



# Wyoming Hydrogram

February 1991

University of Wyoming Water Research Center Newsletter

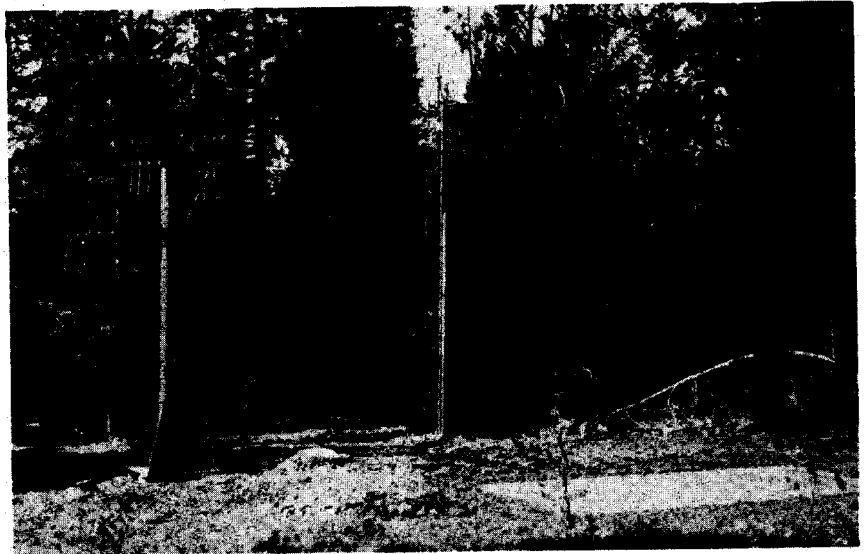
Vol. 3, No. 1

## What's a SNOTEL and why *adopt* one?

-- with Ted Gilbert, USDA-SCS, Casper, Wyoming

Pinedale Middle School, Pinedale, Wyoming, adopted a SNOTEL in December 1990, joining nine other Wyoming schools in the "Adopt a SNOTEL" program.

SNOTEL (for SNOwpack TELemetry) is a near real-time hydrometeorological data collection network in the western United States. It is a key element in the cooperative snow survey and water supply forecasting program directed by the US Department of Agriculture's Soil Conservation Service (SCS).



### Data vital to forecasting

Most of the western US depends on melting snowpack for streamflow. For an accurate prediction of runoff, careful measurements of snow water equivalents at selected index points are taken at frequent intervals throughout the year. This data is combined with precipitation, temperature, and soil moisture readings to prepare runoff forecasts.

Each day over 500 remote data collection sites in the high mountains transmit snow, precipitation, and temperature data every 15 minutes to a central computer facility in Portland, Oregon. Wyoming has 78 SNOTEL sites and is responsible for the maintenance of two more in South Dakota.

Snowpack data is obtained from SNOTEL measurements and monthly manual readings at snow

course locations during the winter and early spring. The Centralized Forecasting System (CFS) in Portland analyzes the data and generates stream flow forecasts and data summaries.

### SNOTEL site visited

Large pillows, filled with a liquid similar to antifreeze, react

*continued on page 4*

## Master's degree option in Water Resources at UW

The Water Research Center at the University of Wyoming cooperates with academic departments on campus to provide a master of science (M.S.) degree program which contains multidisciplinary training in water resources. This M.S. degree is offered as a specialty option

within existing M.S. degree programs currently offered through sponsoring departments. The Water Resources option is acknowledged on the graduate transcript and certifies to potential employers that the candidate has completed an in-depth course program in the broad area of

water resources.

The course requirements to obtain this special option are rigorous and may include training in Civil Engineering, Geology, Geography, Law, Agricultural Economics, Microbiology,

*continued on page 2*



## How much snow?

Basin-wide forecasts from the USDA-SCS indicate that water users across most of Wyoming will experience water flows this spring and summer which are below to much below average.

High country snowpack is doing fair in parts of the state, but lower elevation accumulation is much below average for this time of year (reports are current as of mid-January).

Fall precipitation over most of the state was fair but most of December was below normal. The fall precipitation added much needed soil moisture to high elevation soil profiles.

Keyhole Reservoir is only 29% of normal total storage for this time of year. In the North Platte drainage, all the reservoirs except Alcova and Guernsey are below normal. These two reservoirs are just slightly above average.

Forecasts will move closer to probable figures as the forecast season progresses. For now, predictions are that areas which will see runoff flows much below average will be in the Black Hills, the southwest corner of the state, the Little Snake drainage, and the west side of the upper North

Platte drainages.

If current trends continue, only the upper Wind River, Shoshone, Clark's Fork, and upper Green River drainages are forecast to receive near to slightly above average streamflow.

For more information on one of the tools used in predicting annual streamflow, see the article on the SNOTEL data collection instrument, page 1.

## M.S. degree

*continued from page 1*

Zoology and Physiology, and Botany, among others.

Departments at UW currently offering the Master of Science/Water Resources option are Botany, Civil Engineering, Economics, Geology and Geophysics, Geography, Zoology, Agricultural Economics, Range Management, and Agronomy.

The academic program of study is designed to enhance the graduate student's expertise through course work in hydrology, resource economics and resource law, and water quality.

Admission to the program requires acceptance by both the academic department sponsoring the graduate degree and by the Water Center Academics Standards Committee.

For further information on the M.S./Water Resources program, contact the academic department or the WWRC at (307) 766-2143.



The *Wyoming Hydrogram* is published bimonthly by the Wyoming Water Research Center with funds provided in part by the U.S. Geological Survey, Department of the Interior, as authorized by the Water Resources Research Act of 1984.

**Director**

Steve Gloss

**Associate Directors**

Vic Hasfurth, Research

Ari Michelsen, Information

**Editor**

June Rain

**Thanks to this issue's contributors:**  
Ted Gilbert, Jim Kircher, Jim Rankl,  
Tom Wesche

**Note to readers:**

We welcome guest editorials and other articles of interest. Please write or call the Editor for guidelines.

Please keep us informed about address changes, and let us know about meetings and news items the *Wyoming Hydrogram* should cover. We need time-sensitive materials at least 4 weeks in advance of publication dates. Publication dates for 1991 are the first week of the months of February, April, June, August, October, and December.

The *Wyoming Hydrogram* is edited and written by the Editor unless otherwise credited. Opinions expressed are those of the authors, not necessarily those of the sponsoring organizations. Contents may be reprinted if properly credited. There is no charge for subscriptions. Address editorial material and correspondence to:

Editor, *Wyoming Hydrogram*  
University of Wyoming  
Water Research Center  
Box 3067  
Laramie WY 82071-3067  
or phone (307) 766-6205



Recycled Paper

**WWRC Research**

**Brown trout population and habitat changes associated with increased minimum low flows in Douglas Creek, Wyoming. USDI-Fish and Wildlife Service, BIOLOGICAL REPORT 90(14): S.W. Wolff and T.A. Wesche, University of Wyoming Water Research Center, and D.D. Harris and W.A. Hubert, USDI-FWS/University of Wyoming Cooperative Fish and Wildlife Research Unit.**

Most research on minimum flows focuses on development of instream flow and habitat models but minimal reported evidence links biological response of fish populations to changes in minimum flow. This study assessed the biological significance of an increase in minimum flow to the brown trout (*Salmo trutta*) population in Douglas Creek, Wyoming.

The Douglas Creek study area has been impacted by railroad tie driving, gold dredging, and water development, yet continues to support a sport fishery dominated by brown trout. After over twenty years at a minimum flow of 1.0 cubic feet per second (cfs), this regulated stream underwent a substantial increase in required minimum low flow, to 5.5 cfs, when Stage II of the Cheyenne water project was initiated in 1986.

Population and habitat data obtained during the period when minimum flow was 1.0 cfs (1972-

76) was compared with data collected after the minimum flow was increased to 5.5 cfs (1988-89). This was a rare opportunity to compare the effects of increased minimum flow on the fish population before and after mitigation measures.

Four reaches of the stream, divided into eight study sites, (Fig. 1) were sampled by electroshocking using removal methods.

Standing stock estimates were made and compared to pre-increase numbers on a pounds/mile and pounds/surface area basis.

More than a twofold increase in brown trout standing stock

between 1973 and 1988-89 was measured in a 1.6 km (1 mile) reach between Rob Roy Dam and the point of water diversion. Within this reach, discharge was occasionally as low as 3.0 cfs before 1986, but the low flow was not as severe as downstream from the water diversion.

A four- to six-fold increase in brown trout standing stock was indicated between 1972 and 1988-89 in a 10.3 km (6.4 mile) reach immediately downstream from the point of water diversion. Within this reach, the minimum low flow was 5.5 times greater than in the 1970s,

*continued on page 4*

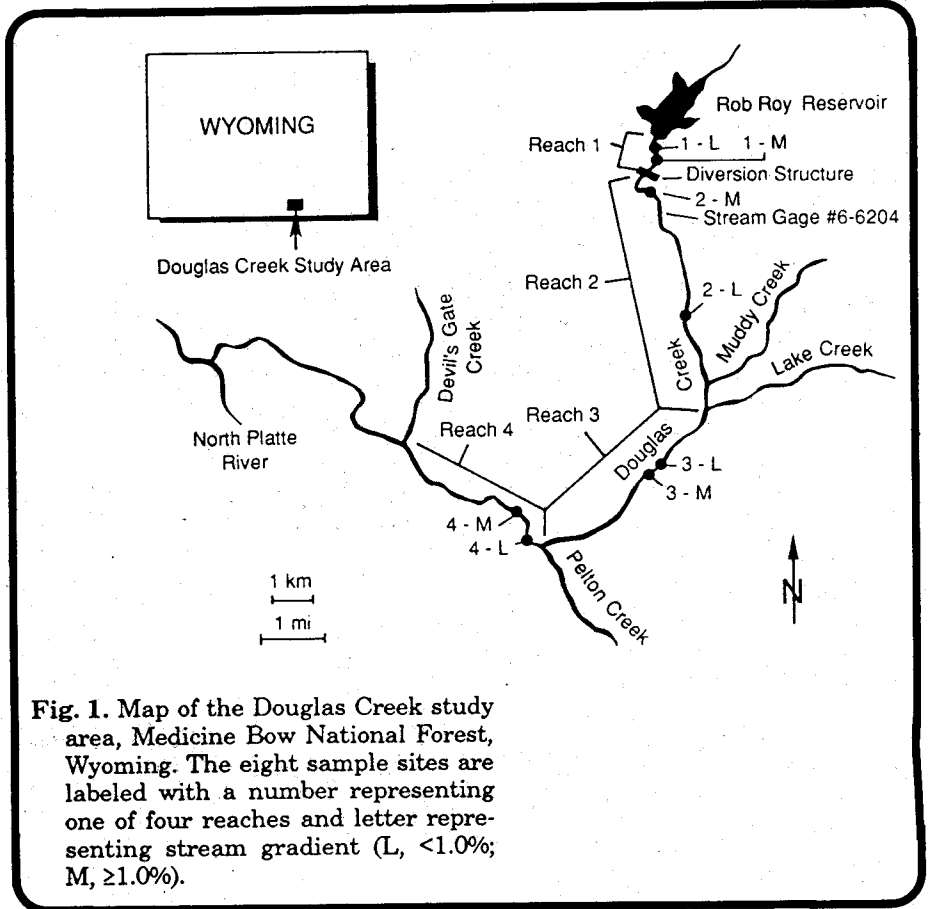


Fig. 1. Map of the Douglas Creek study area, Medicine Bow National Forest, Wyoming. The eight sample sites are labeled with a number representing one of four reaches and letter representing stream gradient (L, <1.0%; M, ≥1.0%).

## SNOTEL

*continued from page 1*

to the pressure of snow accumulation and send readings via electric current to data collection equipment. Near the pillows, which lay in level sand beds on the ground, are shelters which are equipped with manometers for visual checks, and precipitation and temperature gauges.

Animal damage to the pillows is rare but the occasional half-ton bull elk will bed down at the exact time a scheduled 15-minute reading takes place. The outsized "blip" which occurs is edited out of the data. Some pillows have been damaged by bears hoping to overturn them for the grubs which hide underneath.

The pillows are made from either a heavy rubber or metalized fabric and are visited by SCS personnel frequently to check for wear or damage.

### How about adoption?

Along with Pinedale, schools in the Wyoming towns of Hanna-Elk Mountain, Saratoga, Baggs, Lander, Cody, Farson, Afton, McFadden, and Dubois have adopted SNOTEL sites. Schools awaiting SCS visits to join the program are located in Lyman, Mountain View, Newcastle, Evanston, Gillette, and Cokeville.

The SCS attempts to take the students to the SNOTEL site they have adopted. These field trips are usually held in the early fall, but some sites are so remote as to make visits impractical.

Schools are not responsible

for site maintenance. The schools sign an agreement with SCS covering the use of the system and are assigned a logon ID and password so that they may access the CFS computer system.

The CFS data set contains historical, current, and average figures. Students are given access to data from a comparison site in the state to check the reliability of their site's data. The possibilities for analyses of the data received depends on the grade level of the class.

Lower grades may simply graph temperature or snow water equivalents, while advanced science classes may generate a streamflow procedure.

Local groups can get further information on the SNOTEL program from their SCS District Conservationist or from Ted Gilbert, USDA-SCS, 100 East "B" Street, Room 3124, Casper, Wyoming 82601.

---

**W**ATER SAVER TIP You can avoid water waste outdoors by planting native and/or drought-tolerant plant species; watering lawns in the early morning; watering lawns slowly, deeply, and infrequently; and repairing leaky faucets and hoses.

---

## research

*continued from page 3*

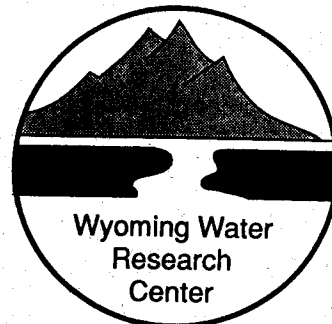
wetted width at low flow was doubled, and weighted usable area for adult fish was almost 5 times greater.

At sites more than 10.3 km (6.4 miles) downstream from the water diversion structure, where the effect of reduced flow had been less because of the addition of water from tributary streams, there were no measurable changes related to the enhanced minimum flow.

Though additional work is necessary, this study supports the long-term value of increased minimum low flow to fish populations.

For additional information, please contact Tom Wesche at the Wyoming Water Research Center, (307) 766-2143, or Dr. Wayne Hubert at the USDI-FWS/University of Wyoming Cooperative Fish and Wildlife Research Unit, (307) 766-5415.

This research was funded by the US Department of the Interior-Fish and Wildlife Service and the Wyoming Water Research Center.



## Employment opportunities in water resources with USGS

by James E. Kircher, District Chief, USGS, Cheyenne, Wyoming

The United States Geological Survey (USGS) offers several kinds of employment opportunities for those students interested in water resources.

The first of these is the **Coop Program**. This is a program which incorporates academic work with on-the-job training. It is a planned and progressive career-related student employment program. A key feature of the Coop Program is the potential for noncompetitive conversion of a student into the competitive service after satisfactory completion of the education and work requirements.

The student can participate by attending school full-time and

alternating full-time work terms or work and attend school part-time. The student should contact the Career Planning and Placement Center located on the second floor of Knight Hall at the University of Wyoming in Laramie for more information.

Other types of work appointments include **Summer Help** which would be full-time work between May and September. A **Continuing Part-Time Appointment** allows the student to work 16-32 hours a week while going to school, and a **Volunteer Appointment**, which offers no pay, but can provide a valuable work experience.

Information on all these jobs can be obtained from the Career Planning and Placement Center or by calling the District Chief, USGS, Water Research Division, in Cheyenne, Wyoming at (307) 772-2728.

Students interested in these programs should have an interest in one of the following technical areas: ground water, water quality, surface water hydrology, hydraulics, hydrogeology, sediment transport, chemistry, geochemistry, modeling, computers, or statistics.

---

## \$12 million EPA survey yields water well data

Nitrates were found in more than half the drinking water wells tested during the U.S. EPA's five-year, \$12 million national ground water survey. The National Survey of Pesticides in Drinking Water Wells was the first survey of its kind ever conducted in the United States.

Over 1,300 community and rural wells, some from every state, were tested for 126 pesticides and pesticide breakdown products, as well as nitrates.

Nitrates in ground water have several sources, including fertilizers, human and animal wastes, and naturally occurring

nitrogen in soils. EPA officials announced that the survey indicated no cause for alarm about human health in the use of ground water wells for drinking water.

Henry Habicht, EPA Deputy Administrator said, "The findings of the survey indicate that the vast majority of drinking water wells in this country do not have levels of pesticides or nitrates that would pose a risk to public health."

Though less than 1 percent of the wells tested have pesticide residues above EPA levels considered safe for human health, continued monitoring seems in order.

A nitrate level of 10 parts per million (ppm) maximum contaminant level has been established by the EPA to protect human health. About 1.2 percent of community wells and 2.4 percent of rural wells tested nationwide reached or exceeded the 10 ppm limitation.

The EPA has not yet published state-specific reports. The *Wyoming Hydrogram* will provide details when the information becomes available.

---

## Wyoming section to host national meeting

-- with Jim Rankl, USGS, Cheyenne, Wyoming

The 1994 National Symposium of the American Water Resources Association will be held in Wyoming, according to Jim Rankl, 1991 president-elect of the Wyoming section.

AWRA officials at the national level accepted the Wyoming proposal from a group of submissions from competing states. Proposals from state AWRA sections across the country are submitted, and, with no lobbying allowed, the national committee selects sites for future meetings. Rankl said, "We just submitted a very good proposal and we're happy they chose Wyoming."

An organizational meeting between Wyoming and national AWRA planning committee members will be held this spring in either Laramie or Cheyenne.

The Wyoming section held their third annual technical conference in Laramie at the University of Wyoming in October 1990. The UW site for the 1990 conference was chosen partly to include members of the recently formed Student Section of the AWRA. Previous state meetings have been held in Douglas and Cheyenne.

The AWRA is a scientific and educational non-profit organization established to encourage and foster interdisciplinary communication among persons of diverse backgrounds working on any aspect of water resource disciplines. Membership information may be obtained from

Rankl, or from Maria Plafcan, 1991 Membership Committee Chair, both at the USGS in Cheyenne, 772-2718.



### Water rights course offered

A course in western water rights and water engineering will be taught at the Univ. of Colorado at Denver. It is for engineers and utility planners concerned about the effects of water rights on water resource management. The course will be offered on Tuesdays from 7 to 9 pm, from Feb. 19 to Apr. 23; the cost is \$140. For more information, call Max Morstad at UCD, (303) 556-8408.

---

### Wetlands as sewage treatment system

Wetlands are naturally designed to break down waste materials, and the town of Colonial Beach, Virginia may make use of that fact in its sewage treatment system. In lieu of upgrading its conventional treatment plant, Colonial Beach is studying the possibility of creating a wetlands

system that would biodegrade sewage into components that do not pollute water.

Small wetlands treatment systems already exist in towns across the nation, but Colonial Beach has proposed a system capable of treating up to 1.5 million gallons per day. Wetland systems are much less expensive than conventional treatment plants. -- information from Virginia Water Resources Center.

---

### Pollution short course in Texas

The University of Texas at Austin, College of Engineering, announces a five-day short course on Advanced Water Pollution Control - Biological Wastewater Treatment, March 4-8, 1991, at the Thompson Conference Center in Austin. Questions concerning registration should be directed to Continuing Engineering Studies at (512) 471-3506. Questions concerning content of the course should be directed to Dr. Joseph F. Malina, Jr., Department of Civil Engineering, UT-Austin 78712 or phone Dr. Malina at (512) 471-4614.

---

**W**ATER SAVER TIP  
Energy and money are used to transport, treat, and heat water -- use it wisely.

---

## *Water under the bridge*

It's worth noting that water shortages are nothing new: Douglas, Wyoming city leaders passed an ordinance reducing the hours for irrigation and lawn sprinkling - over one hundred years ago.

*It provided that water can only be used for such purpose between the hours of 4 and 8 pm of each day, and the use of water other than that required to irrigate the lot licensed is strictly prohibited.*

Recent research has shown that watering your lawns slowly, deeply, and infrequently - and in

the early morning hours, is better for the lawn and uses less water.

These findings are a fraction of the research results made necessary by population pressures on our planet's water resources. Individual efforts to conserve water and preserve water quality have proven to have a positive cumulative effect on this precious natural resource.

The nation's 54 water resource research centers, like the WWRC, are continually involved in research to learn more about water and water management.

## **Record number of Legislators attend Forum**

The annual Water Resources and Law Forum for Wyoming Legislators was held on Jan. 7 in Cheyenne. Almost half the Legislative delegation attended the Forum and took part in discussions on current water issues as well as on Wyoming water law.

The following State organizations made presentations: Engineer's Office, Attorney General's Office, Water Development Commission, Depts. of Environmental Quality and Agriculture, and the UW Cooperative Extension Service.

The Forum was presented by the Legislative Services Office and the WWRC.

## **WWRC Calendar**

**Public Water Resources Seminar, 2011 Fairgrounds Road, Casper WY, Feb. 19, 1991, Contact: Jerry Buk (307) 235-9400.**

**Colorado Water Engineering and Management Conference, Denver CO, Feb. 27-28, 1991, Contact: Neil S. Grigg, Water Resources Research Institute, Ft Collins CO 80523 (303) 491-6308.**

**Nonpoint Source Pollution: The Unfinished Agenda for the Protection of Our Water Quality, Tacoma WA, Mar. 20-21, 1991, Contact: State of Washington**

**Water Research Center, Pullman WA (509) 335-5531.**

**Seventh International Water Resources Association World Congress on Water Resources, May 13-18, 1991, Rabat, Morocco, Contact: Dir. Recherche & Planification de l'Eau, 212-786-90.**

**AWRA Symposium on Water Supply and Water Reclamation, San Diego CA, June 2-6, 1991, Contact: Michael Fink, (301) 493-8600.**

**Water Management for the Sustainable Environment, Saskatoon, Saskatchewan, Canada, June 4-7, 1991, Contact: Gener-**

**al Manager, Waterscapes '91, (306) 373-9089.**

**Joint Conference of the Rocky Mountain Section of the American Water Works Association and the Rocky Mountain Water Pollution Control Association, Sep. 8-12, 1991, Jackson Hole WY, Contact: David Engles (307) 672-5280 or Harry LaBonde (307) 856-6505.**

**Twenty-seventh annual AWRA Conference, Water Management of River Systems, New Orleans LA, Sep. 8-13, 1991, Contact: Harry C. McWreath, Fort Worth TX, (817) 334-5551.**

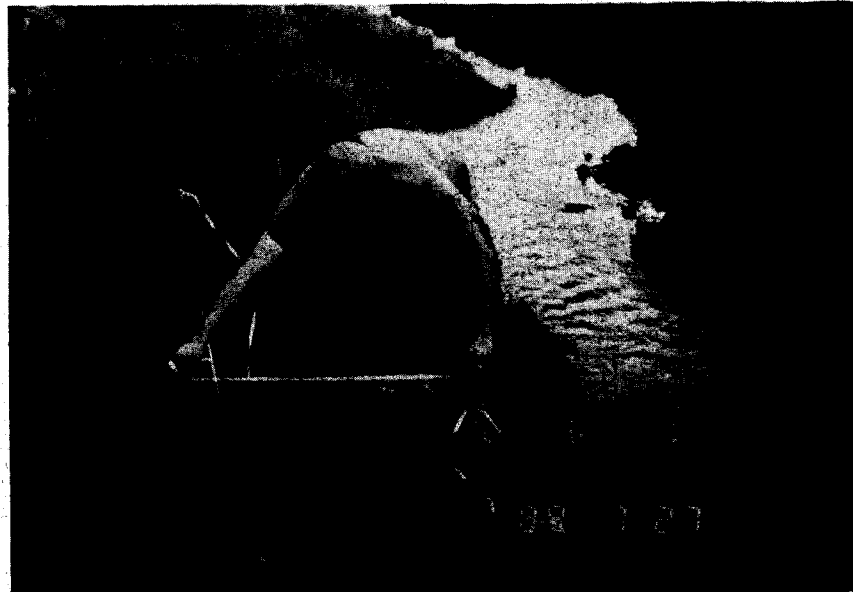
**WWRC Focus**

Robert J. Henszey has over ten years experience in the investigation and inventory of riparian zone resources. His research has included the hydrology of riparian meadows and effects of stream-flow augmentation on the riparian vegetation of previously ephemeral streams.

Bob is currently a Research Associate II with the WWRC where he is investigating the hydrology of wet meadows along the Platte River in central Nebraska. He is also pursuing a Ph.D., with an emphasis on water resources, through the University of Wyoming Department of Range Management.

He received his B.S. degree in Wildlife Management from Humboldt State University, Arcata, California, and an M.S. in Range Management/Water Resources from UW.

Bob worked for the BLM as a Range Technician and Biological Technician in Kemmerer and Rock Springs, Wyoming, and in Susanville, California, and as a Biological Technician for the



USFWS at the Kern and Lower Klamath National Wildlife Refuges in California.

He has been affiliated with the WWRC since 1985 when he started working here as a Watershed Technician.

Bob's waders have been kept busy over the past 10 years conducting riparian vegetation surveys, managing beaver, collecting biological and physical data on streams, and conducting surveys on small mammals, songbirds, and waterfowl.

Bob is a member of the Society for Range Management,

and the honorary organizations Phi Kappa Phi and Gamma Sigma Delta. He has also found time to author or co-author more than 10 publications and national presentations, make numerous regional and local presentations, win graduate scholarships, and make the Dean's Honor List (5 times!)

The picture accompanying this article shows Bob measuring the South Fork of Middle Crow Creek, east of Vedauwoo, in the Pole Mountain area between Cheyenne and Laramie.

**UNIVERSITY OF WYOMING**

Wyoming Water Research Center  
P.O. Box 3067  
Laramie WY 82071-3067

Wyoming Hydrogram  
Vol. 3, No. 1

Non-Profit Organization  
U.S. POSTAGE  
PAID  
Laramie, Wyoming 82070  
Permit No. 1

**Don't forget - Water Resources Seminar - Casper, February 19!**