



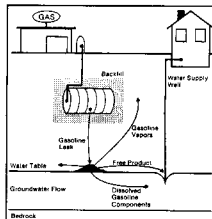
Legislature Passes LUST Control Bill

As a recent Wyoming newspaper headline stated, the Wyoming environment is not as pristine as some would like to think. A major problem is underground, where pollution lies hidden from searching eyes in the form of leaking underground storage tanks (LUSTs).

Every county in the state has contaminated areas due to leaking tanks, according to a February 1990 report from the Department of Environmental Quality (DEQ). Of the 575 sites involving groundwater and soil contamination which have been identified, 375 have not been corrected, and roughly half of these sites have

contaminated groundwater and have the potential to affect groundwater uses. In addition, gasoline vapors have polluted residences, businesses and school properties. Conservative DEQ estimates sets the likely total number of LUST contamination sites in Wyoming between 1,000 and 2,000.

LUSTs constitute a major environmental contamination problem nationwide. Congress, in 1984, directed the Environmental Protection Agency (EPA) to initiate a major federal program to regulate all underground storage of petroleum products and hazardous substances. In the following years, EPA developed federal regula-



tions which cover leak detection and prevention, inventory control, technical standards, installation standards

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Streamflow Below Normal

Most usable water in western states originates as snowfall in the mountains. Because of the importance of snowpack, measurements are taken by the Soil Conservation Service and other agencies throughout the winter and spring. These snowpack measurements are used to project water supply and streamflow.

Snowpack in Wyoming on May 8 ranged from a high of 124 percent of average in the Powder River-Tongue River drainage basins to a low of 9 percent of average in the Belle Fourche drainage basin. However, streamflow in many areas of the state is predicted to be lower than snowpack estimates would indicate. Some of the snowmelt will replenish the dry-soil profile and will not make it to streams.

Streamflows for most of the western states are projected to be below to well below average with few exceptions.

In Wyoming, the amount of water being held in major reservoirs in the state improved during the April over most of the state. The latest streamflow predictions indicate that water-users in central and southwestern (Bear River) Wyoming can expect flows much below average (70 percent, or less, of average). In the upper part of the North Platte River and the Laramie River drainages will observe flows that are near to just slightly below average during the runoff season.

Big Horn Mountain drainages are forecast at near to slightly above average for summer. Streams in the Black Hills are estimated to have near average levels in the north and slightly below average in the south.

The remainder of the state is projected to have runoff 10 to 25 percent below average.

Grant-in-Aid Research Funds Awarded

The Wyoming Water Research Center (WWRC) each year receives grant-in-aid funds from Wyoming to conduct research on water resource issues of interest to the state. This year 16 proposals for state grant-in-aid funds were received from individuals at Wyoming's seven community colleges and the University of Wyoming.

Nine proposals were awarded state grant-in-aid research funds this year, with grant awards ranging from \$10,000 to \$30,000.

All proposals were peer-reviewed by no fewer than three outside individuals from state agencies, other universities, and University of Wyoming departments, with expertise in proposal subject areas. Final approval is granted by the WWRC Research

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LUSTs continued

and financial responsibilities. States are required to develop their own LUST programs or have EPA implement a program for the state.

Wyoming LUST Legislation

The Wyoming Legislature, during the 1990 budget session, passed the Water Pollution from Underground Storage Tank Correction Act of 1990 (Enrolled Act No. 18) authorizing development of a state underground storage tank (UST) program. The purpose of the Act is to:

- 1) obtain state primacy of the federal UST program,
- 2) cleanup past UST releases, and
- 3) provide financial assurance responsibility.

The Act sets up a corrective action fund to clean up past and future releases and provides tank owners and operators the ability to meet the \$1,000,000 federal financial responsibility requirement. The Act specifies that Wyoming UST standards and regulations can be no more and no less stringent than federal EPA regulations drafted in December 1988.

Financial Assurance Program

The Act requires UST owners to have a minimum of \$1,000,000 in UST coverage (financial assurance). Tank owners may obtain this coverage privately, which can be prohibitively expensive, or they may enter into the state financial assurance program. A state financial assurance program was included to ensure that economical coverage would be available throughout the state, especially for small business enterprises that could not afford private coverage. Tank owners must meet three conditions to be eligible for the program. These conditions are: 1) an assessment of the site must be conducted (in part to identify existing problems), 2) existing releases must be stopped, and 3) a registration fee of \$200 per tank per year must be paid. Program participants will be covered for up to \$1,000,000 in LUST third party damages such as a neighbor's well, and all corrective action costs.

The UST Act also establishes a cleanup fund through a 1 cent per gallon

fuel tax. The fund will be used for corrective action (cleanup) of past releases and for corrective action under the state financial assurance program.

UST Program Regulations

The Department of Environmental Quality and Environmental Quality Council are responsible for developing the regulations to implement UST programs under the Act. It is anticipated that it will take about one year to develop final regulations. A first step toward developing regulations will take place on May 15 when the DEQ holds a required public meeting prior to drafting of the regulations. The regulations will then be drafted by the Water Quality Division, approved by the Water Quality Advisory Board and a public hearing will be held by the Environmental Quality Council before adoption.

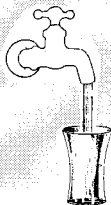
For additional information contact Jake Strohmman at the Wyoming Department of Environmental Quality, Water Quality Division in Cheyenne (777-7781).

What's in My Water?

California residents need no longer wonder what is in their drinking water. Water suppliers must now reveal the exact constituents of the water they provide.

Beginning this year, California Domestic Water Quality and Monitoring Regulations require that water purveyors mail each consumer an annual report on the quality of water served. The report must list the water sources; physical agents, minerals; inorganic and organic chemicals; radioactivity; drinking water standard (MCL) where applicable; the range and average values of contaminants; and a telephone number of someone at the agency who can answer consumer questions.

Because California tends to be a trend-setting state, other states would do well to pay close attention to the process and results of this new program. Do you know what is in *your* drinking water? (National Water Line, November-December 1989).



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WWRC Research

Researchers Study Saline Oil-field Discharge

Environmental and regulatory concerns are increasing over the possible effects of discharging co-produced waters from oil fields to natural receiving waters. These discharges, known as oil-field brines, are often high in total dissolved solids and have a variety of organic and inorganic constituents. Relatively little is known about the toxicity and persistence of these discharges in the receiving waters.

Under the direction of Dr. Harold Bergman of the University of Wyoming, a study is underway to assess the effects of oil-field brines on water quality in Salt Creek and the Powder River. Salt Creek, a major tributary of the Powder River in northeastern Wyoming, flows through a large oil-producing basin and receives the discharges of several oil-field operations.

During the first year of the study, water samples were collected from



Salt Creek, upstream of all dischargers, just outside of Teapot Dome Naval Reserve

three sites in Salt Creek and three sites downstream in the Powder River, during high, medium and low flow periods in the rivers. Laboratory tests with these water samples indicated no effect on fathead minnow survival, but *Ceriodaphnia* (an aquatic invertebrate) survival was significantly reduced in waters collected downstream of oil-field discharges.

During the second year of the study, additional water samples are being

tested for toxicity and analyzed for chemical constituents that may be contributing to the toxicity.

This research is being funded in part by the Wyoming Water Research Center. For more information, contact Dr. Harold Bergman or Ann Boelter at the UW Fish Physiology and Toxicology Laboratory, Department of Zoology and Physiology (766-4330).

WWRC Publications

Selenium Bibliography Available

Selenium toxicity and selenium deficiency have long been identified as problems for plants and animals in Wyoming. A Governor's Task Force was created in 1987 to investigate the status of selenium in Wyoming, and in 1988 the WWRC funded a literature search and acquisition for use by the Task Force. This bibliography and index was developed to facilitate the use of that literature and assist selenium research workers in Wyoming and is now available from the State of Wyoming Geological Survey as *Selected Bibliography on Selenium* (Bulletin 69).

"And the recipient is..."



Karen McCormack, right, a University of Wyoming master's degree candidate in geology and water resources, receives from Richard Marston of the WWRC, the \$1,500 Willard C. and Elaine N. Rhoads Scholarship for 1991. The annual award honors the late Mr. Rhoads, who was a long-time member of the Wyoming Water Development Commission.

WWRC Research

Coring Glaciers in the Wind River Range



Mike Strobel (USGS, Columbus, OH) and David Susong (USGS, Cheyenne, WY) drilling on Gannett Glacier while Jim Harte (USGS, Arvada, CO) looks on.

A record of atmospheric deposition is frozen in the ice of alpine glaciers in the Wind River Range of Wyoming. For three years, Dave Naftz, Kirk Miller and other research team members of the Cheyenne, Wyoming, office of the U.S. Geological Survey have been sampling this glacier ice in order to determine its chemical concentrations and construct a record of atmospheric depositions.

The first cores were collected in 1988 on Knife Point Glacier, and subsequent collections have been made on Gannett Glacier. These glaciers are in remote, rugged areas requiring several days of travel on foot and horseback. Ice cores were collected at elevations from 11,800 feet to 13,000 feet using a hand-powered coring auger.

During one research expedition, the team was unable to collect a sample

because the coring auger froze solid in the hole. This year a special solar-heated coring tool will be used to help prevent freeze up. Once extracted, the ice core samples are kept frozen with dry ice during transport off the glacier. To date, ice core samples of snowfall back to the early 1920s have been collected.

Preliminary results indicate a strong relationship between the chemical composition of the glacier core material and atmospheric deposition recorded at a lower elevation monitoring site in Pinedale, Wyoming. Concentrations of sulfate and other chemicals in deeper annual ice layers (pre-1982) will be examined in future research and used to estimate long-term trends in chemical deposition. This research is important in evaluating the patterns of acid and chemical deposition as well as evaluating long-term climatic records in Wyoming.

Grant-in-Aid *continued*

Review and Priorities Committee appointed by the Governor and the UW President. The nine proposals, listed below, were funded for at least one year (July 1990 through June 1991):

- Chemical, physical and biological characteristics which control selenium form and distribution in soils and plants across landscapes. Principal investigators are S.E. Williams and L.C. Munn from UW Plant, Soil and Insect Sciences and K.J. Reddy from WWRC.
- Snowy Range Observatory climate validation. Principal investigators are T.A. Wesche from WWRC and UW Range Management and Q.D. Skinner from UW Range Management.

- A comprehensive water education program for Wyoming's elementary schools. Principal investigators are R.E. Beiswenger, V.G. Sindt, P. C. Ellsworth and E.L. Sturges from the UW Center for Teaching and Learning.

- Hydrogeology and recharge mechanics of alpine carbonate terranes in Wyoming thrust belt mountain ranges. Principal investigators are J.I. Dreyer and P.W. Huntoon from UW Geology.

- Modeling groundwater flow and contaminant transport in heterogeneous aquifers. Principal investigator is M.B. Allen from UW Mathematics.

- Consumptive use and irrigation water requirements for Wyoming. Principal investigators are L.O.

Pochop from UW Agricultural Engineering, R.H. Delaney from UW Plant, Soil and Insect Sciences, G.L. Kerr from WWRC and V. Hasfurther from UW Civil Engineering and WWRC.

- Microbial transformation of herbicides known to contaminate ground water in Wyoming. Principal investigator is P.J. Colberg from UW Molecular Biology.

- Evaluation of surface water/groundwater interactions in a cold desert stream system. Principal investigators are V. Hasfurther from UW Civil Engineering and WWRC, T.A. Wesche from WWRC and UW Range Management and Q.D. Skinner from UW Range Management.

USGS Block-Grants Awarded

The United States Geological Survey (USGS) has awarded the Wyoming Water Research Center (WWRC) \$103,703 on a matching basis for research this year.

Each year funds are given to water institutes designated by each state in the U.S. for research on subjects of interest on a state, regional and/or national level.

The WWRC received eight proposals for USGS matching grant research funds in 1990. Four projects were recommended for 1990 funds and were submitted to the USGS for approval.

Following USGS approval, the projects will be initiated June 1, 1990, and will continue for a minimum of one year. These four projects are:

- Transformation and stimulated plant uptake of selenium by soil microorganism. Principal investigator is S.E. Williams from UW Plant, Soil and Insect Sciences.
- Development of a chemical and biological method to reclaim alkaline solid wastes. Principal investigators are S.E. Williams from UW Plant, Soil and Insect Sciences and K.J. Reddy from WWRC.
- Theoretical studies of pollutant

transport in water bodies. Principal investigators are S.D. Shih from UW Mathematics and Y.K. Tung from WWRC.

- Transport, detection and degradation of aldicarb in droughty irrigated soils of the Big Horn Basin of Wyoming. Principal investigators are D.N. Barkan and R.C. Palmquist from Northwest Community College and D.A. Nelson from UW Chemistry.

In addition to the funded projects, a portion of the funds will be used for information dissemination and technology transfer by WWRC.

WWRC Calendar

Teacher's Institute

A Water Institute for Teachers will be held in Laramie on the University of Wyoming campus July 9-20, 1990. The Institute will give teachers the opportunity to expand their knowledge about water issues in Wyoming and receive two semester hours of college credit. The course will include classroom sessions, field trips, and hands-on activities with opportunities to develop concepts and activities for existing curricula. Wyoming water issues that will be addressed include: water supplies, water quality, legal and environmental issues and watershed management. Project Wild Aquatic activities will also be taught. The Institute is sponsored jointly by the Wyoming Water Research Center and the UW Center for Teaching and Learning. Scholarships are available through the WWRC and class size is limited. For further information call (307) 766-6381.

Conserv 90

Conserv 90, a national conference and exposition on Water Supply Solutions for the 1990s will be held in Phoenix, Arizona, August 12-15, 1990. The

Conference will feature presentations, workshops, panel debates, and software demonstrations on water use, water conservation, drought management, planning and water transfers. Conference sponsors include the American Society of Civil Engineers, American Water Resources Association, American Water Works Association and the National Water Well Association. Dr. Ari Michelsen, WWRC Associate Director of Technology and Information Transfer, is co-author of a paper about evaluating the impact of water conservation programs to be presented at the conference. For more information on Conserv 90, call (614) 761-1711.



Pesticide Conference

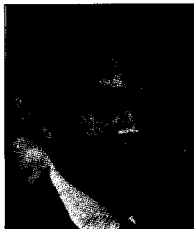
A national research conference, "Pesticides in the Next Decade: The Challenges Ahead," will be held November 8-9, 1990, in the Hyatt Hotel, Richmond, Virginia. Sponsored by the Virginia Water Resources

Research Center, the Virginia Polytechnic Institute and Virginia State University, the Conference will cover such topics as: Pesticide monitoring in soil, air, and water; Bioaccumulation of pesticides; Waste disposal techniques for pesticides; Pesticides in drinking water and food; Society's role in evolving pesticide policy; Alternatives to pesticides; and Economic incentives for farmers to modify current practices. Further information is available by calling (703) 231-5624.

Lakes Conference

The International Water Resources Association has issued its final call for abstracts for the Fourth International Conference on the Conservation and Management of Lakes in Hangzhou, China, on September 5-9, 1990. In addition to the main topics of the conference, two special sessions will focus on the interaction of scientists, citizens, and local, national, and international agencies in lake management. Further information is available from: International Water Resources Assn. University of Illinois 205 North Mathews Avenue Urbana, IL 61801.

WWRC FOCUS



Dr. Katta J. Reddy

Dr. Katta J. Reddy is a Research Associate at the Wyoming Water Research Center and he holds an appointment as an Adjunct Assistant Professor in Plant, Soil and Insect Sciences at the University of Wyoming. Dr. Reddy's research since joining the WWRC, has concentrated on examining and modeling geochemical interactions in energy-related solid wastes such as fly ash, coal mine spoils, and spent oil shales. His recent research has included movement of calcite ion products in soils, solubility and availability of selenium in soils, and development of chemical and biological methods to reclaim alkaline solid wastes. He has authored more than 25 technical reports and publications.

Dr. Reddy earned his Ph.D. in agronomy (soils) at Colorado State University, Fort Collins, CO, in 1986. His dissertation research examined the solubility, mobility and plant uptake of toxic elements in retorted oil shales. He holds an M.S. in soil chemistry, which he received in India in 1980, and a B.S. in agriculture which he received in 1977.

Dr. Reddy (K.J.) came to the University of Wyoming because of its reputation as a leader in fossil energy research. He especially enjoys the camping and fishing opportunities in the nearby Snowy Range.

Water Under the Bridge

One hundred years ago Cheyenne City Engineer, Mr. Miller, called the attention of the city council to the "fearful waste of water in Cheyenne." From May 1, 1988, to September 1 of the same year 2,000,000 gallons were used daily. This was 250 gallons per capita every 24 hours, or 75 gallons more than the daily water use per capita in Washington, D.C. Mr. Miller said the water was wasted primarily by persons who irrigated lawns and gardens, but he wondered if people were tapping into city water lines to steal water from the city. The city water committee was instructed to investigate the matter.

One hundred years later, the city of Cheyenne supplies an average of 12,000,000 gallons of water per day (gpd) to consumers and has the capacity to produce 39,000,000 gpd. Average water use per capita in Cheyenne, including commercial and industrial use, is still around 250 gallons per day.

Although detailed water use data is not available for Cheyenne, meter data from other cities along the front range (Fort Collins and Denver, Colorado) show that residential (excluding commercial and industrial) water use averages 160 gpd per capita. Indoor use accounts for about half (49 percent) of this amount. The breakdown on indoor water use per person as reported by the American

Water Works Association is 27 gpd for toilets, 17 gpd for laundry, and 14 gpd for showers. Most of the remainder is used in sink faucets, baths, and dish-washing.

Wyoming ranks fourth among the states in daily domestic water use per capita, according to the USGS. Only Idaho (282 gpd), Utah (217 gpd) and Nevada (215 gpd) have higher rates of water use per capita. States with the lowest water use per capita are Ohio (53 gpd), Wisconsin (54 gpd) and Oklahoma (56 gpd). Rising water supply-and-treatment costs and water shortages are causing many communities to implement water conservation programs. How much water do you use?

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