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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.

WATER LINES

A QUARTERLY NEWSLETTER PUBLISHED BY FRIENDS OF THE TETON RIVER

From restoration to recreation...

FTR members and staff enjoy a full summer of projects and activities

It has been a busy and exciting summer for all of us at FTR. From watershed hikes high in the Big Hole and Teton mountains to streambank restoration on the Teton River, we've been out in our beautiful watershed all summer. The FTR office has been filled with researchers, interns, volunteers and visitors heading out to work on projects throughout the valley.

This summer we completed restoration projects on the Teton River and Fox Creek; have completed one of the first aquifer recharge projects in eastern Idaho; are studying juvenile Yellowstone Cutthroat trout populations; continue to monitor water quality throughout the Teton Valley; are surveying fish habitat on the Teton River between Rainey Fish and Game Access and Highway 33; have led educational hikes to the highest elevations of the watershed and have floated down the river in the full moon.

Thanks to all of you for your support and enthusiasm, we love your visits to the office and your participation in our work.



Completing restoration work on the Teton River.



Volunteers after a long day of willow planting on Fox Creek.



Participants in FTR's watershed hike above the North Fork of Teton Creek.

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MARY LOUHANSEN

Two great interns help FTR this summer

BURKE KUNZ. I have lived in Teton Valley my entire life. I have four brothers and five sisters. My family operates a dairy farm which has been in our family for three generations. This fall I will be a junior at Teton High School. I love to play sports, especially soccer and basketball. I am also involved in choir and National Honor Society at school and enjoy participating in school plays.

During the summer I have had the opportunity to work with many people at FTR. While working with John Rice, also known as "the water guy," I learned a ton about our water in the Valley. One of the main reasons I wanted this scholarship was to learn more about how the water works in the Valley and I did just that.

I also worked with Martin Koenig, a fish biologist. I learned so much about fish. From how to tell two species apart, to what habitat is best for spawning.

I have just recently started to work with FTR's habitat specialist, Mike Lein. It's been great to get out on the water.

I'd just like to thank the FTR staff and board members for giving me the opportunity to work for them this summer. It's been a great experience for me to learn about our great Valley. THANK YOU!!!!!!

MEGAN TALBOT. Teton Valley has been part of my life since I was three years old. As my parents moved from Wyoming, then between Minneapolis and Seattle, this was our constant—our home. Here are my memories of growing up along the Teton River: learning to fly fish from my dad, building bird habitat with my mom and kayaking the river with my brother. Those are the times that are etched into my heart. When I decided to attend the University of Wyoming, I leaned toward the sciences with a concentration in biology and zoology. I know the memories and experiences in Teton Valley helped shaped my future direction.

This summer's internship at Friends of the Teton River has been a great experience. I came into the role already knowing that the Teton River was the lifeblood of this valley. Working with the river over the summer has given me a deeper respect for how important it is to the valley—and how critical the work done by FTR is as



This summer FTR enjoyed the help of two wonderful interns: Megan Talbot (above), a junior at the University of Wyoming and Burke Kunz, a junior at the Teton County High School.



well. I'm glad the work we are doing will help ensure the river will be here and will be healthy for future generations.

I split my time between work in the office and work in the field. Through time spent in the field, I learned the hydrology of the river and how important ground water is for the Teton Valley. I assisted in testing water for nutrients present or absent and the impact that research has for the fish in the river. My work also consisted of walking miles and miles of the river and tributaries in search of Yellowstone Cutthroat Trout spawning beds in hope of raising their numbers. Growing up in Minnesota, I knew how to identify a walleye and northern pike. Now I can identify every species of trout in the valley. I even learned to identify and appreciate the many bugs around the river that are a vital food source for the trout. From my work in the office, I learned how important members and donors are to the success of all the scientific projects. Mostly I learned the passion of the FTR staff and volunteers for this wonderful resource we know as the Teton River.

As I return to Laramie to continue my education, I will sincerely miss the river and the people that have been part of my life this summer. Thank you for your support and for this experience I will never forget.

Water Quality Monitoring Update

Since 2001, the Friends of the Teton River (FTR) has tested water quality at 12 sites in the upper Teton River watershed. The results of the monitoring program are helping us to gain a deeper understanding of the hydrology of the watershed, as well as indicating where we have water quality concerns that require our attention.

OUR MONITORING SITES

Figure 1 shows the location of FTR's 12 monitoring sites. Based on their location and hydrology, the monitoring sites can be divided into three groups. These include four main stem Teton River sites (TR1, TR2, TR3, and TR4), five valley-floor tributary or "spring-creek" sites (Woods, Six, Fish, Fox, and Warm Creeks), and three mountain-headwater tributary sites (Darby, Teton, and Fox Creeks).

WHAT WE TEST FOR AND WHY

At each site, samples are collected and laboratory analyzed for sediments, nutrients and E-Coli bacteria. In addition to the laboratory analyses, several parameters are measured in the field, including dissolved oxygen, specific conductance, pH, temperature and turbidity. Measurements of the stream flow are also made at each site. Each of these laboratory and field parameters provides not only a measure of some aspect of water quality, but also important clues about the hydrology of the stream.

TDS and Conductivity

TDS and conductivity are measures of the amount of dissolved mineral material in the water. These parameters are indicative of the flow pathway that the water has followed to reach the stream. Elevated TDS and conductivity indicate a relatively greater contribution by groundwater to the total stream flow, because water that infiltrates into the ground picks up dissolved mineral material as it flows through the subsurface. In contrast, snowmelt, and the resulting surface runoff, is essentially still like precipitation and is relatively low in dissolved constituents.

Sediment

We measure the amount of suspended sediment in our streams because sediment can reduce the amount of light penetration into a stream, reducing photosynthesis, which then reduces primary production, and insect and fish production. Suspended sediment can also interfere with a fish's ability to obtain oxygen from the water. Lastly, sediment accumulation on the stream bottom fills the intergranular spaces between sand, gravel and cobbles (critical spawning habitat), smothering fish embryos and fry as well as aquatic insects.

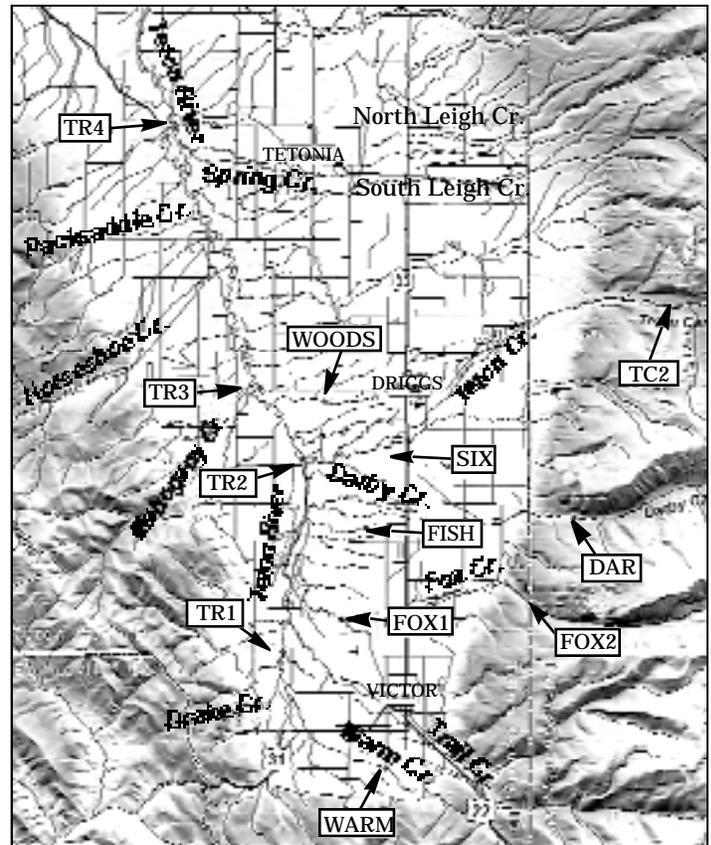


FIGURE 1. FTR's water quality monitoring stations in the Teton Basin.

Nutrients – Nitrogen, Ammonia and Phosphorus

Nitrogen, Ammonia, and Phosphorus are nutrients that are present at low concentrations in natural waters. Elevated concentrations are generally the result of discharges from septic systems, animal wastes, and the use of fertilizers in the watershed, and can be directly toxic to fish and other aquatic organisms. Elevated nutrients can also lead to eutrophication, which occurs when human-caused over fertilization leads to the production of too much aquatic vegetation and algae, which in turn depletes the dissolved oxygen needed by fish and other aquatic life.

Dissolved Oxygen

The amount of dissolved oxygen in our streams is important for a variety of aquatic organisms, ranging from tiny macroinvertebrates to the trout that feed on them. As mentioned above, low dissolved oxygen can often be traced to elevated nutrients, which can produce excessive aquatic vegetation that, when it dies, is broken down by bacteria whose metabolic processes rob dissolved oxygen from the water. Elevated temperatures also act to reduce dissolved oxygen.

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Summer news from Friends of the Teton River



FTR's contribution to the Teton Arts Council "Buffalo in the Basin" exhibit included a "Buffalo Trout" by Dale and Dan Burr.



Cole and Hanna Palmer participate in the Heritage Days float on July 24th in FTR's new drift boat donated by the Teton Springs Foundation.



Laurel Hall, U.S. Congressman Mike Simpson's Congressional Aide, joined FTR for a tour of restoration sites on the Teton River and Fox Creek.



About 45 people joined FTR to float from Rainey Fish and Game Access to the Packsaddle Bridge under the July Full (Blue) Moon. It was an exquisite night, and the clouds cleared to give us a glorious moonrise from the river.



FTR's new tri-fold display, donated by Greg Gefner and North Sculpture, and banner, donated by Apparels of Pauline. Many, many thanks for these generous gifts. PHOTO COURTESY OF GREG YASKOT



Scenes from the Fourth Annual River Party



LEFT: Auctioneer Ken Chambers swaps fishing stories with Baker Salsbury.
 ABOVE: Mike Whitfield, Mike and Nancy McCoy enjoy the summer evening.
 RIGHT: Lyn Benjamin and George Geiges get caught up on Teton River news.
 BELOW LEFT: Dave Work, FTR board member.
 BELOW CENTER: Many thanks to Charlie Otto and Grand Teton Brewing for their beverage donation. BELOW RIGHT: Clouds but no showers for the FTR Annual River Party.

PHOTOS COURTESY OF DAVID WITTON



Friends of the Teton River sincerely appreciates all the individuals who attended the Fourth Annual River Party. Thank you to the following businesses and volunteers for their generous donations of auction items and time:

Andrea Pierce
 Babette Thorpe
 Barrels and Bins
 Ben Winship
 Bev Flitcroft
 Big Hole Music
 Big Hole Sports
 Broulins
 Burke Kunz
 Dan Burr
 Dark Horse Books
 David & Suzy Work
 Dining in Catering
 Douglas Self
 Dr. Gill Sanders
 Edwards Films, Inc.

Exum Mountain Guides
 Gardeners Helper
 Gary Olerud
 Gene & Patty Wallace
 Grand Targhee
 Grand Teton Brewing
 Heron Glass Company
 High Country Flies
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 Idaho Rivers United
 Images West
 Jack Dennis Outdoor
 Shop
 JH Nordic Center

Jackson Hole Whitewater
 John Pehrson
 John & Nancy Siverd
 Kate West/Alan
 McKnight
 Katie & Baker Salsbury
 Ken Chambers
 Leapfrog Books and Toys
 Leslie Prendergast
 Marge Edwards
 Martin Koenig
 Megan Talbot
 Moose Creek Resort
 Mountain Valley
 Mushrooms
 NOLS - Mark Bergstrom

O'Rourke's Bar & Grill
 Patagonia, Inc.
 Peaked Sports
 Phil Lansing
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 Reel Women Fly Fishing
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Temperature

A suitable range of temperature, like dissolved oxygen, is very important to aquatic organisms, but water temperature can also tell us something about a stream's hydrology. Spring creeks display less variation in temperature seasonally, because they are fed chiefly by groundwater which maintains a relatively constant temperature year round. Elevated temperatures can also be caused by the return of irrigation water, where the water has been heated by being spread on fields before flowing back to a local river or stream.

pH

pH tells us how acidic or alkaline (basic) the water is. The widespread occurrence of carbonate rocks (limestones) in the mountains surrounding the Teton Valley results in higher stream water pH's (i.e. more alkaline waters).

WHAT WE'VE LEARNED

In addition to indicating where we have water quality concerns, the monitoring data have revealed secrets of the valley's hydrology.

In the mountain-headwater tributaries, streamflow experiences a high peak in the spring and early summer due to snowmelt, but drops back relatively quickly to the base-flow level which reflects the input of groundwater discharging into the stream at a relatively uniform rate over most of the year.

The hydrology of our valley-tributaries or spring creeks is very different. These streams arise from groundwater discharging from one or more springs, with little or no surface water input over most of the year. The variations in flow of these streams are therefore more subdued than that of the mountain streams. Peak flows are somewhat delayed and prolonged as compared to the mountain streams.

The Teton River's flow reflects the dominant input of the numerous

spring creek tributaries, with some influence from the peak surface water runoff flows that reach it in the spring and early summer. Flow variations in the Teton River are therefore more subdued than that of the mountain tributaries, but with higher peak flows than most of the spring creeks and a higher baseflow (groundwater input) than the mountain tributaries over much of the year.

Water Quality Issues

The monitoring data suggest that *E. Coli* bacteria and Nitrogen (as nitrate + nitrite) are the primary pollutants of concern in the Teton River watershed. In addition, elevated concentrations of Ammonia and Phosphate have been periodically detected in Woods Creek. There is also a widespread problem with excessive sediment in our watershed.

E. Coli

Throughout the water quality monitoring program, several "spring creek" tributaries as well as the main stem of the Teton River have produced elevated counts of *E. Coli* bacteria. The Woods Creek sampling site remains a particular concern for *E. Coli* (Figure 2). FTR has measured concentrations as high as 1334 cfu/100mL (during August, 2003) at the Woods Creek site. The Idaho Department of Environmental

Quality (DEQ) has performed more detailed sampling on Woods Creek, including the collection of multiple samples on both the North and South Forks of the creek. In August 2003 DEQ measured levels up to 1700 cfu/100mL in the South Fork and over 2400 cfu/100mL in the North Fork of Woods Creek. A July 2003 sample collected just below the confluence of the two forks produced a concentration of 8700 cfu/100mL. FTR is currently cooperating with DEQ to more intensively sample for *E. Coli* at multiple locations on Woods Creek this year.

At the four main stem Teton River sampling sites, *E. Coli* concentrations are consistently elevated, but again are generally below both the Primary and Secondary Contact Recreation Standards used by the state of Idaho (IDAPA 58.01.02.101.01a) of 406 and 576 cfu/100 mL, respectively, for instantaneous measurements. A relatively consistent trend of decreasing *E. Coli* concentrations in a downstream direction is evident amongst the four main stem Teton River sites, with the highest concentrations observed at the headwaters site. This downstream decrease in *E. Coli* is likely due to dilution effects. Specifically, the upper river is chiefly comprised of water from tributary streams that have flowed across

CONTINUED ON NEXT PAGE

Teton River Stewards Update

FTR sincerely appreciates the following individuals for joining the Teton River Stewards between January and July of 2004. Stewards provide the foundation to preserve and protect vital water resources in the Teton Valley. For more information, please contact Bonnie Berger at 208-354-3871.

Fox Creek Level
(\$10,000 or more)

Donald C. Brace
Foundation
John Short
Karen Scheid

Teton Creek Level
(\$2,500-\$4,999)
Al & Deeann Baldwin



Badger Creek Level
(\$1,000-\$2,499)

Mary & Scott Burton
John & Jeanie Cushman
David & Deborah Fosdick

George P. Geiges • Grand Targhee Ski Resort
Intermountain Aquatics • Wood & Judith Moyle
Kathryn Myers & Robert Mechikoff
Trey Peacock & Chris Bryan
Georgie Stanley • H. Grant Theis

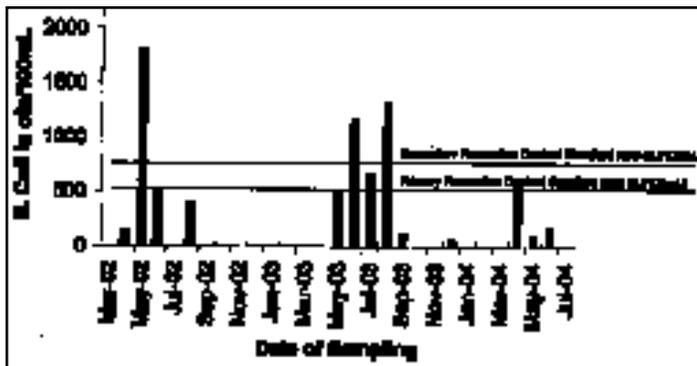


FIGURE 2. Sampling results from the Woods Creek sampling site. Excessive concentrations of *E. coli* were found

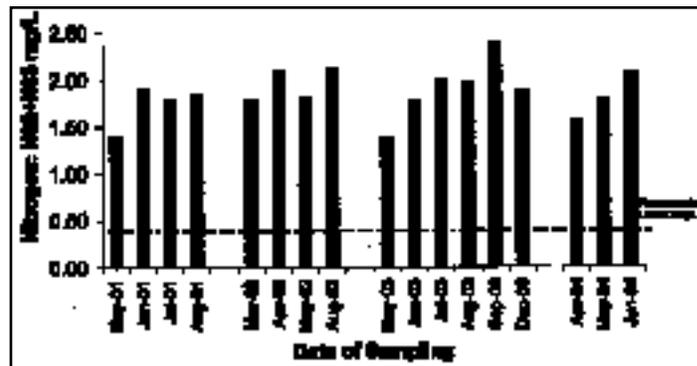


FIGURE 3. Nitrogen levels at the headwaters of the Teton River, 2001-2004. Elevated nitrogen levels were found at every sampling site, with the highest concentrations measured at the most upstream sampling site.

Continued from Previous Page

several miles of valley floor, where it is exposed to surficial sources of bacteria. As the Teton River flows downstream, however, it receives an increasing contribution from groundwater sources. Since bacteria are not readily transported via groundwater flow over great distances through the subsurface (due to filtration), the groundwater is generally relatively bacteria-free, and as it flows into the river it acts to dilute bacteria concentrations.

In general, *E. Coli* concentrations appear to display some seasonality at all the sites, with the highest concentrations tending to occur between mid summer and fall.

Nitrogen (nitrate/nitrite)

Based on water quality guidelines for Nitrogen concentrations in freshwater streams and rivers, all of the sampling locations in Teton Valley have relatively consistently yielded elevated levels of Nitrogen. Although there are no specific numeric criteria for dissolved nitrogen in Idaho waters, researchers have recommended that 0.3 mg/L to 0.6 mg/L total nitrogen should not be exceeded in fresh water streams and rivers. Background or “natural” Nitrogen (as nitrate/nitrite) concentrations at our study sites appear, however, to exceed these concentrations. At the three mountain-headwater tributary sites, which are located on streams draining relatively pristine (undeveloped) mountain watersheds on U.S. Forest Service property, FTR has consistently measured Nitrogen concentrations in the range of approximately 0.8 – 1.1 mg/L. Recent communications with USGS researchers suggests that these concentrations may indeed be representative of “background” concentrations. But regardless of exact background concentrations, Nitrogen levels are clearly elevated on both the main stem Teton River and valley-floor tributary sites. Concentrations at the Teton River sites consistently range from 1-2 mg/L, with the highest concentrations occurring at our most upstream site, TR1 (Figure 3). Similar to *E. Coli*, Nitrogen concentrations decrease in the river in a downstream direction due to the effects of dilution.

Ammonia and Phosphate

Elevated concentrations of Ammonia and Phosphate have been detected in Woods Creek. The detection of Ammonia and Phosphorus in Woods Creek may be the result of the activities of the local wastewater treatment plant which discharges effluent to the headwaters of the South Fork of Woods Creek, approximately 1.5 miles upstream of the sampling site. Ammonia and Phosphate are consistently near or below laboratory detection limits at the other 11 sampling sites.

Sediment

According to the DEQ, excessive sediment is the most widespread water quality problem in our watershed, and Total Maximum Daily Load (TMDL) levels were developed by the DEQ for a number of stream and river segments in the valley to address the sediment issue. Excessive sediment is caused by a variety of land uses in the watershed. In an effort to reduce sedimentation, FTR is working with riparian landowners to restore degraded stream banks along the Teton River and its major tributaries.

Future Plans

The importance of maintaining the water quality monitoring program over the long term cannot be overemphasized. As we build the data base over the years, it will be invaluable, not only as a guide to FTR’s stream-bank restoration program, but to our planners and decision makers and all those who strive to understand the place we live in order to maintain the quality of life that we all enjoy in the Teton Valley.

FTR wishes to thank the following groups for their support of the water quality monitoring program:

- Idaho Department of Environmental Quality
- Idaho Association of Soil Conservation Districts
- Teton Conservation District
- U.S. Geological Survey, Boise Office
- U.S. Congress
- Our faithful volunteers

Protect Teton Valley's Precious Water Resources: Donate to Old Bill's Fun Run

Help protect one of Teton Valley's most valuable assets—the Teton River and its associated watershed. If you make a donation to Friends of the Teton River through Old Bill's Fun Run by Sept. 17th, your contribution can be matched by approximately 50 percent.

An Old Bill's contribution will fund a variety of programs including scientific research, stream bank and instream restoration, and public education efforts. Since this fundraiser provides FTR with a majority of its operational funds, your donation is of vital importance.

Official Old Bill's donor forms are available at local merchants, the FTR office (36 East Little Avenue in Driggs)



ARTWORK BY DAN BURR

or by request at 208-354-3871. Please make your contributions to the Community Foundation of Jackson Hole and designate the amount you

would like to go to Friends of the Teton River today.

With gratitude,
Bonnie Berger
DEVELOPMENT DIRECTOR

Friends of the Teton River

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