FLATHEAD LAKE JOURNAL

(Formerly the Yellow Bay Journal)

A publication of the Flathead Lake Biological Station
The University of Montana

Director's Column

By Jack A. Stanford

State of the Lake – 2002

During the last two drought years the lake stayed very clear and warm. Because the lake was steaming, giving up its high summer heat load, the winter was foggy and overcast much of the time. This year we had above average snow pack and a wet, cold spring with an extended runoff from the rivers. We have had three peaks in the runoff, a phenomenon not previously observed. A lot of turbid water has come into the lake from the river and spread over the surface, sinking to the bottom. This is the usual pattern in wet years as the Flathead River system is naturally erosive and retention of fine sediments in the lake has always occurred. Of course some sediment is pulled out, as the spill gates at Kerr Dam have been wide open for some time. Due to the cold spring and extended inflow of snowmelt, the lake will be colder this summer (June 19 it was 15°C {58°F} at the surface).

Primary productivity,

(Continued on page 2)

Kamchatka Steelhead Project (KSP)

Station faculty, Jack Stanford and Bonnie Ellis, have been working with scientists and conservationists of the Wild Salmon Center (WSC) and Moscow (Russian Federation) State University (MGU) to proactively work towards conserving rivers and their salmon and trout resources in Kamchatka, Russia. This FLBS research project is funded by the Trust for Mutual Understanding, New York City, NY.

Kamchatka rivers have the healthiest populations of Pacific salmon and trout in the world. These largely pristine rivers provide a natural standard for management and restoration of the many rivers and fisheries damaged by decades of overexploitation and mismanagement elsewhere around the Pacific Rim.

Kamchatka rivers have the most robust runs of steelhead [sea run rainbow (*mykizha* in Russia)] in the world. Our studies focus on mykizha seeking to determine the distribution of salmonid fishes, in relation to the ecological processes of each river system. Long-term objectives are to describe the biophysical complexity of the rivers, quantify the species of fish communities, describe the use of channel and flood plain habitats by juvenile salmonids, and determine life history variation within the rainbow-steelhead and some of the salmon species. We are already applying what we have learned in Kamchatka to restoration problems in the USA.

The science team conducts explorations of unknown rivers by rafting to the ocean after drop off by MI-8 helicopters at headwater sites. At various sites along the study rivers we survey and map channel and river habitat for salmonid fishes. We also survey the channel and flood plains to obtain ground-based data that will be related to satellite images to document comparative channel and floodplain morphology.

Bonnie Ellis with

With WSC and MGU we have begun to develop and operate more permanent camps on some rivers to merge the scientific objectives with alternative local economic opportunities, especially sport fishing. We hope this will help protect the runs and the riverine environments. Eventually, if we can obtain sufficient research funding, FLBS will operate as an informatics

(Continued on page 2)

Director's Column

(Continued from page 1)

one of the key measures of water quality, continues to increase in the lake. Data for 2001are being calculated and the preliminary estimate is 95 g C m^{-2} (grams carbon per square meter), which is below the long-term trend line for the first time in several years. Primary productivity has increased 1/3 since FLBS began keeping continuous records in 1977. The increase would be greater if controls on pollution had not been accepted for the sewage treatment improvements in the early 1990s. Nonpoint sources of nutrients, the main pollutants of concern, continue to be a problem in spite of efforts by the Flathead Basin Commission and EPA to reduce them. We need greater emphasis on installing high quality household sewage treatment systems in rural and ex-urban areas of the Kalispell Valley, treating street and parking lot runoff in constructed or natural wetlands, and maintaining wide riparian forests along our rivers, streams and the lake shoreline. A recent report by the Lakers properly designated flood plains and alluvial aquifers along the Flathead and other valley rivers as critical lands requiring care and protection. Constant vigilance by all citizens is required to accomplish nonpoint nutrient controls, especially since our area is a focal point for developments that too often increase nonpoint pollution.

The *Mysis* (opossum

(Continued on page 3)

Biocomplexity on the Nyack Flood Plain

The FLBS has a large new project on the Middle Fork of the Flathead River in the Nyack area upstream from West Glacier. This research documents the role flood plains play in controlling natural water purification of rivers and the distribution and abundance of plants and animals within the river basin. Flood plains of rivers are an important part of the river ecosystem and if unable to operate naturally the ecosystem will slowly degenerate. The National Science Foundation calls this phenomenon "biocomplexity" and FLBS has recently won a $2.6 million grant to study these processes on the Nyack.

Flood plains are enormously complex ecologically. Studying flood plains provides significant insight into the rest of the ecological system because they appear to be sites where materials carried by the river are entrained and cycled. We hypothesize flood plains are organizing units for regional biodiversity and we know the soil in flood plains is among the most productive on earth. We also know river flooding creates and maintains a "shifting habitat mosaic" that supports a huge variety of plants and animals.

Thanks to help from the John Dalimata Family (who own most of

(Continued on page 3)

Nyack Flood Plain

Kamchatka

(Continued from page 1)

hub for the system of field stations on the study rivers. We will electronically send outputs from data analysis and synthesis to MGU, WSC and other scientists to underpin conservation objectives.

Since 1999 the science team has studied eight rivers in Kamchatka. We discovered 33% (nine species) of the world's salmonine fauna exist in one very ecologically complex river. The extensive floodplain forests and associated off channel habitats allow the co-existence of all Pacific salmonid species known in Kamchatka. This provides a new frame of reference critically important in channel-floodplain connectivity, river biodiversity and the sustainment of fisheries specifically. We now know full scale flood plain restoration will be required to restore salmon and steelhead runs in damaged North

(Continued on page 4)

Biocomplexity

(Continued from page 2)

the Nyack Flood Plain), FLBS has exclusive access for research and educational activities. The study site is an ideal place to conduct detailed floodplain research because it is very pristine, well defined geomorphically, with narrow bedrock canyons up- and downstream and bounded by steep valley walls on the sides.

Traditionally, river research focus has been on surface water. We are expanding the view of rivers to include the interaction of surface- and groundwater and the ecological implications of these interactions. A characteristic of alluvial flood plains is that water travels through the flood plain above and below ground. Our work has shown the alluvial aquifer system occupying the porous bedsediments of the flood plain fed by the river are key to understanding rivers in an ecosystem context. In addition, the structure of the flood plain changes through three interdependent processes. The course of the river and its bed are changed through *erosion and deposition* by the river. The flux of water, heat, nutrients and oxygen over the floodplain surface and through the associated alluvial aquifer contribute to the *course and speed* of the water and its *clarity*. Biochemical processing and the cycling of nutrients and oxygen in aquatic, terrestrial and subsurface environments promotes species diversity and naturally purifies the water that moves downstream.

Subsurface paleochannels route river water at high velocities from injection points at the upper end of the flood plain through the aquifer. The water emerges downstream as springbrooks, ponds or other distinctive wetlands. This is the "shifting habitat mosaic" and it facilitates the existence of biodiverse food webs above and below ground.

We are linking our biophysical studies with the latest airborne remote sensing tools to complement our field studies. We have acquired a special camera deployed from an airplane that provides detailed spectral data. By relating this data to our studies on the ground we can quantify attributes and processes that encompass the entire 10x3 km flood plain at a resolution of less than one square meter. In other words, we can document the "shifting" of the habitat mosaic over time to show how the distribution and abundance of biota and the productivity of the flood plain are controlled by water and material fluxes.

We have installed well grids focused on likely zones of preferential flow and instrumented the sites with small PVC wells and multi-level piezometers to record

(Continued on page 5)

THANKS!!

JOHN BRUEGGEMAN STAN FISHER BOB KEENAN

for taking the time to travel to Southeastern Montana and Northeastern Wyoming to learn about the COAL BED METHANE issue. Our next issue will have information regarding this fact-finding trip. We also hope to have information posted on our website in a month or so.

Thanks again, Bob, John and Stan☺

Director's Column

(Continued from page 2)

shrimp) population in the lake was stable as in 1999-2000 at about 35 per m^2 in our fall 2001 census. Lake trout and lake whitefish populations remain robust based on net sets done by State and Tribal biologists, an occurence we have long associated with the establishment of *Mysis* in the lake. Craig Stafford, a Station Ph.D. graduate, showed through analysis of ear bones that growth of young fish in years 1-3 were similar, but growth declined in ages 4-10 after *Mysis* established in the Lake. These results suggest increased growth was not the mechanism by which lake trout populations expanded post *Mysis*. *Mysis* foraging behavior tends to shuttle surface productivity to the lake bottom likely increasing the opportunities for small lake trout and lake whitefish to forage in deep waters, reducing predation risk and increasing survival rate of young fish.

Stafford also found fish growth rate was much less important than fish diet in determining mercury levels in lake trout and lake whitefish, contamination increased with the foraging depth of the fish. These findings strongly suggest individual fish have long-term preferences in foraging depth and individual differences in dietary mercury intake explains variation in contamination levels.

(Continued on page 4)

Director's Column

(Continued from page 3)

We do not know the source of mercury and other carcinogenic pollutants identified in Flathead Lake fishes. Oil spills, contaminated soils eroded by the river, dust from within and outside the basin, and two cycle engines on some jet skis and boats are likely sources. We monitored pollution from the construction barge that sank multiple times during the last year and verified a long list of organic pollutants over large areas. Enforcement of water quality laws and agency response preparedness to spills needs your support.

FLBS scientists will continue to conduct research on the lake and describe it in context with water problems locally, nationally and internationally. We need your help to continue the detailed monitoring program. Bob Keenan, Stan Fisher, John Brueggeman, other Flathead legislators and the Montana DEQ have worked hard to fund FLBS water quality monitoring program. Unfortunately for the first time in two decades, I had to cut back the monitoring

Kamchatka

(Continued from page 2)

America and other Pacific Rim river systems.

Our studies show floodplain trees provide energy in the form of leaf fall to various fish habitats along the river corridor and form huge wood jams that cause shifting of river channels. The movement of the channels on the flood plains creates the full range of fish habitats required to sustain the incredible salmon and trout diversity in Kamchatkan rivers. Indeed, we discovered side channel and springbrook habitats of the complex river flood plains are literally full of juvenile salmonids. Many species spawn in these shallow riparian habitats and undergrowth along them is beaten down by grizzly bears traveling in search of their salmon "lunch counters." We encountered these giants routinely, as they are a key part of the floodplain landscape. Off channel habitats in the overall productivity of these rivers, as well as the importance for bears and other abundant wildlife, will be a focus of our future studies.

All the rivers carry high nutrient content probably associated with decomposition of the abundant salmon runs. We will have to do substantially more sampling, including collection of fishless tributary water, and relate water chemistry and stable isotope measures, to fully document the role of marine-derived nutrients in supporting river productivity. By studying the isotopic signatures in the food web and fish tissues we determine how the river food webs are influenced by marine-derived nutrients from the fish. We expect to use this and other scientific data to show why some *mykizha* (resident rainbow) do not migrate to the ocean and others (steelhead) do. This is important because steelhead are the most prized sportfish in the world.

Salmonid genetics experts affiliated with FLBS have examined genetic variation of *mykizha* within and between study rivers. They found fish exhibited low levels of genetic variation in mitochondrial and nuclear DNA as compared to North American rainbow trout. Analysis revealed significant

(Continued on page 5)

TEST YOUR KNOWLEDGE *Answers on page ten

1.) How many times has Flathead Lake frozen over since 1977?
a.) 0 b.) 2 c.) 4 d.) 6

2.) How many acres is Wild Horse Island?
a.) 1,200 b.) 2,100 c.) 3,500 d.) 4,000

3.) What year was the Flathead Lake Biological Station established?
a.) 1899 b.) 1912 c.) 1927 d.) 1964

4.) Due to incremental increases in pollution in the Flathead Basin, how much has water quality in Flathead Lake deteriorated since 1977?
a.) 5% b.) 22% c.) 33% d.) 44%

5.) How many of the 25 species of fish most commonly found in the Flathead River-Lake Ecosystem are native?
a.) 3 b.) 10 c.) 17 d.) 20

6.) What is the average flushing time of Flathead Lake?
a.) 1.7 years b.) 3.4 years c.) 6.2 years d.) 15 years

7.) Is the water from the FLBS waste water treatment plant clean enough to drink?
a.) Yes b.) No

8.) What is the temperature of the water at the deepest point of Flathead Lake?
a.) 0° C (32°F) b.) 4°C (39.2°F) c.) 10°C (50°F) d.) 13°C (55.4°F)

Kamchatka

(Continued from page 4)

differences among populations from different river systems but non-significant differences between anadromous and resident life histories either within or among rivers. As geographic separation increased among Kamchatkan rainbow trout so did genetic distance. This supports a stepping-stone model of population isolation and differentiation following a probable series of Pleistocene founding events during the most recent glacial age by rainbow trout from northwestern North America.

We have begun studying *mykizha* productivity based on analysis of egg masses in steelhead. The long-term objective of this type of analysis is to relate life history variation to bioenergetics of the populations in the study rivers.

We believe the presence of abundant, high quality habitat ensures the co-existence of salmonid species known in Kamchatka rivers, since healthy populations strongly indicate ecologically intact river ecosystems.

The long-term aim of the KSP is to quantitatively relate *mykizha* life histories to habitat characteristics of the rivers and estuaries. The mykizha are particularly well suited for linking conservation, scientific research and ecotourism. Monitoring of steelhead and salmon runs and better understanding of their ecology is required for sound long-term management.

In USA rivers, native steelhead runs have been substantially depleted or eliminated due to dams, irrigation withdrawals, overfishing and floodplain construction. Information from the project will be used to help restore salmon and steelhead in these rivers and help stop decline in others. Our Kamchatka experience often guides other projects, including two very large projects funded by the US Bureau of Reclamation (Yakima River, WA; Snake River, ID) where costly plans to restore floodplain structure and function for fisheries enhancement are being considered.

Stanford and Ellis, with graduate student Nick Gayeski, will return to Kamchatka in the next couple months to explore more rivers with our Russian colleagues. We are particularly interested in learning the status of cottonwood gallery forests and discovering *mykizha* spawning grounds. In addition we will begin work on other salmon runs and document the full range of riverine biodiversity to underpin long-term conservation of these beautiful rivers.

Volunteers who can donate time and money to the effort assist our work in Kamchatka. This has been especially fun for people who like to fly fish for giant steelhead and rainbows in a wilderness setting. If you are interested in going to Kamchatka, please contact FLBS or take a look at our Kamchatka web pages.

Biocomplexity

(Continued from page 3)

geochemical and limited ecological sampling. These will be modified as appropriate at tracer study sites to document flow paths and groundwater velocities.

We have developed an integrated GIS/hydrologic modeling system for simulating surface- and groundwater flow in three dimensions on alluvial flood plains. The resulting floodplain structure within the model is comprised of a detailed topographic representation of the floodplain surface combined with a complex matrix of different underlying soil types juxtaposed in three dimensions. Three interactive tasks are required to fully elaborate our conceptual foundation of the shifting habitat mosaic in a computational framework

1)Model changes in floodplain structure. Erosion and deposition will be integrated into the model to predict where erosion, deposition and avulsion have the potential to occur on the flood plain.

2)Model terrestrial nutrient cycling and delivery to river and ground water. An existing model we routinely use can track water and nutrient uptake, plant growth/respiration, senescence, mortality and decomposition.

3) *Model Carbon, Nitrogen, and Phosphorus transport and transformation along surface- and groundwater flow paths.* The whole floodplain biochemistry will be modeled as an emergent property of the biochemical cycles occurring within groundwater cells, and the interactions among cells, in a spatially explicit grid network.

Sensitivity analyses will be conducted for the Nyack by imposing hypothetical changes in floodplain structure, vegetation characteristics, sediment inputs

(Continued on page 6)

Biocomplexity

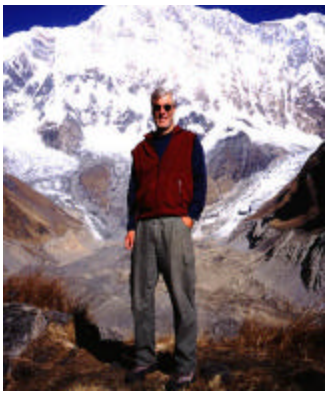
(Continued from page 5)

and flows. We currently have ongoing floodplain research for the Yakima (WA), Snake (ID) and Yellowstone (MT) Rivers and have acquired airborne multispectral and multitemporal digital imagery, field surveys and detailed classifications of channel geomorphology and floodplain characteristics. We are actively comparing emergent properties of the Nyack with a similar, unregulated system in Italy. These systems are examples of large montane rivers modified to varying degrees through river regulation, removal or alteration of native riparian vegetation, irrigation withdrawals and revetments. Simulated changes in floodplain dynamics at Nyack will be assessed by evaluating general floodplain attributes of other systems where similar impacts have occurred.

The floodplain biocomplexity project builds on the long tradition of field ecological education for advanced college undergraduates at FLBS. Students use standardized methods to gather data germane to the FLBS summer courses at geo-referenced sites on the flood plain. These databases are web based with computerized visualizations. FLBS and the Salish and Kootenai College (SKC) are in the process of jointly developing a Flathead River Flood Plain web site for sharing data, interpretations and community outreach. SKC has field trips to Nyack from six of their classes to introduce students to the biocomplexity of the floodplain environment and five SKC students serve annually as rotating field research assistants for the project. Finally we are developing a new three-credit, self-supporting class-workshop entitled Environmental Biocomplexity: Theory and Application. The intent of this course is to introduce college students, practicing professionals and high school teachers to complexity theory.

Is there a topic you want to learn about in the next Flathead Lake Journal? Let us know at flbs@selway.umt.edu

Dr. F. Richard Hauer appointed President



Dr. F. Richard Hauer was elected President of the North American Benthological Society (NABS) for the 2003-2004 term and will serve as President Elect in 2002-2003.

The North American Benthological Society (NABS) is an international scientific organization whose purpose is to promote better understanding of the biotic communities of lake and stream bottoms and their role in aquatic ecosystems. NABS provide media and disseminates new investigation results, new interpretations and other benthological information to aquatic biologists and the scientific community at large.

Benthos refers collectively to all aquatic organisms that live on, in, or near the bottom of water bodies. This includes organisms inhabiting both running and standing waters as well as organisms from saltwater and freshwater habitats. They inhabit such disparate habitats as the small aquaria formed in the bottom of pitcher plant leaves, to the bottom inhabitants of the Mississippi River, the Great Lakes and oceans.

Members of the North American Benthological Society are scientists mainly interested in freshwater biology (i.e. rivers, streams, lakes, reservoirs, wetlands, and bog habitats). Benthologists study life histories, population ecology and systematics of the benthos. They elucidate the community ecology of the benthos and freshwater ecosystems and work for their conservation. Benthologists develop pollution monitoring methods and impact assessment techniques. They study pest organisms, such as black flies, zebra mussels, and nuisance algae to develop strategies for reducing the health or economic impacts of pests. Because many benthos are important as fish food their study is important to fisheries management.

Dr. Hauer received his B.S. in 1973 from Michigan State University, Department of Fisheries and Wildlife;, his M.S. in 1975 from Michigan State University, Department of Fisheries and Wildlife; and his Ph.D. in 1980 from the University of North Texas, Limnology and Stream Ecology. He has been working at FLBS

(Continued on page 7)

Word Search

*Answers on page eight

1. These animals have been spotted on Station grounds and can weigh nearly 500 pounds
2. The name of the Station's research vessel
3. Was recently elected President of the North American Benthological Society
4. One tenet of the Flathead Lake Biological Station
5. A native species inhabiting Flathead Lake
6. The name of the flood plain where biocomplexity work is being conducted
7. The name of the Russian area where steelhead research is being conducted
8. The wastewater treatment plant treats this kind of water
9. The name of the bay where FLBS is located
10. FLBS faculty and local legislators traveled to Southeastern Montana and Northeastern Wyoming to learn more about this
11. Distribution and abundance of plants and animals within the river basin

A	L	L	E	M	O	L	I	J	A	N	A	S
B	I	O	C	O	M	P	L	E	X	I	T	Y
L	P	E	Y	T	O	K	N	S	E	R	I	E
A	K	A	M	D	O	A	N	S	T	A	N	L
C	P	L	A	R	T	M	O	I	E	L	A	L
K	E	X	I	R	E	C	T	E	B	V	L	O
B	A	U	C	I	L	H	E	B	O	M	E	W
E	M	S	U	C	O	A	L	B	E	D	S	B
A	O	N	L	H	D	T	E	A	S	B	I	A
R	U	N	Y	A	C	K	M	L	E	E	T	Y
S	T	O	P	U	M	A	T	T	W	A	S	S
S	H	U	T	E	V	E	R	Y	E	A	R	S
K	I	N	D	R	E	S	E	A	R	C	H	S

Dr. Hauer

(Continued from page 6)

since 1986 and is currently the Professor of Limnology. He has been Research Professor, Director of the Leland Schoonover Freshwater Research Laboratory, Associate Research Professor and Assistant Research Professor while at the FLBS. Prior to his employment at the FLBS Dr. Hauer did fellowship work at the University of Alabama, University of Georgia, University of North Texas and Michigan State University.

Dr. Hauer teaches and continues his research at the FLBS. His interest encompasses the fields of stream and wetland ecology. His continuing research goal is a synthesis of the many areas of organismal biology and ecology and their application toward holistic understanding of stream and wetland environments. This has led him to investigate a broad range of topics, such as interaction of temperature and stream hydrologic cycles on growth and production of stream invertebrates, nutrient and organic matter dynamics in disturbed stream systems, the role of large woody debris in bull trout spawning habitat and the role of hydrology and geomorphology on wetland vegetation structure and function.

Dr. Hauer and his wife, Brenda, reside in Polson. They are proud parents of two children, Bethany and Andy and new grandparents to Montana Rose.

Congratulations to Dr. Hauer on this great honor!

New Terms *

Alluvial: Deposit (clay, silt, sand, gravel, etc.) of a stream where it issues from a gorge upon a plain; a tributary stream at its junction with the main stream

Anadromous: Referring to life cycles of fishes, in which adults travel upriver from the sea to breed, usually returning to where they were born

Biophysics: A branch of science concerned with application of physical principles and methods to biological problems

Biotic: Flora and fauna of a region

Diel: Involving a 24-hour period, usually includes a day and the adjoining night

Fauna: Animal life; animals of a region, period or special environment

Invertebrate: Lacking a spinal column

Kamchatka: An eastern Russian peninsula 750 miles long between the Sea of Okhotsk and the Bering Sea

Piezometer: An instrument for measuring pressure or compressibility

Riparian: Relating to, living or located on, the bank of a natural watercourse

Salmonid: A family of elongate bony fishes that have the last three vertebrae upturned

Stratigraphy: Geology that deals with the origin, composition, distribution and

New Faces at FLBS

Jeremy Nigon

Jeremy began working at the Station in February 2002 after spending five years in Seattle with a software/network integration company and with the University of Washington's Computer Operations branch. He is one of two Information Systems Support Specialists at FLBS. It is his job to make sure our system runs properly. Jeremy and his colleague, Don, are the first people who hear the desperate cries from less computer literate individuals.

As a systems administrator he supports everything that does not have to do with FlatDat research & data - basically the network, hardware, software and website. (only!)

His wife, Renee, finished her teaching job in Seattle and has now joined Jeremy here☺. They live a couple miles up the road where they have two cats that are teaching them children will be a huge responsibility!

Jeremy and Renee plan on spending their summer weekends in Glacier and the Bob Marshall hiking and camping. During the week Jeremy is active in several three-season soccer leagues in Missoula. In addition he keeps himself busy by being offended by others making fun of overzealous Star Wars fans (you've got to see the new movie before you make fun of him!), determining the effectiveness of CD-encryption techniques or sitting down and reading a good Linux manual.

Marie Kohler

Marie started working at the Station in January 2002 as the Administrative Support Aide. Her job centers around providing administrative support to Station employees so they can meet FLBS stated objectives.

Prior to joining FLBS she traveled extensively across the US and Canada for 12 years managing software and business process improvement projects for medium to large cap companies implementing client server and web-based financial applications. Before joining the software company she held two different positions reporting to controllers of oil and gas industry exploration, production and distribution companies. She was the systems liaison for a mid-cap operation and manager of accounting for an international petroleum-trading firm. While her undergraduate studies focused on fine arts at NIU, after joining the working world in 1978, she returned to school for her MBA in 1983 at UC, Denver.

Marie and her husband Rob are happy to join his extended family in Montana and provide their daughters, Sierra and Delaney, with a more rural and serene community. Some of her passions and interests include gardening, cooking, hunting, fishing, camping and parenting. Ever since backpacking in the Bob Marshall Wilderness in 1983 and watching the Perseid meteor shower every August while visiting Flathead Lake, she knew this area would eventually be her home and it has been since 1999.

Graduate Work at FLBS

Michelle Anderson

Michelle is originally from Newport, Rhode Island and received her undergraduate degree in marine biology at the University of New Hampshire with a one-year exchange program at the University of California, Santa Cruz. After receiving her B.S. degree she took graduate classes at Humboldt State University, CA. She chose to pursue her graduate education at FLBS because of its location and the opportunity to work on a large-scale, long-term, multidisciplinary project with Jack Stanford, a great guy and an innovative scientist.

The work she is beginning this summer on the Nyack flood plain is designed to integrate measures of native and nonnative aquatic biota habitat and food web structure over a distinctive subset of floodplain habitats. To accomplish this goal she will be looking at how native and nonnative fish populations are distributed in shallow margins, backwaters and sidechannels of the flood plain collectively referred to as "lateral habitats" and how these fish communities affect lateral habitat food web structure.

She hopes to explore how the physical and biological setting of individual lateral habitat units influence fish population distribution and abundance, both within unit types and across the expanse of the flood plain at a landscape level. She is expecting to place an emphasis on exploring how gene flow within and among habitat patches influences fish assemblages and population demographics. In addition, she will also be examining diel, seasonal, and interannual patterns of native and nonnative fish distribution and abundance, as they expect to see differences in fish assemblages across these temporal scales.

In her spare time she enjoys running, vegetarian cooking, itinerant gardening, music, rambling, scuba diving, reading international fiction, film, natural and cultural history.

When she graduates with a Ph.D. in aquatic biology in Spring 2005, she plans on taking a three-month vacation around the western United States and to continue traveling and working with interesting people who teach her new things for the rest of her life.

Brian Reid

Brian is originally from Mattapoisett, Massachusetts but has been residing in Montana for the past year. He received his B.S. from Cornell University in 1990 and became interested in continuing his education at FLBS because of the long-standing work in groundwater ecology.

While at the Station he is working on groundwater fauna in alluvial floodplain aquifers. In the Flathead system, wells penetrating the high flow paleochannels may produce up to 80 species of animals, some entirely adapted to groundwaters hundreds of meters from the main river channel. He is particularly interested in some of the smaller organisms (meiofauna), which have received much less attention both individually and also with respect to their larger ecological role (i.e., in food webs). A great deal of the current work at the FLBS is broadly relevant to current problems in conservation and water resources management.

In his free time Brian enjoys doing anything outdoors. He is a Ph.D. candidate and will probably seek a post-doctoral appointment in the southeastern United States or overseas. He hopes to be finished in 2004/2005. Upon completion of his degree, he would like to go out for sushi and kayak the Bering Strait.

A Letter from the President of Friends of FLBS

Friends and Neighbors,

My name is Bruce Young and as President of Friends of the Flathead Lake Biological Station, it is incumbent upon me to contact you and ask for your assistance.

As you may know, the Flathead Lake Biological Station (FLBS) performs many tasks concerning water quality in the Flathead Basin as well as water issues worldwide. We are fortunate to have one of the best research/academic facilities in the world with a first-class staff.

Your immediate help and participation is essential. The FLBS needs funding for **monitoring** the water in the basin. Funding in this area has diminished drastically from the State and neither Flathead nor Lake County is providing resources for this activity. Without monitoring we cannot develop sound water management policies nor can we detect new water degradations and address them in a timely manner. The lake is extremely vulnerable and the Flathead Valley is experiencing a lack of planning at a time of increased growth and development. Without your assistance now, the lake could be in serious trouble from new sources of pollution. Monitoring problems will be difficult to detect and substantiate without continued monitoring.

The work being done at FLBS and scientific discoveries about the ecosystem are being shared worldwide and locally. The burden of funding has fallen to the University system, which is under pressure with a lack of funds for these essential public programs. The proposal to fund a permanent endowment to monitor the water is the only guarantee the public has that lake water will be tested and science will be presented each year. This information is critical to any water management of our most precious basic resource.

The FLBS is also seeking to **endow additional professorships** and **improve their facility**. Endowing all six faculty positions will enable professors to devote their time and energy to teaching future scientists and to continue valuable, groundbreaking research. Right now they spend valuable time securing research grants. Dr. Charles Goldman, a world-renowned limnologist recently said the FLBS is "the foremost limnological field station in the world." To remain at the forefront, the FLBS has plans to **expand housing** to accommodate graduate and post-graduate students year round, create a **Scientific Visualization and Communication Center** and an **Interpretive Center** adjacent to a **Nature Trail.** If any of this sounds interesting to you, check out their website at www.umt.edu/biology/flbs or give them a call to discuss ways you can contribute.

Please consider what your assistance can do to help protect the lake and quality of life that comes with clean water. A few people cannot do this job alone. Only major, collective participation by all users and property owners can position the Flathead Basin to develop a viable and accountable management strategy. Public endowment is our waters only viable protection. **WE** have an opportunity to make it possible to maintain a sound water research and monitoring program.

The monetary amount needed for these projects will cost upwards of $12 to $14 million dollars. This may seem like a lot of money; however, it is a drop in the bucket compared to the value we are seeking to protect. Without your assistance much will be lost.

If you concur that Flathead Lake is valuable in its present condition, I must ask you to act by sending a donation to Flathead Lake Biological Station, The University of Montana, 311 Bio Station Lane, Polson, MT 59860-9659. Your contributions are tax deductible and will be invested in the general operating fund unless specified for a specific endowment. If you have questions please call the Station (406.982.3301). All donations are welcomed—large or small—corporate or private.

Answers to TEST YOUR KNOWLEDGE

1) Four. The winters of 1978-1979; 1987-1988; 1988-1989 and 1989-1990.
2) 2,100 acres
3) The Station was established in 1899 in Bigfork by Dr. Morton J. Elrod and moved to its current site in 1912.
4) 1/3 or 33%
5) 10 (redside shiner, peamouth and squawfish minnow, large-scale and longnose sucker, sculpin, bull and cutthroat trout, pygmy and mountain whitefish)
6) 3.4 years
7) Yes
8) 4°C (39.2°F)

Student Statistics for Summer Session 2002 at the FLBS

Students are from 25 colleges. In addition, two high school teachers and one college professor are attending the summer session. The following colleges and universities are represented.

The University of Montana-18; *Colgate University*-11; *Baylor University*-3; *Augustana College* and *Sierra Nevada College*-2; *Albertson College of Idaho, California State U at Long Beach, Cedar Crest College, Colby College, Depauw U, Elon U, EPA Scientist (CSU), Florida Atlantic U, Gonzaga U, Middlebury College, Syracuse U, Ohio Northern U, U of Greensboro, U of MN, U of WI at River Falls, State U of NY, Southern Oregon U, Stone Child College, U of TX at Austin, U of ME.*

Nineteen states represented

Students in the field

There are 29 male students and 28 female students enrolled in a total of 423 credits. Nearly 15% of the students are receiving scholarships.

A	L	L	E	M	O	L	I	J	A	N	A	S
B	I	O	C	O	M	P	L	E	X	I	T	Y
L	P	E	Y	T	O	K	N	S	E	R	I	E
A	K	A	M	D	O	A	N	S	T	A	N	L
C	P	L	A	R	T	M	O	I	E	L	A	L
K	E	X	I	R	E	C	T	E	B	V	L	O
B	A	U	C	I	L	H	E	B	O	M	E	W
E	M	S	U	C	O	A	L	B	E	D	S	B
A	O	N	L	H	D	T	E	A	S	B	I	A
R	U	N	Y	A	C	K	M	L	E	E	T	Y
S	T	O	P	U	M	A	T	T	W	A	S	S
S	H	U	T	E	V	E	R	Y	E	A	R	S
K	I	N	D	R	E	S	E	A	R	C	H	S

1. **Black Bears** have been spotted on FLBS grounds
2. The name of the Station's research vessel: **Jessie B**
3. **Dr. Ric (Richard) Hauer** was recently elected President of the North American Benthological Society
4. **Research** is one of the FLBS tenets
5. **Peamouth (minnow)** is a native species in Flathead Lake
6. The **Nyack** is the flood plain where biocomplexity work is being conducted
7. **Kamchatka** is the Russian area where salmon research is being conducted
8. The treatment plant treats **sewer** water
9. FLBS is located at **Yellow Bay**
10. FLBS faculty and legislatures learned about **Coal Bed (Methane)** in southeastern MT and northeastern WY
11. **Biocomplexity** is the distribution and abundance of plants and animals within the river basin