demonstrated that the weevils stocked in 2004 had over-wintered and re-entered the lake. We have EnviroScience perform a survey every summer, where historical stocking sites are measured and EWM is collected. The collected milfoil is taken back to the lab, where counts are performed for eggs, larvae, and adult weevils. In addition, density measurements, and the amount of damaged is determined. From these surveys we have determined that the biomass of milfoil plants has been declining in Standley Lake since the last stocking of weevils in 2006. In 2006 the biomass of milfoil had an average density of 550 stems/ m². In 2008, the average density was 200 stems/ m², and in 2009 the average density was down to 110 stems/ m². The milfoil density has decreased since 2006 by roughly 79 %. There are still very large patches of milfoil in the lake, but there are very large areas where milfoil doesn't grow any more as well. *Article continued on page 10.*



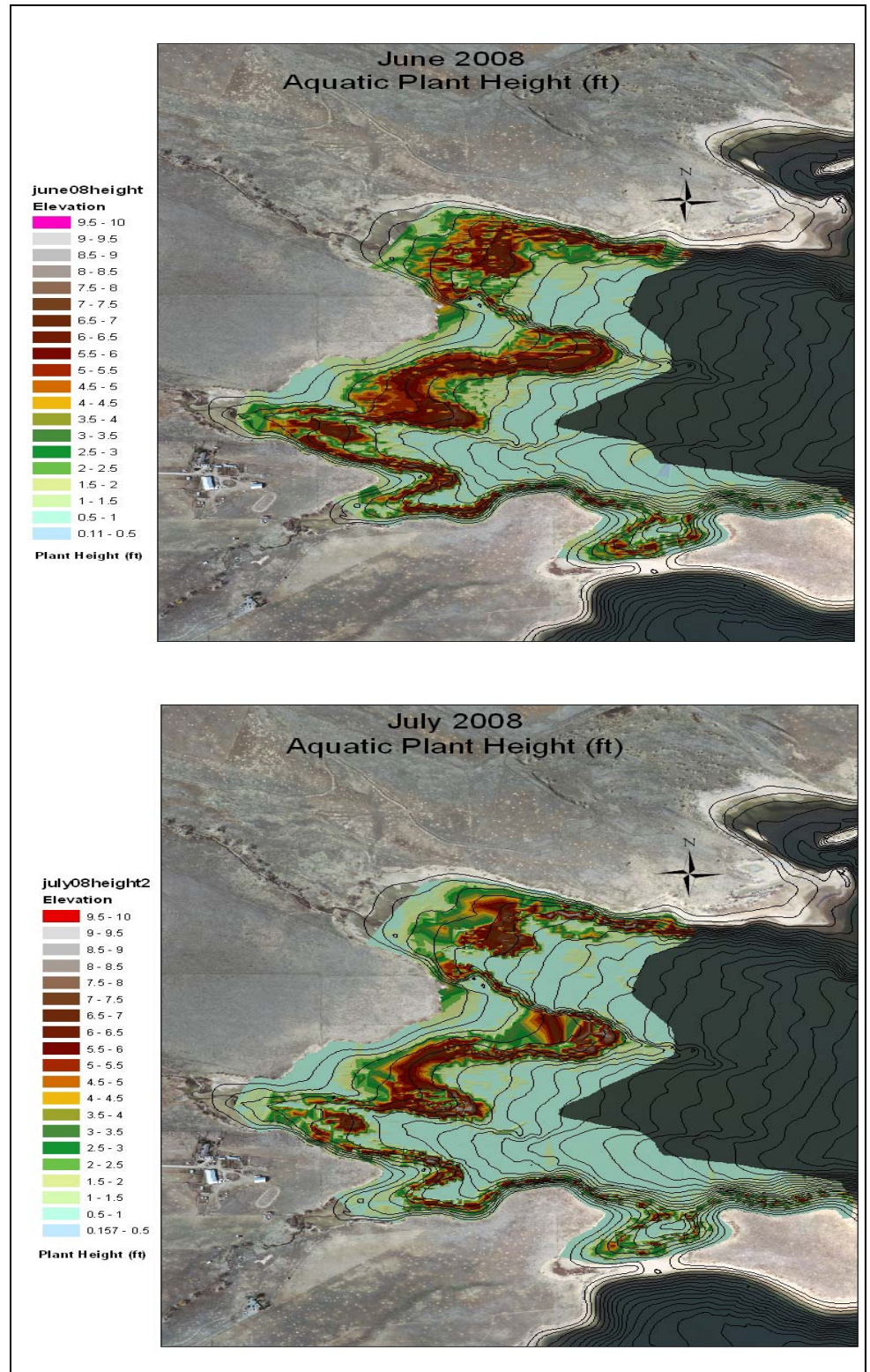
Biological Control of Eurasian Watermilfoil, Continued from Page 9

Biosonic Acoustic Mapping

We purchased acoustic mapping equipment for aquatic plant surveys in 2007. We have been mapping the milfoil beds with Biosonic's acoustic equipment for three years. With this mapping equipment we are able to map the presence, and the height of aquatic plants. The maps show large reduction in historical milfoil beds, with the most dramatic changes occurring from spring to summer. In other words, as the temperature of the water increases, the density of the milfoil decreases.

Before weevil introduction, the density and height of the EWM plants would increase with an increase in water temperature. There is one major drawback with our acoustic mapping process; it doesn't distinguish between milfoil and other aquatic plants. When weevils damage milfoil plants, they die back. Native aquatic plants will often re-establish in the die back areas, and will appear as plant growth on the maps. In the future, we will be collecting aquatic plants in conjunction with GPS coordinates, which will help us map the true EWM plant assemblage. *Article continued on page 11.*

Aquatic Plant Height in Stanley Lake



Discussion

The cost of the entire program has been about \$250,000 dollars. Since we have naturally reproducing weevils, we haven't had to re-stock them in the lake. So the program right now has cost us roughly \$31,250/yr. Next year, the price per year will be even less. As the milfoil density continues to decrease, so will the weevil population. Eventually the milfoil density will re-surge, and in order to maintain a manageable density of EWM, we will have to stock the lake with weevils again. Biological control is exactly that.....control. We will never be rid of the milfoil completely. The best we can hope for is keeping the density at a manageable level. All the other control options require additional treatments as well. We like the biological control option because it has less of an impact on water quality, and avoids the use of herbicides in our drinking water supply.



Stanley Lake in Westminster Colorado.

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Ask the *Lakespert*

By Steve Lundt



Q: How in the heck do you figure out if your lake is violating the ammonia standard? Could it get any more complicated?

Thanks, Chris Greengal (Pine Junction, CO)

A: Ammonia standard is a doozy! You first have to have 5 years worth of recent data that includes ammonia (total as N), water temperature, and pH.

Once you have all the data assembled in a spreadsheet, you will then begin the detective work of figuring out how to read Regulation 31: The Basic Standards and Methodologies for Surface Water. Believe me, there is nothing “basic” about it. To avoid having to read all 190 pages, just go to page 51 and try to focus your eyes on Table II: Inorganic Parameters. As you look across the first row titled “Ammonia (mg/ l of N) Total”, you will witness no numbers, instead lots of letter and footnote references. This is because there are formulas to calculate whether or not your ammonia data are in violation.

There is no ammonia standard for agriculture or domestic water supply uses. It also doesn't matter if your lake or reservoir is classified as class 2 Cold or Warm. They didn't want to confuse us lake folks anymore by provide extra formulas for class 2.

Speaking of formulas, there are four of them: two for chronic and two for acute. For chronic, you need to determine if you have “early life stages” present (cute baby fish swimming around between April 1st and August 31st) or absent (not so cute bigger fish swimming around between September 1st and March 31st).

$$\text{Chronic} \\ \text{Early Life Stages Present (elsp)} = \left(\frac{0.0577}{1 + 10^{7.688 - \text{pH}}} + \frac{2.487}{1 + 10^{\text{pH} - 7.688}} \right) * \left(\text{Min. } (2.85, 1.45 * 10^{0.028}) \right)$$

$$\text{Early Life Stages Absent (elsa)} = \left(\frac{0.0577}{1 + 10^{7.688 - \text{pH}}} + \frac{2.487}{1 + 10^{\text{pH} - 7.688}} \right) * \left(1.45 * 10^{0.028 * (25 - \text{Max.}(T, 7))} \right)$$

$$\text{Acute} \\ \text{Salmonids Present (sp)} = \left(\frac{a}{1 + 10^{7.204 - \text{pH}}} + \frac{39.0aa}{1 + 10^{\text{pH} - 7.204}} \right)$$

$$\text{Salmonids Absent (sa)} = \left(\frac{0.411}{1 + 10^{7.204 - \text{pH}}} + \frac{58.4}{1 + 10^{\text{pH} - 7.204}} \right)$$

Article continued on page 13.



The formulas to spit out an ammonia standard for any given pH and temperature are the easy party, now you have to interpret Regulation 31 and figure out if your ammonia data is in violation with the results from your calculations. The 15% tile applies to the ammonia standard. One way to interpret this is that you would be in violation if more than 15% of your ammonia values were higher than the calculated values. But what if on the same day you collect a top sample and a bottom sample and only your bottom sample is in violation and the fish can swim to higher water? Is there some hypolimnetic exemption like for dissolved oxygen that allows for natural conditions near the sediments? No! So good luck with that one.

So that is the answer to your first question. The answer to your second question is, YES, you could analyze for unionized ammonia instead of total ammonia.

Place your add here!

Reach out to the CLRMA membership. Our members include consultants, agencies, municipalities, experts, and citizen volunteers.

1. Go to www.clrma.org and download our "advertisement document"
2. Choose your advertizing package (see options below)
3. Submit the advertisement document with payment to the "Colorado Lake & Reservoir Management Association".

	Full Page	Half Page	Quarter Page
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3 issues	\$180	\$90	\$45
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Colorado Lake and Reservoir
Management Association

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Visit us at:

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