



Letter from the Director

Welcome!

As Director of the Idaho Water Resources Research Institute, it is my distinct pleasure to introduce you to the Institute's first newsletter. Truth be told, this venture into newsletter production is both exciting and nerve-wracking. The

excitement arises from the fact that we now have a written venue by which we can publicize a synopsis of our activities. There are so many great things going on at the Institute and at the University of Idaho relative to water resources, and we cannot wait to tell you about them! But the path is also perilous, for mention of initiatives in this newsletter does not imply any rank order of importance. If we have neglected an area of water resources that is of importance to you, give us

time, be patient and let us get there. This newsletter is just starting, and we strive to distribute information from the Institute to you, in a manner that you will both enjoy and value.

While the Institute is an Idaho entity, I also want to give a shout-out to our friends and collaborators across the country. At the Institute, we firmly believe in the idea of "act locally, think globally," and we are thrilled by the prospect of collaboration across the region and nation, as well as internationally. Over the coming months and years, we will be rolling out some broad-based initiatives and collaborations, and we will let you know about them here.

We cannot wait to start the dialog.

Looking forward,

Alan Kolok, Director

U of I Submarine Drone Will Soon Be Swimming in Lake Coeur d'Alene

by Jamie Rich

Lake Coeur d'Alene is often used for recreational fishing, a popular pastime in North Idaho, but there will soon be a new kind of fish swimming in its waters.

The U of I submarine drone (also known as the Coeur d'Alene Catfish) was built by Gizmo, a non-profit organization that seeks to educate children and adults alike through art, design and technology. The Catfish will be used to map the water quality of some of the very deepest regions of Lake Coeur d'Alene, as well as lakes across Idaho.

The Catfish will be programmed to autonomously travel deep below the surface. The drone, about the width of an armchair, was constructed by a team of adults and students at Gizmo, where learners of all ages can come to complete technology, electronics and art projects. It will be equipped with a 180-degree camera and powerful underwater lights, as well as SONAR to enable it to "see" whether the water is clear or cloudy.

While the Catfish is currently functional, it is slated to be outfitted with sensors and equipment to enable it to measure heavy metal concentrations, dissolved oxygen levels and the turbidity, or murkiness, of the water in Lake Coeur d'Alene. Modifications on the Catfish will be performed by a collaborative team of IWRI researchers,



Marty Mueller (left), co-founder of Gizmo, and Kraig Lysek, Gizmo volunteer, testing the drone in Lake Coeur d'Alene. Photo by Loren Benoit, cdapress.com.

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U of I Computer Science faculty and U of I's Center for Ecohydraulics Research (CER) scientists.

"This project will involve combining expertise in robotics, smart sensing, data analytics, autonomous unmanned vehicles, toxicology and environmental science, and involve collaborators across three U of I campuses as well as from the private and non-profit sectors in northern Idaho," said Dr. Predrag Tomic, a U of I Computer Science faculty member who is involved in the project.

Toxic metals, such as lead, currently exist in the lake, but are trapped in the sediments on the lake bottom. Changing levels of plant nutrients in the water, however, can lead to the growth of algae, which then die and fall to the bottom of the lake where they decompose. When that occurs, the bottom of the lake can become depleted of oxygen, which in turn may allow for metals from the bottom to be released back into the water, IWRRRI Director Alan Kolok explained.

Clearly, water containing lead is toxic; therefore it is prudent to understand the extent to which lead is being released from the sediment into the overlying water.

The team working on the Catfish hopes that this new research will provide a better understanding of what is happening in deep regions of the lake, as events there may contribute to the lake's overall water quality.

"It can help determine what type of treatment, if any, the water needs to go through," Dr. Daniele Tonina, a scientist at CER, commented.

While the Catfish's sensors are vital to its function of

measuring the lake's water quality, there is always the problem that an independent drone can get "lost" underwater. To safeguard the drone, the Catfish will be equipped with a failsafe mechanism that will enable researchers to recover the Catfish from the watery depths in the event of a malfunction. The Computer Science team has installed a small piece of hardware that monitors the battery level and the processors that run the Catfish's software, according to Dr. John Shovic, a member of the Computer Science faculty working on the project. If the Catfish gets stuck or the computer malfunctions,

the watchdog system will activate and open a small CO₂ cartridge, which then fills a balloon with gas, creating buoyancy and carrying the Catfish up to the surface.



Photos of U of I Catfish drone (above) taken at Gizmo's headquarters in Coeur d'Alene. Photos by Jamie Rich.

By designing the Catfish to be easily recoverable, and by using off-the-shelf hardware, such as the small, inexpensive computer called a Raspberry Pi, the team inexpensively combines brains with brawn.

"We're trying to get some science at a reasonable price," Dr. Shovic commented.

And like any good bargain-hunter, the team has struck the perfect balance of low price and product quality. The Catfish, which will

likely be ready for testing this June, will be fully capable of answering researchers' questions about the health of Lake Coeur d'Alene.

The information the Catfish records, swimming with the other fish at the bottom of the lake, will tell scientists at IWRRRI and U of I what needs to be done in order to keep Lake Coeur d'Alene healthy and usable for years to come. 

Mission and Vision Statement

The mission of the Idaho Water Resources Research Institute (IWRRRI) is to:

- 1) facilitate the training of future water professionals,
- 2) coordinate the exchange of information with stakeholders and the public, and
- 3) conduct applied water-related research.

Looking to the future, IWRRRI envisions becoming a nationally recognized research institute focused on integrated water-based human and biophysical systems.

Researchers Present Their Work at IWRRI's 1st Annual Water Resources Research Symposium

On March 7th, at the Integrated Research Innovation Center on the University of Idaho campus, a symposium was held in which the recipients of the 2016 and 2017 United States Geological Survey 104b Seed Grant Awards presented the results of their research activities. The goal of the symposium according to Alan Kolok, IWRRI Director, was three-fold: first, to celebrate the accomplishments of the 2016 and 2017 awardees, second, to provide a mechanism by which water resource researchers at the U of I could get to know each other a bit better and third, to foster a venue in which collaboration could be discussed and fostered.

After an introduction by Janet Nelson, U of I Vice President of Research and Economic Development, six presentations were given. These included discussions by Jeff Langman on the influence of sulfur in a lateral lake of the Coeur d'Alene River system, by Frank Wilhelm on estimating the bulk exchange of water and solutes between fringing wetlands and lakes and by Erin Brooks on linking agronomic soil phosphorus with water quality in Palouse cropping systems. Alycia Bean also discussed her research

regarding the Idaho dairy industry and its vulnerability to long-term drought. In addition, Evan Williamson discussed his current work on the development of the Idaho Waters Digital Library, while Mark Solomon discussed his work related to Idaho drought planning.

Symposium participants and attendees also had the opportunity to hear from three of U of I's four newest Water Resources faculty: Zachary Kayler, Alan Kolok and Chloe Wardropper, who all shared a bit about themselves and their latest research in a series of brief lightning talks.

The symposium, which was well attended and highly successful, is expected to become an annual event. 🌊



Idaho's Top 10 Water Issues List

In Idaho, issues relating to water range from water quality concerns to issues regarding water quantity and the connectivity of surface water to groundwater, to issues related to water rights and water policy. Different stakeholders also view water differently, as water holds a different significance to tribal members than it does for irrigators or energy or food producers.

IWRRI is beginning to put together a Top 10 Idaho Water Issues list. While we recognize that Idaho is a large state and that different regions have different water related

issues, a Top 10 list will help us characterize issues in the state and to define the areas in which we should focus our research efforts. We will be surveying key stakeholders in the state with respect to their opinions relative to the Top 10 list, and one of them is **you!**

You are welcome to email us any water concerns that you think should make the list. Send your email to: iwrri@uidaho.edu. We anticipate that our Top 10 list will be available in one of the next newsletters that we will be producing.





Chemical analysis of nutrients, such as nitrogen and phosphorus, is not technically difficult, but can be prohibitively expensive, particularly when the number of samples to be evaluated is large. IWRRRI is pleased to announce the acquisition of a state-of-the-art automated multi-chemistry discrete analyzer, the Seal Analytical AQ400. The Seal Analytical AQ400 will drop analysis costs by 90-95%, opening the door for U of I researchers to dramatically increase their sample throughput. By doing so, it will also allow them to undertake nutrient research on a much larger and more comprehensive scale.

Acquisition of the AQ400 was made possible by an interdisciplinary U of I collaboration. While the bulk of the funding for the equipment was provided from a grant from National Science Foundation (Idaho EPSCoR), the College of Agricultural and Life Sciences, College of Engineering, College of Natural Resources, College of Science and IWRRRI also financially contributed to the project.



The AQ400 will reside at IWRRRI's Lake Social Ecological Systems laboratory in the Harbor Center at U of I Coeur d'Alene, where it will dramatically increase the lab's research capacity. One of the first projects to use the AQ400, conducted by Erin Brooks, Dan Strawn and Mariana Dobre, will investigate the relationship among wildfire, fire-created charcoal and the transport of naturally occurring phosphorus from forest to stream. The research, funded in part by a seed grant from the USGS 104b program, is of particular importance in forested watersheds, such as those found in North Idaho, where control of nutrient input may prove to be essential to maintaining downstream water quality. ~

The Current

is published by

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Student Opportunities at IWRRRI

For the spring 2018 semester, IWRRRI has partnered with the University of Idaho English Department to give one professional writing student real-world experience: creating a newsletter to help spread the word about what IWRRRI does to help the community.



Hi, I'm Jamie, and I am that student. I have been working with IWRRRI to create a newsletter that highlights all the awesome things they do, both for the community and for students at U of I. The newsletter will be used at conferences and meetings, and it's really rewarding to know that something I helped write will actually be used instead of just graded.

This is a great opportunity, and one that I am really grateful for. I've gained a lot of experience that I can take with me after I graduate in May, and I've learned a lot of valuable skills like working long-distance with a team and organizing a professional document from beginning to end.

IWRRRI is committed to investing in students, and I hope to see this internship offered next semester so that other students can have the amazing experience that I had.

IWRRRI Undergraduate Research Summer Internships

IWRRRI offers a variety of research experiences for U of I undergraduates, including internships at IWRRRI's Lake Social Ecological Systems lab (LaSES) at U of I Coeur d'Alene and a summer placement with the Natural Resources Conservation Service (NRCS) Idaho Snow Survey based out of Boise.

This summer, four LaSES interns will work with U of I faculty on research into the evolution, cycling and transport of nutrients across a forested lake basin, the role and source of nutrients in harmful algae blooms, and the environmental consequences of legacy metal contamination in Coeur d'Alene Lake. The NRCS intern will travel from mountaintop to mountaintop across Idaho with NRCS Snow Survey crews improving and maintaining the NRCS SnoTel remote sensing system.

Contact IWRRRI Associate Director Mark Solomon (msolomon@uidaho.edu) for information on applying for the LaSES and NRCS Snow Survey positions.