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Study determines protection zones around Lincoln well field

The quality of drinking water pumped from the Lincoln well field near Ashland could eventually be affected by contamination from regions up to 4 miles north, according to recent research by a Conservation and Survey Division (CSD) research hydrogeologist.

Jerry F. Ayers, researching well-head protection areas around the for the Lincoln Water System well field, said that long-term protection zones extend well to the north and east of the Platte River. It would take about 20 years for contamination in these areas to reach the well field, he said, but such a possibility must be considered to protect the city's drinking water. Since these regions are mostly farmed, the proper use of fertilizers and pesticides is essential to maintaining high-quality drinking water, he added.

The City of Lincoln contracted with CSD to define well-head protection areas for the well field to comply with part of the Nebraska well-head

protection program, begun with the 1986 passage of amendments to the federal Safe Drinking Water Act that gave states power to protect well-head areas within their jurisdiction from contaminants that may have adverse health effects." The Nebraska Department of Environmental Control is the lead agency in Nebraska. By using computer models and available hydrologic and hydrogeologic information, five different protection zones, of 20 years, 10 years, 2 years, 1 year and 60 days, were delineated.

Contamination that could affect the well field within a 60-day, 1-year or 2-year period could come from local housing developments, a Nebraska National Guard camp and farms.

Potential problems may arise from the improper use of chemicals, leaking sewer lines or septic tanks, leaching of agrichemicals through the soil zone or accidental chemical spills, he said.

Demonstration groundwater observation well to be drilled

Geology and water-science students and others will soon be able to study a groundwater-level observation well on the University of Nebraska-Lincoln campus.

A demonstration well will be drilled this spring just south of the Conservation and Survey Division Annex on UNL's East Campus. A 50-foot well will be drilled as part of the Monitoring and Environmental Drilling Field Workshop, held April

23 and 24, the day the well will be put in, the first day being devoted to classroom discussion. Later, it will be equipped with an automatic water-level recorder. All types of drilling methods will be discussed.

Interested parties are invited to attend the workshop, sponsored by CSD and the Nebraska Well Drillers Association. For more information, contact Lee Orton at (402) 467-3322.

Mineral resource news: oil, gas, limestone and uranium produced

Oil production from the Kleinholz Field in western Nebraska is expanding rapidly.

Exxon Corporation, Advantage Resources Inc. of Denver and independent Bruce Evertson of Kimball produced more than 1,500 barrels of oil daily during 1991 from the Kimball County oil field. Through December 1991, 27 active wells combined to produce a cumulative average of 3,034 barrels of oil, 817,000 cubic feet of gas and 313 barrels of water a day. In total, the field has produced 1,107,533 barrels of oil, 298,167,000 cubic feet of gas and 114,403 barrels of water.

The field was discovered in 1956 by Sam G. Harrison and produced less than 54,000 barrels of oil from shallow sand until it was abandoned in 1966. Exxon began to explore deeper layers in 1985 and found a large reserve in the Wolfcamp

Series of the Permian System. Since then, several producing wells have been drilled, and the possibility for more is being explored.

* * *

Kerford Limestone Co. is constructing Nebraska's fourth underground mine. The company produces 1.3 million tons of limestone annually from near Weeping Water. It started mining the new site last October, as reserves at its old location were dwindling. Company officials estimate the new mine has enough stone to last 50 years.

The pit at the new site is 900 feet long, 140 feet wide and 100 feet deep. Work has begun to tunnel into the sides of the pit with explosives. A conveyor belt system will carry stone from the mine to a processing plant about a mile away.

(See Mineral news continued on page 2)

The bimonthly newsletter of the Conservation and Survey Division

Minerals news *continued from page 1*

Most of what Kerford produces is used in asphalt and concrete for the construction of roads. Limestone exists beneath most of Nebraska but is mined only in the eastern part of the state because of its quality and shallow depth.

* * *

The extraction of uranium from a world-class deposit in western Nebraska began last April.

The Crow Butte uranium deposit, at a depth of 400 to 800 feet below the surface, was discovered in 1980 when geologists of the Wyoming Fuel Co. recorded abnormally high gamma-ray levels in several oil and gas test wells. Further investigation revealed a large cache of the radioac-

tive metal.

A pilot mine was started in 1986 and operated until 1989. Large-scale mining began last April, with first production in May. The uranium mine, located near Crawford in Dawes County and operated by the Denver-based Ferret Exploration Co., produced 333,500 pounds of uranium during the year.

Uranium is used primarily as an energy source and explosive. Additional deposits may be found in the Tertiary age sand and sandstones of western Nebraska or in the Cretaceous sandstones of eastern Nebraska.

* * *

GIS used to evaluate grouse nest-site selection

A geographic information system developed by researchers at the University of Nebraska-Lincoln's Center for Advanced Land Management Information Technologies (CALMIT) was used recently by the Nebraska Game and Parks Commission to evaluate land cover and topography and their relation to nest-site selection by sharp-tailed grouse in the Nebraska Sand Hills.

Susan Traylor, upland game specialist with Game and Parks, said a digital elevation model, digitized from 7.5-minute U.S. Geological Survey quadrangle maps, and vegetative cover classes, measured through field work by the U.S. Forest Service, were incorporated into the geographic information system (GIS). This allowed researchers to compare the vegetative structure and topography of known nest sites to surrounding land cover and terrain to highlight potential nesting sites. The GIS, developed by Luoheng Han, a UNL geography doctoral student working

with the CALMIT program of the Conservation and Survey Division, was used to evaluate one facet of the study--the effect of aspect, slope and vegetation on nest-site selection, Traylor said.

Topographic contour lines and boundaries of vegetation height and density classes were digitized for a 1.25-mile radius surrounding three sharp-tail breeding grounds, she said. All breeding grounds studied were on the Bessey Division of the Nebraska National Forest near Halsey.

Information collected during the study will also be used to assist the U.S. Forest Service in implementing the Land and Resource Management Plan for the Bessey Ranger District of the Nebraska National Forest. That plan, implemented in 1984, requires the U.S. Forest Service to improve habitat conditions for sharp-tailed grouse and other wildlife species.

MidAmerica GIS Symposium to be held May 4-7

The second MidAmerica GIS (geographic information systems) Symposium will be held May 4-7 in Overland Park, Kan., near Kansas City. The symposium is sponsored by the University of Kansas Division of Continuing Education and 10 public agencies, universities and professional organizations. In 1989, the MidAmerica GIS Consortium, made up of representatives from Arkansas, Iowa, Kansas, Missouri, Nebraska and Oklahoma, was formed to enhance regional interaction among those interested in GIS. Dr.

James Merchant, associate professor in the UNL Conservation and Survey Division, has served as the consortium's chair since its beginning. The consortium sponsored the first MidAmerica GIS symposium in May 1990 and more than 500 people attended. For more information, write Karl Kappelman, University of Kansas, Division of Continuing Education, 1246 Mississippi St., Lawrence, Kan. 66045, or call (913) 864-3952.

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Resource News is a bimonthly publication of the Conservation and Survey Division, 113 Nebraska Hall. Institute of Agriculture and Natural Resources, University of Nebraska-Lincoln, 68588-0517. It is distributed free to all interested in earth science in the state. To receive it, write to the address above. In addition, the Resource News audience will receive Resource Notes, the annual report of the division. The Conservation and Survey Division is the agency designated by statute to investigate and interpret the geologically related natural resources of the state, to make available to the public results of these investigations and assist in the development and conservation of these resources. The Conservation and Survey Division provides information and educational programs to all people without regard to race, color, national origin, sex or handicap. Background of nameplate on page one depicts the layered rock column from the Geologic Bedrock Map of Nebraska. Layers shown are (from the bottom) Precambrian, Cambrian, Ordovician, Silurian and Devonian rocks.

Visiting scholar from China joins CALMIT

Wogen Wen has joined the CALMIT faculty as a visiting scientist for the spring semester of 1992. Wen is a senior engineer of remote sensing and photogrammetry with the Research Institute of Surveying and Mapping, National Bureau of Surveying and Mapping (NBSM), Beijing, China. He is a graduate of the Wuhan Technical University of Surveying and Mapping and has completed post-graduate study in digital image analysis at the International Institute for Aerospace Survey and Earth Sciences, the Netherlands. He has also served as a visiting scholar studying spatial analysis at Hanover University, Germany, and was a visiting lecturer in Islamabad, Pakistan.

Wen has been involved with the NBSM-U.S. Geological Survey EROS Data Center (EDC) Exchange Program on Mapping with Space Data since 1986 and has hosted visits by EDC staff to China as recently as last summer. His research has focused mainly on analytical photogrammetry and aerotriangulation. He has, however, also worked on projects involving development of image-processing software, radar image processing, feature extraction for thematic mapping, change detection and remote sensing applied to soil erosion and flood control. While at UNL, Wen will be studying GIS and working with CALMIT on research directed toward integration of photogrammetry, GIS and remote sensing.

New groundwater geologist staffing Norfolk office

Joining the Conservation and Survey Division (CSD) recently has been hydrogeologist Susan Olafsen Lackey. Olafsen Lackey joined the division's Norfolk office in November 1991. She will provide expertise on groundwater issues to local governing bodies and to the public. Her research will focus on the impact of small reservoirs on local and regional groundwater flow systems and on aquifer characterization as it relates to well-head protection.

Olafsen Lackey earned a bachelor's degree in geological

engineering from the South Dakota School of Mines in 1982. In 1990, she took nine graduate hours at Oklahoma State University, studying practical approaches to groundwater geology and contamination.

Before coming to CSD, she worked at BCI Geonetics of Laconia, N.H., a groundwater exploration and development consulting firm for municipalities and large land developers. From 1983 to 1987, she was a construction engineer for the South Dakota Department of Transportation.

New map first to depict bedrock and surface features

The U.S. Geological Survey (USGS) has for the first time published a 1 x 2 degree quadrangle map of west-central Nebraska depicting surface deposits, bedrock exposures and bedrock configuration. Titled "Geologic Map Showing Configuration of the Bedrock Surface, North Platte 1 x 2 Degree Quadrangle, Nebraska," the map shows the depth to bedrock, type of surface deposits and thickness of the Ogallala Group for a large portion of west-central Nebraska.

Robert F. Diffendal, Jr., research geologist with the University of Nebraska-Lincoln Conservation and Survey Division (CSD), compiled the map data. CSD collections of drill-hole and irrigation-well logs provided information on bedrock depth and Ogallala thickness. The geology of the ridge dividing the North and South Platte rivers near

North Platte was determined through Diffendal's personal investigations.

The map, part of a USGS project to depict the state's bedrock at a 1:250,000 scale (1 inch equals approximately 4 miles), provides a refined idea of the overall volume of the High Plains (Ogallala) Aquifer and may prove a valuable reference for future groundwater exploration. It may also be useful in locating volcanic ash and sand and gravel deposits.

The full-color map is available from CSD, 113 Nebraska Hall, Lincoln, Neb. 68588-0517 for \$5.50 plus \$3 for first-class or \$1.50 for third-class mail. Nebraska residents should add state and city sales tax.

Division seeks comments for strategic planning process

The Conservation and Survey Division (CSD) is in the process of revising its strategic plan and implementing new action plans, according to the director of the division, Perry Wigley.

"These plans not only help affirm our continuing commitment to provide to the state service and research in broad natural resource areas, they also help us to focus on particular areas of critical need," Wigley said. Our process is a part of the overall planning efforts of the University of Nebraska-Lincoln Institute and Agriculture and Natural Resources (IANR) and is coordinated with other units of the

IANR, he added.

Internally, the division has been convening planning sessions of the soils, water, geology and geographic information systems groups, and would welcome additional comments related to these or other natural resource-related issues in the state, Wigley explained. If any individuals or agencies know of areas needing to be considered by CSD, please write to the division before April 15. In addition, the division will gladly meet with such individuals or groups to discuss any major areas of concern, Wigley said.

New publications on Nebraska geology, geography and water

Available from the Conservation and Survey Division

--Crow Butte Uranium Deposits, Nebraska Geonotes, 1990 (revised January 1992): Raymond R. Burchett, CSD; 2 p. (GIM-21) 50 cents

--Uranium Deposits in Nebraska, Nebraska Geonotes, 1990 (revised January 1992): Raymond R. Burchett, CSD; 3 p. (GIM-44) 50 cents

--Geologic Map Showing Configuration of the Bedrock

Surface, North Platte 1 x 2 Degree Quadrangle, Nebraska: R.F. Diffendal, Jr., U.S. Geological Survey in cooperation with CSD; 1:250,000 scale (I-2277) \$5.50 plus \$1.50 shipping

--Boone County Test-Hole Log Book, R.R. Burchett and F.A. Smith, CSD; 95 p. (THR-6) \$5.50

Please use order numbers (in parentheses). Nebraska residents should add state and city sales tax.

Coming up: National, state and regional meetings and workshops

--CALMIT Workshops: Introduction to GIS, March 9-13; Fundamentals of ARC/INFO, March 16-20; Image Processing and Digital Analysis, March 23-27, Lincoln; contact Chris Keithley for more information (402) 472-2565.

--Nebraska Water Conference, on wetlands, March 16-17, Cornhusker Convention Center, Lincoln.

--Nebraska GIS Forums, March 18 and April 22, Lincoln; contact James W. Merchant for more information (402) 472-7531.

--Lincoln Gem and Mineral Club, annual show, March 21-22, Lincoln.

--Shallow Exploration Drillers Conference, March 24-26, Stillwater, Okla.

--American Association of Geographers, April 18-22, San Diego.

--Monitoring and Environmental Field Workshop, sponsored by CSD and the Nebraska Well Drillers Association, April 23-24, Lincoln.

--The Geological Society of America North-Central Section, April 30-May 1, Iowa City, Iowa. Meetings of regional sections of the Paleontological Society, the Society of Economic Paleontologists and Mineralogists, the National Association of Geology Teachers, and annual meetings of the Pander Society and the Geological Society of Iowa, will be held in conjunction.

--1992 International Geoscience and Remote Sensing Symposium, May 26-29, Houston.

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