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Majority of Livestock Waste Lagoons Pose No Risk to Groundwater Pollution

by Steve Ress,
UNL Water Center

Good news for Nebraska livestock producers: a recent University of Nebraska study indicates livestock waste lagoons may not be significant contributors to groundwater pollution.

"This is particularly significant because of agriculture's importance to our state and to the public, considering roughly 85 percent of Nebraskans drink groundwater," said research hydrochemist Roy Spalding, director of UNL's Water Sciences Laboratory (WSL).

Scientists at the WSL and UNL Department of Agronomy and Horticulture graduate student Mariappan Sadayappan recently completed a two-year study of 13 livestock waste confinement facilities in eastern and central Nebraska. Their study was designed to determine indicators of waste lagoon seepage and evaluate the impact these lagoons might have on groundwater quality.

The samples they collected were analyzed for nitrate-nitrogen, ammonia-nitrogen, chloride, dissolved organic carbon and total organic carbon.

Large groundwater concentrations of chloride and ammonia, in particular, are prime indicators of groundwater pollution from livestock waste lagoons, Spalding said.

Samples also were analyzed for nitrogen isotopes, which can help discriminate between potential nitrate sources to water, such as from fertilizer, animal waste or naturally occurring soils.

In a couple of the lagoons, the N-isotopes did not have characteristic high values that normally occur in animal waste accumulations, Spalding said. The upshot of this was that in order to eliminate confusion, N-source evaluation projects should require isotopic analysis of both the lagoon waste

nitrogen and nitrate and/or ammonia in the groundwater water downgradient from the lagoon, Spalding said.

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FISHING FOR LAGOON TROUT? Research Assistant Professor Glen Martin and graduate student Mariappan Sadayappan sample a confined animal feeding operation (CAFO) waste lagoon as part of a two-year UNL Water Sciences Laboratory study to determine whether CAFO lagoons contribute to groundwater pollution (photo: Jeff Toavs).

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Annual NIWR Meetings Focus on Research Funding Sources; Planning Continues for July Water Tour

from the DIRECTOR



J. Michael Jess

Enactment of the federal Water Resources Research Act in 1964 prompted many colleges and universities to create organizations like Nebraska's Water Center. Presently, 54 water centers or Water Resource Research Institutes (WRRI), as some prefer calling them, are located in each state, plus the District of Columbia, Puerto Rico, the Virgin Islands and Guam. Initially, the mission of most water centers was narrow. Using funds made available from the U.S. Geological Survey (USGS), they supported multi-year research, education and information transfer projects

focused upon state and regional priorities.

Later, many water centers identified other funding sources. Most of them now administer a variety of activities supported by public funds, by private-sector contracts and philanthropy. Continued USGS funding support permits leveraging of other funding sources and is an important component for most water centers.

Federal funding to support the 1964 Act, and in turn the efforts of water centers, was a frequently mentioned topic at the March 3-5 meeting of the National Institutes for Water Resources (NIWR) in Washington, D.C. Prompting the discussion was concern for continued funding for water resources research. The 36 water center directors attending these meetings were especially dismayed to learn that the collective success of water centers was the reason White House officials cited when asked why funding for them was entirely omitted from recommendations recently forwarded to Congress.

In response, the directors rode buses to Capitol Hill and lobbied members of their respective Congressional delegations. Later that day, directors reported generally favorable reactions to their pleas for support. Because federal spending decisions will not be known until late summer, the ultimate success of these lobbying efforts will not soon be known.

Those attending the NIWR meetings also heard federal agency speakers discuss future trends in federally supported research by colleges and universities. For example, one speaker referenced homeland security, and he said his agency is expected to fund research aimed at safeguarding public water supplies and similar objectives.

In conjunction with new regulatory requirements for arsenic and other carcinogens, a U.S. Environmental Protection Agency representative said research funding supported by the EPA will likely emphasize infrastructure and "affordability" issues being faced by officials in small communities. Continued research funding for innovative water conservation and re-use was mentioned by several speakers.

When referring to a changed emphasis originating in the Office of Management and Budget, several speakers said they foresee a shift away from traditional sources of research funding. It was said reasons for the shift are based upon a desire to emphasize short-term research endeavors over commitments which extend over long periods of time. As a substitute for diminished funding of agencies such as those under the Department of Interior and the Department of Agriculture, they pointed to an increase in funding for

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WATER CURRENT

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Meet the Faculty

Steven S. Sibray

Associate Geoscientist/Hydrogeologist, University of Nebraska Panhandle Research and Extension Center, Scottsbluff. UNL Conservation and Survey Division since 1989.

Education:

BS, Geology, University of California-Davis, 1972
MS, Geology, University of New Mexico, 1977



Steve Sibray

Current Programs:

- Currently working with the U.S. Geological Survey and North Platte Natural Resources District (NRD) studying the chemistry and age of groundwater in the Pumpkin Creek Valley.
- Helping NRDs establish a groundwater monitoring well network. This work consists of logging test holes with borehole geophysical equipment, which gives us a much better idea of the subsurface geology. This helps in selecting the different depths to be tested at each site.

Past Programs:

- Using water chemistry and isotopes in order to determine the extent of groundwater recharge from leaking irrigation canals in the North Platte Valley. Research has demonstrated unlined irrigation canals are a significant source of recharge and that lining the canals would have a negative impact on groundwater supplies in the North Platte Valley.

- Investigating fracture zones in the Brule formation. The Brule Formation is a siltstone and usually does not produce much water unless it is fractured. Modeling the hydraulic behavior of the Brule Formation during pump tests has shown that the fracture zones are horizontal to sub-horizontal and can transmit large quantities of water with little drawdown.

Outreach Programs:

- Providing public information on the distribution and quality of groundwater supplies in the Nebraska Panhandle. Collecting data on the characteristics of our groundwater supplies. Recently used old oilfield logs to help locate a source of water at a depth of 730-feet for a landowner in Kimball County. Prior experience in the petroleum industry has helped in this effort. In addition, previous experience in the uranium mining industry has

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Dr. Blair Siegfried

Professor in the Department of Entomology (11 years), University of Nebraska-Lincoln.

Current Research:

Insecticide resistance: Resistance to insecticides has been identified as the foremost problem facing applied entomologists today. Because of the exponential increase in the number of resistant insect pests and the ever increasing costs associated with development of new compounds or



Blair Siegfried

new technologies, the practice of switching to a new insecticide when resistance develops is no longer a viable option to the pest control industry. This research area is particularly relevant given the recent introduction of transgenic insecticidal crops for pest control. In many respects, this technology represents one of the most significant advances in pest management technology in the last four decades. However, the potential economic and environmental gains associated with this technology are compromised by the threat of resistance development. Specific research projects in my laboratory focus on the biochemical and genetic basis of insecticide resistance among major crop pests of Nebraska. Additionally, my laboratory has been involved with insecticide resistance monitoring programs designed to identify and quantify resistance among major insect pest species such as the European corn borer and western corn rootworm.

Aquatic toxicology: A second major area of my research program concerns

the effects of agrochemical contaminants of surface waters on non-target organisms. Specifically, this work examines the biochemical and physiological mechanisms that determine sensitivity of aquatic organisms to pesticide contaminants. Increased awareness of the mechanisms of sensitivity and selective toxicity is critical to the decision process used to register new compounds and will allow more informed regulations to be formulated. Current research projects involve identification of the mechanisms of selective herbicide toxicity in freshwater algae. Herbicide contamination of surface waters has reached epidemic proportions, yet there is little information on the effects of these contaminants on aquatic ecosystems. Through a collaboration with Dr. Kyle Hoagland (UN-L, SNRS) we have established that various components of the algal community respond to herbicide exposure differentially which could affect the species composition of aquatic ecosystems exposed to herbicide contamination.

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Do Upstream Landowners Sacrifice Too Much For Downstream Protection?

by Stan Staab,
General Manager,
Lower Elkhorn NRD

Watershed and flood prevention have endured a long and dramatic history in Nebraska. The devastating Republican River Basin floods in 1935 killed 113 and caused an estimated \$26 million (\$800 million in 1997 dollars) in property damage, leading to construction of Harlan County Reservoir and several smaller dams in southwest Nebraska.

Gavins Point Dam, built in the early 1950's as the last downstream component of the massive federal Pick-Sloan Plan for the Missouri River, seemed to signal the demise of big dams for flood control although other large projects including Lake McConaughy and Calamus were constructed for irrigation.

Public support and passion for big dams seems to have passed, although the public continues to demand more lakes for recreation.

Today, environmental concerns for endangered species, funding difficulties and landowner resistance have drastically altered the controversial business of flood control and dam building. Building dams of any size is not impossible, but projects require more time and patience than ever. Working with affected landowners is the key and cannot be overstated.

The most asked question however, is whether upstream landowners give up more than necessary to appease downstream neighbors who suffer from loss of property and livelihood, not to mention potential loss of life, is difficult to answer.

The answer is often a moral dilemma, which lies within the conscience of the individual. How much is too much?

Flood control is something most people take for granted, especially after storms have passed and dry times return.

Traditionally, the U.S. Army Corps of Engineers has been charged with planning and funding major flood control projects including Harlan County Reservoir and Gavins Point Dam. Though still true, the Corps now tends to focus on larger, national projects. The U.S. Department of Agriculture - Natural Resource Conservation Service (NRCS) has assisted with planning/design of nearly 900 watershed dams. Most of these emerged from the PL 566 Program, known as the National Watershed Protection and Flood Control Act of 1954. Nebraska has nearly 900 of these mid/small dams in 55 watersheds. Only watersheds under 250,000 acres are eligible for PL 566 dams and once abundant federal funds have nearly evaporated, leaving the dam business to state and local government.

Nebraska's Natural Resource Districts (NRDs), unique nationally since 1972, are considered by many

to be watershed management models, acting as the most efficient entities to address flooding problems. NRDs have locally elected boards representing both rural and urban interests. Since flood control and development of water-based recreation is the responsibility of each NRD, individual NRD's can better respond to local concerns.

Many landowners now rely on NRDs for planning, funding assistance and local sponsorship to complete projects in problem watersheds.

It now seems dam building tests the skill and endurance of every elected NRD board and staff member if a project is to be completed. Several years (5-10) are not unusual to finish even a small project and larger dams/reservoirs can take decades to complete.

Why does it take so long? Cooperation and secured funding are keys, although many other factors enter into a NRD's decision to build a project.

Many NRD's face constant political pressure to protect life and property after major flood events. In response to demands by private and public sectors, NRD's across Nebraska have developed strategies to cope with the challenge of building dams, but all projects are remarkably similar.

A definite process must be followed by NRD's for each project.

This begins with a request from those affected or interested in investigating a potential site. The request is normally followed by at least one (and often several) public meeting with landowners and citizens. Later, the NRD board recommends a feasibility study to determine if the proposed dam site is suitable. Major factors include geology and hydrology, economic viability and environmental acceptability, as well as public support.

But what does it all cost ?

An engineering study helps board members make a sound technical decision. However, that decision is often made difficult by opposing landowners applying pressure in any way possible, including via lawsuits. All NRDs reserve the right of eminent domain, the power to acquire land rights, if necessary. This authority is used sparingly and with great caution. Approval of dams is often the most difficult decision NRD board members make because they must weigh upstream landowner rights against downstream flood damage.

Flood protection is especially difficult in eastern Nebraska. Storm events of six to 10 inches of rain are not uncommon, while rolling terrain and relatively light soils magnify runoff and erosion. Many watersheds have potential sites for large and small dams, but the majority of the land is privately owned and the usual response from landowners after initial investigation is...."That's a great idea, just build YOUR dam on someone else's land."

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The U.S. EPA on Water-Supply Security

Below are frequently asked questions we (the EPA's Office of Water) have been receiving concerning drinking water safety:

Q: Is the nation's drinking water supply safe from terrorist attack?

In general, the threat of contamination of drinking water through terrorist activities is small. Most contaminants would need to be used in very large quantities, thereby minimizing an actual threat. Treatment processes already in place will deactivate many contaminants. Also, following the tragic events of Sept. 11, 2001, drinking water utilities across the nation were alerted about the need to increase security and have augmented surveillance and protection measures.

Q: What kinds of threats or terrorism are there to drinking water?

The primary threats to the nation's drinking water supplies are contamination by chemical, biological or radiological agents; damage, destruction, or sabotage of physical infrastructure; and disruption to computer systems. Generally, biological agents considered to be weapons of mass destruction pose the most danger in aerosol form (i.e., direct exposure to pathogens transported in the air).

Q: What is EPA doing to protect the drinking water supply?

EPA is working in partnership with state and local governments to protect the nation's drinking water supply from terrorist attack. Under Presidential Decision Directive (PDD) 63, issued in May 1998, EPA was designated as the lead agency for the water supply sector. The following is a brief description of the activities that have taken place since that directive:

- In September 1998, the agency established a public/private partnership with water-related organizations and subsequently appointed Diane Van de Hei executive director of Association of Metropolitan Water Agencies (AMWA), as the water sector liaison to the federal government on critical infrastructure.
- Over the past several years, EPA and its partners have developed training for utilities on how to assess vulnerabilities, determine what actions need to be taken to guard against attack and develop emergency response plans.
- In October 2001, the Water Protection Task Force was established to ensure that activities to protect and secure water supply infrastructure are comprehensive and are carried out expeditiously.
- In October 2001, EPA Disseminated to America's water utilities useful information about steps they can take to protect their sources of supply and their infrastructure. Working with the FBI, EPA also sent notice to local law enforcement agencies asking them to work closely with their local water utilities to provide extra security.
- EPA is working with Sandia National Labs and AWWA to develop training materials for water companies to help them conduct thorough assessments of their vulnerabilities.

Q: Is bottled water safer than water from the tap?

Bottled water is not necessarily safer from terrorist attack than your tap water. Bottled water is valuable in emergency situations (such as floods and earth-

quakes), and high quality bottled water may be a desirable option for people with weakened immune systems. In most cases, bottled water comes from a water source just like water from your tap. The safety of bottled water depends on the safety and emergency response plans in place at the bottling plant. Tap water is protected at the drinking water facility through local security measures advocated and supported by EPA, state and local governments, as well as state and local-based water organizations.

Q: Will boiling water help?

Boiling water is effective in removing certain contaminants. When microorganisms, like those that indicate fecal contamination, are found in drinking water, water suppliers may be required to issue boil water notices. Boiling water kills these organisms that can cause disease. However, boiling water containing certain contaminants, such as lead and nitrate, will increase the concentration and the potential risk. It is best to check with your local water utility or health department to determine if boiling water is necessary.

Q: Could a small amount of biological or chemical agent introduced into a source of drinking water contaminate a whole city's drinking water supply?

Not likely. Over the year, EPA, with other federal experts at the Centers for Disease Control and the Department of the Army, have studied chemical and biological threats to water. We have consistently found that it would take very large amounts of a contaminant to threaten the safety of a water system. Because of increased security at water reservoirs and utilities around the country, and because people are being extra vigilant as well, it would be difficult for someone to introduce

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UNL water sciences student Leah Bomberger (left) and Water Center secretary Tricia Liedle (center) help fifth graders paint fish as part of a Water Center presentation on Nebraska game fish and water quality at last month's Children's Groundwater Festival in Grand Island (photo: Steve Ress).

From the Director (continued from page 2)

research programs falling under the umbrella of the National Science Foundation.

On the back page of this edition of the newsletter, note that we have printed the annual reader survey. Your critical answers to these questions are of considerable importance to the shape and content of this publication. Please take the time to answer the questions and return the survey to our offices.

I also want to take the opportunity to thank all of the guest columnists and writers that have given so freely of their time, talents and knowledge in penning

articles for recent issues of this publication. You have helped make it a broader and better publication and we will undoubtedly be contacting more of you for your inputs to future issues.

Planning for the annual July water and natural resources tour continues and you will soon be receiving information and registration mailings from the Kearney Area Chamber of Commerce. If you do not receive these mailings and are interested in being part of the tour, please contact Steve Ress at (402)472-3305 or email sress1@unl.edu.

Majority of Livestock Waste Lagoons Pose No Risk to Groundwater Pollution

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The UNL scientists found that "The majority of waste lagoons in the study have not adversely impacted groundwater quality," Spalding said. Ten of the 12 active lagoons they sampled did not appear to contribute to groundwater pollution in their immediate vicinity and three of the lagoons "Probably contributed to a reduction of high nitrate levels in the area around them," he said.

Groundwater beneath only two of the sampled lagoons showed evidence of elevated ammonia and nitrate levels from lagoon leakage. Both are located where the depth to groundwater was less than 35 feet and where soils are coarse and permeable (silty and sandy).

Lagoon seepage water from 10 lagoons appeared to stimulate denitrification because of high dissolved organic carbon, oxygen-poor conditions beneath them, he added.

"Though it appears a majority of the examined lagoons have not contributed to groundwater pollution, we can't be complacent since there are still documented cases where these facilities can have negative impacts on groundwater quality," he said; "That makes it important to carefully review each facility in order to better understand the possible effect it might have on groundwater pollution."

The WSL also sampled all but two of the sites for antibiotics commonly used in feed or water additives for swine and cattle. These

included oxytetracycline, tetracycline and chlortetracycline. Groundwater samples showed no detectable levels of these antibiotics even though traces of at least one of the three were present in 23 of the 26

individual samples collected from the 13 waste lagoons.

There remains a wide range of factors that must be considered before all livestock waste lagoons can be declared innocent of contributing to groundwater pollution, however.

Their impact on groundwater quality depends on site specific conditions of each lagoon, for example, depth to groundwater, geology and soil type and extent of groundwater use in the immediate vicinity are all factors.

The Institute of Agriculture and Natural Resources research laboratory conducted the two-year study in cooperation with the Nebraska Department of Environmental Quality (NDEQ), which is tasked with developing and implementing programs to manage storage, handling and application of animal wastes associated with livestock operations.

NDEQ reviews new permit applications, and requests for modifications to existing permits, to determine whether groundwater at the site needs to be monitored for possible pollution.

Operators of 13 confined animal feeding operations volunteered for the UNL monitoring study, which began in 1999 and ran through 2001. The facilities represented both cattle and swine operations. They varied greatly in size and environmental settings. All but one were being actively used.



UNL Water Sciences Laboratory Research Technician Jeff Toavs uses a Geoprobe to gather groundwater samples near a confined animal feeding operation (CAFO) waste lagoon as part of a UNL Water Sciences Laboratory study to determine livestock waste lagoon contributions to groundwater pollution. Lagoons and the groundwater near them were sampled for a wide variety of potential pollutants (photo: Mark Burbach).

The Proposed Nebraska New Depletions Plan

by J. David Aiken and Jim Cook

The proposed Nebraska New Depletions Plan (NDP), the current draft of which is discussed below, is one element of a program being developed by the State of Nebraska, natural resources districts, water users and others as part of a Proposed Recovery Program for Platte River endangered species.

Development of the Proposed Program is taking place pursuant to a Cooperative Agreement that was signed July 1, 1997 by the states of Wyoming, Colorado and Nebraska, and by the federal Department of Interior.

Cooperative Agreement

Before describing the details of the draft NDP, it is important to outline another element of the Proposed Program. That is a plan to reduce shortages to what are called "target flows." Those flows have been established by the U.S. Fish and Wildlife Service (FWS) as the flows needed to produce and maintain habitat for the endangered species. While the states have not agreed that those flows are scientifically required to provide habitat for the species, they have agreed that, in order to have a basinwide program, improvements in flows will need to occur.

They have also agreed to implement three initial water projects that collectively will provide 80,000 acre-feet in shortage reduction to the FWS "target flows." An Environmental Account in Lake McConaughy is Nebraska's project; it has been operating since 2000 and has been a significant factor in maintaining flows in the Platte in the Lexington to Chapman reach during the dry summers of 2000 and 2001.

In addition to those three initial projects, the Cooperative Agreement also provides for another 50,000 to 70,000 acre-feet of shortage reduction by the end of the first 13 year increment of the Proposed Program. A reconnaissance level water action plan identifies a variety of water management projects and programs to accomplish that additional shortage reduction, including water storage, timing changes in streamflows, improving irrigation water use efficiency, ground water recharge, power interference and leasing water rights from irrigators.

Nebraska New Depletions Plan

The draft NDP is intended to be Nebraska's response to the portion of the Cooperative Agreement which was included to prevent further depletions to the FWS "target flows" while the parties are working collectively to reduce the current shortages to those flows. To accomplish that, each of the three states is developing its own new depletions plan. Those plans are to either prevent or mitigate for "target flow" depletions that are caused by water uses begun on or after July 1, 1997.

Both (1) new and expanded surface water uses, and (2) new or expanded hydrologically-connected ground water uses that affect habitat streamflows would be covered by the plans. An important component of the proposed Nebraska NDP is the identification of the geographic areas within which well pumping would result in streamflow depletions. A COHYST study (Cooperative Hydrology Study) funded in part by the Environmental Trust Fund is being conducted to identify those geographic areas. Initial results from that study are expected this summer or early fall.

Before decisions can be made on the adoption of Nebraska NDP by the state, the natural resources districts (NRDs), and others, that plan will be the subject of much discussion within the state. This article provides a very brief overview of the proposed NDP in its current form; it is subject to change at any time.

Depletion offsets

Under the draft Nebraska NDP, the state of Nebraska would assume responsibility for offsetting depletions to the target flows caused by water uses initiated between July 1, 1997 and December 31, 2003. However, for new water uses begun on or after January 1, 2004, the offset responsibility would be divided between the state and those responsible for the new water uses, whether they be for irrigation, municipal or industrial purposes. Beginning then the new water user would be responsible for any offset needed to replace depletions to Nebraska "water right flows."

Those are the flows required to satisfy the demand for water by then existing Nebraska water rights including Nebraska's instream flow appropriations. To the extent that the user-provided offsets for depletions to the "water right flows" did not fully offset all the depletions to the FWS "target flows" (which are generally greater but have no official recognition in Nebraska's water rights system), the State of Nebraska would assume responsibility for the additional offset water needed.

Streamflow Depletion Zones

The draft NDP identifies what might constitute zone 1 for hydrologically-connected wells depleting Platte River streamflow. Zone 1 is currently defined as the area where 90% of the hydrologically-connected ground water pumped in 24-hours would show up as Platte River streamflow depletions within 48 hours. Wells in zone 1 would be treated as surface water diversions under the draft NDP, and would be ordered to stop pumping during periods when streamflows fell below the Nebraska "water right flows" unless their depletions to those flows were offset. Under the Nebraska appropriation system, surface water users are and would continue to be treated in a similar manner.

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Meet the Faculty

Steven S. Sibray (continued from page 3)

been helpful in answering questions concerning the in-situ uranium mining operations near Crawford.

Recent Publications:

— *Scotts Bluff County Test-Hole Logs*, Steven S. Sibray and Frank A. Smith, Nebraska Water Survey Test Hole Report No. 79 (Sept. 2000) Sept. 2000

Dr. Blair Siegfried (continued from page 3)

We have also initiated studies to determine the physiological and biochemical basis of these different responses. Because freshwater algae are the most important primary producers in aquatic communities and form the base of aquatic food webs, an understanding of the effects of herbicide contaminants is essential to understanding their effects at a community level.

Teaching:

- **Insecticide Toxicology:** Study of the principles of toxicology as they relate to insecticides and insect pest species. Emphasis on insecticide classification, mode of action, metabolism and environmental consequences of insecticide use. This course was also delivered via distance education in 1998 and 2000.
- **Insecticide Toxicology Laboratory:** Introduction to laboratory techniques relevant to the bioassay, quantitative analysis and toxicokinetics of insecticides.
- **Toxins in the Environment:** An introduction to the principles of toxicology as they apply to environmental contaminants, emphasizing agrochemicals, but also including industrial and naturally occurring chemicals.
- **Ecology and Evolution of Pesticide Resistance:** Introduction to biochemistry and genetics of insecticide resistance and tactics proposed for managing resistance.

The U.S. EPA on Water-Supply Security

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the quantities needed to contaminate a system without being detected. In addition, should a contaminant be introduced, the treatment system already in place for treating drinking water before it comes out of the tap will, in many cases, remove the immediate threat to public health.

Q: If a terrorist attack on my water supply is carried out, how will I know? Will I be able to tell if my water is contaminated?

In the unlikely event of an attack on your water system, the drinking water utility would activate its existing emergency response plan with local law enforcement and state emergency officials. These plans provide for shutting down the system, notifying the public of any emergency steps that need to be taken, like boiling water, and providing an alternative source of water, if needed. Follow the advice of your water supplier if you receive notice of a threat.

— *Delineating Ground Water Recharge from Leaking Irrigation Canals Using Water Chemistry and Isotopes*, F. Edwin Harvey and Steven S. Sibray, *Ground Water*, Vol. 39, No. 3 p 408-421 (May-June 2001).

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Selected Publications:

- Tang, J. and B.D. Siegfried. 1996. Bioconcentration and uptake of a pyrethroid and organophosphate insecticide by selected aquatic insects. *Bull. Env. Cont. Toxicol.* 57: 993-998.
- Tang, J., K.D. Hoagland, and B.D. Siegfried. 1997. Differential toxicity of atrazine to selected freshwater algae. *Bull. Env. Contam. Toxicol.* 59: 631-637.
- Siegfried, B.D., M. Ono, and J.J. Swanson. 1997. Purification and characterization of a carboxylesterase associated with organophosphate resistance in the greenbug, *Schizaphis graminum* (Homoptera: Aphididae). *Arch. Insect Biochem. Physiol.* 36: 229-240.
- Tang, J., K.D. Hoagland, and B.D. Siegfried. 1998. Uptake and bioconcentration of atrazine by selected freshwater algae. *Env. Toxicol. Chem.* 17: 1085-1090.
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- Nelson, K.J., K.D. Hoagland, and B.D. Siegfried. 1999. Chronic effects of atrazine on tolerance of a benthic diatom. *Environ. Toxicol. Chem.* 18: 1038-1045.
- Miota, F., B.D. Siegfried, M.E. Scharf, and M.J. Lydy. 2000. Atrazine induction of cytochrome P450 in *Chironomus tentans* larvae. *Chemosphere.* 40: 285-291.

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Q: What should I do if I see someone or something around my drinking water supply that looks suspicious?

As soon as possible, contact your local law enforcement authorities, or 911 to report a suspicious event, or if you witness a perceived terrorist activity. Remember, the more facts that you can provide, the quicker the response time. Please, be prepared to provide detailed information to help the authorities as much as possible.

For more information:

Safe Drinking Water Web Site www.epa.gov/safewater/
Safe Drinking Water Hotline (800)426-4791
Drinking Water Basics

www.epa.gov/safewater/dwhealth.html

Local Drinking Water information

www.epa.gov/safewater/dwinfo.htm

Centers for Disease Control and Prevention

www.cdc.gov/

The Proposed Nebraska New Depletions Plan (continued from page 6)

Additional streamflow depletion zones would be established where streamflow depletions would be less. For example, in zone 2, the specified streamflow depletion effect might be that felt within 7 days; in zone 3 the time period could be one month; in zone 4, three months, and so forth.

The draft NDP does not identify the criteria for establishing zones beyond zone 1; however, it does indicate that the zones will need to extend out to at least the locations where pumping wells at those locations for 40 years would cause a depletion to the stream of 28% of the amount pumped.

Offset Options

Ground water irrigators who are within a streamflow depletion zone could offset the depletion effect of their pumping in a number of ways. Nebraska is reserving part of the water yield of some of its water action plan projects to provide water for depletion offsets and some of that water may be available to offset new uses begun after January 1, 2004. Also, a ground water irrigator could retire a specified number of irrigated acres to offset the irrigator's own pumping.

For example, irrigator A in zone 2 irrigating 130 acres with a 2004 well might be allowed to satisfy his offset requirement by paying irrigator B within zone 2 to stop irrigating irrigator B's 130 acres. Another possibility would be to allow the ground water irrigator (or a group of ground water irrigators) to purchase stored water that could be released when needed to meet water right flow requirements. A third option would be purchasing or leasing water rights from surface irrigators or other surface appropriators to meet offset requirements. Buying or leasing water rights would require new legislation.

NDP administration. Under the Nebraska Ground Water Management and Protection Act, Natural Resources Districts (NRDs) may implement a wide variety of ground water regulations to deal with conflicts between surface water users and ground water users and would be responsible for implementing the part of the NDP requiring new users of hydrologically connected ground water to offset the impacts of their new use on the Nebraska "water right flows." The Nebraska Department of Natural Resources would be responsible for administering the surface water portions of the plan and likely would be responsible for additional offsets required to prevent depletions to FWS "target flows" and for monitoring the success of the program overall.

Commentary

COHYST study results indicating the location of streamflow depletion zones will generate considerable discussion. The proposed state offsets for July 1, 1997-December 31, 2003 new or expanded Platte streamflow depletions is very appropriate, given the technical difficulties in establishing depletion zones and developing effective offset strategies. The Cooperative Agreement offset requirement represents a dramatic new chapter in Nebraska water law. Next month's Water Current will include an article exploring how water leasing, water banking, and similar water management options may facilitate meeting Cooperative Agreement offset requirements.

(Editor's Note: J. David Aiken is a UNL Water & Ag Law Specialist. He can be reached at (402)472-1848 or daiken@unl.edu. Jim Cook is Legal Counsel, Nebraska Department of Natural Resources. He can be reached at (402)471-3930 or jcook@dnr.state.ne.us).

Do Upstream Landowners Sacrifice Too Much For Downstream Protection?

(continued from page 5)

Watershed projects are more than dams. If funding is obtained from the Nebraska Department of Natural Resources, 75 percent of the land above the dam must be covered with land treatment. Erosion practices may include terraces, waterways and conservation tillage, reducing the amount of soil runoff, increasing project life. Additional funding may be obtained from several sources, including the Nebraska Game and Parks Commission (NGPC), Nebraska Department of Environmental Quality and the Nebraska Environmental Trust Fund, and local NRD funds.

Today's dams are more environmentally friendly than ever because the federal Endangered Species Act requires projects to address fish and wildlife interests. Wetlands are often incorporated in backwaters to reduce silt loads, enhance wildlife and mitigate acres from other projects. In-stream target flows in the Lower Platte, Elkhorn and Loup River basins must also be met.

Because the cost of larger projects can exceed several million dollars, most are designed for fishing, boating, swimming, picnicing and camping. Many NRD lakes are leased to the NGPC and managed as state parks. Popular hiking/biking trails are often included in designs. Nebraska has nearly 60 of these NRD-sponsored projects.

For many years NRDs have accepted the difficult responsibility of watershed management to protect and enhance water and natural resources. Despite the difficulty of dam building, local stewardship ethics are as strong today as in the past. Many mid-size (100-650 surface acre) projects are now being considered by NRDs. Funding and environmental concerns are the major hurdles, not lack of effort.

Do upstream landowners give up a great deal — YES. Are flood control and multi-purpose projects needed — YES We will move on, as we always have.



Water News Briefs

Schepers Named Water Guardian

The Mid-America Crop Protection Association honored UNL's James S. Schepers with its 2001 Water Guardian Award in February.

Schepers accepted the award at a mid-February meeting of the Nebraska Agri-Business Association in Omaha. The award recognizes his efforts at workshops targeting water quality and the prudent use of fertilizers and pesticides. Schepers is a research leader and supervisory soil scientist, U.S. Department of Agriculture Agricultural Research Service (USDA-ARS) and adjunct professor, Department of Agronomy and Horticulture at UNL.

Student Award

Stefan Kollet, Ph.D. student in the UNL Department of Geosciences, has won an Outstanding Student paper Award for his presentation at the 2001 Fall American Geophysical Union (AGU) meeting in San Francisco, CA. About 9,000 participants attended these meetings.

Kollet presented a paper entitled *Interpretation of Pumping Tests in Unconfined Aquifers: Heterogeneity vs. Drainage Processes Above the Declining Water Table*. The AGU's congratulatory letter on the presentation stated that it set an example for fellow students, as well as the entire AGU membership. Official announcement of the award will be published in an upcoming issue of *Eos*.

Award nominations are submitted by various sections of the AGU. The hydrology section is the largest of these and the award is considered a very prestigious one for graduate students starting academic careers in the geosciences.

Kollet is currently working toward a Ph.D. in hydrogeology un-

der the supervision of UNL Geosciences Professor Vitaly A. Zlotnik. Kollet's research interests include surface-groundwater interactions, experimental and theoretical aquifer hydraulics and quantitative modeling in geomorphology.

Summer Tour

Planning continues for this summer's water and natural resources tour which will follow the North Platte River in three states. The tour is July 22-25, beginning and ending in Kearney.

Tour overnights are in Fort Collins, CO, Casper, WY and Scottsbluff.

Planned stops include Cabela's in Sidney, NU's Panhandle Research and Extension Center in Scottsbluff, Pumpkin Creek near Bridgeport, the headwaters of the North Platte River near Walden, CO, reservoirs along the North Platte River, the Terry Bison Ranch, a new visitors center at Lake McConaughy and others.

Cost is expected to be in the \$400 to \$450 range, depending on final arrangements and motel occupancy. Registration includes all food, motel, and motorcoach expenses.

Registration is through the Kearney Area Chamber of Commerce. Contact them at (800)652-9435 or the UNL Water Center at (402)472-3305 for more information.

Registration information and materials will be sent to past tour participants.

Sponsors are Central Nebraska Public Power and Irrigation District; Nebraska Public Power District; Nebraska Association of Resources Districts, EA Engineering, Science and Technology; Kearney Area Chamber of Commerce; Gateway Farm Show; and UNL's Institute of Agriculture and Natural Resources, Water Center and Conservation and Survey Division.

Water and Natural Resources Seminar

"Current Water and Natural Resources Issues in Nebraska," the UNL Water Center's spring semester series of 13 weekly lectures, will end Wednesday, April 24.

This year's seminar has featured speakers from Maryland, North Carolina and Colorado in addition to a wide range of subject-matter experts from across Nebraska and throughout the University of Nebraska system.

Topics in the free or for-credit

(continued on page 11)



David Admiraal (left), assistant professor in the UNL Department of Civil Engineering, explains the workings of a model of Lake Ogallala that is being used in a multi-disciplinary study aimed at finding solutions to low dissolved oxygen levels in the lake that contribute to fish kills. Admiraal gave the presentation as part of the UNL Water Center's spring semester water and natural resources seminar series (photo: Steve Ress).

APRIL

23-27: "Landscapes in Transition: Cultural Drivers and Natural Constraints," 17th Annual Symposium of the International Association for Landscape Ecology - U.S. Regional Assoc., Lincoln, NE. Contact Jim Merchant at (402)472-7531 or e-mail jmerchant1@unl.edu.

24: UNL Water Center Water and Natural Resources Seminar, "Revision of the Missouri River Master Manual, a panel discussion: Rob Robertson, Nebraska Farm Bureau; and Chad Smith, American Rivers, 3 p.m., Room 116, L.W. Chase Hall, UNL East Campus.

25-27: Third Annual Natural Stream Channel Design Summit, State College, PN. Contact Lesley Moore at (814)768-9584 or lesley.moore@canaanvi.org

MAY

7-8: "Tools for Wetlands and Watershed Protection: A Workshop for Local Governments, Charleston, SC. Sponsored by US EPA Office of Wetlands, Oceans and Watersheds and EPA Region IV. For information or to register online, visit www.horsleywitten.com/epaworkshop or phone (508)833-6600 (ext. 101).

9-10: 29th Annual Conference on Ecosystems Restoration and Creation, Hillsborough Community College, Tampa, FL. Deadline for abstracts is Jan. 31, 2002. For more information, email fwebb@hcc.cc.fl.us or pcannizzaro@hcc.cc.fl.us.

13-15: "Coastal Water Resources," American Water Resources Association Spring Specialty Conference, New Orleans, LA. Contact AWRA at (540)687-8390 or pat@awra.org.

16-18: Ozark-Prairie Regional Society of Environmental Toxicology and Chemistry (SETAC) 2002 Annual Meeting: "Nonpoint Source Pollution in the Urban Environment," Omaha. To submit abstracts or to register, contact Dr. Alan Kolok at (402)554-3545 or akolok@mail.unomaha.edu.

17-21: River Rally 2002, Asheville, NC, the River Network's third annual workshops. Contact Robin Chanay at (202)364-2550 or rivrally@rivernetwork.org.

20-23: Third National Water Quality Monitoring Conference, "Water Quality Monitoring 2002: Building a Framework for the Future," Madison, WI. Sponsored by the National Water Quality Monitoring Council. Go to www.nwqmc.org.

29-June 1: Water Environment Federation's 2002 Collections Systems Conference: "Wet Weather and O&M Water Quality Issues: Planning for the Inevitable," San Francisco, CA. For registration information, go to www.wef.org or phone (800)666-0206.

JUNE

3-7: Forty-seventh Institute in Water Pollution Control, "Water Quality Modeling and Treatment of Contaminated

Waters," Manhattan College, Riverdale, NY. For a brochure and information, contact Nafeeza Altaf, Environmental Engineering Dept., Manhattan College, Riverdale, NY 110471 or email naltaf@manhattan.edu.

JULY

1-3: AWRA Annual Summer Conference, "Groundwater/Surface Water Interactions," Keystone, CO. For information, phone (540)687-8390 or mike@awra.org.

10-13: Energy, Climate, Environment and Water: Issues and Opportunities for Irrigation and Drainage, San Luis Obispo, CA. Contact Larry Stephens at (303)628-5430, email stephens@uscid.org or go to <http://www.uscid.org/-uscid>.

22-25: UNL/Kearney Area Chamber of Commerce Summer Water and Natural Resources Tour. Follows the North Platte

River basin in Colorado, Wyoming and Nebraska. For information or registration materials, phone the Kearney Area Chamber of Commerce at (800) 652-9435 or the UNL Water Center at (402)472-3305.

SEPTEMBER

18-21: Fifteenth Annual Arizona Hydrological Society Symposium, Radisson Woodlands Hotel, Flagstaff, AZ. For information, go to www.AzHydroSoc.org or email Sean.Welch@nau.edu.

NOVEMBER

3-7: American Water Resources Association (AWRA) annual conference, Philadelphia, PA. For information, go to www.awra.org or contact Harriette E. Bayse at (540)687-8390.



Water and Natural Resources Seminar (continued from page 10)

lecture series have covered a range including endangered Tiger Beetles, workings of the Nebraska Environmental Trust, protecting municipal water supplies from terrorism, updates on two interstate water cases, instream flow incremental methodology and a Lake Ogallala dissolved oxygen study.

Special Williams lectures were presented by George Gibson, senior scientist at the U.S. Environmental Protection Agency Laboratory, Ft. Meade, MD and Kenneth Reckhow, director of the Water Resources Research Institute, North Carolina State University, Raleigh, NC.

The annual Kremer Memorial lecture was presented by James

Corbridge, Professor Emeritus, School of Law, University of Colorado, Boulder, CO.

Remaining lectures are press time were "Confined Animal Feeding Operations," Ralph Summers, CAFO specialist, U.S. Environmental Protection Agency, Region 7, Kansas City, KS on April 17 and a panel discussion on "Revision of the Missouri River Master Manual," with Rob Robertson, Nebraska Farm Bureau Federation, Lincoln and Chad Smith, American Rivers, on April 24. Both lectures are at 3 p.m. in Room 116, L.W. Chase Hall on the UNL East Campus.

Time For the Last Word

We want to know what you think.

Please take a few minutes to fill-out and return our annual reader survey. If you do, we will enter your name in a drawing for one of three Water Center coffee mugs. To be eligible for the drawings, return your completed survey by **Friday, June 7** to Steve Ress, UNL Water Center, P.O. Box 830844, University of Nebraska, Lincoln, NE 68583-0844 or FAX it to (402)472-3574. NU subscribers may return surveys via campus mail to 103 NRH, EC 0844. Please mail or FAX the **entire page** (so we have your name for the coffee mug drawings.....your comments, on the other hand, will be held in confidence).

1. Rank in order of importance, the usefulness of the following general areas of the *Water Current* (1 - most important to 7 - least important):

- News Briefs
- Calendar
- Meet the Faculty
- Previews of upcoming events, seminars, conferences, etc.
- Director's Notes
- Articles on water and environmental research
- Guest editorials/columns

2. What articles would you like to see in upcoming *Water Currents*?

3. What are your primary water and environmental interest?

4. Do you read each issue of the *Water Current* you receive?

Yes No

5. Do you circulate your copy of the *Water Current* to anyone else?

Yes (if so, how many others _____)
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6. Should the *Water Current* be distributed

more often less often
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7. Do you like the revised appearance of the *Water Current* and the new two-color logo on the top of the front page?


Yes No

8. Do you ever access the virtual copy of the *Water Current* on the Water Center's web site at <http://watercenter.unl.edu>?

Yes No

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