



# the Whirling Disease Initiative Newsletter

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Left: Silvia Murcia on  
Pelican Creek

## Whirling Disease in Yellowstone National Park by Amy Rose, Silvia Murcia, Julie Alexander

### Part I: The Big Picture

**P**art I: The Big Picture  
*Myxobolus cerebralis* was first detected in Yellowstone cutthroat trout from Yellowstone Lake in 1998. Since then, efforts have been directed at determining severity and spatial extent of *M. cerebralis* in the Lake and its cutthroat spawning tributaries. From 1999 to 2001 a large-scale investigation was conducted focusing on histological analysis of by-catch adult Yellowstone cutthroat trout and sentinel fry exposures in cutthroat trout spawning streams over a wide range of water temperatures and flow regimes. Examination of over 1,500 fish revealed the prevalence of the parasite from near 20 percent in the northern section of Yellowstone Lake to about 10 percent in the south arms. Dr. Todd Koel, the Supervisory Fisheries Biologist for the Park and whirling disease researcher, oversees much of this investigation. He monitors waters throughout the park, including the tributaries of the Lake; conducts his own research projects, and coordinates a team of researchers from the Park, Montana State University, the University of Wyoming, the U.S. Geological Survey (USGS) Western Fisheries Research Center, the U.S. Fish and Wildlife Service-Bozeman Fish Health Laboratory, and the states of Idaho, Montana, and Wyoming. The Yellowstone Whirling Disease Research Program has been funded primarily by the Whirling Disease Initiative, the Whirling Disease Foundation, and the National Park Service.

Pelican Creek, a spawning tributary to Yellowstone Lake, became a priority of whirling disease research when monitoring during the large-scale investigation revealed that the cutthroat population had been almost completely wiped out by the disease. The presence and effects of the whirling disease parasite created a critical situation almost immediately. Due to Yellowstone National Park's conservation and preservation goals of maintaining a natural and pristine ecological system, human interference such as stocking fish to replace lost populations is not typically an option. The loss of cutthroat trout in Pelican Creek has created a gap in the natural food chain with trophic-level implications. Birds and bears are required to switch to a different prey base and, on a social level, anglers have lost a favorite trout fishery—a fishery often touted as the *best* cutthroat fishery in the *world*. Pelican Creek is now closed to angling to allow the cutthroat to rebound and prevent the potential movement of the parasite into other drainages in the Park.



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**Solutions Through Research**

Silvia Murcia is a researcher for the Yellowstone Whirling Disease Research Program and a graduate student pursuing a doctorate in Fish and Wildlife Management at Montana State University-Bozeman. Under the advisement of premier whirling disease researcher, Dr. Billie Kerans, Murcia's research focuses on spatio-temporal variation in whirling disease risk to the Yellowstone cutthroat trout in three spawning tributaries of Yellowstone Lake: Pelican Creek, Clear Creek, and the Yellowstone River.

One puzzling aspect of this issue is *why* the problem is so severe in Pelican Creek. Murcia postulates that the severity results from a combination of environmental factors: the movement of buffalo and elk adding organic material to the water, naturally occurring high water temperatures, and angler movement. All of these factors have helped create a warm, mucky habitat ideal for tubificid and whirling disease proliferation.



*Silvia Murcia conducting fieldwork*

Murcia's research, which began in 2001, analyzes whirling disease presence in sentinel and wild-reared Yellowstone cutthroat fry using polymerase chain reaction (PCR) analysis and histology. For potential correlations to disease prevalence and severity, she also looks at the physico-chemical features of the environment around and within the focus tributaries.

To establish infection risk among the wild native cutthroats, Murcia is also examining current and historical *adult* Yellowstone cutthroat trout spawning data (to assess the start, peak, and end of spawning), the age of collected wild fry, and numbers of adult cutthroat that die after spawning.

She hopes her research will answer questions about fish health and diagnostic, management, and control methods for whirling disease in native cutthroat trout and other vulnerable salmonids. Results from her research and the larger scale investigation should assist the Park and other regional fisheries managers to understand and control whirling disease in a variety of stream types. Quantification of environmental characteristics preferred by *M. cerebralis* in the Yellowstone Lake basin will assist in predicting probable high-risk sites for infection. Of particular concern are tributary basins with landscape-level characteristics similar to Pelican Creek, such as Beaverdam, Trail, and Chipmunk Creeks in the remote south and southeast arms of Yellowstone Lake.

Dr. Kerans will use Murcia's data to further develop a whirling disease risk assessment model that could be applied to a range of watersheds across the Intermountain West. This model has a good chance of helping fish biologists and managers identify future management actions to reduce disease risk, increase public awareness, and reduce the chances of this non-native pathogen invading other systems.

## Part II: Filling in the Gaps

Another student of Dr. Kerans, Julie Alexander, started research on the same project in June 2004. Alexander's work complements Murcia's by investigating the oligochaete role in the whirling disease problem in Pelican Creek. She is examining the potential of high resolution thermal imagery and habitat characteristics to detect "hot spots" of *M. cerebralis* infection and high tubificid abundance. Alexander is working on this project in pursuit of her PhD in biology. The focus of her dissertation is parasite-mediated *T. tubifex* ecology. The specific objectives of her research are to:

- 1) document *M. cerebralis* infection risk in Pelican Creek by assessing infection in the *T. tubifex* host and in sentinel fish exposures,
- 2) assess the physical and chemical habitat characteristics at tubificids collection sites, and,
- 3) correlate *M. cerebralis* infection risk to habitat characteristics and high-resolution thermal imagery.

Prior to the start of her research, thermal imaging conducted by NASA was completed on the entire length of Pelican Creek for the larger scale investigation. The Yellowstone Ecosystem Research Center then analyzed these data and compiled GIS data files. Alexander's results—percent of infected *T. tubifex*, abundances of tubificids, and *T. tubifex* and physico-chemical habitat characteristics—will be related to data from the thermal images.

Alexander has also mapped the spatial distribution of the parasite to help detect the infection in worms and fish. For Pelican Creek, Alexander used Murcia's data as a baseline. This year, she is using Murcia's study methods to create her own data set of infection prevalence and parasite severity for mapping purposes. Further, because the abundance of infection in Pelican Creek made it nearly impossible to draw decisive conclusions about what could be causing or affecting the parasite's ability to proliferate, Alexander's study area was expanded to cover 12 tributaries rather than the previous year's sole tributary, Pelican Creek.

Another component of Alexander's investigation involves documenting the actinosporean varieties and numbers that may be present. Actinosporeans (the phase of the parasite expelled by the tubifex worm) have presented yet another mystery to researchers in the Park. Collaboration with Charlotte Rasmussen and Kendra Kinnan, USGS Western Fisheries Research Center, showed that twenty of 3,037 tubificids collected in Yellowstone National Park in 2001 produced actinospores, and PCR analysis indicated that none of them were *M. cerebralis*. The team is now wondering whether there are other myxosporidians in the Park. If there are new and different myxosporidians and actinosporeans in the system, the potential for new and different problems, either affecting fish or other living parts of the system, creates an additional management concern.

Alexander's field work is expected to fill gaps identified by the principal investigators, Drs. Kerans and Koel. Results should explain why whirling disease risk varies as a function of host ecology, assemblage

*J. Smith and J. Alexander picking worms out of kick net samples in clear creek 2005*



## Working in Yellowstone National Park

Working in Yellowstone is a fantastic experience, but it does have its challenges. Silvia and Julie have had to maneuver around both regulatory and natural obstacles in order to complete their field work. Park policies such as constant radio contact with rangers, travel restrictions, area restrictions, and parking and traffic rules are details that require constant planning.

For instance, the Park only allows for a short season of access to the research sites in order to accommodate dangerous spring melting and run-off. Access is allowed from approximately mid-July through mid-September and time restrictions are further imposed on a daily basis. These restrictions often create significant obstacles to the research, especially in the areas of data collection and analysis.

For Silvia's project, some of the research test sites are so far up the stream that it takes nearly four hours to hike to them, in addition to time spent working at the site. There are several field sites to tend to in one day. Due to Park-instituted "bear closure times" that apply to Silvia's test sites, the crew is almost always starting its day working against the clock and within extremely tight time limitations.

Both Silvia and Julie manage field crews in order to accomplish their research, and each relates unique experiences working with teams. As crew leader, Silvia has to be aware of the physical demands called for by this type of work. Tremendous physical stamina is required

*Continued on page 4 sidebar...*

*Continued from page 3 sidebar...*

to hike in the heat of the summer while packing sentinel cages, coolers packed with water and live cutthroat fry, and other field equipment. Silvia explained, “The physical labor can be very demanding and I need to account for, and know my crew’s limitations and strengths, and plan accordingly when sketching the season’s timeline. The Park is so large and the study sites so numerous and often remote, accessible only on foot, that I can’t always get everything done that I need or want to get done, or I can’t always obtain the data and information necessary to the study.”

Julie described her experience with crews as smooth, positive, and extremely productive. “I’ve been lucky for my two field seasons to have had a crew that is cooperative and excited about wandering around and looking for worms. I love what I’m doing and sometimes I think that carries over to the people I’m working with. Dan Mahony and Jeff Arnold at the Yellowstone Center for Resources always provide support and assistance with the backcountry trips and have also been an invaluable source of data and knowledge on whirling disease in the Park. In addition, the rangers have been helpful too—allowing us to use cabins that are really meant for backcountry rangers’ use only.”

Natural disturbances such as uncontrolled, left-to-burn, wildfires precluded Silvia and her crew from reaching many of the study sites in 2003. The fire barred Silvia from setting two of three planned exposures and created a significant data gap for that particular research season. Other unfortunate data gaps have been caused by bears, herds of bison, and elk running over cages. Animals have also dislodged cages causing them to be swept away by strong currents, and opened cage lids, allowing fry to escape.

All of these challenges are taken in stride by Silvia and Julie and ultimately the work continues. ❧

community, habitat, and the variable interactions among six tributaries to Yellowstone Lake.

Overall, Murcia’s and Alexander’s work will contribute to the larger scale investigations. Results can be used to determine an appropriate management strategy for the area. Ultimately, once infected reaches are located, appropriate actions (riparian management or sediment removal) may be evaluated.

Yellowstone National Park and many other organizations in the Intermountain West are working to restore native salmonids. Knowledge of the relationships among the environment, tubificid susceptibility, and whirling disease risk could improve the prioritization process of stream restoration and increase the probability of costly restoration success. In addition, this quantitative data should improve the ability of managers to carry out risk assessments, particularly for native cutthroat trout in other back country areas. As whirling disease spreads across the Intermountain West it is likely to invade other areas and techniques for management in these areas will be needed. Thus, this work may become a model for such areas.

#### **About Silvia:**

Silvia is from Barcelona, Spain and has been living in the United States since she arrived in the White Mountains area of New Hampshire at age 18 for a high-school student exchange program. Silvia liked the area and lifestyle—streams, forests, sports, and schooling—so much, that she decided to attend school there an additional year. She then attended college in Boston graduating from Northeastern University with a major in biology and a minor in marine studies.

After graduation, Silvia entered the East-West Marine Biology Program working out of the University of Washington’s Friday Harbor Laboratories, and the University of the West Indies Discovery Bay Marine Laboratories in Jamaica. She then continued on with her education entering graduate school at Montana State University, and has been there for the last three years.

She was attracted to her current area of research not only because it granted the opportunity to work in the heart of the Rocky Mountains, but also because whirling disease, salmonids, and fresh water ecology were different from the aquatic subjects she had previously studied. Silvia could not resist the challenge to learn about an entirely new group of fish species, their habitats, diseases, and pathologies.

#### **About Julie:**

Julie is a dual citizen of the United States and Canada. She grew up spending periods of time in both Ottawa and Washington, D.C. She credits this experience for the development of a unique mixture of values based on two very different places.

She attended the University of Mary Washington in Fredericksburg, Virginia for two years then went to the University of Tasmania in Australia and finished an undergraduate degree in biology. She says she fell in love with fish while in Australia and was motivated to immediately start working on a master’s in natural resource management at James Cook University in Townsville, Australia. Her research focus there was stream restoration via hydraulic upgrades.

Julie worked for the U.S. Federal North Pacific Groundfish Observer Program and the Washington Department of Fish and Game. This gave her the opportunity to work with organisms, salmonids, and other fish from ports of the Aleutians in Alaska to Vancouver to the Puget Sound area. It was during this time that Julie became excited about salmonid research. ❧

# Ponds and Whirling Disease

by Barry Nehring, Amy Rose, ed.

Ponds have played a troubling role in the spread of whirling disease in the Intermountain West ever since the 1990s when the disease began causing noticeable population impacts. Thousands of private ponds dot the map in many states. In Montana alone there are more than 5,000 legally-licensed private ponds. On average, 150 new ponds are licensed every year. Several introductions of whirling disease to previously uninfected drainages have been traced to ponds. The cause is usually pinpointed to the stocking of diseased fish. However, there are several other pond factors that contribute to the problem.

Ponds used for stocking or rearing of trout are vulnerable to the establishment of *M. cerebralis*. Because the water is slow-moving, over time, ponds accumulate nutrients and organic matter which are the perfect substrate for building dense populations of *T. tubifex* worms. If spores are introduced to this environment, the probability of whirling disease establishment is high. Additionally, pond discharge to downstream areas will carry triactinomyxons to the receiving stream and result in parasite establishment in free-ranging salmonids in that stream. This is the most plausible explanation as to how the parasite made its way into the Fryingpan River in Colorado in the mid-1990s, six-to-eight years after infected fish were inadvertently stocked into a series of nearby fish ponds on private property in the late 1980s.

Private ponds are vulnerable to infection by *M. cerebralis*, especially if they are constructed where the parasite is enzootic (a disease that is constantly present in an ecosystem). However, proper construction of a pond can help in the prevention of the disease. Several private fish hatcheries and rearing units in Colorado rear trout in earthen ponds near lakes and streams where the spore is enzootic. Yet, these ponds have remained negative for *M. cerebralis* for more than 15 years. This is because they are supplied with artesian spring water, and the private grower hatches his own trout eggs and has *not* and does *not* purchase trout from other private growers.

Proper pond construction and use of stocking permits help to prevent ponds from becoming a hazard to surrounding waters. In most Intermountain West states a pond owner needs a pond license and a stocking permit in order to stock the pond, and the pond can be stocked only with certified fish. Illegal stocking of infected fish is suspected in several whirling disease infections throughout the Intermountain West. Unauthorized placement of aquatic species to or from ponds is not only illegal but also poses a substantial threat of introduction of disease and other invasive species into the environment.

If a pond does become infected, cleaning it up is extremely difficult and requires aggressive persistence. Eradication of the parasite is almost impossible once it becomes established. Drastic approaches for cleaning up whirling-disease infected

ponds have been tried without much success. Measures such as breaching the pond or treating the water have not provided dependable or consistent solutions. Draining a pond does not solve the problem unless the area becomes completely dry with no possibility for future standing or moving water at the site. The chemical treatment of ponds or the soil of drained ponds has proven too cost- and labor-intensive to be of any real value. Also, the majority of past treatment efforts have mostly ended in poor and imperfect results.

Fortunately, through the implementation of Best Management Practices (BMPs) the ambient levels of infectivity can be greatly reduced. BMPs include stocking trout that are more resistant to infection (such as brown trout, as opposed to brook trout and rainbow trout that are highly vulnerable to infection), stocking fewer numbers of fish, and stocking trout only at catchable size or larger.

Landowners are the best resource for stopping the problem of whirling disease in ponds. There are several actions landowners can take to ensure their ponds will not cause damage to nearby trout populations. The first step in creating a disease-free pond is contacting the state fisheries pathologist—this can be done by calling the nearest fish and wildlife agency. State fisheries pathologists in the Intermountain West maintain lists of private growers and rearing units that are certified *M. cerebralis* negative. However, the landowner should be wary when purchasing fish from a private grower. At a minimum, landowners should do the following:

- » request to see a current disease-free certification from the prospective seller,
- » inquire as to whether the fish to be purchased were actually hatched and reared at the seller's facility, or whether they were purchased from another grower,
- » purchase fish only from the grower's own production,
- » ask the state fisheries pathologist for the grower's disease inspection history,
- » if at all possible, purchase fish *only* from a grower whose facility has been certified whirling-disease negative for at least two or more years,
- » verify the pond is licensed for the species of fish intended for placement, and
- » ensure any necessary import and transport permits are obtained prior to stocking the pond. ❏



Recently the Whirling Disease Initiative was excited to see one of the Initiative-funded projects highlighted in the Montana State University publication, *Discovery*. We happily reprint the article here.

## Mobile anglers help with whirling disease study on Montana rivers

by Evelyn Boswell, MSU News Service

BOZEMAN -- Flitting birds were the only ones stirring when Kiza Gates and Adam Grunstra pulled up to the Cameron Bridge fishing access near Bozeman. A man snoozed in his car. An exploded cooler laid around the corner from a sign that forbade fireworks.

A quiet day is sometimes the case for Montana State University students who are studying whirling disease and angler movements in Montana.

Gates and Grunstra are visiting six Montana rivers this summer for Gates' master's degree in biological sciences. Grunstra, an undergraduate student in fish and wildlife management, is Gates' technician. The two are asking anglers on the Gallatin, Madison, Missouri, Yellowstone, Beaverhead and Bighorn about their fishing and gear-cleaning habits. They're washing boots to collect the mud they'll examine later. They're handing out brochures on the transmission of aquatic diseases and sometimes cleaning boots and fishing gear.

Abundant spring rains led to high waters which means that anglers were slow to fish the Gallatin River this summer, Gates said as she waited at the Cameron access.

When a visitor finally arrived, he climbed out of his truck, eyed the side channels of the Gallatin and continued his cell phone conversation. He didn't fish, but told Gates and Grunstra he might return after a meeting.

"We thought about keeping diaries of funny things people do at access sites," Gates said. "When you are there six hours at a time, you see lots of interesting things."

They're getting a taste of Montana's angling culture in addition to their official research, said Gates who grew up in Oregon, learned how to flyfish in college and became the only angler in her family. Grunstra came to MSU from Maryland. Used to working hard for his fish, he said he still can't get over the "awesome fishing" in Montana. He and Gates are amazed at Montana's wild and native trout and prolific hatches.

"The insect hatches here are like nothing I have ever seen anywhere else," Gates said.

As the researchers explained their washing and sampling equipment, John Warden parked his truck at the access and donned his waders. Agreeing to participate in the survey, the high school teacher from Reno, Nev. said he knew about whirling disease and New Zealand mud snails but had never seen a fish with whirling disease. He usually cleaned his boots after fishing.

"By all means," he said when asked if he'd like more information about whirling disease.

Gates started interviewing anglers last fall as a trial run for this summer. Planning to continue next summer, she said she'll start writing up her results in the fall of 2006 and hopes to present them at professional meetings and publish them in scientific journals. In the meantime, she has already learned a thing or two about Montana anglers. For one, they're surprisingly warm and interested in her study. For another, they're highly mobile.

"So many people who have fished here have fished in other places around the country, even around the world fairly recently," Gates said.

Out of 100 anglers interviewed on the Missouri River in preliminary work, one had fished in New Zealand within the previous 30 days. Besides the United States, the anglers came from Austria, Bermuda, Canada, England, Ireland, Italy, and Norway.

Such movements increase the likelihood of spreading aquatic nuisances and disease, Gates said. Researchers, in fact, are wondering if anglers could be the vector for whirling disease. They may carry the microscopic spores between streams if they don't clean and dry their gear properly.

The Montana Department of Fish, Wildlife and Parks is a partner in Gates' research project. The FWP has a similar program, but it requires anglers to participate, Gates said. It involves reservoirs as well as streams and has a boat-washing station. That program is headed by Eileen Ryce, a former graduate student at MSU.

*Evelyn Boswell, (406) 994-5135 or [evelynb@montana.edu](mailto:evelynb@montana.edu)*



*Kiza Gates and Adam Grunstra use a mild detergent to collect mud samples and clean boots in an effort to understand angler movement and the spread of aquatic diseases in Montana. (Photo courtesy of Kiza Gates).*

# Whirling Disease Initiative Outreach Program 2005 Update

by Amy Rose

In 2004, the Whirling Disease Initiative established an outreach program. Its purpose is to disseminate the most current whirling disease research, management, and control methods for application in the field. The primary audience of the program is technical professionals: fishery managers and administrators, hatchery operators, fish health specialists, researchers and agency land managers. Additionally, the program reaches the fishery industry, educators, and fishery outreach organizations such as the Whirling Disease Foundation, Trout Unlimited, and the Federation of Fly Fishers.

Many outreach products and services are now available to fisheries managers and the public. These include an updated Whirling Disease Initiative web site (the central repository for whirling disease information and resources including an archive/bibliography of project proposals, reports, and publications) and quarterly *Whirling Disease Initiative Newsletter* providing information to a contact list of 900 readers. The outreach coordinator, Amy Rose, has also provided program publicity and developed stronger communications links among researchers, project partners, and technical advisors. Additionally, she regularly presents on whirling disease at national and regional fishery meetings.

In the coming year the program will produce an updated report of whirling disease in the United States, an updated report of the geographic scope of the disease and state regulations, and a new national and regional whirling disease management brochure

The outreach program is especially excited to launch production of an updated film documentary on whirling disease. This project is possible through the collaboration of the Montana Water Center with the Montana State University's Master of Fine Arts in Science and Natural History Filmmaking Department.

The Science and Natural History Filmmaking program is designed to provide filmmaking training to individuals with science backgrounds. Collaboration between this program and the Montana Water Center provides the opportunity for the Whirling Disease Initiative to work with graduate film students on a mutually beneficial project. Two film students, Kristin Glover and Stefanie Mistzal, will produce the film.

The main goal for the project is to educate fisheries managers, anglers, and the general public on current whirling disease research. It will highlight the past decade of research and focus on how to prevent the further spread of the disease. Three different products will be created to target specific audiences: a 26-minute feature length documentary that will air on local Public Broadcasting Service networks, an eight-to-ten minute DVD that will be distributed to fisheries managers, and various 30-second to two-minute news clips.

The full 26-minute product will tell the story of whirling disease for the general public, showcasing current research on how the disease is spread and attempts to control it. It will highlight the relevance of the disease to anglers and the ways they can actively prevent the spread of the disease.

The short DVD version will provide a tool for fisheries managers to inform the public about the dangers of whirling disease and the current research to control it. It will emphasize the lifecycle of the disease and how the managers act to control it. This version will contain a higher scientific content designed for professionals communicating their work concerning whirling disease to the general public.

The clips will be packaged into relevant segments for either cable or news shows. Clips such as these can reach much larger audiences and direct them to places where they can find more information about how to help prevent whirling disease where they live. ❏

## Meetings and Conferences:

- » American Fisheries Society 135<sup>th</sup> Annual Meeting; September 11-15, 2005; Anchorage, Alaska
- » North Pacific International Chapter of the American Fisheries Society, 2nd Coastal Cutthroat Trout Symposium; September 29-October 1, 2005; Fort Worden State Park, Port Townsend, Washington
- » National Partnership for the Management of Wild and Native Coldwater Fisheries Annual Board Meeting; October 25-27, 2005; Pray, Montana
- » Midwest Fish and Wildlife Conference; December 11-14, 2005; Grand Rapids, Michigan
- » Western Division American Fisheries Society; Annual Meeting; May 13-20, 2006; Bozeman, Montana (Montana Chapter Annual Meeting will be held in conjunction)
- » American Fisheries Society 136<sup>th</sup> Annual Meeting; September 10-14, 2006; Lake Placid, New York

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