1992

Resource News-January/February 1992

Resource News

Vol. I, No. 2
Institute of Agriculture and Natural Resources

January/February 1992
University of Nebraska–Lincoln

Three universities cooperate to study land cover and use in nonpoint pollution

by James Merchant
Research geographer, CSD

Scientists at three Great Plains universities are working together on a sweeping study of the effects of agricultural land use, vegetative cover and other factors on nonpoint-source water pollution.

The Center for Advanced Land Management Information Technologies (CALMIT) of the Conservation and Survey Division (CSD), University of Nebraska-Lincoln, Iowa State University's Leopold Center for Sustainable Agriculture and the Kansas Biological Survey of the University of Kansas are doing joint research on the way farming practices, land cover, terrain and hydrology affect nonpoint-source pollution and the implications for management of stream ecosystems. CALMIT, is taking the lead in research on close-range remote sensing of water and the development of ways to understand the nature of the midwestern landscape and nonpoint-source pollution.

Land cover is crucial to understanding a number of environmental issues worldwide (see related story below). This research focuses on a study of 15 watersheds in the western cornbelt, with special emphasis on Nebraska, Kansas and Iowa. The watersheds represent small ecosystems that will be used to study interactions on land and in water that affect the movement of nonpoint-source pollutants such as eroded soil, pesticides,

(See **Pollution** *continued on page 3)*

U.S. AVHRR database is prototype for global land-cover assessment

A comprehensive land-cover database for the coterminous United States is being developed by Conservation and Survey Division (CSD) researchers at the University of Nebraska-Lincoln in cooperation with the Earth Resources Observation Systems Data Center of the U.S. Geological Survey located in Sioux Falls, S.D. The effort is a prototype for global land-cover assessment.

Land-cover characterization is critical to global environmental research. Being able to map and monitor changes in the earth's land cover is required to model the global carbon and hydrologic cycles, to study interactions between land-surface and climate and to determine rates of tropical deforestation.

This new U.S. database, developed under the direction of James W. Merchant, associate director of the CSD Center for Advanced Land Management Information Technologies (CALMIT), was based on 1990 satellite images from the Advanced Very High Resolution Radiometer (AVHRR) of

(See **Database** *continued on page 2)*

Earth-science groups encourage women to enter, remain in geoscience careers

Women geoscientists should encourage other women to enter and remain in the field and to serve as mentors, said Anne Matherne, water scientist with the Conservation and Survey Division of the University of Nebraska-Lincoln.

One organization devoted to these activities is the Association for Women Geoscientists (AWG), which is why she joined the group, Matherne said. A research hydrologist, she spoke recently at one of the group's Lincoln chapter meetings on her doctoral work at the University of Illinois-Chicago (see related story on p. 3).

A desire to promote and encourage women in the geosciences led to forming the association in 1977, said Janet L. Wright, a UNL geology instructor and AWG national vice president. Many women earn bachelor's and master's degrees in the geosciences, traditionally a male-dominated field, but few get their doctorates, said Wright, leading candidate to become 1992 national vice president of the 1,000-member association that is committed to the exchange of information about geoscience and about job opportunities among its members.

In a related vein, Wright serves as project coordinator for Women Investigating Science and Environment, a statewide program partially funded by a National Science Foundation grant. Founded in 1990 by UNL geology professor Nancy Lindsley-Griffin, it helps rural and minority girls enter

(See **Women geoscientists** *continued on page 2)*

The bimonthly newsletter of the Conservation and Survey Division

Database *continued from page 1*

the National Oceanic and Atmospheric Administration. Using AVHRR data, changes in land-cover conditions over short periods, such as a growing season, can be monitored.

The data were used to analyze changes in vegetation "greenness" which were then related to vegetation type and land-surface conditions. The prototype has several components, including "seasonally distinct" land-cover regions--regions that have similar vegetation and a similar time for the onset, length and peak of greenness, as well as related tabular data. The data were ultimately broken into 171 land-cover classes.

The potential applications of the U.S. database are being evaluated by scientists researching climate change, water quality, soils and other areas. Future plans call for research to enhance methods of land-cover assessment and extend these efforts to other countries and continents.

Women geoscientists *continued from page 1*

college and find careers in science, Wright said. These efforts include countering the myth that women can't do math and science; advice by teachers and counselors to avoid math and science; social pressure to not seem smarter than boys; ignorance about better opportunities for women in science and math careers; the isolation of rural life and small schools, where few may be interested in science, and where equipment and teachers are scarce and opportunities for hands-on experience limited, as well as fears about whether one can combine a career with marriage and family.

Rock-hounds name Pabian to Hall of Fame

On a field trip near Holmesville one day in 1959, Roger Pabian split open a geode to examine the enclosed crystals.

Those crystals opened up for Pabian a fascination with minerals, gems and fossils that led to a career as a research geologist at the Conservation and Survey Division (CSD) of the University of Nebraska-Lincoln. This career led to a reputation as a gem, mineral and fossil expert and a champion of rock hounds in the region.

For his contributions to earth-science hobbyists, Pabian was inducted this fall into the Rock-Hound Hall of Fame, sponsored by the American Federation of Mineralogical Societies and located in Murdo, S.D.

Pabian has devoted much of his career to producing field guides and other educational material for amateur collectors because he noticed early on the lack of such material available to non-professionals. People get involved in rock collecting because it's fun and because they are curious about the world around them, he added.

"Collecting rocks causes creative juices to flow," he said. "It makes people think about how the world came to look like it does today and how it must have looked in the past. It makes them think about the conditions needed to produce different minerals and gems and it makes people ask why some organisms flourished and some became extinct."

In eastern Nebraska, Pabian said, the best places to look for gems and minerals such as agates, jade, garnet, tourmaline, sapphires and rubies are gravel pits, quarries, road cuts, river gravel bars and plowed fields. Since these areas are usually located on private property, acquire permission from the owner before beginning the hunt, he added.

Throughout the year, gem and mineral shows are held around the state to support hobbyists and provide them with new ideas. These shows are a good place for beginners to learn more about the hobby, Pabian said. The annual show of the Lincoln Gem and Mineral Club is March 21-22 at Pershing Auditorium. Admission is $2. A complete list of field guides, circulars and other publications related to gems, minerals and fossils is available from the Conservation and Survey Division, UNL.

University of Nebraska–Lincoln
Institute of Agriculture and Natural Resources
Vice Chancellor
Irvin T. Omtvedt
Conservation and Survey Division
Director
Perry B. Wigley
Editor
Charles Flowerday
Editorial Assistant/Writer
Brad Rundquist
Cartographers/illustrators
Jerry Leach – Chief
Dee Ebbeka
Ann Mack

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.

Accuracy of hydrologic models can be improved

Through the use of computerized hydrologic models, scientists are now better able to predict when and where floods are likely to strike. But to make more accurate predictions, they must first determine how large an area their model really governs and take seasonal variations into account, said a University of Nebraska-Lincoln water scientist recently.

Anne M. Matherne, research hydrologist with the UNL Conservation and Survey Division, speaking in December at a biweekly meeting of the Association for Women Geoscientists held at the division, said traditionally scientists have gathered data on water flow paths for fairly small areas and then applied the model to drainage basins covering many thousands of square miles, which doesn't always produce great accuracy.

Her research has shown, she said, that accuracy can be increased when larger areas are modeled and the models are then applied to a given drainage basin. Seasonal variation of the water table can also affect runoff that could lead to flooding, and they need to be taken into account, she said.

For example, in upland basins of the ridge and valley country of southwestern Wisconsin, groundwater recharge occurs in the spring from snow melt, causing the water table to be higher at that time and lower the rest of the year, she said. Heavy runoff is likely in the spring, because the ground is already saturated. In contrast, in low basins, the water table is higher in the early fall, she said, and heavy runoff is more likely to develop then.

Pollution *continued from page 1*

herbicides, nutrients from the application of fertilizer and plant and animal waste into streams and other water bodies. Data developed will provide a framework for evaluating the role of land use and land cover, topography, stream channelization, riverbank vegetation and other factors on water quality; such data will provide critical information for developing and helping farmers use best management practices, land-use practices that minimize the effect of agricultural chemicals on the land and water.

The geographic information systems (GIS) technologies identify, quantify and analyze land-based features that influence water quality such as watershed geology, soils, land cover and land use and management. The studies involve cooperative efforts of specialists in land management, remote sensing, GIS, biological water quality and agriculture.

Funding for the first year of the project was provided by the U.S. Environmental Protection Agency in April 1991. Two more years of support have been requested, and support for the second year is likely.

Newly funded CSD projects *(funding agencies in italics)*

Geology

--COGEOMAP--Mapping of Bedrock Surface and Geology of West-central Nebraska, Ray Burchett; *U.S. Geological Survey (USGS):* $35,000.

--Application Review for Low-Level Radioactive Waste Facility Siting in Nebraska - 2nd year, Marv Carlson; *Nebraska Department of Environmental Control (NDEC):* $189,110 (1st year) and $103,245 (2nd year).

Soils

--Cherry County Soil Survey, Mark Kuzila; *Upper Loup Natural Resources District (NRD), Middle Niobrara NRD and Cherry County Commissioners:* $15,600.

--Dundy County Soil Survey, Mark Kuzila; *Upper Republican NRD:* $9,500.

--Hall County Soil Survey, Mark Kuzila; *Central Platte NRD:* $12,000

--Saunders County Soil Survey, Mark Kuzila; *Lower Platte South NRD, Lower Platte North NRD and Saunders County Commissioners:* $26,000.

--Sioux County Soil Survey, Mark Kuzila; *Upper Niobrara-White NRD:* $13,500.

--Washington County Soil Survey, Mark Kuzila; *Papio-Missouri River NRD:* $15,000.

--State Soil Survey, Mark Kuzila; *Nebraska Natural Resources Commission and USDA Soil Conservation Service:* $182,240.

Water

--Characteristics of Older Groundwater Reservoirs, Marv Carlson and Steve Sibray; *NDEC:* $9,100.

--Study of Western Nebraska Hydrogeology, Steve Sibray; *Upper Niobrara-White NRD:* $9,950.

--Three-Dimensional Numerical Modeling of Transient Hydraulic Behavior in the Brule Formation, Steve Sibray; *South Platte NRD and City of Sidney:* $8,000.

--Well-head Protection, Lincoln Well Field, Jerry Ayers; *City of Lincoln:* $4,986.

Geographic Information Systems

--Research on Non-point Source Pollution: Scale-related Issues in Remote Sensing (phase I), Jim Merchant, in cooperation with the University of Kansas; *U.S. Environmental Protection Agency (USEPA):* $322,000.

--Acquisition, Integration and Delivery of Spatial Information for Environmental Assessment--A Prototype Study, Jim Merchant; *NDEC:* $41,000.

--Research on Landscape Regionalization and Characterization of Landscape Structure in Multi-Resolution Satellite Image Data, Jim Merchant; *USGS:* $44,987.

--Development of GIS-based Methods for Wetlands Risk Assessment in Region VII, Don Rundquist and Jim Merchant; *NDEC and USEPA:* $52,000.

New publications on Nebraska geology, geography and water

Available from the Conservation and Survey Division

--Groundwater Vulnerability to Contamination in Nebraska Using the DRASTIC Method, 1991: compiled by the Center for Advanced Land Management Information Technologies (CALMIT), CSD, and the Nebraska Department of Environmental Control; 19" x 30" (LUM-31) $2.50 plus mailing fee of $1.50 (folded map) or $2 (unfolded).
--Groundwater Levels in Nebraska, 1990: by G.V. Steele, USGS, and P.B. Wigley, CSD; 82 p. (WSP-69) $6.50

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

Available from the U.S. Geological Survey

--Analytical data for bituminous coals and associated rocks from Arkansas, Iowa, Kansas, Missouri, Nebraska and Oklahoma, 1990: by S.J. Tewalt and R.B. Finkelman; 50 p. (OF 90-0669) microfiche $4; paper copy $7.75
--Ground-water quality in the Nemaha Natural Resources District, southeastern Nebraska, 1989: by D.Q. Tanner and G.V. Steele; prepared in cooperation with the Nemaha Natural Resources District; 52 p. (WRI 90-4184) microfiche $4; paper copy $8.50
--Seismisity map of the State of Nebraska (reprint): by B.G. Reagor, C.W. Stover and S.T. Algermissen; scale 1:1,000,000 (1 inch=16 miles); sheet 41" x 28" (MF-1350) $1.50
--Surface-water-quality assessment of the lower Kansas River basin, Kansas and Nebraska; concentrations of major metals and trace elements in streambed sediments, 1987: by D.Q. Tanner, R.F. Sanzolone and R.B. Zelt; 73 p. (OF 90-0581) microfiche $4; paper copy $11.75
--Uranium and diagenesis in evaporitic lacustrine mudstone of the Oligocene White River Group, Dawes County, Nebraska: by K.A. Dickinson; 25 p. (B 1956) $1.75
--Water-level changes in the High Plains Aquifer underlying parts of South Dakota, Wyoming, Nebraska, Colorado, Kansas, New Mexico, Oklahoma and Texas; predevelopment through nonirrigation season 1988-89: by J.T. Dugan, D.E. Schild and W.M. Kastner; 29 p. (WRI 90-4153) paper copy $23.50

Contact the Nebraska district office of the USGS to order at 100 Centennial Mall, Lincoln, Neb. 68508 (402) 437-5082

Coming up: State and regional meetings

--Nebraska Association of Resource Districts Legislative Conference, Jan. 27-28, 1992, Lincoln.
--Nebraska Well Drillers Association Annual Convention, Feb. 12-13, 1992, Lincoln.
--Mid-America GIS (geographic information systems) Symposium, March 4-7, 1992, Kansas City, Mo.
--Children's Groundwater Festival, sponsored by the Nebraska Groundwater Foundation, March 10, 1992, Grand Island.
--Nebraska Water Conference, on wetlands, March 16-17, 1992, Lincoln.
--Shallow Exploration Drillers Conference, March 24-26, 1992, Stillwater, Okla.

Printed on recycled paper

Conservation and Survey Division
Institute of Agriculture and Natural Resources
University of Nebraska–Lincoln
113 Nebraska Hall
Lincoln, NE 68588-0517