VOL. 2 NO. 4 LATE FALL 2002

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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

PHOTO BY TED NEWSOME

A midsummer view of the Teton River with the Teton Range in the background. (Just a reminder that the summer solstice is only 6 months away!)

Celebrating 2002 milestones, looking forward to 2003 …

By Lyn Benjamin
EXECUTIVE DIRECTOR

The Teton River has long been celebrated nationally as a blue-ribbon trout fishery and now, thanks to your support, the upper Teton watershed is receiving regional and national attention for its attributes and vulnerabilities. In this article I'll describe some of Friends of the Teton River's 2002 milestones and how we've contributed to the growing interest in protecting the water resources of the Teton Basin.

Teton River Habitat & Restoration Project

In October we completed the first stage of the Teton River Habitat and Restoration Project with intensive geomorphic and fishery surveys of eleven sites on the river and the installation of permanent cross sections. Our field crew, Mike Lien and Ross Wehnke, did an incredible job working with Katie Salsbury to design and implement the data collection process.

Over the winter we will use this information to work with willing landowners to design restoration plans for degraded sites; on a long term time scale we will resurvey our monumented cross sections at regular time intervals to track the rate of change of bank stability and instream habitat on the river.

As we learn more about geomorphic processes on the river we will be able to refine restoration techniques to optimize their effectiveness for this particular river system. We are very excited to start streambank and instream restoration work

-see MILESTONES on page 3

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Thank You to Old Bill's Donors and New & Renewing Members

This year's Old Bill's Fun Run was a huge success for Friends of the Teton River. Thanks to your contribution and the generosity of the event's co-challengers, we received a total of $29,794.08 for this year. Funds generated through Old Bill's will comprise 50 percent of our annual operating budget enabling Friends of the Teton River to maintain protection and restoration programs on the Teton River and its associated watershed. We deeply appreciate this fundraising opportunity. We would like to offer a special thanks to the staff and board of the Community Foundation of Jackson Hole for planning and orchestrating this amazing event!

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Measuring river depth for cross-sections was tricky when depths exceeded 4 feet. Luckily our survey team was quite creative. After the Idaho Department of Fish & Game loaned us a canoe, we were able to retire the minnow!

MILESTONES from page 1

next summer. On page 8 Annie Eby, who helped the survey crew for a day, gives a 14-year-old's perspective on field work and the Teton River.

We are in the process of fundraising to undertake restoration work at selected sites.

Groundwater Model

Also in October the first draft of the Groundwater Model for the Upper Teton Valley Watershed was completed and presented to the public by Dr. Michael Nicklin of Nicklin Earth and Water, Inc.(subcontracted by Cascade Earth Sciences). Dr. Nicklin did an extraordinary job of compiling all available ground and surface water data and producing a three-dimensional flow model that represents well levels and groundwater flow patterns in the valley.

The model developed five simulation scenarios to predict changes in groundwater levels under drought, full development and changed irrigation conditions. Following comments from reviewers, the final draft will be completed in January and we are working to put it in a PDF format to make it available on the FTR website. When the final version is completed we will summarize the report in this newsletter.

FTR worked with the Teton County Commissioners and the Land Use Subcommittee to provide input about water resource policy for the new Teton County comprehensive plan; again, as details of the plan are finalized we will provide information here.

Many thank yous to the Teton County Commissioners, cities of Driggs, Tetonia, and Victor, Idaho Department of Environmental Quality, and U.S. Geological Survey for their support of this study. Their vision and concern made this important first step possible.

Water Quality Sampling

As part of the groundwater study two rounds of water quality sampling from 50 wells throughout the valley were conducted in May and October. We have not yet received the results from the October sampling and will present both sets of data in the next newsletter.

We continued our surface water quality sampling efforts through the summer and fall and found elevated levels of nitrates and E.Coli in both tributaries and the Teton River; we are currently discussing these data with IDEQ and Idaho Association of Soil Conservation Districts.

As part of the Total Maximum Daily Load process, the EPA requires an implementation plan to address water quality problems in a watershed, FTR is an active partner in collecting data and developing remediation plans for water quality impaired streams.

FTR board member Bill Kelly has written an excellent article on nutrients and water quality that you will find on page 4; it is the first of a series of articles on water quality issues.

September 26

September 26 was a busy day for all of us here at FTR. Representatives from the U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, Idaho Fish and Game, Teton County Commissioners, and the Teton Regional Land Trust participated in an information-sharing morning float from South Bates to Bates Bridge.

The Army Corps of Engineers has expressed a strong interest in supporting FTR's restoration efforts in the watershed and we are involved in ongoing discussions with them about future funding for projects.

In the afternoon, FTR and the Land Trust hosted the board of Arthur B. Schultz Foundation on a float from Bates Bridge to Rainier Access. Arthur B. Schultz Foundation has provided funding for FTR's habitat assessment efforts on the Teton River and we were happy to show them the kinds of work that we've been doing.

Many thanks to all the individuals who helped with guiding and shuttling services, especially Tom Fenger, Dan Burr, Chuck Quint, Rob Marin and Ben Hammond.

-see MILESTONES on page 6

Nutrients and water quality in Te

By Bill Kelly
FTR Board Member

First in a series of articles about water quality issues

In the spring of 2001, FTR began regular monitoring of the upper Teton River and certain tributaries and springs for "nutrients" and other water quality factors, gradually increasing the number of sites and the chemicals we test for. The USGS has also been testing wells for nitrate in groundwater. We have previously reported some of these test results; and this winter we will organize all of the FTR and USGS data, as well as other data, on a new website and will be updating it regularly. Accordingly, we need to begin explaining the significance of these data–starting with the levels of "nutrients" in our water. We will provide more detailed data and explanations on the website.

TOO MUCH OF A GOOD THING?

"Nutrients" sounds beneficial. Yet, some of the surface waters in Teton Valley have been listed as "impaired" waters by the U.S. EPA at least partly due to contamination by "nutrients". Why? And what are they?

The nutrient levels we are watching are nitrate (NO3), nitrite (NO2), ammonia (NH3), and phosphorus (P). All are essential to plant and animal life, assisting in metabolism and the synthesis of proteins.

Many of us are familiar with the use of nitrogen (provided by nitrate) and phosphorus in bagged fertilizers, with the first two numbers on the composition label (for example, 15-30-15) indicating the percentage of nitrogen and phosphorus. (The third is potassium.) Like other essential nutrients, however, such as fats, salt, iron, and selenium, too much can cause problems.

Elevated levels of NO3, NH3, and P can cause adverse effects on both human health and aquatic life. The most susceptible humans are infants under six months and foetuses. Too much nitrate in their drinking water can interfere with the ability of blood to transport oxygen, leading to "blue baby syndrome" or miscarriages.

In the aquatic environment, higher levels of nutrients can lead to "cultural eutrophication," human-caused overfertilization of water which produces too much aquatic vegetation and algae and thereby depletes the oxygen available to fish and other aquatic life. All of these nutrients can also be directly toxic to fish and other organisms.

In addition to monitoring nutrient levels, FTR has been monitoring other factors which can indicate or influence levels and potency of nutrients, or developing eutrophication. These factors include dissolved oxygen, turbidity, temperature, and pH.

STANDARDS

The State of Idaho and EPA are working to develop non-point water quality standards tailored to specific waters in Idaho and throughout the country, called TMDLs (total maximum daily loads). The State expects to propose TMDLs that will include nutrient levels later this year.

Nitrate. Both the U.S. EPA and Idaho have set a drinking water standard for nitrate of 10 milligrams per liter (mg/L) (measured as nitrogen, N, from NO3) based on the risk of blue-baby syndrome. There is no single standard for prevention of eutrophication in surface waters. The level of 0.3 mg/L is often cited as a rough benchmark for where nitrates begin producing excess aquatic vegetation and eutrophication. However, what are considered beneficial vs. harmful levels can vary in different waters and geographic regions with different fish species and other organisms. The presence of large quantities of aquatic vegetation is not necessarily due wholly or partly to excess nutrients, since natural spring-fed waters are notable for such vegetation.

The appropriate nutrient standards for waters in Teton Valley are still being debated. The U.S. EPA has placed Teton Valley in "Ecoregion III" for determining TMDLs to prevent eutrophication, with its recommendation for area-specific standards in a range of 0.22 to 0.90 mg/L for total nitrogen.

There is surprisingly little data on levels of nitrate that are harmful to many aquatic species. Trout are regarded as a sensitive species, with levels as low as 2.3 mg/L cited as significantly toxic to eggs and fry.

Phosphorus. The U.S. EPA guidance for our region for environmental effects is in the range of 0.01 to 0.055 mg/L.

Ammonia. There is no single standard for ammonia, since monitoring is usually for total ammonia, whereas only the un-ionized form is toxic, and since its potency varies, increasing with higher pH and temperature and lower dissolved oxygen. As little as 0.06 mg/L can cause gill damage; and at levels near 2.0 mg/L trout can begin to die.

Some states have a standard of 0.02 mg/L for un-ionized ammonia in cold-water streams; however, some consider levels as low as 0.002 mg/L harm-

eton Valley

ful to trout. Some states have set a drinking water standard of 0.5 mg/L for ammonia measured as nitrogen based on a National Academy of Sciences recommendation.

HOW ARE WE DOING?

Nitrate. Data collected by researchers at Idaho State University stimulated formation of FTR. Their monitoring during the period from 1997 to 2000 indicated levels of nitrate in the river from the headwaters of the Teton to Route 33 in the range of 0.2 to 1.2 mg/L, with slightly lower levels in several tributaries. FTR's monitoring of surface waters for nitrate since 2001 has indicated levels in the range of 0.8 to 2.1 mg/L between the river headwaters and Route 33. Levels in some of the monitored tributaries and springs have sometimes exceeded 2.3 mg/L. Levels have varied depending on location and time of year.

Preliminary results from the USGS monitoring for nitrate in drinking water from wells indicate a wide range of results, with some wells showing less than 0.1 mg/L, several showing levels above 7 mg/L, and a considerable number in the 2.0 - 7.0 range.

Phosphorus. FTR monitoring so far has shown levels in the river have ranged from less than 0.05 to 0.07 mg/L; with levels in tributaries and springs about the same, and one reading of 0.14.

Ammonia. Our monitoring to date has indicated levels mainly of 0.06 mg/L or less, with one reading of 1.3 in the river; and levels in tributaries and springs varying from less than 0.5 to 0.15, and 3.7 in one instance.

SOURCES

In a pristine environment, nitrate, ammonia, and phosphorus are generated primarily by natural biological process associated with the decomposition of plant residues and other organic matter. They exist in a complex relationship to each other–for example, with ammonia being converted to nitrate, and lower levels of phosphorus limiting uptake of nitrate and higher levels allowing greater utilization of nitrate.

The likely principal anthropogenic sources for potentially excess quantities of nutrients of concern in Teton Valley are agricultural and turf fertilizers, animal wastes, and septic systems. Fertilizers containing ammonia, nitrate, and phosphorus can become a problem if they are applied in quantities which exceed the capability of plants to utilize them and are washed into surface waters or leach into groundwater. Animal wastes can present a similar problem.

Septic systems are more complicated as a potential source. The systems themselves do not remove nutrients, but a properly designed and located system should substantially reduce levels of nutrients seeping from the system into the surrounding soil. However, significant quantities of nitrate can enter groundwater from systems which are clustered in areas with porous ground above shallow groundwater, or from systems which are not properly maintained. Sewage treatment plant discharges can also supply nutrients, particularly phosphorus, to surface waters.

Identifying the source of excess nutrients in groundwater or surface water is a complex problem. In testing well water, the USGS is testing for substances such as E. coli, sulfate, and chloride because the presence of such substances can indicate whether excess nitrates are coming from septic systems or other sources. Locations with higher inputs and relationships with high rates of precipitation or runoff can also provide clues.

PREVENTION AND MITIGATION

Buffer zones, careful use of commercial fertilizers at agronomic rates, and good management of animal wastes can prevent runoff and leaching of nutrients into surface waters.

Prevention of groundwater contamination by excess nitrates will depend on proper spacing and maintenance of septic systems in susceptible areas, and careful use of fertilizers at agronomic rates. Once nitrate enters groundwater, it is very difficult to remove, and it travels easily in subsurface flows until it reaches surface waters and feeds aquatic vegetation.

> We need to keep a long-term watch on nutrient levels in our surface and groundwater.

Wetlands can substantially reduce nutrient levels from overland flows and emerging groundwater. Types of bacteria which thrive in wetlands denitrify nitrates and reduce phosphorus. However, if wetlands are exposed to high levels of nutrients, their species diversification can be harmed because the excess will allow certain species to outcompete others.

We need to keep a long-term watch on nutrient levels in our surface and groundwater, since short-term measurements can be insignificant for effects such as eutrophication; however, short-term effects can be significant for direct toxicity to humans and aquatic life forms. Setting valid target standards for our area and interpreting monitoring results for the purpose of prevention and mitigation will be a scientific challenge requiring the collection, correlation, and analysis of extensive data.

What DO fish do in the winter?

By Katie Salsbury
INTERMOUNTAIN AQUATICS, INC.

Just about the end of November, when the snow begins to settle on the ground and the nighttime temperatures stay well below 30, most of us are dreaming of the upcoming ski season and have long forgotten about the trout that we chased all summer long. The fish in our rivers don't get to head south like the migratory birds and waterfowl in the valley, instead they hunker down for what is essentially a long winter's nap. The onset of winter results in significant changes in the underwater climate of our rivers. The shorter days, colder temperatures and snowstorms affect our rivers and streams just as much as they do the landscape above.

The water in our rivers during the winter is not only colder (about 34 degrees) but it also freezes on the edges and bottoms forming anchor ice that can shrink the river channel, increasing the competition for resting spots and food. Anchor ice can also plow along the river banks and bottom scouring away anything in its path. In addition to the anchor ice, frazil ice (the floating, slushy kind) can develop and create a veritable obstacle course for feeding and moving fish.

The trout in our rivers, much like the bears in the wilderness feed all summer long to fatten up for the upcoming winter. Because of the harsh environment that develops with the winter season, most trout slow down and look for a nice deep hole or undercut bank to hang out in until the spring thaw. Trout are cold blooded animals and their metabolism slows down as the water temperature gets colder. They become very efficient at feeding and expend much less energy because of their reduced activity. A trout's survival through the winter is dependent upon two things 1) how much they are able to feed and stock up on fat reserves during the rest of the year and 2) finding a good deep hole or protected lie where they do not have to expend much energy to rest and occasionally feed.

Trout will feed during the winter when food is readily available without much effort. Typically, this occurs when the climate on land is stable and warmer. An increase in water temperature from 1 to 3 degrees and/or stable clear, weather for a few days can entice a fish to wake up from an almost nap-like state and start feeding. In addition to the general slowing down of trout behavior, the dominant territorial behavior of the summer months is broken down and schooling is more common.

Most aquatic insects in our rivers and streams go on feeding and moving around in the substrate throughout the winter. They are well adapted to the colder temperatures and live in essentially the same spaces as they do during the warmer months. Although caddis fly, mayfly and stonefly all continue to feed underwater in their nymph stage, the duration between their hatches increases. This increase results in less activity for trout to feed on. These bugs are most accessible to trout when they go from the nymph to adult stage floating up to the surface and hatching out into the air. When they are happily feeding on rocks and detritus they are not readily accessible to most trout.

In addition to the trout and aquatic insects in our streams, there are other fish and wildlife species that stick around and endure a long, mountain winter. The smaller non-game fish species like shiners, sculpin and dace behave very similarly to trout and slow down to rest and occasionally feed in the substrate. At the water's surface, migratory waterfowl often stay through Christmas feeding on insects, plants and mollusks in the river. Trumpeter swans come in the hundreds to winter on the upper Teton River feeding on last year's macrophyte growth. Bald eagles also come to the Teton to winter to feed on fish and birds and scavenge on winterkill.

The aquatic world in the Tetons reacts very similarly to the landscape above during the winter. The pace slows down and most animals rely on food storage from the previous months and find a nice place to rest until an anticipated spring thaw.

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Educational Outreach

Over the past few months FTR has given talks on water and fishery resources to the Teton Valley Rotary club, Henry's Fork Watershed Council, the Targhee Institute Elderhostel, and a delegation of Japanese scientists and economists. We have received very positive feedback about the work we do and the way we do it! It looks like FTR will finally have a website by the New Year; a million thanks to David Witton and Tracy McFadin who have worked hard to put it together.

Looking Ahead to 2003

The FTR Board has outlined projects that FTR will be involved with next year (see article on page 7). We look forward to your feedback and involvement in those projects and thank you for all your support over the past year.

We need your support!

An end-of-year donation will help implement several important projects during 2003

Dear Members,

As we celebrate the accomplishments of a successful summer here at Friends of the Teton River, we look forward to 2003 as a crucial year to accomplish many of the near-term goals outlined in our comprehensive plan. Our work to date has provided a foundation from which we will maintain and initiate important research and restoration projects on the Teton River and its associated watershed.

For the summer of 2003 we have established several projects designed to monitor and improve water quality, increase trout populations, educate residents of Teton Valley and work with government representatives to protect ground and surface water. Your continued support is central to the implementation of these projects and we respectfully request that you consider an end-of-year contribution to support this important work.

■ **The Habitat Assessment and Restoration Project.** Cutthroat trout populations have been consistently declining on the Teton River. Loss of habitat has been identified as a probable cause of this decline. Through collaborative efforts with state and regional experts, we have identified five sites on the Teton River for restoration projects in 2003. Your support will help improve fish and wildlife habitat and protect the overall health of the Teton River.

■ **Teton River Tributary Restoration.** Historic evidence indicates that tributaries to the Teton River have served as spawning areas for Teton River trout populations. Over the past 80 years several factors (including agricultural land use) have resulted in excessive sediment in these streams, loss of spawning habitat, and increased sedimentation in the Teton River. FTR will implement demonstration streambank and instream restoration projects on the tributaries of the Teton River.

■ **Water Quality and Quantity Monitoring Program.** This ongoing project has helped us understand the hydrology and groundwater quality factors of the Teton Basin. We are using this information to monitor the health of streams and to provide a baseline against which future water quality can be measured. Results from this study will be available on our new website in January.

■ **Aquifer Recharge Program.** The recently published Upper Teton Watershed Groundwater Model projects potential water table declines of 0-40 feet in the Teton Valley as a result of drought and reduced recharge inputs. Additionally, it is thought that changes in irrigation practices (from flood to sprinkler irrigation) over the past 20 years have resulted in declines of wetlands adjacent to the Teton River and lowered water levels in Teton Valley wells. FTR will work with local farmers to initiate a small watershed managed recharge effort to examine the surface/ground water interactions and the feasibility of larger scale aquifer recharge.

■ **State of the Upper Teton Watershed Project.** FTR will produce a user-friendly publication titled The State of the Upper Teton Watershed that will compile and explain information about the water resources of Teton Basin. This publication will be a valuable resource for future planning in the Teton Valley.

■ **Technical Support for Aquifer Study.** The aquifer study was completed in October, 2002 and has provided baseline information from which to compare future trends in Teton Basin. FTR will continue to monitor ground and surface water levels and will maintain a database reflecting changes. We will work with the Teton County Commissioners to interpret this information so that it can be used in the comprehensive plan.

■ **Educational Programs.** Based on the success of the student stream studies, we will continue this program for elementary students in the valley. In addition, we will continue to sponsor regular public forums on water-related issues.

Please become a part of these projects and maintain your support of Friends of the Teton River today! You can join our Adopt a Site Program and sponsor a restoration site on the Teton River or a tributary. In addition, we rely on donations to sustain our operating budget, without which we could not administer the above projects.

We look forward to sharing an ongoing partnership with you to protect and improve the Teton River and its associated watersheds.

A Day on the River

By Annie Eby

It's a crisp, fresh morning and the sky is cloudless. I enter the office to meet Mike, a hydrologist who is employed at Friends of the Teton River, and Ross, a biologist who works for FTR and Intermountain Aquatics. Ross, Mike and I get prepared for the day, loading the truck with stakes, a stadia rod (similar to a yard stick, except about eight-feet-tall), the automatic level, a canoe, and all the other gear required for our mission today.

We drive west of Driggs until we encounter the iridescent Teton River, mist emerging from its surface as a King Fisher plunges through the air and darts back up again with a beat of its wings. The sun has not yet risen, though the sky is bright and warm pinks and yellows caress the eastern mountains. Upon arriving at our parking site, we unload the canoe along with the rest of the equipment and put on our cumbersome waders and water boots. We then jump into the boat and head downstream where we stop at the convergence of two forks of the Teton River.

Our first task is to measure the complete distance of our site, determining this by how far along the bank is unstable (An unstable bank's characteristics consist of bare, steep sides that look as though they have been cut away by the stream's constant current.). We then divide the distance by four and place a stake on each side of the river at every cross-section. At the first section, we place the stakes at least ten feet from the water's edge so that in years to come, the stakes will remain on ground even if geomorphic (stream channel movement) changes occur. We then string a measuring tape from one stake to the other to measure the distance across the waterway. Next the automatic level (gun) is set up.

Ross, on one side of the channel, identifies how far along he is on the measuring tape, holding the stadia rod for Mike to see through the level's scope, thereby determining the depth of the deep green water. Ross progresses about three feet, then stops to allow Mike to read the stadia rod's numbers. This continues until the entire width of the river has been covered.

Next, we take the viewing box, a square glass figure that has one hundred small squares on it. Every four to seven feet, Ross records the percentage of lush, grass-like macrophytes that occupy the streambed while Steve records on land. "Macrophytes" are basically a technical word for "water plants" used by scientists.

These operations were also executed on the other cross-sections. This information will later be programmed into the computer to make a kind of topography map of this portion of the Teton River. Two or three years from now, it will be surveyed again to see the change in the stream channel to see if any geomorphic changes have taken place.

Fourteen-year-old Annie Eby, right, helps Ross Wehnke survey a cross-section on the Teton River.

This information is extremely important if Friends of the Teton River is to preserve the Teton River's banks. Next year, willows and other riparian vegetation will be planted to help hold the bank's soil and preserve our stunning river the way the natural world meant for it to be.

As the day comes to an end, the sun is beginning to near the western sky. The water shimmers with a glistening yellow and we idly load up the canoe and backtrack our way to the car through the dappled shadows that the willows cast on us ... just another day on the river.

Annie is originally from Wichita, Kansas but now lives in the Teton Valley. She skiis on the Grand Targhee Ski Team and volunters with the Land Trust and the Young Adult Board of the Teton County Library.

Friends of the Teton River
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Dedicated to understanding and improving the water resources of Teton Basin.