



Laboratory of Limnology  
Lake Mendota

# LIMNOLOGY NEWS

University of Wisconsin- Madison  
College of Letters and Science



Trout Lake Station  
circa 1935

Number 16

Fall 2008

## ***From the Director's Desk, Fall 2008***

Dear Alumni and Friends of the CFL:

Once again, it's time for the appearance of loons, grebes and coot on Lake Mendota. That's our prompt for reporting a year's worth of activities and accomplishments from those of us in the Center for Limnology. This issue includes a diversity of pictures representing stories about swordfish, submersibles, streams and snow on the roof of a new housing facility at Trout Lake.

Our featured alumnus in this edition is Chris Boggs. His account takes us on a round trip from his youth in Manoa Valley on Oahu, then to Madison, and, via California, back to Manoa Valley. We typically ask new graduate students: "Where do you want to be in ten years?" The answer helps us plan for the type of research pursuits and associated development of a professional network that might help a new student be most competitive for the kind of position they seek. In most cases, answers are somewhat vague and general. Chris immediately offered his answer: "In Hawaii working on tunas!" That's a very well defined target and threading that needle was a challenge. In fact, that is precisely where he is today. As you'll learn, a network of CFL alumni played an important role in that outcome.

Among the unique events this year was a pilot voyage of the ENDURANCE in Lake Mendota. The Hasler Laboratory served as home base and provided logistic support for the field test of a submersible next destined for work in Antarctica's Lake Bonney. Baptism in Lake Mendota, then Lake Bonney are steps in preparation for NASA-sponsored explorations of oceans on one of Jupiter's moons, Europa. In another interesting expression of the CFL network, the pioneering limnological research on these Antarctic lakes owes to alumni Gene Likens and Bob Ragozkie. Yes, the ENDURANCE folks were fully aware of that connection.

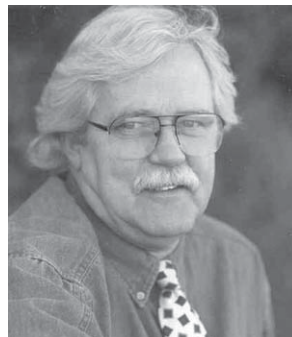
Emily Stanley offers an account of the linkage that takes nitrogen cycling from the corn fields of Wisconsin to the Gulf of Mexico. The federal biofuels initiative has produced a huge increase in acreage dedicated to corn. Fertilizers enhance that production and create concerns about excessive nutrient inputs to our waters, especially the streams in agricultural areas. Emily's group is working in collaboration with an ongoing stream restoration project to gain insights from a whole-ecosystem, comparative study of nitrogen transformations in Wisconsin streams.

This year includes a particularly important recognition in that we dedicated a new housing facility at the Trout Lake Station. In June, the American Society of Limnology and Oceanography honored Tom Frost with a Citation of Scientific Excellence. In October, we held a ceremony that dedicated the "Tom Frost House". In many ways, this place recognizes Tom's leadership as Director of the Trout Lake Station during 1981-2000. The new facility will house visiting investigators, provide a home base for a miscellany of workshop activities and, thereby, increase the diversity and tenor of research based at Trout Lake. Those were among the activities that Tom vigorously encouraged and, in honoring his memory, we are pleased to have accomplished a contribution that promotes such efforts in the future.

As is our custom, we highlight awards and recognition afforded to members of our faculty, staff and students. We also document the graduations and migrations of this year's group as the CFL network continues to expand.

Sincerely,

Jim Kitchell



## **Highly Migratory Biologist**

*By Chris Boggs (PhD 1984, Kitchell)*

In the late 70's I came to the Lake Lab from Honolulu on a WARF fellowship. In my application to graduate school my goal had been to acquire the degree I'd need to return home and improve Hawaii fisheries. I started graduate studies working on John Magnuson's studies off Cape Hatteras, and also moonlighted in the aquarium room with boring gastropods (fascinating, but not remunerative). I stayed salty, despite the surrounding sea of corn, and was soon included in Jim Kitchell's NSF project on tunas. Out in Hawaii, alumnus Andy Dizon was operating a live tuna research facility at NOAA Fisheries (NMFS), previously run by John Magnuson. Through many summers of Hawaii fieldwork followed by frozen Madison winters I became known to the NOAA Fisheries shogun in Honolulu, Richard Shomura, who hired me to work on "highly migratory species" a congressional euphemism that at that time excluded tunas, billfishes, and similar species from being considered "fish" under the Magnuson-Stevenson Act. After a brief NRC post doc in La Jolla investigating fish bioenergetics with alumni John Hunter and Bob Olson, I returned permanently to Honolulu to work on forecasting tuna fishing success, the effects of hook depth and time on tuna and billfish fish vulnerability to longline fishing, and on localized depletion of



*Boggs with opah.*

highly migratory species (with alumnus Xi He).

I was promoted to managing other scientists studying tuna physiology and behavior, life history, and stock assessments. Congress accepted that tuna were fish. Kitchell got another big NSF project funded on apex predators. For a decade, every January, NOAA Fisheries in Honolulu had an unofficial UW branch office working on models of the pelagic ecosystem. Meanwhile bycatch of sea turtles, which had always been fish under the Magnuson-Stevenson Act, became a cause célèbre, and the Court closed Hawaii's largest fishery (a judge also stated that turtles were not fish, but air-breathing mammals). I worked to improve fishing methods in ways that allowed that fishery to reopen, realizing my initial goal for graduate school. I now run a program of 30 scientists, and provide scientific advice from NOAA to the Western and Central Pacific Fisheries Commission and other regional tuna fisheries management organizations. Working with the CFL family has been a big success for me, and whole lot of fun.



*Chris Boggs, serious about safety when working with swordfish.*

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## **Support the Center for Limnology**

Private support from alumni and friends of the University of Wisconsin-Madison plays a crucial role in helping the University achieve continued excellence in teaching, research, and public service. Gifts to the Center for Limnology provide important support for graduate and undergraduate students, visiting scholars, faculty research and facilities development. If you would like to make a donation to the Center, please contact Trish Haza at 608-262-3304, or via e-mail at [phaza@wisc.edu](mailto:phaza@wisc.edu). You may also find more information about the Center for Limnology endowment programs, including how to make donations online, by visiting our web site, <http://limnology.wisc.edu> and clicking on the "Friends and Support" link.

If you would like information on making a gift of securities or including the Center for Limnology in your estate plans, please contact Christopher Glueck, University of Wisconsin Foundation, 608-265-9952, or via e-mail at [chris.glueck@uwfoundation.wisc.edu](mailto:chris.glueck@uwfoundation.wisc.edu).

## ***From Lake Mendota to Outer Space***

The Center for Limnology provided logistical support this last February (2008) as researchers from NASA and the University of Illinois at Chicago came to the ice-covered Lake Mendota to test their submersible ENDURANCE — Environmentally Non-Disturbing Under-Ice Robotic Antarctic Explorer. ENDURANCE is designed to swim under the ice, create three-dimensional maps of the underwater environment and sample microbial life. The project is intended to demonstrate concepts and technology for exploring the ice-bound oceans of Jupiter's moon Europa. Plans call for the robot to be shipped later this year to Antarctica, where it will be used to map Lake Bonney, a 2.5-mile long, one-mile wide and 130-foot deep perpetually ice-covered lake.



*Above, workers clear a hole in the ice as camera crews record the process.*



*Above, ENDURANCE takes her first ice bath.*



*Above, the crew readies ENDURANCE for another test run.*



*Left, the Hasler Lab parking lot became a temporary crane habitat.*



*Close up of the ENDURANCE research vessel.*

## On the Receiving End: Nitrogen in Wisconsin Streams

by Emily Stanley



*A typical Wisconsin farm stream showing the major sources of nitrogen to surface waters: corn and cows.*

For many, the first image that comes to mind when Wisconsin is mentioned is a bucolic picture of rolling farmlands and cows. Wisconsin has long embraced its identity as America's dairy land and taken great pride in its farming legacy. But most state residents, and certainly virtually all limnologists, have long known that this beloved cheesehead tradition comes at a cost to many of the State's waterways. Indeed, early studies led by Art Hasler, carried on by Steve Carpenter, Jim Kitchell, and Dick Lathrop, unraveled many of the consequences of excess phosphorus derived from manure and fertilizer on Wisconsin lakes. While these problems of excess phosphorus are enormous for our local lakes, beyond the boundaries of the State many researchers are directing their attention toward the other major nutrient derived from these agricultural sources: nitrogen.

In the past two decades, rapid expansion of coastal "dead zones" throughout the world, including the Gulf of Mexico and the Chesapeake Bay, has been fueled by eutrophication due to excess nitrogen loading. Despite widespread awareness of the cause, several factors have conspired to limit the success of efforts to reduce coastal hypoxia. These include the separation of the cause (in the case of the Gulf of Mexico, fertilizer use in the Upper Mississippi River basin) and effect, the economic costs of controlling nitrogen inputs and potential losses of agricultural production associated with reduced fertilizer use, and the absence of surface water standards for nitrogen. With the prospect of agricultural intensification driven by the burgeoning biofuel industry on the horizon, the problem may get worse before it gets better.

The absence of nitrogen standards for surface waters throughout much of the U.S. can, in part, be attributed to the apparent lack of effect of excess nitrogen on streams and lakes. Unlike phosphorus, nitrogen additions to most eastern and midwestern water bodies do not create nuisance algal growth and have long been assumed to be ecologically neutral. As a result, little scientific and management attention was directed to this nutrient. Only when the consequences of excess nitrogen became apparent in coastal areas was serious attention finally directed toward questions such as: "Where does this nitrogen come from?" and "Can nitrogen from agricultural regions be prevented from leaking out of farm fields and traveling through streams and rivers to coastal regions?" Emily Stanley and her lab group have been interested in these and other related questions to help understand and manage the consequences of the legacy of nitrogen enrichment in Wisconsin streams.

To develop a better understanding of the problem, Stanley and fellow CFL staffer Jeff Maxted surveyed 72 streams throughout western and southern Wisconsin to determine how much nitrogen was present, and the chemical form of this nutrient. As expected, they found nitrogen concentrations closely related to the amount of farming in the watershed, with some streams having concentrations that exceeded EPA's safe drinking water standard of 10 mg/L. Unexpectedly, they also found that about 1% of nitrogen in stream water occurred in the form of nitrite. This form of nitrogen is usually assumed to be extremely low or absent, or present only in extreme situations (e.g., downstream from sewage discharges). It is also highly toxic, and may affect sensitive biota at concentrations as low as 0.1 mg/L. So while 1% seems like a small slice of the pie, it translated to maximum levels that exceeded this 0.1 mg/L threshold in a handful of nitrogen-rich streams. Thus, a key message taken from this survey was that the effects of nitrogen



*Drain tiles are particularly effective at routing nitrogen from row crop areas directly to streams, and are pervasive throughout southern Wisconsin.*

may not be limited just to coastal areas. There may be local consequences for sensitive aquatic organisms residing in these nitrogen-saturated streams.

This unexpected discovery has led to a new set of questions which Stanley is currently investigating, including: “When, where, and how is nitrite produced in Wisconsin streams?” Fortunately, an ongoing restoration project being undertaken by the Wisconsin Department of Natural Resources and The Nature Conservancy has provided Stanley and her students with an excellent laboratory for this work. The conversion of the channel and riparian habitat of the East Branch Pecatonica River to its pre-European configuration has offered a whole-ecosystem experiment to compare nitrogen dynamics in restored channels to those reaches passing through areas of intense agricultural use. Preliminary results have been informative. While tile drains are extremely effective at moving nitrogen into streams, nitrite appears to be produced in loose bed sediments common in agricultural streams. More work remains to be done as Stanley and her group continue to unravel the processes affecting nitrogen in these streams.



*A restored section of the East Branch Pecatonica River.*

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### ***In Memory of...***

**John Carl Neess**

6/16/1925-10/26/2007

A faculty member in UW's Zoology Department for 40 years, John Neess inspired several generations of students through a broad array of courses. He served as a consultant in biostatistical methods throughout the College of Letters and Science. John's teaching and innovative instructional techniques distinguished and endeared him to students and colleagues alike. His love of natural sciences was cultivated by his grandfather, and encouraged by his mentors Aldo Leopold and Arthur Hasler. John was a tireless environmental advocate through the years, serving on multiple boards and committees and helping to establish and support various non-profit organizations--including the Rancocas Conservancy, a watershed-based land trust. John requested that memorial donations be directed to the John C. Neess Conservation Fund, Rancocas Conservancy, PO Box 2188, Vincentown NJ, 08088.

***Center For Limnology online***  
***<http://limnology.wisc.edu/>***

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## Noteworthy/Awards

### Faculty and Staff Awards

**Jake Vander Zanden** has been nominated to give the J.C. Stevenson Memorial lecture for 2009 at the Canadian Conference for Fisheries Research.

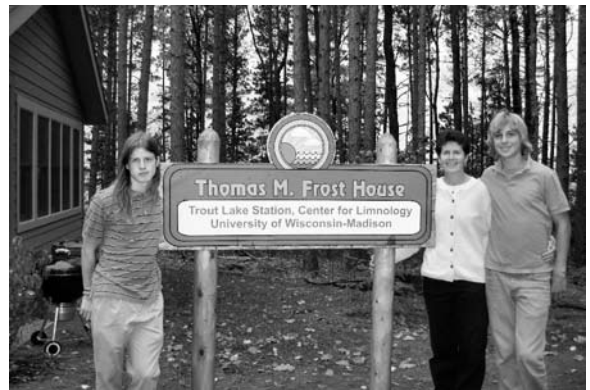
**John Magnuson** received the 2007 Outstanding Achievement Award from the American Institute of Fishery Research Biologists. This is one of the two most prestigious awards designated for fishery scientists--the other is the Award of Excellence from the American Fisheries Society, which was awarded to John some years ago.

**Tom Frost** was honored with the American Society of Limnology and Oceanography Citation for Scientific Excellence Award. This award is given periodically to recognize ASLO members who could not fulfill their career potential because of early death or disability. Susan Knight accepted the award on behalf of Tom at the 2008 ASLO meeting.

In addition to the ASLO award, the new cabin at Trout Lake Station was dedicated "The Frost House." The construction was supported by a grant from the National Science Foundation. A science symposium and dedication ceremony was held 13-14 October 2008.



*Frost House, mid-construction, summer 2008.*



*Susan and Tom's sons, Elliot (L) and Peter.*



*Frost House, Fall 2008.*

### Student Awards

John Jefferson Davis Travel Awards were presented to **Oonsie Biggs, Matt Van de Bogert, Stephanie Schmidt, Matt Diebel, and Katrina Butkas.**

Anna Grant Birge awards were granted to **Reinette Biggs** (Limnology and Marine Science, Carpenter), **Matt Fuller** (Zoology, Pekarsky), **Sally Gallagher** (Botany, Zedler), **Natalie Huisman** (Environmental Chemistry and Technology, Karthikeyan), **Matt Kornis** (Limnology and Marine Science, Vander Zanden), **Ying-Tien Lin** (Civil and Environmental Engineering, Wu), **Steve Powers** (Limnology and Marine Science, Stanley), **Ashley Shade** (Microbial Sciences, McMahan), **Scott Ven Egeren** (Environment and Resources, Dodson), **Brian Weidel** (Limnology and Marine Science, Kitchell).

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## Graduations, Migrations, and New Faces

**Katrina Butkas** (MS, 2008, Vander Zanden)

Thesis Title: The Importance of Method Choice, Effort and Uncertainty in Scaling from Population to Whole-Lake Estimates of Benthic Invertebrate Production.

**Oonsie (Reniette) Biggs** (PhD, 2008, Carpenter)

Thesis Title: Uncertainty, Learning and Adaptation in Ecosystem Management. Oonsie leaves Madison to take up a 2-year postdoctoral position at the newly established Stockholm Resilience Centre in Stockholm, Sweden. Her research will focus on synthesizing current understanding about important ecological thresholds that different ecosystems may be subject to, and exploring new methods for dealing with uncertainty in the management of ecosystems.

**Matt Diebel** (PhD, 2008, Vander Zanden)

Thesis Title: Prioritizing Stream Restoration in Agricultural Landscapes. Matt will be continuing on at the CFL as a post doc collaborating with Jake Vander Zanden (UW) and Markl Fedora (The Nature Conservancy/US Forest Service) working on creating a method for identifying strategic road crossings, whose reconstruction would most benefit stream fishes by restoring stream network connectivity.

**Justin Fox** (MS, 2008, Kitchell)

Thesis Title: A Quantification of Sea Lamprey (*Petromyzon marinus*) Damage to Fishes in Lake Superior. Justin has accepted a position as a research specialist at the University of California-Santa Cruz.

**Olaf Jensen** (PhD, 2008, Kitchell)

Thesis Title: Pelagic Fish Movements in a Predator-Prey Fishery Management Context. Olaf is now on a Smith Fellowship (Society for Conservation Biology) postdoc at the University of Washington, where he is working on collapse and recovery of fish stocks with Ray Hilborn and CFL alumnus, Tim Essington.

**Stuart Jones** (PhD, 2008, McMahan)

Thesis Title: External Drivers of Lemnetic Bacterial Communities. Stuart is currently working at Kellogg Biological Station (Michigan State University) as a postdoc with Jay Lennon. He continues to study aquatic microbial ecology, but with an emphasis on the role of microbes in the carbon cycle.

**David Gilroy** (MS, 2008, Vander Zanden)

Thesis Title: Home Range and Seasonal Movements of Taimen (*Hucho taimen*) in the Eg and Uur Rivers, Mongolia. David is continuing his research on giant fish in Mongolia, while continuing to assist with the development of sustainable fishing practices.

**Steve Powers** (MS, 2008, Stanley)

Thesis Title: Pulse and Plateau Phosphorus Dynamics in Streams. Steve will be continuing his doctoral studies at the UW.

**Stephanie Schmidt** (PhD, 2008, Vander Zanden)

Thesis Title: Stable isotope analysis of the Laurentian Great Lakes food webs: Quantifying spatial and temporal food web differences. Stephanie is currently a visiting assistant professor in the Environmental Studies and Biology departments at St. Olaf College. The position is part of a teaching postdoctoral fellowship through the Consortium for Faculty Diversity (CFD) program, and is split between teaching and research.

**Christopher Solomon** (PhD, 2008, Vander Zanden)

Thesis title: Lake food webs and the benthos: cross-habitat connections, terrestrial subsidies, interaction strengths, and invasive species. Chris is continuing on at the CFL as a post doc working with Jim Kitchell on projects related to apex predators in the Central Pacific, and also with Tim Kratz and Paul Hanson focusing on the use of data and models from the GLEON network.

## ***Limnology News***

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