VOL. 3 NO. 2 SUMMER 2003

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The Friends of the Teton River is dedicated to understanding and improving ground and surface water resources in the Teton Basin, including the Teton River, its tributaries and wetlands. We will further this mission by conducting scientific research about the Teton watershed, effectively communicating this information to the public, and implementing on-the-ground improvement projects. In carrying out this mission we will actively cooperate and collaborate with all other groups, agencies and individuals working for the welfare of the Teton Basin.

Friends of the Teton River

WATER LINES

A QUARTERLY NEWSLETTER PUBLISHED BY FRIENDS OF THE TETON RIVER

Get ready for some great fishing on the Teton River

A new fishing season has arrived and my thoughts are full of past seasons and the excitement and anticipation of the great ones still to come. Of all the rivers I fish in Idaho none of them produce a larger Cutthroat trout than the Teton River. What makes this river so special is not only the surrounding Teton Mountains and its lazy spring creek nature, but the willingness of the fish to feed on dry flies. There is much to look forward to in season on the Teton.

Casey Fenger holding a large Teton River Cutthroat Trout.

Good fishing starts in late June as spring runoff begins to subside. Giant stone flies hatch on the Lower River and PMDs emerge in masses towards the headwaters providing spectacular early season fishing. Hopper fishing follows from mid- July through September. The grand finale for many of us who fish the Teton is the Grey Drake hatch, from late August through mid-October. Large trout that have been very difficult to catch during smaller hatches take these big mayflies. With a better snow pack this year we are looking forward to a great season.

The Teton watershed, the lifeblood of Teton Valley, is not without its problems. Accelerated growth and past land use practices have not only adversely affected our surface waters but the ground waters that feed them as well.

Because of your support, FTR is addressing many of these concerns. Earlier this year FTR received $270,000 from the U.S. Congress to help in the Upper Teton Watershed Project. We are pleased to announce the recruitment of our new Development Director Bonnie Berger to carry us forward in our mission. However, much more is needed; it is through your membership and private donations that FTR is provided with vital operating dollars.

If you are not a member please join us in preserving and restoring one of our Valley's greatest assets and protecting the quality of life for all those that live in and visit Teton Valley.

FTR sends out its deepest regrets to the Berry Family for the loss of Sandy, wife of Randy Berry. She was truly a special person and an inspiration to many. Our thoughts and prayers are with them.

Tom Fenger

Board President, Friends of the Teton River

Lyn Benjamin,
Executive Director
Bonnie Berger,
Development Director
Marge Edwards,
Development Associate
Kimberly Ball,
Research Associate

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We welcome two new staff members

Friends of the Teton River is thrilled to welcome new staff members Kimberly Ball and Bonnie Berger, who add their many talents to our organization. Kimberly will serve as FTR's first research associate and will be responsible for our water quality program, groundwater monitoring, habitat surveys, and GIS mapping. Bonnie will take on full-time responsibilities as FTR's Development Director and business manager. Many congratulations to Marge and Stan Edwards who are expecting their second child in December. Marge will continue to write grants for FTR and assist Bonnie in her work.

Bonnie Berger

Bonnie will join Friends of the Teton River as the Development Director in early June. She recently completed her Master of Public Administration at Cornell University with a focus on environmental policy and water resource issues.

Prior to graduate school, Bonnie resided in Gunnison County, Colorado where she worked as a non-profit fundraiser, administrator and outreach director. During this period, she was employed by the High Country Citizens' Alliance, a local conservation organization, and the Crested Butte Center for the Arts. Before happily settling in the nonprofit sector, Bonnie received a Bachelor of Science in Business Administration and worked as an accountant for several large firms.

After two years of graduate school, Bonnie is excited to return west to the rugged mountains, wild rivers and fresh powder. She is also looking forward to working for FTR and meeting all the members and volunteers that make it so successful.

Kimberly Ball

Kimberly has just finished her last semester of graduate course work at the University of Idaho towards her Master's degree in Environmental Science. Her thesis research is based on estimating stream bank erosion and will be finished in the fall of 2003. She received her Bachelor of Science in 1996 at the University of Wisconsin-Eau Claire. She majored in Environmental Geology with an emphasis in hydrogeology. She centered most of her course work on water quality. During this time she donated her time as project geologist and held an internship with the Department of Natural Resources for two semesters.

Kimberly has been a resident of Teton Valley since 1997. She spent her first two summers as a science instructor at Targhee Institute. In this position she assisted in development and research of educational materials, taught fundamental environmental ideals, and organized academic and outdoor activities.

In January of 2000 she obtained a position with the Idaho Department of Environmental Quality (IDEQ). In this position she was involved in creating a database of impaired streams listed on the 1998 303(d) list and mapping those streams. During the summer months this position was composed entirely of field work. The field work involved measuring channel morphology, Wolman pebble counts, riparian area assessments, stream flow, collecting macroinvertebrates, McNeil core samples, and electrofishing. This was a temporary eight month position and when it ended she was awarded a graduate fellowship to attend graduate school.

Her graduate work was completely funded by the IDEQ through the University of Idaho. In return for the funding, she has assisted with the development and research of the Big Lost River Subbasin Assessment and Big Lost River Total Maximum Daily Load (TMDL).

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Implementing the Upper Teton Watershed Plan

Friends of the Teton River designed the Upper Teton Watershed Plan to work with regional agencies, local landowners and citizens to improve water quality, water quantity and the Teton River fishery. The overall goals are:

1. Improved ground and surface water quality throughout the Upper Teton Watershed;
2. Enhanced trout habitat and spawning conditions in the Teton River and its tributaries;
3. Increased understanding of surface/groundwater processes, and protection of the aquifer as land use change occurs;
4. Provision of educational programs about water resources in the Upper Teton watershed. With funding from a Congressional appropriation, private foundations and individual members and donors, in 2003 FTR will implement the following projects to meet watershed plan goals:

- **The Yellowstone Cutthroat Trout Habitat Restoration Project.** The purpose of this project is to increase available habitat for Yellowstone cutthroat trout by stabilizing degraded stream banks and constructing habitat on the Teton River. FTR will utilize new stream bank stabilization techniques to provide immediate and long-term protection for the restored sites.
- **The Fox Creek Restoration Project.** The goal of this project is to maximize the available habitat for all of the life stages of Yellowstone cutthroat in Fox creek.
- **The Water Quality and Quantity Monitoring Project.** This ongoing program will enable FTR to develop a comprehensive understanding of water quality and quantity in the Upper Teton watershed. The goals of the water quality monitoring program are to develop a long-term water quality database for the upper Teton Watershed and identify sources water of quality problems and remediation strategies.
- **The Juvenile Cutthroat Trout Study** (in cooperation with the Idaho Department of Fish and Game). This project will identify factors limiting the abundance of juvenile trout in the Teton River and will provide a basis for prioritizing efforts to increase trout populations in the Teton River fishery.
- **Surface Water/Ground-Water Data Collection and Recharge Demonstration Project.** Results of the Ground-Water Model for the Upper Teton Valley Watershed have highlighted the need to better understand the factors that impact the recharge of the Teton Valley aquifer. This project will collect groundwater data that will be used to design and implement a recharge demonstration project.
- **Student Watershed Education Program.** FTR will continue student stream study programs with elementary school students from the Teton School District and the Teton Valley Community School. Additionally, FTR will sponsor a high school internship program whereby students assist with research and restoration projects for school credit.
- **Community Education Program.** FTR will continue to sponsor/conduct two to three watershed related forums per year. Many of the previously mentioned projects will culminate in a forum to share project results and techniques with valley residents and watershed stakeholders.

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Working with the IDEQ, Kimberly also developed map coverages using Geographic Information Systems and specifically using ArcView and ArcGIS. The coverages she has built utilize parameters such as land types, soil types, land activities, vegetation, climate, and hydrology to illustrate areas which are sensitive to erosion.

Working in the Big Lost River Subbasin has provided her with experience in working with several state and local agencies. She has worked with the Bureau of Land Management, Forest Service, IDEQ, and INEEL in researching the Big Lost Subbasin. This experience will help FTR continue its good communication with state and federal agencies.

Kimberly has done this all while living in the valley and spending many hours traveling between Driggs, Idaho Falls, and Mackay. She has been interested in FTR since its beginning, volunteering on occasion, and is dedicated to water quality and watershed issues in Teton Valley. The Teton River is important to her because of its recreational capacity, its quality, and its economic value to the valley.

Developing and implementing monitoring programs will be a large part of Kimberly's position. Water quality and groundwater data will be collected and analyzed, as well as, stream morphology and fisheries data. Once data is collected it will then be integrated into a Geographic Information System.

Where have all the little fish

A Story of Sediment, Red Worms, Cartilage-Eating Parasites, and Whirling Fish

Barry Commoner, one of the great environmental thinkers of the post-World War II era, explained the relationship between life and the environment that supports life with a few simple words: ...everything is related to everything else. You can't find a better illustration of Dr. Commoner's elegantly simple definition of ecology than the story you're about to read.

By Sheryl Hill, AQUATIC BIOLOGIST

The story begins with sediment. Commonly recognized as the muck on the bottom of the river that sucks anything from flip flops to tightly laced waders right off your feet, sediment is technically defined as particulate matter that is transported by wind, water, or ice and deposited in a stream, river, or other surface water.

One of the primary functions of even the most pristine stream is to move sediment. The rich farmland between Rexburg and the Henry's Fork River was created in part by the slow and methodical deposition of sediment by the Teton River over thousands of years. But we humans have such a knack for accelerating the rate and amount of sediment that ends up in our streams and rivers, that sediment is now the most common pollutant affecting streams and rivers throughout Idaho.

We humans have such a knack for accelerating the rate and amount of sediment that ends up in our streams and rivers, that sediment is now the most common pollutant affecting streams and rivers throughout Idaho.

Row cropping, livestock grazing, irrigation, timber harvest, mining, road construction, residential and industrial development, stream channelization, and streambed alteration are all activities that accelerate sediment production. And all of these activities occur in Teton Valley or in the watershed surrounding the upper Teton River.

If you'd like to see sediment being created, just go outside during a heavy rain storm and look at an exposed patch of soil. Water flowing over the soil disturbs individual soil particles, pushing them along until small channels appear. These channels create a direct route for the water and soil particles to tumble along until they cascade into the closest gutter or ditch, which frequently discharge to a tributary of the Teton River.

The smallest sediment particles remain suspended in the water column whereas larger sediment particles settle out of the water column and become incorporated into the substrate of the stream channel. When and where the sediment particles fall from the water column are determined by the energy of the stream.

High-gradient streams, such as the segments of Teton, Fox, Darby, and Trail Creeks located on the Caribou-Targhee National Forest, have enough energy during spring runoff to move several thousand tons of sediment over long distances. But low-gradient streams, such as the segments of Teton, Fox, Darby, and Trail Creeks located west of Highway 33 on the Valley floor, have barely enough energy to move sediment slightly downstream before it settles onto the surface of the streambed. That's the reason that substrates in high-gradient stream segments consist of cobble-sized rock, and substrates in low-gradient stream segments consist of gravel, sand, and silt.

Although we don't know exactly what the substrate of the Teton River looked like before the Valley was settled, it's probable that the surface of the river channel consisted of relatively small substrate materials such as sand and gravel. The river is located in an ancient lake bed, so the soil beneath and around it was formed by the deposition of sediment. When the lake burst through the north end of the Valley, and most of the water drained away leaving just a river, it took a lot of the very finest sediment with it.

A few hundred thousand years later, just before the first settlers arrived, the river was probably less well-defined than it is now, with multiple channels and numerous beaver ponds. Sediment would slowly accumulate in the beaver ponds, which would then become vegetated with willows and other riparian plants. Water flow would be diverted, causing the shape of the stream channel to change. New gravels would be exposed, releasing more fine sediment, and the cycle would begin again. But with eradication of beavers, stream dewatering for irrigation, and confinement of stream and

ies gone?

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river flows, the river could no longer renew its channel and refresh its substrate. Sediment began to accumulate faster than it was exported downstream.

We don't know how much sediment has accumulated since the Valley was settled, but we do know that the loss of soil from cultivated fields and the accumulation of sediment in the Teton River and its tributaries were recognized as problems more than 50 years ago. That's when farmers in the Valley organized the Teton Soil Conservation District to address agriculture's contribution to these problems.

Sediment can cause a variety of undesirable biological effects in a stream or river, and these effects depend on whether the sediment is suspended in the water column or deposited in the substrate of the stream or river bed.

Suspended sediment can reduce the amount and depth of light penetration in water, thereby reducing photosynthesis, which reduces primary production, which reduces insect production, which reduces fish production. Trout and other salmonids avoid water with high concentrations of suspended sediment whenever possible. Suspended sediment can interfere with their ability to obtain oxygen through their gills and to see and capture prey. Suspended sediment can also cause physiological stress, making fish more susceptible to diseases and toxicants, and altering their behavior. But concentrations of suspended sediment increase only slightly in streams in the Teton Valley, and usually only for a few weeks during spring runoff or during extreme rainstorms.

Sediment is a problem in the Teton River and its tributaries mostly because it changes the quality of the channel substrate. As fine sediment particles settle into the spaces between larger particles of sand and gravel, oxygen is prevented from reaching fish embryos and fry in the gravels below, and they suffocate. Fry may be unable to emerge from redds because they cannot swim through the heavy layer of sediment coating the gravel. The survival of wintering fry is reduced because spaces in the substrate that provided refuge are filled with sediment.

And then there are the effects on insects. The nooks and crannies that mayflies, stoneflies, and caddisflies need to cling to and feed on disappear in a blanket of fine silt. These insects, which are meat and potatoes to trout, are replaced with sediment-tolerant worms and worm-like insect larvae that are not even on the trout's menu.

One of these worms, Tubifex tubifex, is an aquatic relative of the earthworm. It was one of the first organisms recognized as an indicator of water pollution, and was so frequently found downstream of raw sewage discharges, that it became known as the sludge worm. Because it frequently occurs in nutrient-rich environments in which dissolved oxygen is almost absent, its blood contains hemoglobin, the same molecule that ferries oxygen around our bodies and makes our blood, and its body, bright red. So Tubifex are also frequently known as blood worms.

Sediment can cause a variety of undesirable biological effects in a stream or river, and these effects depend on whether the sediment is suspended in the water column or deposited in the substrate of the stream or river bed.

In just the past few years, Tubifex has become notorious in Colorado, Wyoming, Idaho, and Montana because it is the critical, intermediate host of the protozoan, Myxobolis cerebralis, the parasite responsible for causing whirling disease in rainbow trout and other salmonids. The infectious form of Myxobolis cerebralis is a life-stage of the parasite known as a triactinomyxon, or TAM, which develops within the Tubifex worm.

The TAMs are released into the water where the tiny parasites swim until they attach to a very young fish. They burrow into the cartilage in the heads of the young fish, where they develop into mature spores. The neurological damage done to the fish by the developing spore causes it to swim in circles, which is the reason the infection is known as whirling disease. The infected fish may also become physically deformed, with curvature of the spine and an indentation in the top of its head.

The mortality rate for the young infected fish is very high, probably because impaired swimming ability makes the fish more susceptible to predation. When an infected fish is eaten by another fish or bird, the spore passes through the predator's digestive system, and is eaten by a Tubifex worm, starting the cycle again. Although many species of trout may become infected with whirling disease, rainbow

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trout are most seriously affected. And the most susceptible rainbow trout are young-of-the-year.

Dr. Dan Gustafson of Montana State University surveyed streams in the Greater Yellowstone area, including the Teton Valley, and concluded that spring creeks and almost any stream or river that has been influenced by urban, agricultural, or forestry practices is likely to contain Tubifex.

Dr. Wayne Hubert and his associates at the University of Wyoming and Wyoming Department of Fish and Game studied the occurrence of whirling disease in the Salt River drainage of the upper Snake River. They found a strong relationship between stream characteristics such as fine-sediment substrates and abundant aquatic macrophytes, and evidence of whirling disease in young-of-the-year trout. Although many researchers have speculated that flow regime and summer temperatures were also related to the occurrence of whirling disease, Dr. Hubert's group did not find evidence to support those suspicions.

In April, Bill Schrader of the Idaho Department of Fish and Game reported the results of more than ten years of study of fish populations in the Teton Valley to FTR. Bill concluded that 1) the overall abundance of fish has recently declined in the upper Teton River, 2) the relative numbers of big fish increased while the numbers of small fish decreased, and 3) the abundance of rainbow trout has declined relative to Yellowstone cutthroat trout, whereas in most watersheds, the reverse has happened. Could these findings be related to whirling disease? Most likely, yes.

They found a strong relationship between stream characteristics such as fine-sediment substrates and abundant aquatic macrophytes, and evidence of whirling disease in young-of-the-year trout.

We know that whirling disease occurs in the upper Teton River. Whirling disease kills fish, which may be contributing to the overall decline of fish populations in the upper Teton River. Whirling disease causes death among young fish, which may be contributing to the skewed age and size distributions among fish populations. And whirling disease is more lethal to rainbow trout than other species of trout, which may be contributing to the increase in cutthroats relative to rainbows.

But is whirling disease the only contributor to recent changes in trout populations in the upper Teton River? Most likely, no.

Let's conclude this story where we began, with sediment. The story of whirling disease simply illustrates how a change in one element of a river system, in this case sediment, can have totally unexpected consequences. It also illustrates that with appropriate efforts to understand what we observe, we can correct problems almost as quickly as we create them.

Whirling disease can only occur if Tubifex worms are present in a river system. So the best way to eliminate Tubifex is to eliminate the sediment in which they thrive.

Whirling disease can only occur if Tubifex worms are present in a river system. So the best way to eliminate Tubifex is to eliminate the sediment in which they thrive. We can't really eliminate the sediment that's already in the Teton River and its tributaries, but we can reduce the amount of sediment that's introduced in the future so that the river and its tributaries can have an opportunity to cleanse themselves of the excess sediment that's already present. When that happens, there will be more habitat for fish spawning, increased reproductive success, and increased fry survival in the winter. Mayflies, stoneflies, and caddisflies will also increase in numbers and diversity. This will increase the foods available for all age groups of fish, which will ultimately increase fish production.

FTR is addressing the problem of sediment in the Teton River in many ways. First, FTR is monitoring water quality to identify the locations and sources of accelerated sediment production. Second, FTR has conducted stream walks to identify where spawning is occurring and where it is not occurring due to excessive sediment. Third, FTR is funding research to better understand the factors influencing juvenile fish survival and population recruitment. And fourth, FTR is restoring habitat on Fox Creek and the Teton River in order to reduce the amount of sediment generated by land use activities in these watersheds.

Much can be done to improve the health of the Teton River, and much of it is related to sediment.

The author thanks Dr. Rob Van Kirk for providing information used in this article. Sheryl Hill is a freelance aquatic biologist living in Idaho Falls. You can contact her at sheryhill@cableone.net.

NOTICE OF ANNUAL MEETING OF FTR MEMBERS

DATE AND TIME: Saturday June 28, 2003 at 6:00 pm. The annual meeting is also the FTR annual riverside party, and is open to the public.

PLACE: On the west bank of the Teton River, north of Victor. From Victor take Cedron Road to where it turns west at the tree farm. At that point, turn right (east, towards the river) on the gravel road towards Teton Valley Lodge. At the Lodge entrance turn right about one-quarter mile.

FTR members elect one-third of the Board of Directors at each annual meeting. At this annual meeting, three current Directors are standing for re-election. They are Kim Keeley, Karen Scheid, and Phyllis Anderson. The Board highly recommends their re-election. You can also vote for write-in candidates instead of, or in addition to, these three candidates. We always welcome and encourage new participation.

The annual meeting is also a great opportunity for everyone to learn more about FTR's current activities and plans, to discuss issues, and to make suggestions – and have a great time!

Members who have paid their dues for calendar year 2003 prior to or at the annual meeting and who are 18 years or older are entitled to vote. Only one representative of a family or corporate membership may vote. Votes may be cast (1) in person, (2) by a proxy appointed using the proxy form attached to the ballot, or (3) by mailed or delivered ballot. All mailed ballots must be received no later than July 3 at P.O. Box 768, Driggs 83422 or our offices.

A list of Members is available to any Member at our offices at 69 S. Main St., Suite 7, Driggs.

We hope you will attend to cast your vote in person and engage the Board in discussion.

BALLOT - 2003 Annual FTR Meeting

I, [please print] _____, vote as a Member/proxy of a Member/representative of the family of/entity of _____ [strike out the ones that do not apply] for the following individuals to serve as members of the Board of Directors of Friends of the Teton River, Inc. I hereby affirm that I am 18 years old or older.

Place your initials to the right of each typed name, or write in the name of the person you are voting for on the blank lines and place your initials next to the new name.

Kim Keeley
Karen Scheid
Phyllis Anderson
_____
_____
_____

Signature of Member: _____ Date: _____

PROXY APPOINTMENT

I, [please print] _____, hereby appoint _____ to vote as [my] proxy [for the _____ family/corporation] at the FTR 2003 annual meeting.

Signature of Member: _____ Date: _____

Please join us for FRIENDS OF THE TETON RIVER's Annual River Party and Adventure Auction

Teton Valley Lodge
Saturday June 28th 6:30 p.m.
Hors d'oevres and beverages,
updates on FTR's work.
Music and great adventures
to bid on.

$15 for new or renewing members

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