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## Resource News-Summer 1995

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## First joint GSA North-Central/South-Central meeting features diversity and new research

Hosting the first joint regional meeting of the North-Central and South-Central sections of the Geological Society of America (GSA) at the University of Nebraska-Lincoln was a major undertaking but proved to be an overall success, said the chair of the North-Central section of GSA.

Bob Diffendal, research geologist with the UNL Conservation and Survey Division (CSD) and chair of the section, said the meeting was a success because it was well-attended and featured a diverse group of participants, as well as much new research from the region and the state.

Held in late April at the Nebraska Center for Continuing Education and the student union on the UNL East Campus, the meeting also marked the first time since 1971 that a regional section meeting of GSA had been held in Nebraska.

"It had been 24 years since we held a section meeting here, which made it exciting because we had 24 years of new developments and research to show people," Diffendal said.

Diffendal said attendance at the meeting was about 720, slightly higher than pre-meeting estimates.

"We had participants from most of the 50 states, most of the Canadian provinces, Germany,

Russia and other countries, along with a large number of foreign students studying at universities in the United States," Diffendal said.

Diffendal said about 370 papers were accepted for the meeting, and 42 sessions were held on East Campus during the two-day meeting.

Eight field trips examining various sites of geological interest in Nebraska and Kansas were also well-attended, Diffendal said.

"We organized two field trips before the meeting and six afterward and had about 240 people sign up, which represents an extremely good turnout," Diffendal said.

Diffendal said that he was pleased with the communication he saw among meeting organizers, sponsors and participants.

"The primary purpose of meetings like this is to exchange ideas with others in the field. I think we provided an excellent place for that to happen and also impressed some people with our work and the things this state has to offer," Diffendal said.

"It was a lot of work to get everything planned, and I'm still busy paying bills for various meeting expenses. I might be ready to do another one of these meetings in another 24 years," Diffendal said.

## *Sand layers in peatlands reveal regional drought within last 1,000 years, may yield new soil classification*

Research originally intended to create a updated soil map of the Sand Hills region is beginning to create a little added scientific excitement as well. In addition, it may even produce a new soil classification.

Chuck Markley, a University of Nebraska-Lincoln soil scientist with the Conservation and Survey Division (CSD) who works out of Valentine, has been studying organic soils and peatlands, or "fens," while producing a new soil map for Cherry County.

"Over the course of the project I noticed a trend of sand layers in the upper parts of these organic soils," Markley said. Continuous layers of sand, often up to 12 inches thick, were found a short distance beneath the surface between layers of peat in the mucky, organic-rich Cutcomb soils that make up the Sand Hills fens. These layers appear to be wind-deposited (eolian), rather than water-deposited (alluvial), Markley said.

If the sand deposition on these organic soils is  
(See *Sand Layers* continued on page 2.)

## **Morrill County and Scottsbluff geologic maps in press, represent the result of six years of combined field work**

Two geologic mapping projects involving areas in the Nebraska Panhandle and representing about six years of combined field work are coming to a close.

Morrill County and the Scottsbluff 1 x 2 degree quadrangle are the respective subjects of two geologic maps recently completed by the University of Nebraska-Lincoln Conservation and Survey Division (CSD). Geologic mapping of

Nebraska has always been a priority for CSD, which includes the Nebraska Geological Survey and other natural resources surveys, and these projects are no exception.

"Mapping aids in our understanding of the earth and helps to answer a number of significant geological questions," said Jim Swinehart, CSD research

(See *Geologic maps* continued on page 2.)

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Institute of Agriculture and Natural Resources/University of Nebraska-Lincoln**

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## ***Sand layers*** continued from page 1

truly eolian, Markley said, then significant parts of these soils, where the deposited sand is thick, would not be technically classified under the current U.S. soil classification system.

"If our assumption about the origin of these soils is correct, they would represent a new soil family that should be submitted for recognition," Markley said.

The focus of Markley's research is not limited to this goal, however. Markley said that his main job at this time is to find the extent of Cutcomb soil deposits in the Sand Hills and then determine how extensively within the Cutcomb soils these sand deposits occur. This will tell researchers if they are dealing with an isolated eolian phenomenon or a widespread pattern in soil and landscape development.

The ultimate purpose of this Sand Hills project would be to pinpoint the last major movement of sand in the area, Markley said. This data could lead to a better understanding of droughts and their effect on vegetation loss and resulting dune movement.

In the summer of 1990, Markley contacted Jim Swinehart, a CSD research geologist, with news relating to Swinehart's dating of the Sand Hills dunes and research into the reactivation of dunes.

## ***Geologic maps*** continued from page 1

geologist and co-author on both maps. The other co-author on both maps was CSD research geologist Bob Diffendal.

"It is an essential tool in expressing three-dimensional relationships," Swinehart said. "And it is also an art form to some extent."

While earth scientists who do basic research will probably use them most, the maps could also be used for wetlands inventories, groundwater management and policies, natural-resource management, uranium exploration, large-scale construction and landfill siting.

Some mapping, such as the Morrill County map, is done on a county-by-county basis. Other maps are done within subdivisions of latitude and longitude measurements known as "degrees" of parallels or meridians, respectively. Quadrangle maps such as the Scottsbluff quad are named for cities within their boundaries.

Both mapping projects began in the late 1970s and are now approaching the final stages of production. The Morrill County map has been through the U.S. Geological Survey (USGS) review process and should be published soon. Two map revisions and three text revisions were required before

"When we got around to taking some core samples in the summer of 1992, we found a sand layer 5 feet under the surface that was even deeper than Chuck (Markley) had thought, in addition to still deeper layers of sand," Swinehart said. "We felt that the sand had to have been blown in over peatland with no vegetation present, which is a pretty good sign that the water table dropped due to a major drought."

Researchers have radiocarbon-dated peat immediately beneath the sand layers at several localities to determine the time a major drought may have occurred. The dates reveal the sand was deposited within the last 1,000 years.

"This will also give researchers a better idea of the variability and magnitude of climatic changes in the region," Swinehart said. Earth scientists believe the best data base we have on future climate change comes from looking at past changes.

The Sand Hills research is an ongoing process that continues to evolve as new things are discovered, Swinehart said.

"We are now proposing to go back to the Sand Hills to focus on areas with upper sands and some older soils," he added.

final approval of the finished product. Meanwhile, the Scottsbluff quadrangle map has also made it through the review process and is in press.

The Scottsbluff map was created as part of CSD's 2-degree map series, which typically uses a scale in which 1 inch represents 4 miles. Also to be published in the future in this series are the Broken Bow, O'Neill, Valentine and Alliance quadrangles. Six quads have been published and are available from CSD or the USGS.

Swinehart said that the Morrill County map was a special project and that the detailing of the area was complex enough to justify a scale in which 1 inch equals 1 mile.

The Morrill County map will be published by the end of 1995, and the Scottsbluff quad should be available in late 1996, Swinehart said. In addition, two maps in a USGS series of maps of Quaternary geology covering Nebraska have recently been published at a scale of 1 inch equals 16 miles.

Upon completion, the maps can be purchased from the Conservation and Survey Division by contacting Map and Publication Sales in 104 Nebraska Hall, University of Nebraska-Lincoln, 68588-0517, or by calling (402) 472-7523.

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# Researchers successfully test groundwater cleanup method; new technique saves towns millions through irrigation

A University of Nebraska-Lincoln research team has successfully cleaned up contaminated groundwater with a technique that could save communities millions of dollars.

Sprinklers, hallmarks of irrigated agriculture, can be used to safely clean up some kinds of contaminated groundwater, the researchers said. An interdisciplinary UNL research project has shown in preliminary findings that the treatment removes contaminants known as "volatile organic compounds" from groundwater through irrigation.

"It captures, contains, removes and remediates contamination," said Roy Spalding, director of the Water Sciences Laboratory in the Institute of Agriculture and Natural Resources (IANR) at UNL, who heads the research. Spalding is associate director of the UNL Water Center/Environmental Programs. "This is the first demonstration and confirmation of the effectiveness of this procedure."

This research is a cooperative effort between the Water Center/Environmental Programs unit and the UNL Center for Electro-Optics. Electrical Engineering Professor Dennis Alexander, who heads the optics center, used ultraviolet light to study the degradation process. Co-principal investigators are Mary Exner Spalding, research chemist, UNL Conservation and Survey Division; and Derrel Martin, associate professor, Biological Systems Engineering.

The project is designed to clean up groundwater at two subsites of the Hastings Groundwater Contamination Site. Hastings is on the U.S. Environmental Protection Agency's (EPA) Superfund National Priorities list.

Savings to communities, companies and individuals could be enormous, Spalding said. Average cost for a Superfund site

is \$27-\$30 million. Use of the sprinkler technique could reduce costs to \$500,000 or less, Spalding said.

The testing site is a cornfield east of Hastings. Contaminated groundwater lies 120 feet below the surface. It contains trace levels of three degreasing agents or solvents, trichloroethylene (TCE), trichloroethane and ethylene dibromide.

These contaminants easily vaporize into the atmosphere. In the new method, contaminated water is sprayed through a nozzle against a pad, on which the water forms a film from which small droplets emerge. The contaminants are then released to the atmosphere where some degradation can occur.

"Embracing the irrigation alternative would save the taxpayer and responsible parties millions of dollars in remediation costs," Spalding said.

Traditional cleanup methods, involving pumping, cleaning and re-injecting water, are very slow and costly. The EPA has encouraged development of new technologies to increase effectiveness of cleanup and reduce costs.

The experiment began in late summer of 1994, and findings are still preliminary. However, it is clear that the treatment offers many benefits, and work will continue this summer. In addition, the risk to public health or the environment is minimal, Spalding said.

The two-year project is sponsored by a U.S. Department of Agriculture Cooperative States Research Service grant and the Nebraska Research Initiative, and the UNL Water Center/Environmental Programs unit, Conservation and Survey Division, Department of Electrical Engineering, Center for Electro-Optics, and IANR's Agricultural Research Division.

## *Chinese geology department creates scholarship with money from UNL visiting professor and Nebraska ranch couple*

In a break with Chinese conventions, the geology department at a key university in the People's Republic of China has embraced the academic tradition of awarding collegiate scholarships. These scholarships are the result of a small endowment by a University of Nebraska-Lincoln researcher that was supplemented with donations from a western Nebraska ranch couple.

Bob Diffendal, research geologist with the UNL Conservation and Survey Division (CSD), has visited China four times and twice served as a guest lecturer at Zhongshan University in Guangzhou (also known as Canton), a major city in southeastern China, mostly recently in 1990. During a visit from November 1985 through January 1986, Diffendal and his wife, Anne, who taught conversational English, received stipends to cover living expenses.

"They provided us with a place to stay, meals, and a generous living allowance that was far more than what we needed," Diffendal said.

At that time, Chinese currency could not be legally taken out the country or exchanged for U.S. currency, Diffendal said.

"We had a large surplus of money that the department suggested we use to 'go buy stuff,' but we decided that instead

of silk jackets, we would use the money to do something that would make a difference," Diffendal said.

Diffendal said the money was given back to Zhongshan's geology department so that it could earn interest in a bank account and the annual return be given to geology students doing outstanding research.

"In China, the notion of singling out and rewarding students with academic scholarships was somewhat revolutionary," Diffendal said.

"After we returned to Nebraska in 1986, we told friends about the prize. A ranching couple in Morrill County thought the prize sounded like a good idea and contributed some money. We also donated money saved at the end of our 1990-1991 exchange to enlarge the fund," he added.

Since 1986, the geology department at Zhongshan University has honored nearly 40 geology students with an award named after its benefactors: The Diffendal Prize. The Diffendals just recently received notice of the past few years' winners.

"The name (of the prize) wasn't a specified part of the agreement or anything like that, but it certainly is an honor," Diffendal said.

## In memorium: Monte Babcock

Monte Babcock, soil scientist with the University of Nebraska-Lincoln Conservation and Survey Division (CSD), died on March 3, 1995, in Grand Island at the age of 43.

Babcock, whose research included soil surveying in various places throughout the state, was a UNL graduate and served with CSD for 19 years.

Services were held at First United Methodist Church in

Beaver City, where Babcock was a member.

"The employees of CSD would like to express their support and deepest sympathy to the family and friends of Monte Babcock, and to recognize his 19 years of meritorious service to the people of Nebraska. He will be missed both as a professional colleague and as a friend," said Perry Wigley, CSD director.

## Coming up: national, regional and state meetings and workshops

### July

**National Arbor Day Foundation, Discovery Workshop: "How to Teach Youth About Trees and Environmental Stewardship," July 8-10,** Lied Conference Center, Arbor Day Farm, Nebraska City; contact Susie Wirth, National Arbor Day Foundation, (402) 474-5655.

**American Society of Agronomy North-Central Regional Meeting, "Agricultural Management to Protect Water Quality," July 17-19,** Grand Island, College Park.

**Annual Nebraska Water Resources Tour, July 18-19,** to sites in central and south-central Nebraska; contact UNL Water Center/Environmental Programs, UNL, 103 Natural Resources Hall, Lincoln, NE 68583-0844, (402) 472-3305.

**Water Environment Federation/American Water Association Joint Residuals Management/Biosolids Conference, July 23-26,** Hyatt Regency Crown Center, Kansas City, Mo.; contact WEF at (800) 666-0206.

### August

**Groundwater Pollution and Hydrology--The Princeton Course:** East Coast location, *July 31-Aug. 4*, Orlando, Fla.; West Coast location, *July 10-14*, San Francisco, Coordinated by Princeton Groundwater, P.O. Box 263033, Tampa, Fla. 33685.

**Universities Council on Water Resources (UCOWR) annual meeting: "Whose Thirst is First? A New Paradigm for Water Management," Aug. 1-4,** Portland, Maine,

Holiday Inn by the Bay.

**Soil and Water Conservation Society 50th annual meeting, Aug. 6-9,** Des Moines, Iowa.

**National Water Resources Association 1995 Western Water Seminar, "Old Problems with New Solutions," Aug. 9-12,** Skamania Lodge in the Columbia River Gorge.

**University of Nebraska Center for Sustainable Agricultural Systems, Sustainable Ag Tour, Aug. 17;** contact Center for Sustainable Ag Systems, (402) 472-2056.

### September

**Husker Harvest Days, Sept. 12-14,** Grand Island; contact Nebraska Farmer magazine.

**1995 American Association of Botanical Gardens and Arboreta Regional Meeting, "Our Place on the Plains," Sept. 21-23,** University of Nebraska-Lincoln.

**The Groundwater Foundation, "Priming the Pump: A Water Festival Workshop," Sept. 22-23,** Lied Conference Center, Nebraska City; contact The Groundwater Foundation, (800) 858-4844.

### October

**Fortieth Annual Midwest Groundwater Conference, Oct. 16-18,** Ramada Inn, Columbia, Mo.; sponsors: Missouri Department of Natural Resources, Missouri Groundwater Association, University of Missouri-Rolla, U.S. Environmental Protection Agency-Region VII, U.S. Geological Survey.

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