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Water Current, Volume 22, April 1990

Water Current

Water Center ***University of Nebraska*** **April 1990**

Environmental Studies Part of Geography Department—Jeanne Kay

Earth Day, April 22, 1990, was observed by many geographers as environmental studies is one of the most important topics for the 1990s, the new head of the Department of Geography at the University of Nebraska-Lincoln, said recently. And the Department of Geography addresses many of these concerns in teaching, research and applying scientific expertise.

Dr. Jeanne Kay, geography chair since July, said: "Geography consists of several distinct branches. Human geography is a social science. Physical geography is a natural science. The ground where physical geography and social science meets is environmental studies."

She pointed out that a few of the environmental concerns in geography include:

- How do people relate to their environment?
- How do they use their resources?
- How does the location of natural resources affect their society?

According to Kay many geographers who teach environmental subjects are personally committed to the conservation of the environment. A typical geography department offers a course in the conservation of natural resources.

Where do we find water seeping into this discipline? Four UNL geography faculty teach climatology and meteorology. "Their classes explain how the atmosphere works: for example, if there is a drought, or flood, too much rain or too little rain, and the timing of all of this. People are concerned about precipitation to water our crops and to provide surface water for cities."

Jeanne Kay

Another class, industrial location, points out the importance of the location of water.

Kay has polished her expertise in geographical environmental studies with research that questions human control over nature in the Hebrew Bible (Old Testament). She asks what society's relationship with nature should be and what are the intellectual causes of the current environmental crisis?

Her research demonstrates the Bible's most persistent environmental message is that "God confers human dominion over nature to righteous or

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Twentieth Annual Earth Day Observed April 22

Earth Day was observed April 22 with the theme "think globally, act locally." This was the 20th annual observance of Earth Day. The ground swell of enthusiasm 20 years ago resulted in the passage of the Clean Air Act. This was a beginning. However, the environmental problems that we face today are more far-reaching than we ever imagined.

To commemorate the day and in order to foster conservation of Nebraska's resources, including water resources, year-long, every year, a directory has been produced by the Natural Resources Commission, Nebraska ETV and the Water Center. It will be mailed to you in May.

The goal of this directory that is targeted to educators, is to provide a concise, and up-to-date listing of available educational materials, tours and enrichment. About 15,000 are being distributed to all Class I schools in Nebraska, with a copy to each grade, to science teachers, workshops and through NETV.

Although Nebraskans traditionally have been stewards of the air, soil and

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See pages 4, 5, 6 for Nebraska Water Conference Stories.

(Kay—from page 1)

faithful people; whereas God punishes transgressors with natural disasters like drought."

Kay points out the biblical viewpoint is, in fact, "very different from the twentieth century ecologist's." She summarizes the biblical view as a belief that nature is a tool of divine justice: beneficient nature is a reward for religious observance, and a deteriorating environment is God's punishment for idolatry or immorality.

A woodcut picture taken from a 1555 German broadsheet, the forerunner of newspapers, shows a lightning storm that causes a fire and flood, with accompanying description that "blames citizens for causing the storm by ignoring the word of God."

Kay, a historical geographer, argues that the modern secular environmentalist movement has unknowingly adopted basic values of the Bible's environmental ethic. Examples include belief in an Edenic harmony between pre-technological people and nature and that "immoral" destroyers of nature will be punished through environmental retribution (acid rain, climate deterioration, etc.).

Addressing another concern, Kay laments that general geographical knowledge in the United States "is pretty poor." That's the bad news, she said. "The good news is that it's improving. Part of the problem is that geography became defined as social studies in the public schools around the second World War."

Social studies, she said, is apt to be taught by people with training in history, political science, or economics. Before this, geography was taught as dull memorization of state capitals.

"A certain grounding of geographic knowledge is important to being a citizen and unfortunately, we've lost that."

However, a boost to the teaching of geography has been the National Geographic Society's development of consortiums of university and public school geography faculty. The Society also has workshops for teachers in Washington, D.C., and encourages

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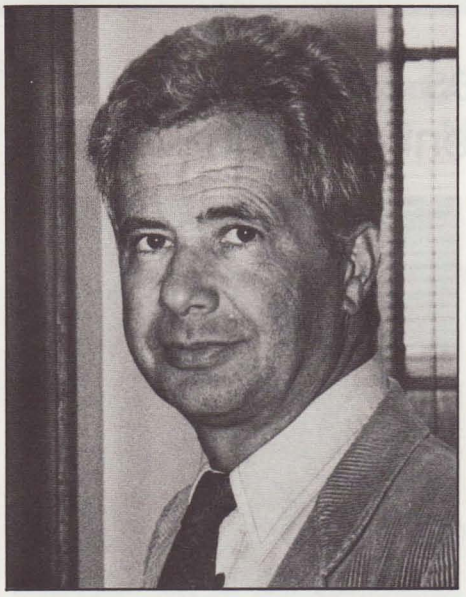
NATO Advanced Research Workshop to be Held at UNL in September

Nitrate Contamination: Exposure, Consequences and Control workshop will be held held at the University of Nebraska- Lincoln Sept. 9-14. This workshop is sponsored by the North Atlantic Treaty Organization (NATO).



Istvan Bogardi

According to the program committee, the motivation for this advanced research workshop is related to the magnitude, the adverse health effects and the high cost of control of groundwater nitrate contamination.

"The nitrate content of water is most important because of the large amount of water that is ingested daily," Istvan Bogardi, workshop director and professor of Civil Engineering at UNL, said. Nitrate in drinking water is the factor most commonly associated with methemoglobinemia, especially in infants, he said.

Also, nitrate intake appears to be a major contributor of gastric nitrite which produces nitrosamines and nitrosoamides, which are etiologic agents for human gastric cancer. In fact, Bogardi said, "Total nitrate intake in 12 counties shows a significant correlation with gastric cancer incidence.

Bogardi said, "The lack of understanding among the three groups of experts: hydrologists, toxicologists and environmental engineers, has often led to ineffective approaches to the control of this environmental hazard."

The mission of this workshop is to provide interaction among these groups and develop an integrated framework for nitrate risk management. This framework will improve the common practice of focusing on just one of the three specialties.

Fourteen major contributors are expected from France, the Netherlands, Portugal, Denmark, Italy, Turkey, Austria, West Germany, in addition to those from the U.S.,

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water, it is the directory's editors' hopes that this directory will provide an enhanced concern and consolidated commitment for our environment.

The National Board of Directors, who say that Earth Day 1990 was one of the first major events of the nineties, have presented Earth Day Solutions.

Among these are "Water Solutions" that include:

—Install sink faucet aerators and water-efficient showerheads; these use two to five times less water with no noticeable decrease in performance.

—Take showers, not baths, to cut water consumption.

—Do not let water run when it's not actively in use while showering, shaving, brushing teeth or hand washing clothes.

—Use ultra low-flush or air-assisted toilets, saving 60 to 90 percent water; composting toilets use no water and recycle organic waste.

—Buy phosphate-free, biodegradable soaps and detergents; ask your supermarket to carry them if it doesn't already.□

(Kay—from page 2)

teachers and university faculty to present local workshops.

The Nebraska Geographical Alliance is just getting off the ground, but the Society has agreed to participate with Nebraska educators with a $10,000 planning grant. This will develop a "better geography curriculum in all levels of Nebraska education."□

(NATO—from page 2)

including Nebraska. Between 20 and 30 representatives of the NATO countries are invited participants.

This conference is funded in part by the Nebraska Water Quality Research Initiative Funds. Co-organizer is Bob Kuzelka, at the Water Center.

More information will be in the next Water Current, or call Kuzelka at the Water Center, (402) 472-3305.□

First Irrigation Day Held February 22

Irrigation Day 1990 has come and gone. And next year's second annual Irrigation Day will recognize irrigators who have helped to make irrigation an "economic treasure," according to Tim Anderson, chairman of the Nebraska Water Coalition.

Anderson, who is also executive vice president of the Holdrege Chamber of Commerce, said, "Irrigation Day Feb. 22 was celebrated to inform Nebraskans about the importance of irrigation to the state." He said that Nebraska is second only to California in total acres that are irrigated, or about 7.9 million acres are irrigated in Nebraska.

"Irrigation raises property values that contribute to higher local tax receipts and the higher production of irrigated areas increases local purchases," Anderson said.

The Nebraska Water Coalition wants to increase agricultural awareness, mainly irrigation agriculture, on a day set aside each year. The coalition was organized last summer to support water-related issues of Nebraska farmers, Anderson said.

Anderson said that in addition to Gov. Kay Orr issuing a proclamation declaring Irrigation Day 1990, communities held observances to reflect the value of irrigation in Nebraska.

"Next November or December the coalition will meet to plan Irrigation Day 1991 and pick several irrigators to honor for their contribution to irrigation," Anderson said.

He said there are about 600 members of the coalition including farmers, ranchers, chambers of commerce, lake-side residents and recreational activists.□

Just Give Us a Call for Water Seminar Proceedings

1989 Water Resources Spring Seminar Series proceedings are available now at the Water Center.

This seminar series that met weekly from January focused on "Water Quality in Nebraska." Presenters were from the Kansas Geological Survey, the USGS of Reston, VA, Texas, state and university experts.

The annual series was coordinated by Roy Spalding, associate director of the Water Center; transcribed by Audrey Schardt, Water Center secretary; and taped and edited by Pat Larsen, Water Center communications associate.

For a free copy of the proceedings, call the Water Center at (402) 472-3305.□

Festival Highlights Importance of Nebraska's Groundwater

The second annual Children's Groundwater Festival March 9 at Central Community College in Grand Island included fourth, fifth and sixth graders from 63 schools in 44 towns across Nebraska.

Twenty-five hundred children participated in 21 classroom activities, 15 exhibit hall displays and nine activities outside the college. There were 15 teacher s exhibits in a teachers' resources room.

Classes stayed for three or four hours and each child received educational brochures, groundwater comic books, a plant-your-own tree kit, groundwater games and Nebraska-produced refreshments.

Included in the 40-activity festival

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Prevention Key to Pollution

by Marc Krasnowsky
The Lincoln Star

Pesticides applied through chemigation seem no more likely to leach into groundwater than pesticides applied through conventional methods, a just-completed five-year study suggests.

What pollution potential exists, said the University of Nebraska researchers who collaborated on the $1 million Burlington Northern Foundation Water Quality Project, comes from the fairly small chance that back-flow prevention devices in the chemigation apparatus will fail.

Study results were presented at the 1990 Nebraska Water Conference. Project coordinator Charles Bourg of the UNL South Central Research and Extension Center in Clay Center said the study evolved from concerns that chemigation—chemical application through sprinkler irrigation systems—might increase the potential for groundwater contamination.

At least 40 percent of Nebraska's center-pivot irrigation systems, estimated to number more than 25,600 in 1987, are used to apply fertilizers and pesticides, Bourg said.

In 1984, the BN Foundation agreed to fund a study whose objective was to preserve groundwater quality while maintaining profitable agricultural practices.

Most of the actual research took place at Clay Center beginning in 1985. Different research teams investigated such issues as chemigation effectiveness, movement of chemicals and chemical residues through variously tilled soils, and whether safety devices actually work.

Another part of the project looked at nitrogen accumulations, based on the amount of fertilizer used, tillage method and corn hybrid type. That study did not concern chemigation.

Extension entomologist Leroy Peters and UNL agronomy professor Patrick Shea studied the effects of chemigation with the insecticide Lorsban and the herbicides Atrazine and alachlor.

Lorsban, Shea said, is the No. 1 chemigated pesticide in Nebraska and the nation. It is used heavily on corn. Atrazine and alachlor are the most-used herbicides.

More than 80 percent of the herbicide residues went no deeper than 2 inches, and 90 percent were found within 4 inches of the surface, Shea said.

Detections and concentrations declined rapidly at lower depths.

The atrazine found deeper in the soil usually had to be measured in "fractions of parts per billion," he said.

Lorsban, which degrades more rapidly than atrazine, posed even less of a groundwater contamination threat: 95 percent of the Lorsban residues were found at depths of 4 inches or less.

Shea concluded that the study "did not support mass leaching (from chemigated pesticides). But that doesn't mean it can't leach through."

UNL agricultural engineering professor William Kranz and his team studied the potential for leakage in chemigation systems. Because a leak would require the failure of multiple system components, Kranz said, "backflow events" probably will occur 2½ times a year, based on 15,000 "chemigation events" a year.

One Lorsban leak could occur in 2 1/2 years, and atrazine could leak from the system only once in 45 years, Kranz said.

Complying with safety regulations is critical explained UNL hydrologist Roy Spalding. Spalding, Water Center associate director, investigated the possibility of removing contamination from an aquifer. He found that chemicals diffuse rapidly in the aquifer. If the contamination is not reported and found within a few days, he said, it will be difficult to find or even to trace to a source.

"There is no need for extensive research into chemigation accidents," Spalding said. "It can't be easily recovered."

The only solution, he said, is "prevention, prevention, prevention."

(This article appears in the Water Current with the permission of The Lincoln Star.)□

Assessment Atlas Now Available

"Water consumers in Nebraska and throughout the country are concerned with the quality of their drinking water and the risk of harmful health effects," the researchers of the *"Occurrence of Pesticides and Nitrate in Nebraska's Ground Water,"* said. Mary E. Exner, a research hydrochemist with the Conservation and Survey Division, University of Nebraska, and Roy F. Spalding, associate director of the Water Center, the authors, claim, "Almost all of Nebraska's 330,000 rural households and 84 percent of the state's public water supplies rely on groundwater to meet drinking water needs.

"Concern for human health is the reason for this assessment of the quality of Nebraska's groundwater," they said. Because of the widespread use of large quantities of nitrogen fertilizers and pesticides and the potential for their contaminating groundwater, Nebraskans are concerned," they said.

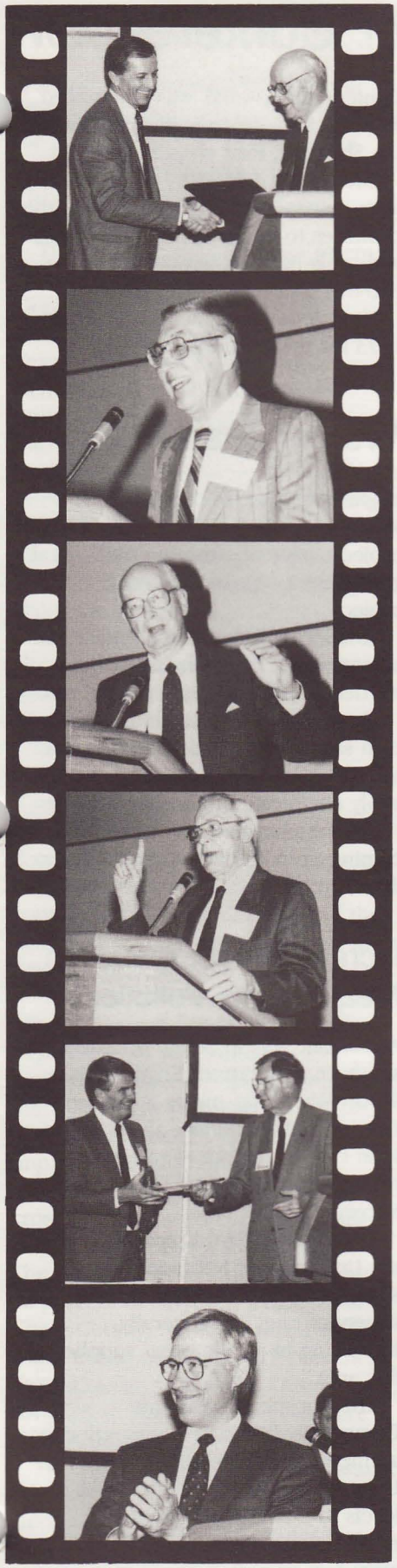
This 34-page assessment based on analysis of pesticide residues in 2,260 groundwater samples and nitrate in 5,826 groundwater samples is now available at the Water Center. The atlas was unveiled at the 1990 Nebraska Water Conference by Exner at one of the first sessions.

Data was provided the authors by the U.S. Geological Survey, the Nebraska Departments of Health and Environmental Control, the Nebraska Natural Resources Districts, and the Lincoln-Lancaster County Health Department. The data base also includes data from the authors' studies.

Nitrate data is from 1984 to 1988 because of the high volume of data. However, pesticide data is from 1975 to 1989. Another factor, the authors said, was the cost of analyses: slightly less than $1 million for the pesticide and $40,000 for the nitrate analyses.

The assessment, complete with three overlays, can be purchased at the Water Center, 103 Natural Resources Hall, University of Nebraska, Lincoln, NE 68583-0844 for $5, add $1.50 for postage. (See page 12 for order form.)□

Water Conference Council Awards



Photos by:
Mark Hansen
UNL Ag Communications

The 1990 Progress Award was presented to the Burlington Northern Foundation by the Nebraska Water Conference Council at its annual awards banquet March 13.

Hal L. Schroeder, awards chairman for the Nebraska Water Conference Council, said, "In October 1984, the Burlington Northern Foundation became the first donor to respond to comprehensive groundwater quality research proposals."

Schroeder said that the 1984 Report and Recommendations of the Nebraska 2001 Committee cited the state's "unique situation astride the 100th Meridian beyond which precipitation and surface water no longer suffice for crop production." And protection of the state's great underground water resources made this a priority research objective for the next 20 years, he said.

The Foundation responded with a commitment of $1 million over a five-year period. This provided research funding for chemigation technology and crop production alternatives to complement current best management practices of irrigation, nitrogen and integrated pest management.

The Pioneer Award for exemplary leadership in irrigation development was presented to Deon D. Axthelm, former extension water resource specialist at the University of Nebraska-Lincoln Department of Agricultural Engineering.

Vince Dreeszen, chairman of the Nebraska Water Conference Council, said, "During the drought and depression years of the 1930s on a dryland farm, Axthelm developed a strong interest in water resource development and management of irrigation water."

Axthelm developed groundwater conservation management systems with the Natural Resources Districts in Nebraska, co-authored the Nebraska Groundwater Management Act introduced by the late Senator Maurice Kremer of Aurora and had a major impact on the formation of the Groundwater Management Districts Association, which is composed of most of the Great Plains states and several other states.

The 1990 Founder's Award went to Durward S. "Woody" Varner. His strong leadership and interest in Nebraska's land and water resources led to his appointing the Nebraska Water Conference Council in March 1972 was cited by Schroeder. Varner, then chancellor of the University, became "the most eloquent spokesman in the state of Nebraska on the benefits of irrigated agriculture to the people and the state's economy.

At a two-day conference in 1972, Varner appointed a 25-member Nebraska Water Conference Committee, which in 1979 became the Nebraska Water Conference Council. He charged them with planning and co-sponsoring conferences to discuss the most vital critical issues relating to development and management of the state's soil and water resources.

Other awards were presented to Vince Dreeszen for his leadership as chairman of the Council, and to Richard C. Hahn, president of Farmers National Co., in Omaha, the largest farm management firm in the U.S. Hahn was cited for his outstanding service as tour chairman for the Council from 1975 to 1983.

J. Michael Jess, director of the Department of Water Resources, was recognized for serving as tour chairman from 1984 to 1989.□

1. **Burlington Northern Foundation represented by Tom Jarnagin, Lincoln, general manager of the Nebraska Division of Burlington Northern Railroad, receives the 1990 Progress Award from Durward S. "Woody" Varner, who initiated the Water Conference in 1972. *(Top picture.)***
2. **D. Axthelm receives the Pioneer Award for exemplary leadership in Nebraska's irrigation development.**
3. **Durward S. "Woody" Varner, former president, chancellor of the University of Nebraska, and president of the NU Foundation, receives the 1990 Founder's Award for strong leadership in Nebraska's land and water resources and establishing the Nebraska Water Conference Council.**
4. **Vince Dreeszen, former chairman of the Nebraska Water Conference Council, receives Past Chair Award.**
5. **Richard C. Hahn, president of Farmers National Co., left, was cited for his service as tour chairman for the Council from 1975 to 1983. Hal Schroeder, Council awards chairman, is presenter.**
6. **J. Michael Jess, director of the Nebraska Department of Water Resources, was recognized for serving as tour chairman for the Nebraska Water Conference Council from 1984 to 1989.**

Agency Cooperation Urged at Water Conference

Urging agencies and citizens to work together as a family, Gus Dornbusch, director of the Midwest National Soil Testing Center, SCS, Lincoln, said the nation's resources can't survive without concentrated efforts from everyone. He was keynoter at the 19th annual Nebraska Water Conference March 13 and 14 in Lincoln.

Dornbusch said, "Each one of us should lift ourselves up and focus on our resources as we have so limited time and money for conservation of our soil and water."

With agencies working together, erosion can be controlled and safe quality water can be maintained, he said. Research on water contaminate sources and identifying the biological and chemical process of contamination is needed.

"Practical management systems with an interrelated data base should be developed," he said. "There's a need for more public information." A water quality information center is needed with more workshops and conferences that attract diversified groups such as this conference, Dornbusch said.

LuJuana Wilcher, assistant administrator for water with the U. S. Environmental Protection Agency, Washington, D.C., said, "A new challenge is pollution prevention. "We must stop air, soil and water pollution before it happens."

Wilcher said, "We can solve our pollution problems and have a "sound and economical ecology if we all work together." Products used by urbanites and rural neighbors must be used safely.

At what levels are contaminants a threat to us and to our children? Wilcher asked.

"Continued research is necessary to answer this."

On the other hand, the president of the Nebraska Fertilizer and Agricultural Chemical Institute, Bob Anderson, said, "It's a matter of economics: Farmers aren't putting on too much fertilizer." Farmers are environmentalists, too, he said, there's just a few "out there" that aren't.

David Chambers, head of the groundwater section of the Nebraska Department of Environmental Control, asked, "How clean is clean after water has been contaminated?" He said a challenge for everyone is landfills, underground storage tanks, and groundwater pollution. Prevention programs are the answer to contamination problems, he said, because of lack of funds and staff.

The annual Nebraska Irrigation Tour, sponsored by the Nebraska Water Conference Council, was announced for Aug. 5-11. Texas is the destination, Les Sheffield, tour coordinator, said.

Sheffield, a University of Nebraska farm management specialist, said, "this promises to be one of our best tours with only 80 places available on the two-bus tour."

He can be reached at (402) 472-1773 for more information.□

'90s Exciting Times in Water Resources

by Julie Daul
UNL Ag Communications

To develop and manage water resources in the 1990s, research, education and partnerships, will be needed, Dennis Underwood, commissioner of the U.S. Bureau of Reclamation, said.

Underwood, said the '90s are "extremely exciting times" for water resources and will bring not only a greater emphasis on water conservation, but also water quality.

"We can't have a good life, if we don't have good water quality," Underwood said.

To help ensure water quality, he said, education is needed. This includes conferences, like the one held in Lincoln, which bring the "best minds together to deal with problems," Underwood said.

And if officials take the initiative and offer creative solutions and ideas to current water problems and possible water problems in the future, he said, regulations may not be necessary in the years ahead.

However, education alone will not be enough. To help ensure that future generations will inherit a clean, safe and healthy environment, partnerships need to be formed between private business, local, state and federal governments, and individuals, Underwood said.

"Nobody can do it alone," he said. "It's going to take all of us working together, not just the state and federal government, to achieve what we're trying to do."

For example, he said, a partnership might be formed with the private sector to operate and maintain water projects, instead of having the federal government regulate the entire project.

To address water development and management, research also will be needed in the '90s, Underwood said.

He said this might include improved dam safety, construction and project operation and learning better ways to apply chemicals and conserve water.

"We need to have the capabilities of coming up with new ways to address these problems," Underwood said.□

Increased Ag Production Means More Pollution

A dramatic rise in cereal production in southern and eastern England since World War II has meant a dramatic rise in water pollution, according to John Chilton, principal scientific officer with the British Geological Survey.

Chilton, the 1990 Kremer Lecturer at the University of Nebraska-Lincoln, said, "Nitrate concentrations in a variety of rates are generally increasing in public water supplies in this area."

The European Economic Community has issued a directive for all member countries, including the United Kingdom, to bring nitrate levels to a safe limit. Alternative remedies include land-use control measures or radical changes in agricultural practices around public

☞ (see page 10)

Nebraska Counties Included in High Plains Irrigation Research

A report, "Conserving Water in the High Plains," that summarizes findings for a study of irrigator adoption of water-saving practices in the High Plains is available at Kansas State University.

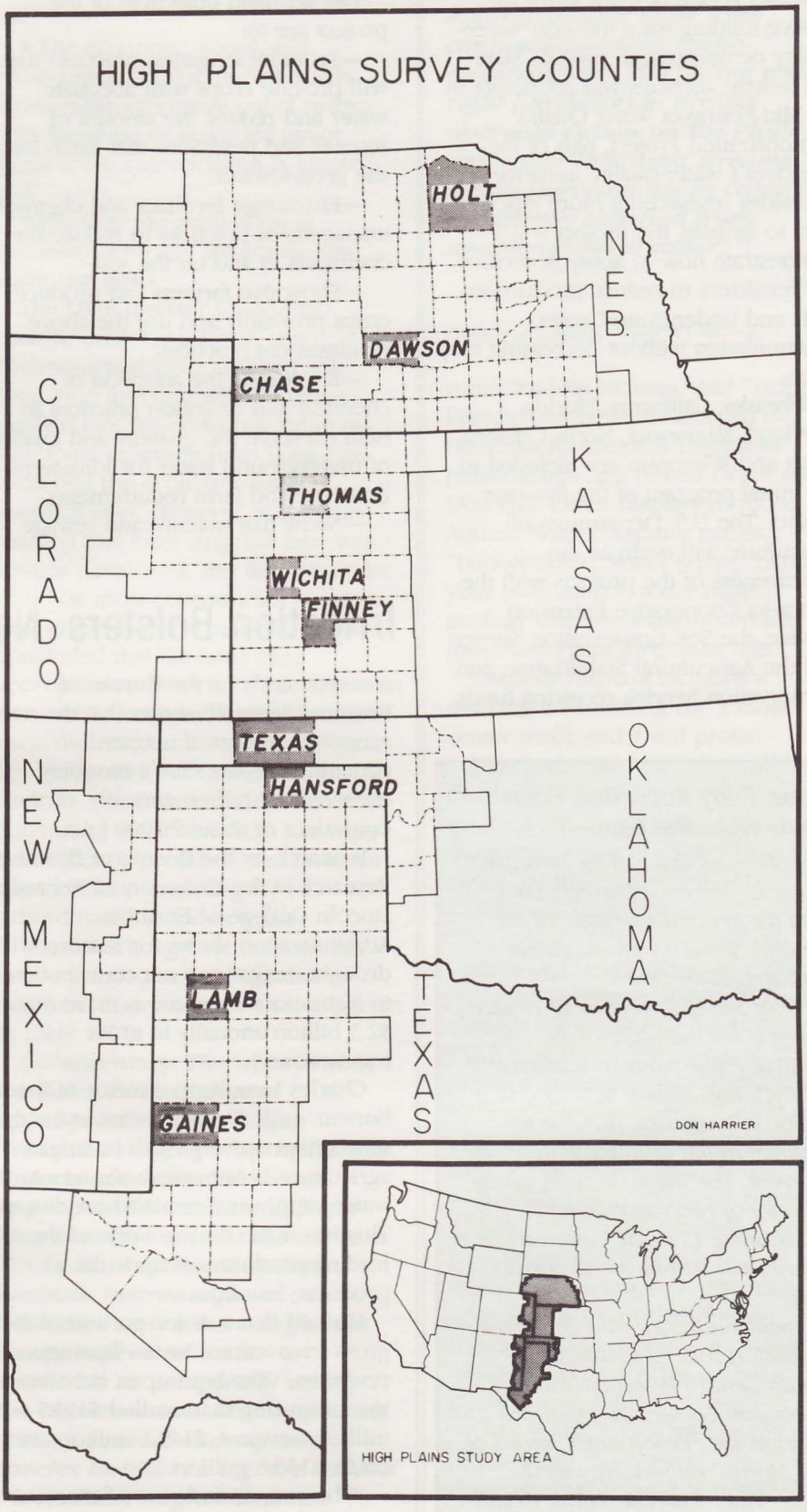
The researchers, David E. Kromm and Stephen E. White, of the Department of Geography, KSU, surveyed 709 farmers and ranchers in Texas, Oklahoma, Kansas and Nebraska. As a result Kromm and White identified 39 strategies grouped into field practices, management strategies and system modifications. They found that of the 39 strategies, only three were used by 50 percent of the irrigators: chiseling, irrigation scheduling and leaving crop residue to reduce evaporation.

They found that irrigation is not a "homogeneous activity." Irrigated agriculture on the High Plains is varied. "Groundwater depletion is a critical issue in the High Plains because aquifers provide nearly all the water used by farmers and municipalities," the researchers said. Four-fifths or more of the water goes for irrigation. They said that if conservation to extend the life of the aquifer is to have any meaning, it must occur in agriculture.

"Farmers are both the users of the water and the people most directly dependent on its continued availability," Kromm said. "Fortunately, there are many practices, techniques and devices that can be used to improve irrigation efficiency."

The 39 water-saving practices were cross classified with each of 15 other variables that produced 585 tables. The researchers reported that about 82 percent of surveyed irrigators in Chase County, Nebraska meter their water use in contrast to 1.9 percent in Texas County, Oklahoma. Other counties in Nebraska surveyed were Holt and Dawson.

The report with a two-page glossary, is available at the Department of Geography, Dickens Hall, KSU, Manhattan, Kansas 68506. Interested individuals may request single copies of the report. Agencies and schools may order 50, 100, or more.□



Mid-Nebraska Water Quality Demo Project Combines State and Federal Agencies to Research Irrigation Efficiency

Nebraska is one of eight states to receive funding for a five-year water-quality demonstration project. State and federal agencies will cooperate in the Mid-Nebraska Water Quality Demonstration Project, part of the president's water-quality initiative.

Besides researching more efficient ways to irrigate, the project will demonstrate how to apply pesticides and fertilizers to reduce production costs and underground water contamination without decreasing crop yields.

Nebraska, California, Florida, Maryland, Minnesota, North Carolina, Texas and Wisconsin are included in the initial program of the five-year project. The U.S. Department of Agriculture will evaluate the effectiveness of the projects with the Nebraska Cooperative Extension Service, the Soil Conservation Service and the Agricultural Stabilization and Conservation Service receiving funds.

The six main objectives of the project are to:

—Promote irrigation practices that will provide crops with adequate water and reduce the amount of nitrates and pesticides that leach into the groundwater.

—Encourage fertilizer and chemical management practices to reduce the chemicals in and on the soil.

—Show that farmers can produce crops profitably and use the above management practices.

—Encourage the adoption of chemical and irrigation practices to help preserve the quantity and quality of underground water for long-term domestic and farm requirements.

—Show that manure and sewage waste can be used to protect underground and surface wter.

—Illustrate that the cooperating agencies can work together with their expertise and resources to research Nebraska's water quality problems.

Richard Ferguson, a soil scientist at the university's South Central Research and Extension Center in Clay Center will head the project. Members of the coordinating group are Jerry Willhoft of the Soil Conservation Service, Andy Christiansen, Hamilton County Extension director; and Tim Murphy, technologist.

Cost-sharing funds will be available to farmers at the 20 or 30 sites that will participate in the demonstration projects.□

Oops, Sorry About that, Frank!

(Note from the editor:)

He's the new chair of the Nebraska Water Conference Council. He's also the general manager of the Central Nebraska Public Power and Irrigation District.

What Frank Dragoun of Holdrege is not is the manager of the Central Platte Natural Resources District. Ron Bishop is.

Sorry Frank and Ron for the mistake in the January Water Current. The story, "Water Quality Priority of Nebraska Water Conference Council," quoted Frank, but misplaced his correct title.

Incidentally, Richard Ferguson, extension soils specialist at the South Central Research and Extension Center, Clay Center, receives the "Proofreader Award of the Month" award. He was the only Water Current reader to call my attention to the error.

Thanks, Richard.□

Irrigation Bolsters Nebraska's Economy

A recent study by the Bureau of Business Research shows that the net economic impact of irrigated agriculture to the state's economy exceeds $1.3 billion annually, or the equivalent of about 20,000 jobs.

Research by the Bureau of Business Research at the University of Nebraska-Lincoln College of Business Administration shows for seasons with drought, irrigation's net contribution to Nebraska's economy is more than $2.3 billion annually in gross transactions.

Charles Lamphear, director of the bureau, said, "Primary reasons for the state's impressive growth in irrigated agriculture is Nebraska's abundant water supply and semiarid conditions." This has made the state one of the leading producers of agricultural products, he said.

He said that a major portion of the gross transactions are in "business revenues." The net impact here was in manufacturing that totalled $191.7 million; services, $143.1 million; and trade, $130.8 million.

"The economic future of many Nebraska communities, especially those in the central and western part of Nebraska, depends on irrigated agriculture," Lamphear said.

Nebraska ranks third behind Illinois and Iowa in corn for grain production. The 6 million acres (1985) of irrigated land represents 27 percent of the total land in Nebraska that allocated to crop production. This land produced about 75 percent of the total corn crop, or 715 million bushels, at a market value of more than $1.7 billion. These statistics for 1985 also show that cash receipts from livestock marketing were more than $4.1 billion.

The Nebraska Department of Agriculture estimates that 40 percent of feed grains produced in Nebraska are fed to livestock in the state. In December 1989, Nebraska reported the largest number of cattle on feed, 2,100,000 head, which put Texas in second place in the U.S. The expansion of cattle feeding in Nebraska has been mostly in irrigated areas, especially the central and the western parts of the state.

He said that challenges facing Nebraska in the 21st century include managing groundwater, protecting the quality of groundwater and resolving conflicts between water development and maintaining instream flows for fish and wildlife.□

First Nebraska Instream Appropriation Granted in December by the DWR

by J. David Aiken

On December 14, 1989, the director of the Nebraska Department of Water Resources (DWR) granted in part the application of the Nebraska Game & Parks Commission (GPC) for an instream appropriation on Long Pine Creek. The Long Pine appropriation is the first granted under Nebraska's 1984 instream appropriation statute.

The GPC filed the first instream appropriation application January 8, 1987 for Long Pine Creek, a tributary of the Niobrara River in northwest Nebraska. Long Pine is the state's highest rated cold water fishery, supporting rainbow and brown trout. The application was vigorously contested by local irrigation interests. The DWR dismissed the application as incomplete June 27, 1987, ruling that required public interest issues had not been addressed. The GPC filed a new application April 29, 1988, which was approved by DWR for the middle and lower stream segments, but denied for the upper stream segment.

There are four water supply requirements for granting an instream appropriation, as well as public interest requirements. The water supply requirements include:

—Whether sufficient unappropriated water is available for instream appropriation;

—Whether the appropriation is necessary to maintain the instream use;

—Whether the appropriation will interfere with any senior appropriation; and

—Whether the rate and timing of flow requested is the minimum necessary to maintain the instream use.

The DWR ruled that the GPC met all requirements for the middle and lower stream segments. However, because cold water fishery habitat in the upper stream segment was sparse, the DWR ruled that the GPC had failed to show the instream appropriation was necessary to maintain a naturally reproducing trout fishery in that reach.

The instream appropriation must also be in the public interest. Public interest considerations include:

- The economic, social, and environmental value of the instream use;
- The economic, social, and environmental value of reasonably foreseeable alternative out-of-stream uses foregone or accorded junior status if the appropriation is granted; and
- Whether the application is consistent with any applicable state water use goals.

The DWR director found that positive economic, social, and environmental value resulted from Long Pine instream uses. Objectors testified that the economic value of additional irrigation from Long Pine exceeded the economic value of instream uses. However proponents testified that most irrigable land was already developed, and the remainder could be most economically irrigated with groundwater. The DWR director concluded that the Long Pine appropriation would not interfere with reasonably foreseeable out-of-stream uses, did not conflict with state water use goals, and was in the public interest. The director noted that if a conflicting more beneficial use were subsequently proposed, the instream appropriation could legally be subordinated to the new use.

The DWR Long Pine decision has been appealed to the Nebraska Supreme Court. A decision is expected in early 1991.

Commentary. ***The approval of the Long Pine instream appropriation is a major Nebraska water policy milestone. Unfortunately the instream appropriation statute will not play a major role in the current Platte River water disputes, because instream flows can be protected only where sufficient unappropriated water is available to completely satisfy the instream use. This approach cannot protect endangered species habitat in e.g. the central Platte River region because pending irrigation projects would leave insufficient unappropriated water for a new instream use.***

Additional legislation is needed to allow instream appropriations to be used conjunctively with supply augmentation (including water right purchase) to protect instream values on the Platte and other Nebraska streams where instream needs cannot be completely satisfied from unappropriated water.□

(Festival—from page 3)

were "Puddle Pictures" and "Drippial Pursuit" tournaments emceed by Nebraska Educational Television personalities Leta Powell Drake and Don Gill. Other displays included Aquatic Wild, computer games, "bubbleology," water poetry, build your own aquifer, water magic, geology displays, a film room and an imaginary Platte River float trip.

Outdoor displays included a working well drilling rig, a model center pivot, and a soil probe.

"We hope this free event will bring the topic of groundwater alive for students and be an opportunity to celebrate our groundwater heritage," Susan Seacrest, president of the foundation, said.

- - -

Another project of the Nebraska Groundwater Foundation was commemoration of Groundwater Week March 24 to 31. Although the primary sponsor of this special week was the Foundation, the Water Center and Cooperative Extension were active participants.

A media packet of over 100 pages of material to be used in news columns, newsletters and for radio and television was distributed to each Cooperative Extension office in Nebraska. This packet was intended for use throughout 1990 in addition to Groundwater Week.

Dale Vanderholm, interim director of the Water Center, said, "This information will assist Nebraskans in making wise decisions in order to conserve our water quantity and quality."□

(Increased—from page 6)

drinking water supply wells, Chilton said.

"Many pesticide compounds are used in this area," Chilton said, "a high level of atrazine has been detected in the public water supply."

However, he said that atrazine is no longer used as a pesticide in cereal production. It's used on airfields, railroad right-of-ways and along motor-ways. "Point source pollution is our concern with atrazine," he said.

Chilton said, "Every pollution is different. All aquifers are vulnerable to contaminants." However, he said that in areas of low productivity in grassland experiments, low levels of nitrate appear in the groundwater. On the other hand, high levels of productivity, show high levels of nitrates in groundwater.

The three-year study in southern England also revealed more nitrate leaching where grassland is grazed by cattle. This indicates that cattle waste adds additional nitrate to groundwater, he said.

The area produces spring and winter barley, winter wheat, oil seed, rape, potatoes, sugar beets and peas. The soil is thin above the chalk aquifer which is revealed in the White Cliffs of Dover.

Chilton said that water suppliers are concerned about public drinking water and asking: What can we do about water contamination? Engineering solutions are expensive, he said, when deepening boreholes for wells. This is also an uncertain method. And with the denationalization of water as a public utility, the UK has been in a transition to private ownership which delays research data and solutions, he said.

Although Chilton has researched water quality problems in Kenya, Mexico, Sri Lanka, Botswana, Libya and other countries, this is his first visit to the United States. About his trip through Nebraska to Grand Island, Chilton said, "All I saw was corn fields, corn fields and more corn fields."

The annual Lecture Series was established in 1983 to honor the late state Sen. Maurice A. Kremer of

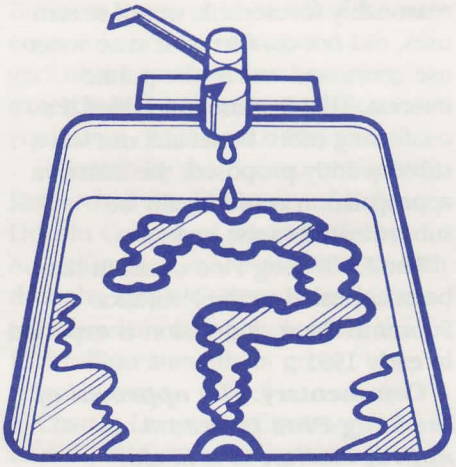
(see page 12)

Safe Water Quality Difficult to Determine

by Ann Z. Dellenbarger
Extension Housing Specialist
University of Nebraska-Lincoln

We all want safe water to drink. However, determining what is safe can be a difficult task. The 1974 Safe Drinking Water Act and its amendments require the Environmental Protection Agency to establish limits on the concentration of certain drinking water contaminants allowed in public water supplies. These limits, or standards, are set to protect your health and ensure that your water is of good quality.

There are two levels of drinking water standards. Primary drinking water standards are based on health considerations and are enforced by the Environmental Protection Agency (EPA). They relate to three classes of pollutants: pathogens, radioactive elements and chemicals.



Maximum Contaminant Levels (MCLs) are the highest allowable concentration of a contaminant in drinking water supplied by a public system. Secondary drinking water standards provide suggested contaminant limits to prevent offensive taste, odor, color, corrosivity, foaming and staining. These standards are not enforced, but provide guidelines for water treatment plant operators and state governments attempting to provide communities with the best quality water possible.

Drinking water quality standards are usually expressed in milligrams per liter (mg/1). One milligram per liter is equivalent to one part per million (ppm).

The MCL for nitrate-nitrogen, for example, is 10 ppm or 10 mg/1.

More than 200 natural and synthetic substances have been detected in groundwater. The EPA is required by the Safe Drinking Water Act to establish mandatory water quality standards for 83 of these contaminants.

The ability of scientists to measure trace levels of substances has increased significantly. Twenty years ago the smallest measurements were in parts per million. Today we can detect quantities as small as one part in a quadrillion. One quadrillion is a one followed by 15 zeros or the equivalent to one teaspoon in two regulation Olympic-sized swimming pools.

While the Environmental Protection Agency has not established MCLs for most pesticides a number of Health Advisories have been established by the EPA. One of these pesticides which has been detected in Nebraska's groundwater is atrazine.

The EPA has set a health advisory level for atrazine in drinking water at 3 parts per billion. In terms of time, one part per billion is equivalent to one second in 32 million years.

The setting of drinking water standards is an imperfect process. Data relating human health effects to chemicals in drinking water are limited, and scientists have had difficulty predicting the effects of drinking small amounts of chemicals for many years.

In addition, regulatory decisions frequently incorporate economic, political and social considerations. Thus, it is important to understand that these standards do not guarantee that water is risk-free. Drinking water standards do, however, guarantee that scientists and public officials have looked at all available information on the health effects of a substance and have made a careful, conservative judgment of the level of contamination that will not endanger public health.□

Laws Need to be Changed to be 'Workable'

by Charles Flowerday
Conservation & Survey Division

Nebraska's inflexible in-stream flow laws need to be changed for more workable agreements between environmentalists and irrigation interests, a University of Nebraska-Lincoln water law specialist said.

The law should allow for partial instream appropriations for fish and wildlife if state or local authorities seeking such an appropriation could show they could get the rest of the water someplace else, according to J. David Aiken with the Intitute of Agriculture and Natural Resources.

He spoke at the April 4 session of the 1990 Water Resources Seminar Series sponsored by the Water Center. This series is held each week of the spring semester. The topic this year has been "The Platte River; Analysis and Policy."

Present law allows only for an instream appropriation when enough water is in the stream at all times to meet the in-stream need, a condition becoming more and more uncertain on the PLatte River. This is particularly true if any new irrigation projects are developed that use Platte River water, Aiken said.

"So there's no way that (the state) Game and Parks (Commission) or an NRD could get a water right on the Platte River for enough water to meet the in-stream need without having to supplement stream flow with water from storage or groundwater," he said.

Aiken said supplemental appropriations could come from:

—Buying up irrigation water rights and switching them to wildlife rights, something that is currently illegal in Nebraska.

—Pumping groundwater from near the stream to supplement flows during low-flow periods, probably also illegal.

—Buying water in storage and having that water released during low flows, probably legal but not clearly defined by the law.

"If we had this kind of flexibility in our water law, environmental groups would be more willing to spend money on water rights for in-stream flows rather than spending their money on lawsuits to stop dams," he said. "But until the laws are changed to provide for this flexibility, we're going to see continued litigation, litigation where the environmentalists, have it stacked their way and will keep coming out on top as they have in the past."

Due to provisions in federal and state endangered species legislation, "as a nation we are moving closer and closer to a point, at least politically, where wildlife have rights in the water allocation process that have to be acknowledged," Aiken said.

Aiken said state water developers have not faced up to the fact that in political terms, environmental protection is at least as important as irrigation development, if not more so.

"In a perfect world, irrigation interests would recognize that they're going to have to face some of these new environmental realities. If they did that, perhaps environmental groups would be more willing to accommodate to some of what the irrigation people want to do," Aiken said.

These new political realities have come about as a result of changes in the interpretation of state and federal statutes, brought about largely through litigation by environmentalists, he said. He pointed to a Nebraska Supreme Court opinion in 1982 requiring an endangered species review process before a new irrigation project could be approved.

This opinion created an impasse in planning and negotiations regarding water development in the state, Aiken said. The 1983 Water Independence Congress set up by former Gov. Bob Kerrey to deal with this impasse resulted in a recommendation adopted by the Legislature in 1984 that authorized in-stream appropriations for the Game and Parks Commission and NRDs to protect fish and wildlife. The first in-stream appropriation was granted to Game and Parks in December on Long Pine Creek in the Niobrara River basin.

Another political mechanism coming from the water congress that was designed to produce more agreements between competing interests on water projects is the state Water Management Board, he said. The board consists of the directors of the Nebraska Natural Resources Commission, the state natural resources planning agency; the Game and Parks Commission, the state wildlife conservation agency; the Conservation and Survey Division, the state natural resources survey; and a political appointee.

The board was meant to have authority to force compromises between environmentalists and water developers to avoid water project litigation, Aiken said. That has not been realized because the legislation exempted pending water projects that had applied for water rights from going before the board's review, he said.

On the federal level, an amendment to federal power legislation in 1986 required the Federal Energy Regulatory Commission to give enrironmmental protection equal weight with power and irrigation considerations when granting new licenses to the Nebraska Public Power and Irrigation District and Central Nebraska Public Power and Irrigation District for the operation of Kingsley Dam on Lake McConaughy.

While this was fought in court by the irrigation interests in 1989 a federal district court ruled that FERC msut require releases from Lake McConaughy for fish and wildlife on the annual interim permits that allow the dam to operate while its long-term license is up for renewal, Aiken said.

"That has broken the logjam a bit and has gotten the parties trying to negotiate minimum in-stream flow requirements for the continued operation of those irrigation projects," he said.

(Increased—from page 10)

Aurora. Kremer, often called "Mr. Water," was elected to the state legislature in 1962 and served as chairman of the legislature's public works committee from 1973 until his retirement in 1982.

This series is sponsored by the Nebraska Water Center and the Institute of Agriculture and Natural Resources.□

New Water Encyclopedia Celebrates Earth Day

The second edition of the Water Encyclopedia has been published, almost 20 years after the first was issued in 1970. This second edition by Frits van der Leeden, Fred L. Traolise and David Keith Todd, contains over a half a million facts and figures presented in 630 tables and 112 diagrams and maps.

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