Spring 2011

Research View, Spring 2011

RESEARCH VIEW
www.umt.edu/urelations/rview
Vol. 13 No. 1 Innovation & Scholarship at The University of Montana SPRING 2011

Wild Prairie Dancers

Major land-use initiative protects sage grouse

A male sage grouse dancing on a traditional breeding ground

Photo by John Carlson

As dawn breaks on a Montana prairie, dozens of male sage grouse fan their spiky tails and inflate bright yellow throat sacs to make a sound with a definite romantic flair – like uncorking a bottle of champagne. The strutting males vie for the attention of females, who choose their mates after weeks of watching the sunrise dances on traditional breeding grounds called leks.

Today, there's new hope for this iconic western bird, despite declines so drastic that the greater sage grouse qualifies for listing as an endangered species. The population has slipped from millions in presettlement days to about 200,000 as habitat is degraded, developed for houses, or lost to oil and gas development. The U.S. Fish and Wildlife Service's decision not to list the species provides a window of opportunity to avoid a listing altogether through voluntary conservation.

Dave Naugle, a University of Montana wildlife biology professor in the College of Forestry and Conservation, serves as science adviser to the Sage Grouse Initiative, which conserves core breeding grounds for the highest density of sage grouse while simultaneously helping rural private landowners make a living.

"It's a reimagining of where we want to work and how we want to work together," Naugle says.

He gives credit for the win-win tactic to a model in UM's backyard: the Blackfoot Challenge. Since the 1970s rural landowners have come together to conserve natural resources and a rural lifestyle in the Blackfoot River watershed. By focusing on the 80 percent of what residents agree on, the group has kept large ranches and working forests intact, conserved vital wildlife corridors for grizzly bears and elk, and improved the nutrition and health of grasslands for ranching and wildlife alike.

Translating the Blackfoot Challenge model to sage grouse conservation is working even in the initiative's first year, Naugle says. To enlist ranchers as voluntary participants, the staff of the lead agency, the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS), talks to landowners mainly about healthier grass, fewer weeds, fatter cattle and keeping land intact instead of subdivided.

"Ranchers embrace the idea of enhancing their rangelands for cattle production while at the same time improving habitat for wildlife," Naugle says. "They're calling us in record numbers to enroll."

The Sage Grouse Initiative targets 56 million acres across 11 Western states and is marshaling existing farm bill resources: $18.5 million in 2010 and $53 million in 2011, including a $23 million investment in perpetual working-lands conservation easements in prime sage grouse habitat, mostly near Wyoming's Wind River Range, where ranchlands are under threat of subdivision.

The money isn't new, Naugle says. Rather, it's taking existing budgets and strategically

Sage Grouse – continued next page

Sage Grouse – continued from front

applying them to shore up the best private land habitat for sage grouse by helping landowners make improvements so their livelihoods will be healthy, too.

NRCS does not typically take on an endangered species challenge, yet the agency is proving to be ideal because of its many field offices located in rural areas, Naugle says. The service has the expertise and the trust of farmers and ranchers to hit the ground running.

Where once the farm bill assisted rural landowners in "1,000 random acts of conservation kindness," as Naugle called them, today NRCS allocates dollars to areas depicted on a colorful map that's generated from hard data gathered by state fish and wildlife biologists who count and track sage grouse.

The bird's entire range shows up in blue, covering 186 million acres in Montana, Wyoming, Colorado, Utah, Idaho, Nevada, Oregon, California, Washington, and North and South Dakota. Within the blue are clusters of bright yellow, orange and red colors, where breeding bird numbers are highest. Naugle generated the map in partnership with The Nature Conservancy and the National Audubon Society.

"Seventy-five percent of the breeding population is concentrated in just 27 percent of the species' occupied range," Naugle points out. "It makes sense to spend your first dollar conserving 500 birds instead of five birds."

He praised the leadership of Dave White, the NRCS chief who knows the Blackfoot Challenge success story firsthand and champions a smart and efficient vision for the farm bill.

"In an era when all agencies are being asked to do more with less, White is working with producers to increase sustainable agriculture and at the same time tackling conservation issues," Naugle says.

Leadership is one breakthrough for the Sage Grouse Initiative. Enlisting science is the second, Naugle says. As science adviser, he pinpoints the core breeding areas and then identifies threats and solutions for conserving prime habitats.

"The threats are very different depending on the location," Naugle adds, from cheatgrass fires that burn up sagebrush in Idaho to energy development in Wyoming. West Nile remains a significant threat, but conserving the biggest and healthiest populations first gives birds the best chance to rebound.

In Montana, NRCS enrolls landowners in grazing systems as an alternative to tilling lands for biofuels production. Once land is plowed up, the sage grouse habitat is gone forever.

Photo by Shawna Sandau

(Left) UM field tech Brandon Sandau releases a radio-collared female sage grouse as part of a field study. (Top) UM researcher Dave Naugle, right, and Tim Griffins, NRCS National Sage Grouse Initiative coordinator

North of Billings between Roundup and Ryegate, almost every landowner has volunteered to be part of the initiative across about 100,000 acres of sagebrush-dominated grasslands. Here, NRCS offers technical expertise and financial support to alter grazing patterns to leave more ground vegetation, which provides food and hiding cover for sage grouse nests and their chicks. Naugle will work this spring with Montana Fish, Wildlife and Parks to radio track sage grouse to study if survival is higher.

Marking or moving fences makes a clear difference for sage grouse, too. Envision a male sage grouse flying in low to a lek in predawn darkness, readying for the sunrise dance. Rather than barreling into a barbed wire fence, he spots flashes of white plastic like playing cards (that dangle from the wires) and avoids a deadly crash.

"The most severe collision risk is right next to a lek," Naugle explains, "but fences can be a problem even a couple of miles out."

Marking fences works, according to the 2011 results of a University of Idaho study. A graduate student walked fence lines and counted impact sites near leks. Before the next spring, he put white tags on the fence wires and then returned after breeding season to find a six-fold decrease in sage grouse accidents.

"We took the estimate from the research and applied it to last year's success of marking 180 miles of fences and figured we've saved about 1,000 birds," Naugle says, cautioning that fencing is just one part of the conservation strategy.

"We have to get popping on all fronts," he says. "The message we always return to is that sustainable agriculture benefits both producers and wildlife."

New grazing systems and other projects should help sage grouse across an area the size of Yosemite and Glacier national parks combined – 1,000 square miles in 2010 and another 2,000 square miles in 2011. Sage grouse are an umbrella species, Naugle says, so by meeting their needs, many other declining prairie species will be helped, too – from pygmy rabbits to Brewer's sparrows.

Naugle is convinced that landscape-level conservation coupled with landowner partnerships should be taught in universities as part of every wildlife biology curriculum. With UM support in 2008, Naugle launched a yearly landscape conservation course that he co-teaches with Greg Neudecker, a private lands biologist for the U.S. Fish and Wildlife Service. As part of the class, students head to the Blackfoot Valley to learn skills that will serve them far beyond basic knowledge of wildlife biology, such as what to wear when meeting ranchers and how to place themselves in the landowners' shoes.

Naugle believes landscape conservation courses, the Blackfoot Challenge and the Sage Grouse Initiative all chart a new path for conservation that links science with effective solutions. That pathway takes center stage in a new book he edited, "Energy Development and Wildlife Conservation in Western North America."

"We're taking a different approach from spending millions of dollars on declining populations that aren't going to make it," Naugle says. "We're investing in the best landscapes for sage grouse and helping ranchers and farmers make a living. We can apply that strategy for other species, too."

— By Deborah Richie Oberbillig

Mapping Waterways

Mark Lorang, a researcher with UM's Flathead Lake Biological Station, holds an Acoustic Doppler Velocity Profiler.

River Analyzer software may launch business

From a distance it looks like a small-horsepower outboard motor, minus the propeller, that UM researcher Mark Lorang attaches to his raft.

Except Lorang apparently puts it into the water upside-down.

This, however, is no Evinrude outboard motor in the hands of a confused boater.

It's an Acoustic Doppler Velocity Profiler – commonly referred to as an ADP – that Lorang attaches. Most of the rest of the world uses them to calculate stream discharge, which measures the water volume flowing past a certain point.

Lorang, an associate professor of geomorphology at UM's Flathead Lake Biological Station, saw far more possibilities in the technology.

It's taken 10 years to perfect, but Lorang has developed new software that uses data collected from the ADP to create three-dimensional pictures of river systems – almost as if he has diverted rivers, as well as their banks and bottoms, through a hospital CT scanner.

Lorang's software creates colorful images such as this slice of the Flathead River. Reds show faster, sediment-carrying areas; blues reveal slower water.

The brightly colored images the software outputs present a fascinating and multifaceted picture of how a river works, almost foot by foot.

"Anyone can collect the data," Lorang says. "It's how you put it together that matters."

That was the hard part – developing software that transforms the data from the ADP into the easy-to-read 3-D images that could eliminate the need for conventional hydraulic modeling.

Mark Lorang calls it the River Analyzer.

Joe Fanguy, director of technology transfer at UM's Office of Research and Development, calls it a potential business that could create Montana jobs.

River Analyzer – continued back page

Chemical Cleansing

UM technology launches Far East factories that pull metal from polluted streams

UM chemistry Professor Ed Rosenberg holds a bottle containing metal-selective composites he invented that have created layers of nickel, copper, iron and cobalt.

Chemistry Professor Ed Rosenberg never suspected the work he does in his UM laboratory would result in a large factory being built in China.

The facility, located near Shanghai, uses technology developed by Rosenberg and a company he works with, Purity Systems Inc., to extract nickel and cobalt from two streams polluted by mining activity. The factory has been in operation for three years and recently expanded.

What's it like seeing your research have such results?

"You can't imagine how good it makes you feel," Rosenberg says. "It's just been a tremendous ride. Now if we could only get this to happen in Montana, that would be something."

A strange synchronicity of events brought Rosenberg to Montana in the first place. A Brooklyn, N.Y., native with a Ph.D. from Cornell University, he was working at California State University, Northridge, when two Missoula entrepreneurs contacted him through a mutual acquaintance about testing a resin they had created to purify drinking water. The men, both UM grads, were real estate contractor George Torp and pathologist Phil Barney. They had formed a company called Purity Systems Inc. (PSI) to advance their idea, and they wanted Rosenberg to evaluate the material. He agreed.

"The twist to this whole story is that these guys came to me," Rosenberg says. "This is an example where the local community took advantage, if you will, of the talents that were available. So Missoula venture capitalists basically started this, and they started with a very idealistic point of view."

That was back in 1991. About that time, Rosenberg started getting Montana Magazine unsolicited in the mail, and he randomly received a letter from Montana's governor urging him to move to Big Sky Country. Then a UM chemistry position opened up, and, because he always had an affection for small, scenic college towns, he made the jump to campus in 1993.

"It was meant to be – the hand of fate," Rosenberg says with a bemused chuckle.

The early PSI resin worked but wasn't truly adaptable to large-scale industrial chemistry, he says. Simple charcoal worked nearly as well at a fraction of the cost. So with his partners' support, Rosenberg redirected the chemistry in a direction "where you can really make money."

The result was a chemical resin that selectively captures metals that are dissolved in water. Valuable metals are extracted, and more innocuous metals pass through.

The resin resembles salt or sand, with particles that are about half a millimeter wide. Rosenberg says the resin starts out as amorphous silica, a very porous material. A chemical is used to bind a liquid polymer to the silica, and then small molecules are placed on the polymer to make it selective for a particular metal or group of metals.

"The process of doing that required a fair amount of research," he says. "There are some little tricks we came up with."

When Rosenberg first came to UM, he was mainly an organometallic chemist trying to understand and improve catalysts for the energy industry. He became involved with PSI at about the time the National Science Foundation generally shifted to funding research with more practical applications. He says switching his focus toward studying and improving the resin has allowed him to maintain nearly uninterrupted support from NSF since 1983. Such continuous support is rare among U.S. scientists.

Rosenberg says investors "threw good money after bad" in the early years of PSI. The first UM patents licensed to PSI were approved in 1997. Then after he became a minority partner in the company, their luck changed. Around 2000, an Australian mine-testing company called Ammtec became interested in the UM technology and eventually purchased a controlling interest in PSI. The original investors and Rosenberg finally got a payday for their investment and work.

"That's when the project really started to take off," he says, "because that company had the connections, the know-how and the equipment to make things happen."

In 2002, PSI became one of the first tenants of MonTEC, a UM-affiliated business incubator located across the Clark Fork River from campus. Company research and development in cooperation with UM takes place at MonTEC. Caroline Hart, the lead PSI chemist there for the past 10 years, came out of Rosenberg's lab. The company now employs about 10 people, with two full-time chemists and one part-time. Rosenberg also now has four graduate students and two undergraduates working on related projects in his lab.

"What's been really gratifying for me is that I've come up with an idea in the lab – a better or cheaper product – and the company adopted it right away," he says. "It's really exciting to do something in the lab and see it immediately adopted into a commercial process."

Rosenberg says the commercial projects using his technology build huge reactor columns filled with enormous amounts of the resin. One project in China eventually will use 20 cubic meters of the materials and will be able to treat 800 cubic meters of fluid per hour.

"The product will be nickel," he says. "You fill the column with fluid, then you rinse and then you strip it with an acid. This can produce nickel sulfate or nickel carbonate, or you can run electricity through the solution to do electroplating."

He says Ammtec has assisted with three projects in China: the aforementioned factory near Shanghai and two smaller facilities that are cleaning mine streams for nickel and cobalt. There also have been two projects in Australia.

"We realized early on that no company will use our material unless they can make money on it," Rosenberg says. "But at the same time companies are under pressure by government agencies to clean up their wastewater. So it's a real carrot-and-stick."

The future of PSI is in flux right now, as Ammtec recently experienced a hostile takeover by another company. He says PSI has yet to turn a profit on its products and might end up being sold again.

"I really think the technology has advanced far enough that the company will survive," he says, "but only time will tell. We made money on the sale of the company, and now we are trying to make money on the products. And it's progressing."

This plant near Shanghai, China, produces materials based on UM technology that are used in environmental remediation around the world.

Photo courtesy of Purity Systems Inc.

What Rosenberg would really love to see is a Montana factory spawned by his research. He says a bench-scale project in his lab showed the technology could cleanse the rising acid lake in Butte's Berkeley Pit.

"The company looked at it and said there really isn't enough copper in the water to make money on it," he says. "Yeah, it's a question of the economics involved, but I think we could do the job."

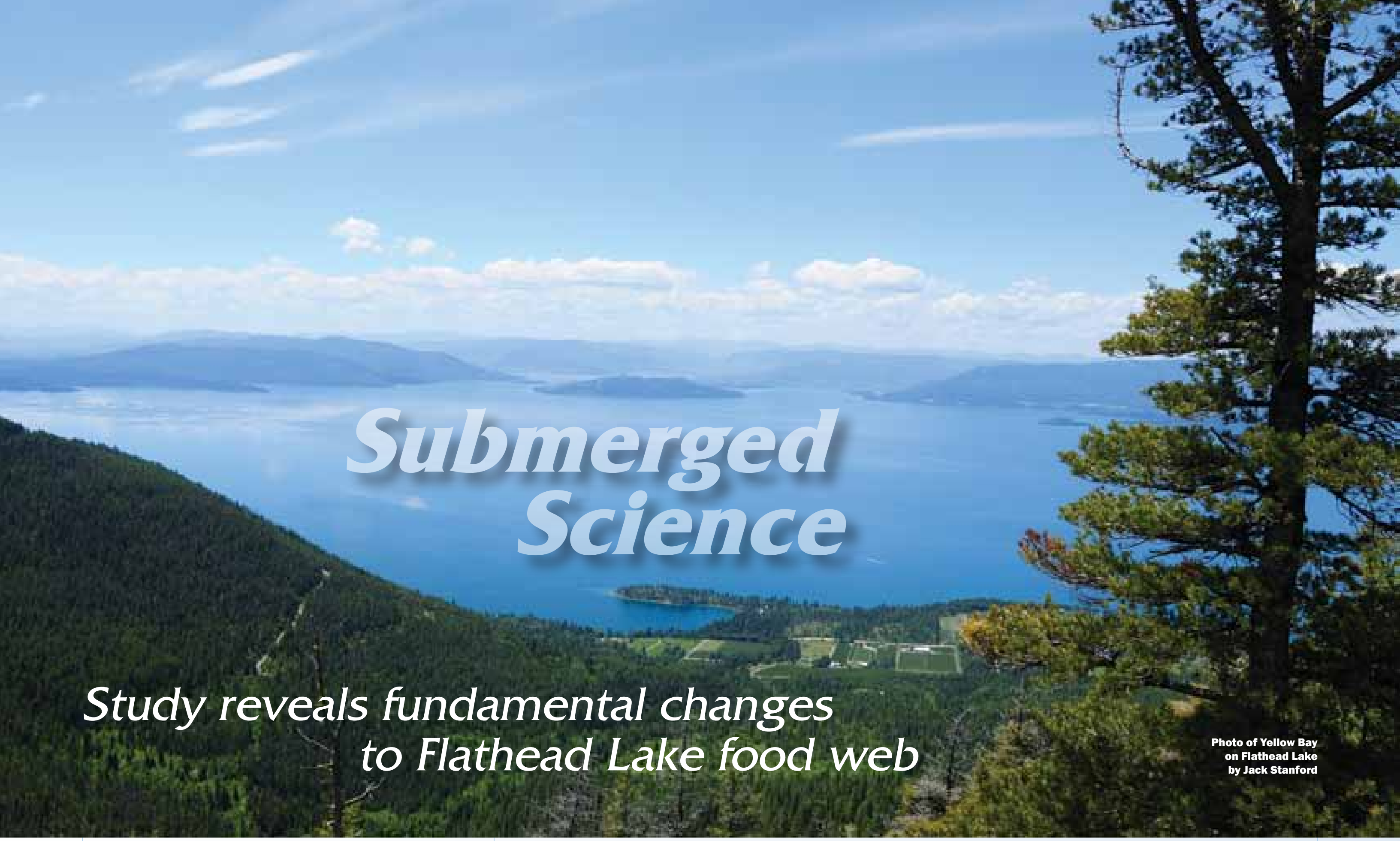
Another demonstration project included helping clean Belt Creek near Great Falls, though that involved no valuable metals. Rosenberg's lab also collaborated with a team from Carroll College to clean an incredibly contaminated stream in Helena. But so far no major Montana commercial project has come along that would require massive amounts of the resin. He hopes that happens in the future.

In the meantime Rosenberg's current research involves trying to shrink his resin particles to the nanoscale. The particles could then be placed on a plastic membrane, which is a better option for certain applications than the huge reactor columns. He also is working with J.B. Alexander "Sandy" Ross, associate dean of the UM Graduate School, to place glowing molecules on the composite resin, allowing them to sense the presence of the metals for nanotechnology purposes.

Rosenberg says the technology he works on resulted from the dream of two Missoula entrepreneurs.

"They brought their dream to me, and now it has become a reality," he says. "It's not making money hand over fist yet, but they got their money back, and they both hope the company will become a viable business that really makes a difference." RV

— By Cary Shimek



Submerged Science

Study reveals fundamental changes to Flathead Lake food web

Photo of Yellow Bay on Flathead Lake by Jack Stanford

In a protected cove on Flathead Lake's east shore, UM operates the oldest active biological station in the United States.

Only six years younger than the 118-year-old University itself, Flathead Lake Biological Station has collected data about the lake since 1899. The state of Montana was just 10 years old when Morton J. Elrod, UM's first biology professor, established the first station near Bigfork and began recording information about the lake and its fishery.

More than a century later at Yellow Bay, where the station moved in 1908, scientists such as Bonnie Ellis continue and expand on Elrod's work. They use those archives started by Elrod to produce important research.

The National Academy of Sciences earlier this year published an article by Ellis and others demonstrating how the introduction or invasion of non- native organisms, even in a lake as large as Flathead, can lead to significant – and sometimes surprisingly rapid – changes in an aquatic ecosystem.

"This archive, which has been very detailed since the late 1970s, shows how invaders have altered the lake's food web and how important nutrients are to the food web," says Ellis, a research assistant professor in limnology at UM. "We didn't think to go back more than 100 years until we had first looked at the past 30."

That led to an article titled "Long-term effects of a trophic cascade in a large lake ecosystem" written by Ellis, biological station Director Jack Stanford and more than a half-dozen other scientists and researchers.

An unintended consequence: The planned introduction of opossum shrimp caused an explosion of lake trout numbers during the 1980s.

Photo by Joe Giersch

Their findings also were featured in Nature, an international weekly journal of science, earlier this year.

A trophic cascade, as Ellis describes it, is "the theory that when you alter predator and/or prey in an ecosystem, you can alter the abundance, biomass or productivity of a population, community or trophic level across more than one link in that food web."

Enter opossum shrimp – *Mysis diluviana* – into Flathead Lake.

UM scientists have long led the way in documenting the effects of the establishment of the mysid shrimp in Flathead Lake in the 1980s. It brought about the collapse of the lake's kokanee salmon fishery, but the exact mechanisms for the demise of the kokanee were not well understood.

There's an interesting back story to all that, but a more important breaking story up front. Because what this new research suggests is that the introduction of shrimp also can be tied to the explosion in the non-native lake trout population and indirect effects that cascaded through the food web.

For their article Ellis and her nine co-authors – including biological station research scientist James A. Craft – divided the lake's history into four distinct periods.

"Put it all together and you get the entire picture of how the food web in the lake has changed," Ellis says.

The first, the native period, existed before 1920, when only 10 species of native fish are known to have lived in Flathead despite the introduction of 14 non-native fish from 1890 to 1920. Then the kokanee period ran from 1920 to 1984. Early in that period anglers began to report the non-native lake whitefish and kokanee, and by 1940 kokanee replaced cutthroat trout as the dominant catch of anglers. Toward the end of this period, native cutthroat remained at low densities, non-native lake whitefish continued to expand and non-native lake trout remained at low densities.

Interestingly, the next period lasted but four years.

"The population of opossum shrimp in the lake exploded from 1985 to 1988," Ellis says. "During that time the population of kokanee in the lake fell and never recovered, bull trout declined and lake trout came to be the dominant top predator. At the same time as the kokanee crashed, bald eagles that concentrated in large numbers in Glacier National Park to feed on the spawning salmon dispersed to other regions where prey was more abundant."

This also is the time when primary productivity – the production of organic compounds via photosynthesis – shot up by 21 percent. While the opossum shrimp numbers quickly dropped to about a third of what they were at their peak in 1986, primary productivity has not gone down.

The time from 1989 to the present has been labeled the "mysid-lake trout period." It's two decades where today's latest Flathead ecosystem has settled somewhat into its routines.

For all intents and purposes, Ellis says, we've had "two different lakes and two different food webs – before *Mysis* and after *Mysis*."

Ellis witnessed the changes that can come quickly in a body of water as a youngster. Growing up in Orange, Texas, across the river from Louisiana, she and her brothers would bait the string on their bamboo poles with bacon and fish the local bayous for blue crab.

"We lost our favorite site to discharge from a pulp mill," she says.

But that loss sparked her interests, and Ellis came to UM and the biological station in 1977 to study the limnology of Flathead Lake. She never left and eventually earned her doctorate.

So she was there when the opossum shrimp planted by Montana Fish, Wildlife and Parks in lakes to the north – ironically, in an effort to increase kokanee populations – made their way into Flathead.

"They came from Waterton Lake, where they're native," Ellis says, "and they were put in Kootenay Lake to try and increase the size and numbers of rainbow trout."

Instead, in Kootenay the shrimp increased the size and numbers of the kokanee salmon.

"Fish managers figured, 'Great, we'll add it to a lot of lakes to stimulate kokanee populations,'" Ellis says.

But Kootenay was unique, she says. The contours of the bottom of the lake and its currents pulled the *Mysis* shrimp off the bottom and into shallow bays where the kokanee could feed on them during the day.

In other lakes – and most certainly in Flathead – the shrimp could stay on the bottom of the lake away from the sight-feeding kokanee during the day and come up at night to feed. Because both *Mysis* and kokanee prefer the same zooplankton, it was believed early on that competition for the same prey caused the decline in kokanee. But the deep-water lake trout, which had been introduced 80 years earlier but had never gotten much of a foothold in Flathead, suddenly had an abundant new food source, *Mysis*, on the lake bottoms where little previously was available. Lake trout flourished, and recent research shows the voracious fish decimated the kokanee fishery and concerns grow that native fishes may be in peril. The change in the fishery promoted a rapid shift in community structure, resulting in a trophic cascade affecting bald eagles, fish, zooplankton and algae.

"Understanding trophic cascades requires that long-term data sets be formalized by robust models because of the extreme complexity of interactions," Ellis and her co-authors wrote in their article. "One important challenge is to determine the tipping point for what might be the next ecosystem state as the community continues on its internally driven dynamics, and as external drivers such as climate change and direct human intervention (a lake trout reduction program is under way, for example) further force the system."

The findings by Ellis and her counterparts are very important to Flathead Lake but have serious implications for other bodies of water around the globe as well.

And the science? It's backed by more than a century of data collected by researchers at UM's Flathead Lake Biological Station. RV

— By Vince Devlin

Scientist Bonnie Ellis, shown here in the Freshwater Research Lab at the Flathead Lake Biological Station, has unveiled important research about the lake's changing food web. Research scientist Tyler Tappenbeck can be seen in the background studying lake zooplankton samples.

River Analyzer – continued from page 3

Hired to determine how a river in Washington would behave if riprap at a state campground was removed, Lorang faced a challenge.

"I needed a great-big three-dimensional view to do the evaluations," he says. "They wanted me to show how much of the campground would flood and how much spawning habitat would be created if the riprap was taken out."

To do that, he invented River Analyzer, which merges a river's ADP hydraulic data with a Global Positioning System – airborne and satellite remote sensing data – to create a dynamic 3-D model of a river.

Programmer Chris Gotschalk, one of Lorang's research partners, helped code the software that produces the pictures from the data.

With the River Analyzer, Lorang can accurately measure large sections of river to provide information and evaluate where a river might change its course or scour its bed, which are important outcomes for many river projects. Lorang says his invention was first used while evaluating a campground site on the Dosewallips River, located in Washington on the Olympic Peninsula.

The detailed 3-D view of the river's depths and velocities near the campground helped Lorang predict for Washington officials what would happen if the riprap was removed.

"I needed it for my research," Lorang says, "but by the time I had built it, it was obvious it would be beneficial to many other people."

From fisheries biologists to dam operators, River Analyzer could be an important tool.

"The real beachhead of good that can be accomplished is it could help determine how to maximize hydroelectric power production while limiting the impact to ecology," Lorang says. "We haven't had a tool that uses real data rather than model estimates to predict how a river will change as we alter its flow. Now we do. This will help us predict the effect of river flow on streambeds, banks and ecosystems."

The initial project analyzed a relatively short section of the Dosewallips, but any distance can be covered. Lorang has since created a 3-D model for 26 miles of the Flathead River north of the point where it discharges into Flathead Lake – and he could similarly map the entire Mississippi if needed.

"Not every piece of data is good," Lorang admits. "There can be problems with both the ADP and GPS signals, or the boat spinning too fast or rocking too much. We spent a good year looking at quality control, so we can flag data that's suspect."

On the other hand, he notes, "We've gone through Class IV rapids with it and gotten beautiful data. Now for 26 miles I can slice and look at the three-dimensional flow of the river meter by meter."

The pictures are bright – think of the often-colorful images associated with Doppler radar weather reports on television. Only in this case, the various colors don't show precipitation or thunderstorms; they reveal where rivers run fast, where they run slow and all speeds in between.

From dark blue (slow) to bright red (fast), a rainbow that includes light blue, dark green, light green, yellows and oranges indicates a river's velocity at any given point and at any given depth.

And he can do it anywhere in the world someone needs such a picture of all or part of a river.

With his single ADP, Lorang says he could sample the Clark Fork River as it runs through Missoula in a day. He could couple that with satellite imagery to create a complete 2-D map of the depth and flow patterns.

"In three to five days, I could get a complete 3-D picture of the Clark Fork, from Hellgate Canyon to the Bitterroot," he says. "That's impossible to do with conventional hydraulic modeling."

So here was Lorang, having developed an unconventional use for Acoustic Doppler Velocity Profilers for his own purposes, but imagining countless other projects where the new technology could be invaluable.

"But I'm a researcher," he says. "I don't know how to go from this to finding investors and setting up a company."

And that's where Fanguy's UM department comes in.

"We encourage faculty to think about commercial applications to their research," Fanguy says. In Lorang's case, he saw "the potential to create jobs through groundbreaking technology."

After some initial discussions, Fanguy had Lorang explain the River Analyzer concept to UM's Commercialization Advisory Board. The seven-person group is made up of one faculty member, Associate Professor Michael Braun of the University's School of Business Administration, and professionals from the private sector – a business attorney, an entrepreneur and people involved in private equity and venture capital firms.

Then several student-led teams from UM's business school became involved in the process, conducting market research and exploring potential business models under the direction of faculty members Klaus Uhlenbruck and Jakki Mohr.

That all led to a dramatic shift in the business plan for River Analyzer. Originally conceived as a company that would sell the software that does the work, it's now seen as a company that would do the work, period – contracting its services out to gather, process and sell the data.

"It's shifted from a software sales model to a service-based model," Fanguy says. "We're actively working with Mark and his team to put together a commercialization package that will allow him to take it to market."

It took an entire UM team to get to the point of being ready to launch, Lorang says, including researchers, students, business school faculty, an advisory board and the technology transfer office.

Fanguy says there's still a long way to go, but River Analyzer illustrates how research-derived technology has the potential to not only launch new businesses, but also provide learning experiences for students.

"Who knows?" Fanguy says. "It's possible that one of our business school students ends up working for a River Analyzer company."

And it all started when someone wondered what would happen if some riprap was removed. RV

— By Vince Devlin

Research View is published twice a year by the offices of the Vice President for Research and Development and University Relations at The University of Montana. Send questions, comments or suggestions to Cary Shimek, managing editor and designer, 330 Brantly Hall, Missoula, MT 59812 (phone: 406-243-5914; e-mail: cary.shimek@umontana.edu). Contributing editors are Brenda Day, Jim Foley, John Heaney, Rita Munzenrider, Jennifer Sauer and Allison Squires. Todd Goodrich is the primary photographer. For more information, call Judy Fredenberg in the research and development office at 406-243-6670. The newsletter is online at http://www.umt.edu/urelations/rview.

The University of Montana