



the Whirling Disease Initiative Newsletter

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Editors & Contributors

Kajsa Stromberg, Editor in Chief
 Kristin Keith, Assistant Editor
 Rick Holscher, Graphic Artist

A publication of:



First evidence of whirling disease parasite in Alaska

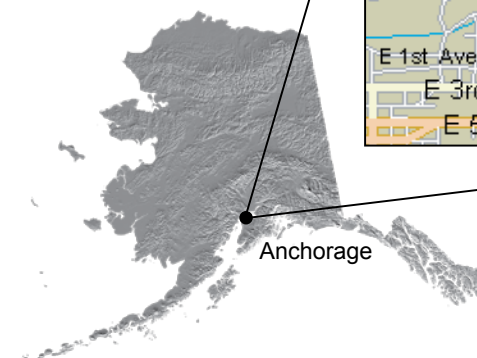
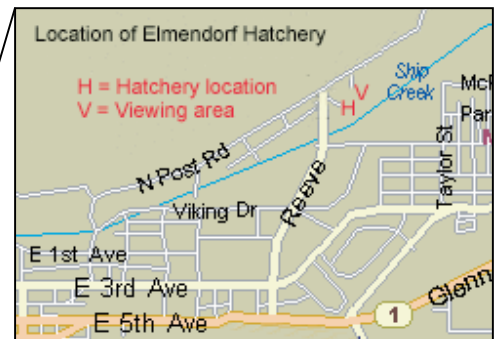
The first evidence of the whirling disease parasite's presence in the state of Alaska was recently discovered. Using a very sensitive molecular test, DNA of the parasite *Myxobolus cerebralis* was detected in rainbow trout from Elmendorf State Fish Hatchery in Anchorage. The discovery occurred during a risk assessment, designed by researchers at Oregon State University, to determine the risk of the parasite's introduction into the state. There were no previous reports of *M. cerebralis* in Alaska.

During 2005 and 2006, the risk assessment research team from Oregon State University collected 180 rainbow trout from Elmendorf and Fort Richardson state fish hatcheries. These were tested using Quantitative Polymerase Chain Reaction (qPCR), a very sensitive test to detect DNA of the whirling disease parasite. Fourteen fish from Elmendorf tested positive for the parasite's DNA. A nested PCR assay was used to confirm the detection. To rule out false positive results, the 18S rRNA gene was sequenced and compared with laboratory isolates from other locations. The qPCR test estimates the amount of DNA present in a sample and suggests that the parasitic infection among Elmendorf State Fish Hatchery rainbow trout is very slight. These samples contained an estimated 10 to 1,000 parasites per fish. No external signs of whirling disease have been observed and no stages of the parasite have been detected during microscopic examination.

This is the first evidence of the whirling disease parasite in the state of Alaska. It is unknown how and when the parasite may have been introduced or how widespread its distribution may be within the state. The closest location to Alaska where the parasite is known to occur is the Snake River basin in northeast Oregon, southeast Washington, and Idaho. The parasite has also been found in fish from the Sakhalin Islands of Russia, across the Bering Sea. The introduction could have occurred with the transfer of infected fish or fish parts, movement of infected water or sediment, movement of the parasite by wildlife, or other pathways.

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Elmendorf State Hatchery is located in Anchorage, Alaska on the north bank of Ship Creek near the intersection of Reeve Boulevard and Post Road.



Ship Creek empties into the Knik Arm of Cook Inlet.

The National Partnership for the Management of Wild and Native Coldwater Fisheries Board Members:

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Stuart Leon
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Dave Nickum
National Trout Unlimited

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Eileen Ryce
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Mike Stone
Association of Fish and Wildlife Agencies

Jay Thompson
Bureau of Land Management

Jim Tilmant
National Park Service

Kate Walker
U.S. Forest Service

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U.S. Geological Survey

Phil Hulbert
State Fisheries East Infected Region

Mark Jones
State Fisheries West Infected Region

Dave Kumlien
Whirling Disease Foundation

Beth MacConnell
U.S. Fish and Wildlife Service

Dick Vincent
Montana Department Fish, Wildlife and Parks

Gretchen Rupp, Program Director
Montana Water Center

Whirling Disease Initiative update from the Director

By Gretchen Rupp, Program Director

The Whirling Disease Initiative was not funded in the federal fiscal year 2007 budget, and we do not expect to receive future federal appropriations. Consequently, the Initiative is in its last phase. Whirling disease research remains vital and there are several highlights included in plans for the Initiative's final phase. Large-scale research into the ecological patterns and fish population effects of the disease are going forward in the southwest and in Montana. These projects will conclude at the end of 2008. Several research projects of more limited scope will conclude at the end of this year. No new research projects will be initiated. We continue to work with investigators to upload their data into the Internet-enabled Whirling Disease Data Repository (<http://data.whirlingdisease.montana.edu/>) for use in future meta-analyses. The outreach program carries on, and we expect to build broader geographic coverage into the parasite distribution map (<http://whirlingdisease.montana.edu/about/map.htm>). In summary, Initiative activity will not taper off and conclude for some time yet. Don't purge us from your rolodex yet! ☒

Gretchen Rupp
Whirling Disease Initiative Program Manager
Director, Montana Water Center



Gretchen Rupp.

Whirling disease in Maryland



Early this spring, the whirling disease parasite *Myxobolus cerebralis* was found in three fish rearing stations in western Maryland. Officials from the Maryland Department of

Natural Resources (DNR) announced that infected trout were discovered at Bear Creek Rearing Station and two experimental rearing stations, one at Mettiki coal water treatment facility and the other at William Jennings Randolph Dam on the North Branch Potomac River. Clinical signs of whirling disease were observed among Mettiki rainbow trout and fish transferred from there, but no other fish showed visible signs.

To reduce the risk of spreading the parasite, fishery managers depopulated all three facilities and destroyed more than 120,000 potentially infected trout. They plan to sanitize the Bear Creek Rearing Station, close the facility at Mettiki, and cease net-pen operations at the Jennings facility. A Coldwater Trout Facilities Biosecurity Plan has been developed to further strengthen fish health protections and guide additional actions. Although DNR found other sources of trout to help offset these losses, spring

continued on page 5...

Unified message to reach Maryland anglers

There has been at least one positive outcome from the recent emergence of whirling disease in Maryland. The Maryland Department of Natural Resources is working with members of Trout Unlimited (TU) and the Federation of Fly Fishers (FFF) to carry out a collaborative education and outreach effort with a unified message.

“We feel it is imperative to have a widespread campaign to educate the public about this problem and how to avoid transporting the whirling disease parasite. Our hope is that the citizens of Maryland will take the necessary precautions to prevent infecting additional streams,” said John Brognard, Conservation Chairman of the FFF Mid-Atlantic Council.

The partnership is asking anglers to help prevent the spread of whirling disease by taking a few simple precautions:

- » Do not move fish from one stream to another.
- » Do not discard trout carcasses in streams or on stream banks.
- » Please be sure to clean mud from boots and equipment before moving from one stream to another.

The agency and fishing groups are communicating with each other to stay informed and to share general information about whirling disease with anglers. They have posted information on their Web sites and the groups are considering other ways to spread the word – such as informative signs at fishing access sites. The Whirling Disease Foundation, the Whirling Disease Initiative and fisheries professionals that deal with whirling disease in other parts of the country have provided technical support and outreach materials. By working closely together, the groups work more efficiently and are more effective at reaching the public with information that is understandable and consistent.

“While we at TU were disappointed with the discovery of whirling disease in Maryland, it has been gratifying to begin an immediate partnership with the Maryland DNR Fisheries Service, Federation of Fly Fishers, and Trout Unlimited to contain the disease and educate anglers on prevention and containment,” said Noel Gollehon, regional council chairman for TU, “Our first calls were to the Whirling Disease Foundation and the Whirling Disease Initiative. We received immediate assistance with referrals for science, laboratory and practical, and an immediate shipment of educational brochures and DVDs. Further contacts with fisheries personnel in Colorado, New York, New Mexico, and Maine have been extremely helpful to the partnership. We are overwhelmed at the willingness of all these folks to respond to our questions and critique our effort. On behalf of the partnership, we are extremely grateful for this terrific response.”

Maryland Department of Natural Resources Fisheries Service

<http://www.dnr.state.md.us/fisheries/>

Mid-Atlantic Council of the FFF

<http://www.macfff.org/conservation.htm>

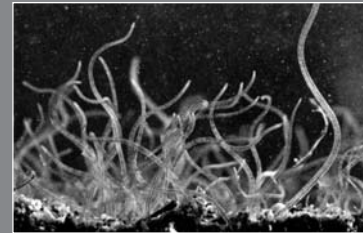
Trout Unlimited

<http://www.tu.org> ☒

Life Cycle



1. *M. cerebralis* spores exist in sediment.
2. Tubifex worms ingest spores.



3. Infected worms produce *M. cerebralis* TAMs and release them into the water column.



4. TAMs enter through the skin of fish.
5. Parasite travels to the head and cartilage of fish.



6. After several months, fish exhibit signs of whirling disease.
7. Mature spores are released from fish and cycle begins again.

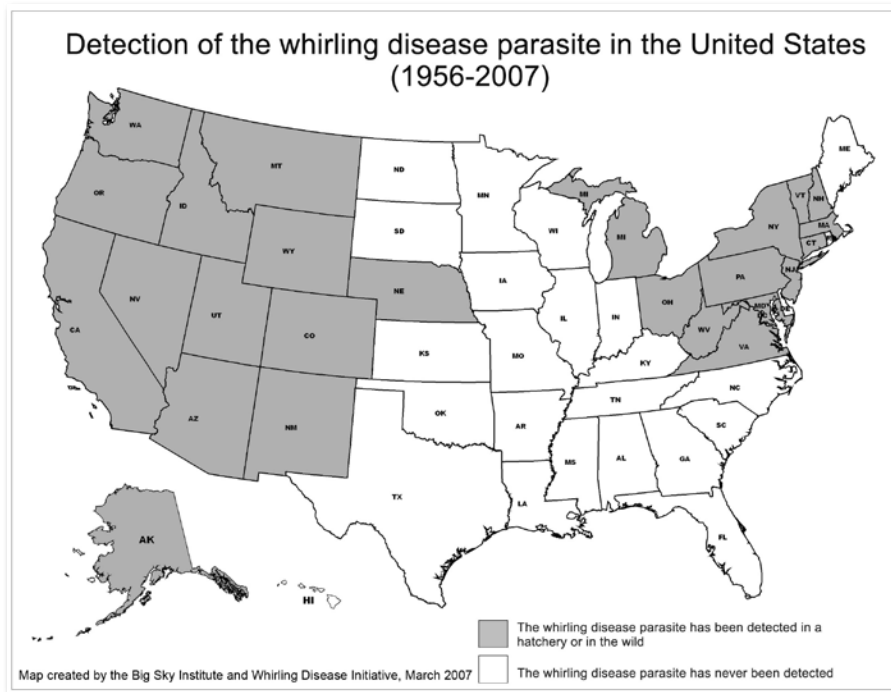


Photos courtesy of (top to bottom): the Whirling Disease Foundation; Maria Markiw, U.S. Geological Survey; Mansour El Matbouli; and the U.S. Geological Survey

Updated whirling disease parasite distribution map now available

An updated map of the distribution of the whirling disease parasite in the United States is now available. The map includes states that have detected *Myxobolus cerebralis* at least once in a hatchery, a wild fish population, or both. Two states have been added: Nebraska (2001) and Alaska (2006). It is important to note that the map does not indicate the continued presence of the parasite or the extent of distribution within the state.

The Whirling Disease Initiative is working on an improved map that will be more informative, providing more updated and detailed information about the parasite's distribution. We will keep you posted on the progress. For now, you may download this map from the Whirling Disease Initiative Web site at <http://whirlingdisease.montana.edu/about/map.htm>. The map has been created as a resource for you, and you may use it in presentations and publications with credit to the Whirling Disease Initiative and Big Sky Institute.



Note: *The map does not indicate the continued presence of the parasite or the extent of distribution within the state. For example, the parasite has been detected in Arizona, but there is no evidence that it has become established in that state. In Alaska, the parasite's DNA was detected among trout at one hatchery, but no stages of the parasite have been observed visually. See the article "First evidence of whirling disease parasite in Alaska" in this issue for more information.* ☒

Leadville National Fish Hatchery certified free of whirling disease

In January, the Leadville National Fish Hatchery in Colorado was certified free of the whirling disease parasite. As a result, the hatchery will now be able to provide more fish and services. The whirling disease parasite was detected at the hatchery in 1995. This led to years of restrictions on locations where fish from Leadville NFH could be stocked. To reduce the risk of whirling disease to wild trout, fish from Leadville NFH were restricted to stocking in lower elevation waters where the parasite was already present.

Now that the Colorado Division of Wildlife has certified the facility free of whirling disease, Leadville NFH can provide fish for the upper Fryngpan-Arkansas River reservoirs, support recovery of endangered fish in the Colorado River, and establish a greenback cutthroat trout broodstock.

Multi-million dollar renovations have been completed to rid the hatchery of the whirling disease parasite and to protect against other pathogens. The hatchery water supply is now treated by an extensive filtration and ultraviolet light system. In addition, concrete raceways have replaced earth-bottom ponds. With these changes, the 118-year-old Leadville NFH will be increasing trout production, pleasing anglers, and fulfilling its important conservation mission.

Visit the Leadville National Fish Hatchery online at <http://www.fws.gov/leadville/>. ☒

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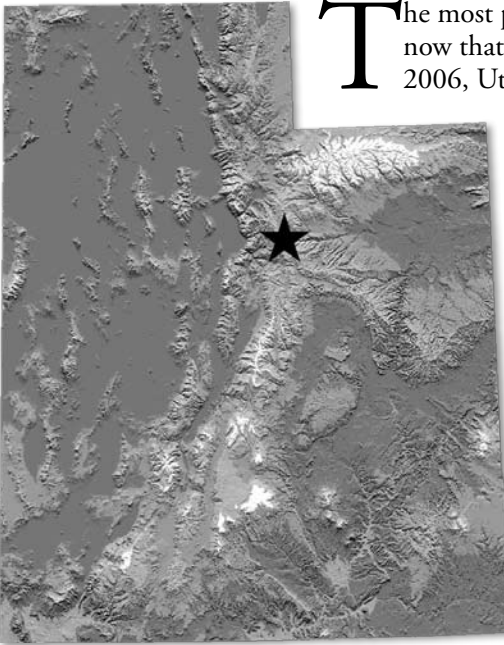
2007 stocking rates for brown and rainbow trout were reduced about 20 percent. The Bear Creek Rearing Station may return to production this year.

The whirling disease parasite was first detected in Maryland in 1995 among trout held in net-pens at the William Jennings Randolph Dam facility on the North Branch Potomac River. It is unknown how the parasite was introduced there and *Myxobolus cerebralis* is now known to occur in the Potomac River's North Branch. It is also unknown how and when the parasite was introduced into the Mettiki facility, but infected trout were transferred from the Mettiki facility to the Bear Creek Rearing Station before their whirling disease status was discovered. This is one potential source of the infection at the Bear Creek facility, but it is also possible the parasite was introduced through other avenues. *Myxobolus cerebralis* was recently detected in trout collected from Bear Creek downstream of the rearing station and in Sand Run downstream of the Mettiki facility. To further determine the parasite's distribution, Maryland DNR personnel plan to test for the parasite in streams that support wild trout. ❧



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Whirling in the Duchesne – Strawberry Reservoir at risk?



The most popular fishery in Utah, Strawberry Reservoir, may be at an increased fish health risk now that the whirling disease parasite has been found in the Duchesne River. In the fall of 2006, Utah Division of Wildlife Resources personnel detected the parasite in the Duchesne River near Hanna. This was the first detection of *Myxobolus cerebralis* in the Duchesne River. Although the river is not naturally connected to Strawberry Reservoir, the Central Utah Project diverts water from the West Fork Duchesne River by pipeline into Currant Reservoir and on to Strawberry Reservoir. With the discovery of the whirling disease parasite approximately eight miles below this diversion, there is concern that the parasite could spread into Strawberry Reservoir through the pipeline.

In November 2005, the Utah Division of Wildlife Resources was notified that potentially infected trout had been stocked into private ponds near Rock Creek, which is a tributary to the Duchesne River. Samples collected from Rock Creek, upstream from these ponds did not detect the parasite, but the parasite was detected in samples collected just downstream. Samples collected near the confluence of the West Fork, North Fork and the mainstem Duchesne River also tested positive for the parasite. The parasite has not been detected in the upper West Fork Duchesne, which is home to a genetically pure strain of Colorado cutthroat trout.

Besides the great popularity of the Strawberry Reservoir (more than 500,000 angler days per year), managers are particularly concerned about whirling disease in this reservoir. This is because the fishery, particularly for cutthroat trout, depends heavily on wild reproduction. Since whirling disease is detrimental to very young trout and unlikely to impact fish larger than 40 mm fork length (1.6 in), young cutthroat could be vulnerable to infection and disease. There are also wild reproducing kokanee salmon in the reservoir that may be vulnerable as well.

Further testing will be conducted to determine the extent of the parasite's distribution in the Duchesne and nearby water diversions. There are also plans to construct a barrier for fish movement to prevent infected fish from moving into Strawberry Reservoir through the diversion. However, other vectors such as anglers and piscivorous birds may move the parasite, and a risk remains that the parasite will spread.

Careful angling practices can help prevent the spread of *M. cerebralis* and whirling disease. These include:

- » Inspect your gear for any plants or dirt.
- » Clean your gear with clean water before leaving a fishing site.
- » Thoroughly dry your gear.
- » Never transport any fish, plants or animals from one body of water to another.
- » Obtain certified disease-free fish for any private fish pond stocking projects.
- » Dispose of fish parts in garbage, by deep burying or by total burning – not in the stream or on stream banks.
- » Tell others to do the same! ❧

...continued from page 1

The American Fisheries Society describes procedures to detect *M. cerebralis* during fish health inspections. These procedures are to conduct pepsin-trypsin digest (PTD) for initial detection of the parasite. This is then followed by confirmation using Polymerase Chain Reaction (PCR) or histology, microscopic observation of fish tissues by a pathologist. The US Fish and Wildlife Service National Wild Fish Health Survey has tested more than 2,000 fish from 26 locations in Alaska using PTD, and have not detected *M. cerebralis*. Additionally, public and private hatchery fish in Alaska are not routinely monitored for the parasite; however, trout culture occurs at only three state hatcheries (Elmendorf, Fort Richardson, and Fairbanks) while all other facilities rear various Pacific salmon species.

Elmendorf State Fish Hatchery is located on Ship Creek in Anchorage, Alaska, in the Cook Inlet basin. The hatchery relied on surface water from Ship Creek for its water supply, the most likely source of the parasite. Alaska Department of Fish and Game personnel will be conducting further tests to determine whether the parasite has become established in Ship Creek. The Department is also planning to investigate rainbow trout populations in watersheds considered high risk for the whirling disease parasite.

There are three state-owned fish hatcheries in Alaska: Elmendorf State Fish Hatchery, Fort Richardson State Fish Hatchery, and an experimental hatchery in Fairbanks. The Oregon State University research team sampled rainbow trout from Fort Richardson State Fish Hatchery and did not detect *M. cerebralis* using qPCR from any of those fish. Fort Richardson is also located on Ship Creek and is the original source of the trout that later tested positive at Elmendorf Hatchery.

Alaska Department of Fish and Game policy would require that all fish at Elmendorf State Fish Hatchery be destroyed and disposed of if there had been evidence of clinical whirling disease or if the parasite was visually observed. The parasite's presence was only confirmed genetically, so the fish will not be destroyed; however, the Department will take precautionary measures to reduce the risk of spreading the parasite. No fish from Elmendorf will be transferred to other facilities and, besides one exception, fish will only be stocked into lakes with no inlet or outlet and have no reproducing salmonid populations. The only exception is that Chinook salmon from Elmendorf which will be released into Ship Creek to maintain broodstock. More than 94,000 hatchery fish that would have otherwise been destined for open watersheds will be transplanted into closed systems in 2007.

For further reading:

Arsan, L., S. Adkinson, S. Hallett, T. Meyers, and J. Bartholomew. 2007. Expanded geographical distribution of *Myxobolus cerebralis*: first polymerase chain reaction (PCR) detections from Alaska. *Journal of Fish Diseases*, in press.

The Clean Angling Pledge and Clean Boating Pledge

To raise awareness and slow the spread of invasive species, two simple pledges for anglers and boaters are now available from the Federation of Fly Fishers and partners. The Clean Angling and Clean Boating pledges ask anglers and boaters to commit to cleaning their equipment to prevent the spread of invasive species.

The online pledge reads, "I pledge to inspect, clean and dry my gear. I am committed to protecting our fisheries resources from invasive species." Visitors to the site find simple recommendations and further information about the spread of invasive species and their impacts.

"This very simple action by anglers and boaters to clean their gear will help protect our rivers and lakes from harmful invaders, explains Leah Elwell, Conservation Coordinator of the Federation of Fly Fishers. This pledge campaign not only helps bring awareness to the problem of invasives, but also empowers water users to engage in this very important ecological issue."

To learn more or to participate in the Clean Angling Pledge and the Clean Boating Pledge, visit their Web sites at <http://www.cleanangling.org> and <http://www.cleanboatingpledge.org>. The Federation of Fly Fishers invites agencies and organizations to join the pledge campaign as partners.

For more information, contact Leah Elwell with the Federation of Fly Fishers at (406) 222-9369 or conserve@fedflyfishers.org. ☒



Recent publications of interest

Peer-reviewed

Bartholomew, J. L., H. V. Lorz, S. D. Atkinson, S. L. Hallett, D. G. Stevens, R. A. Holt, K. Lujan, and A. Amandi. (2007) Evaluation of a Management Strategy to Control the Spread of *Myxobolus cerebralis* in a Lower Columbia River Tributary. *North American Journal of Fisheries Management*. 27:542-550.

Granath, W. O., M. A. Gilbert, E. J. Wyatt-Pescador, and E. R. Vincent. (2007) Epizootiology of *Myxobolus cerebralis*, the Causative Agent of Salmonid Whirling Disease in the Rock Creek Drainage of West-Central Montana. *Journal of Parasitology*. 93(1):104-119.

Kaerer, A. J., C. Rasmussen, and W. E. Sharpe. (2006) An Examination of Environmental Factors Associated with *Myxobolus cerebralis* Infection of Wild Trout in Pennsylvania. *Journal of Aquatic Animal Health*. 18:90-100.

Graduate theses

Gates, K. K. (April 2007) Myxospore Detection in Soil and Angler Movement in Southwestern Montana: Implications for Whirling Disease Transport. Master of Science in Biological Sciences, Montana State University.

McGinnis, S. A. (April 2007) An Analysis of Whirling Disease Risk in Western Montana. Master of Science in Biological Sciences, Montana State University. ☒

Whirling Disease Initiative Funded Studies, 2006-2007/2008

New Projects

An ecological assessment of large-scale spatial and temporal patterns of whirling disease risk and salmonid population response

Billie Kerans, Thomas McMahon, Jay Rotella, and James Robison-Cox, Montana State University
Travis Horton, Montana Department of Fish, Wildlife, and Parks

Southwest regional risk assessment for whirling disease in native salmonids in arid and semi-arid lands: Arizona, Colorado, New Mexico, and Utah

Colleen Caldwell, USGS, New Mexico Cooperative Fish and Wildlife Research Unit
Robert DuBey and Scott Schrader, New Mexico State University
Dana Winkelman, USGS, Colorado Cooperative Fish and Wildlife Research Unit, Colorado State University
Phaedra Budy, USGS, Utah Cooperative Fish and Wildlife Research Unit, Utah State University
Scott Bonar, USGS, Arizona Cooperative Fish and Wildlife Research Unit

Effect of substratum on the development and release of the triactinomyxon stage of *Myxobolus cerebralis* in resistant strains of *Tubifex tubifex*

Dolores Baxa and Ron Hedrick, University of California – Davis

Continuing Projects

Resolving uncertainties in *Myxobolus cerebralis* introduction and establishment risks

Jerri Bartholomew, Antonio Amandi, Oregon State University

***Myxobolus cerebralis* risk to Yellowstone cutthroat trout related to variation in *Tubifex tubifex* abundance and susceptibility: Year two**

Billie Kerans, Montana State University
Todd Koel, Yellowstone National Park

Investigating competition among lineages of *Tubifex tubifex* and the potential for biological control of whirling disease in natural streams

Dana Winkelman, Colorado Cooperative Fish and Wildlife Research Unit
Barry Nehring and Kevin Thompson, Colorado Division of Wildlife
Christine Clapp, Colorado State University

Meetings and Conferences:

- » Fish Health Section of the American Fisheries Society Annual Meeting; June 4-6, 2007; Grand Teton National Park, Wyoming
- » Western Fish Disease Workshop; June 4-6, 2007; Grand Teton National Park, Wyoming
- » Aquaculture Biosecurity Workshop; June 14, 2007; Bayfield, Wisconsin
- » Salmonid Disease Workshop; June 18-29, 2007; Corvallis, Oregon
- » Eastern Fish Disease Workshop; June 18-22, 2007; Gettysburg, Pennsylvania
- » 7th Nordic Symposium on Fish Immunology; July 17-23, 2007; Stirling, Scotland
- » Annual Meeting of the American Fisheries Society; September 2-6, 2007; San Francisco, California

For more updates and events, visit:
<http://whirlingdisease.montana.edu/events.asp>

We want your feedback!

Is this newsletter helpful? Accurate? Informative? Please give us your comments and suggestions. We would also appreciate story ideas or article submissions. Simply e-mail Kajsa Stromberg, Outreach Program Coordinator, at kstromberg@montana.edu.

Acknowledgements

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