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# Water Current

## Teachers downlink water lessons

A hands-on, high-tech new approach to K-12 water science education sponsored by the University of Nebraska-Lincoln is completing a successful pilot year.

However, the Satellite Educational and Environmental Research (SEER) program, made possible by a four-year, \$1 million grant from the National Science Foundation, will not continue into its second year.

Despite the program's success, SEER sponsors were unable to obtain the required matching funds from other granting institutions, said Bob Volk, director of the Water Center/Environmental Programs unit.

Throughout fall 1995, a team of University of Nebraska professors and K-12 teachers produced a weekly, two-hour television show broadcast live to downlink sites across the state. This spring, the participating teachers are applying the lessons in their classes.

For Karen Gibson, chemistry and physical science teacher at Chadron High School, participation in the project translates into networking, improvement of her lesson plans and a chance to be part of innovative science education.

Every day, 175 students pass through Gibson's classroom, making it a challenge to come up with hands-on activities.

"I'm really committed to hands-on science, but you have to work at it. I take all the support and help I can get," Gibson said.

Gibson is one of about 100 Nebraska K-12 teachers who met in small groups across the state to downlink and take part in the program. From Albion to North Platte to Winnebago High School, the SEER program educated teachers about water and took them through hands-on activities. The goal was for each teacher to develop a unit on water appropriate for her or his students. About 10,000 students are expected to take part in a statewide research project, which will include tests for nitrates and other contaminants, this spring.

Marion O'Leary, head of the UNL Department of Biochemistry, oversees the program.

"This is a new way of teaching science. We're expanding the range of people involved in teaching science," he said. Not only professors and teachers from a variety of disciplines, but water experts from a range of agencies and professions assisted in the production of the television show. In Chadron, the manager of the city water department and a homemaker with a master's

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Nebraska science teachers make topographical maps of their watersheds as part of the SEER program. Brent Hollinger and Rick Perk, both of Waverly High School, and Randy Emry of Lincoln Southeast High School are participating. Photo —Mark Sumner



# Missouri, Platte rivers focus of spring events



Bob G. Volk

## from the DIRECTOR

I hope many of you are planning to attend the annual Nebraska Water Conference March 11-13 in Omaha. This year's theme is "The Mighty Missouri River — Past and Future."

The Missouri River has never been featured as a conference topic, but with much federal and state activity related to the river, we decided that it was time to discuss the Missouri's fate in some depth.

The Missouri River has changed, and the conference will take a look at the river from a historical perspective as well as discuss management changes in store for the future.

Invited speakers will cover a broad range of topics including basin views, landowner rights, navigation, governmental perspectives, environmental views and Native American rights.

For those interested in Platte River management, the spring Water Resources Seminar Series offers an opportunity to learn more about the issues involved. Platte River management goals are the focus of the series. Thousands of Nebraskans have an intense interest in Platte River management policies, and this seminar will discuss how management objectives are similar to each other and how they differ. The free seminar is broadcast at several downlink locations across the state.

Satellite coordinates are Spacnet 3, Channel 4. Please contact our office for more details.

The National Institutes for Water Resources (NIWR) has released a publication database containing nearly 10,000 entries. The NIWR database contains citations of journal articles, books and book chapters, dissertations, reports, conference proceedings and many other items related to water resources.

The database is available on computer disk with a quick search utility at a cost of \$10 to cover distribution. Please specify disk size and format when ordering.

To order, contact NIWR, Massachusetts Water Resources Research Center, Blaisdell House, University of Massachusetts, Amherst, MA 01003-0820 or tap the World Wide Web page at <http://wrri.eng.clemson.edu/>.

The Water Center/Environmental Programs unit at UNL always welcomes your questions and comments and seeks to assist you in your search for water-related resources. We are accessible by mail, phone, fax and email. We also have a home page on the World Wide Web (<http://ianrwww.unl.edu/ianr/waterctr/wchome.html>) for your information.

## Water Current

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## SEER.

### Continued from Front Page.

degree in wildlife biology attended the downlink meetings and worked with the teachers. Former Governor Robert B. Crosby, State Sen. Chris Beutler, and Jack Daniel, head of the Drinking Water Division of the State Department of Health, participated in the show.

"We also expanded what can be taught in a science lesson," O'Leary said. "All the dry stuff about atoms and molecules is necessary, but it's not enough. Kids want to know what this has to do with them," he said.

Thus, teachers learned how to sample water for nitrates and bacteria, how to operate a ground-water flow model and how to plant beans. But the purpose of these activities reaches beyond making science more palatable to children.

"It's also about teaching kids about citizenship. This program teaches a part of science that people ultimately will need to understand in their role as citizens," O'Leary said.

Two K-12 teachers, Pat Friedrichsen and Kathy Ahern, were hired full-time for one year as part of the SEER staff. Friedrichsen is on loan from Lincoln High School.

Friedrichsen said she enjoyed the chance to engage in in-depth lesson planning. Ahern, a former chemistry teacher at Pius X High School in Lincoln, said she found the pace of the SEER project exciting.

"I think it works for teachers from the point of view that we are helping to provide a forum for teaching science. Television as an entertainment medium is here to stay. So the question is, how can one use television as a medium for educational purposes?" Ahern said.

Frequent contact and feedback are an important part of the SEER program. SEER staff visited the downlink sites, responded to teacher's electronic journals and communicate with them by phone, mail and fax. Students and teachers are connected through listservs and



A group of Nebraska science teachers follows instructions given via satellite from the broadcast studio at the University of Nebraska-Lincoln. Photo — Mark Sumner

access to a World Wide Web site.

"It helps make long-distance learning more effective and connective," Friedrichsen said.

Assistance to the teachers continues this spring with conferences and visits. The SEER staff also plans to condense the television broadcasts and make them available in CD-ROM format to K-12 teachers.

The group meetings at the downlink site were important because of the contacts teachers gained, said Bob Curtright, chemistry teacher at Northeast High School in Lincoln. Curtright also appreciates the listserv, an electronic mailing list new to the SEER program.

**"It makes science real and relevant to students' and teachers' lives."**

— Bob Curtright, teacher

Curtright and Gibson said they are planning on integrating new ideas from the program into their lesson plans. Gibson, who said she developed a unit on water in previ-

ous years, plans to add a session on legal aspects of water use. Curtright is planning to include a study of one of Lincoln's waterways.

"That's something I probably wouldn't have done without the program," he said.

For Gibson and Curtright, the professional quality of the television show and the plenitude of ideas are definite benefits.

"It's an attempt to make teachers think about integrating science into their curriculum," Curtright said. "It makes science real and relevant to students' and teachers' lives."

For Volk, the program offers a unique opportunity.

"It lets teachers and students experience first-hand why water is important to their lives," said Volk, who helped develop the SEER proposal. "It's disappointing that we won't be able to continue the program despite the support of the National Science Foundation."

The SEER program is sponsored by the Department of Biochemistry and the Center for Curriculum and Instruction with assistance from the Water Center/Environmental Programs unit, UNL.

— by Bettina Heinz, Communications Associate, Water Center/Environmental Programs



# SETBACK RULE:

*Two best management practices may be more practical and effective than a current label requirement*



Tom Franti, UNL biological systems engineer, used water samples from riser pipes such as the one pictured above to evaluate atrazine and cyanazine runoff. Photo — Nebraska Farmer Magazine

Tom Franti, biological systems engineer at the University of Nebraska-Lincoln, is exploring alternatives to the setback rule.

Farmers who use the herbicides atrazine and cyanazine are familiar with the label requirements for setback near wells, streams, lakes and reservoirs. Those who have tile-terraces are also aware of a label interpretation by the U.S. Environmental Protection Agency that requires pesticide applicators to not apply atrazine or cyanazine within a 66-foot setback area surrounding a tile-terrace outlet riser pipe.

"This rule creates management problems for farmers," Franti said.

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A tile-outlet is part of a tile-terrace system.

Terraces are earthen structures built to intercept runoff water. In a tile-terrace system, the water is directed to a pond and underground pipes drain the water from the field. The tile outlet is a vertical pipe with holes through which water enters the drain pipes.

The setback means that a farmer has to delineate a 66-foot area for each riser pipe in the field, avoid spraying the area and spray it with another herbicide. With up to 20 to 30 tiles in a field, the setback means more labor and cost for farmers.

The setback rule was designed to prevent herbicide runoff contamination. Franti thus conducted a study to find out if other management practices might be easier and better suited to achieve that goal.

"We were hoping to show that different management practices are more effective than the 66-foot setback at reducing herbicide runoff," Franti said.

Franti and colleagues in Missouri and Iowa applied four herbicide

management practices on 12 individual tile-outlet terrace watersheds in Nebraska, Iowa and Missouri. The four treatments included the regular setback zone, no-till, herbicide incorporated into the soil and till, all with surface-applied herbicide.

"We found that the setback zone is only effective in proportion to the field area not sprayed," Franti said.

This means, herbicide runoff was reduced, but only because of the reduction of total herbicide applied. The

zone did not reduce the runoff from the remainder of the field sprayed. A setback can reduce herbicide runoff by 20 to 25 percent if the area contributing runoff to the terrace is only approximately one acre in size.

"For larger areas, other best management practices are more effective," Franti said.

**In no-till, the total amount of herbicide lost was reduced by 90 percent, attributed to a 72-percent reduction in runoff water.**

Mechanical incorporation reduced the loss of herbicide in runoff by 25 to 35 percent.

"The most dramatic reduction occurred in no-till," Franti said.

The total amount of herbicide lost was reduced by 90 percent, attributed to a 72-percent reduction in runoff water.

DuPont, which sponsored the study, has submitted the results of the study to the EPA with the suggestion to change the label. The suggested label change would allow pesticide applicators to use no-till or mechanical incorporation of pesticides as an alternative to the 66-foot setback rule.



# Biofilms

## Zhang stretches potential of tiny organisms

It's the little things that matter to Tian Zhang — the kind of things you might see under a microscope.

Zhang, assistant professor of civil engineering on the University of Nebraska at Omaha campus, studies surface accumulations of microorganisms called biofilms. He joined the department in fall 1994.

Biofilms are large amounts of microbes which bind cells and other materials together. They are used in process machinery such as trickling filters, rotating biological contactors and submerged filters for water and wastewater treatment.

But biofilms have other potential uses, such as treating nitrate contamination in groundwater, a strong environmental concern in Nebraska.

Zhang uses microelectrodes to measure concentrations of oxygen, pH, ammonium and nitrate to identify changes within the biofilm. His experimental research in determining biofilm properties, mass transfer resistance and substrate concentration profiles provides information to bridge the gap between mathematical modeling and laboratory observation of biofilms.

"Biofilms, in nature or in engineered processes, are very complex and dynamic," Zhang said. "Any discovery or discussion of biofilm properties has been largely limited by experimental techniques."

A native of Wuhan, a city of 5 million people in central China, Zhang grew up in the aftermath of Maoism and China's Cultural Revolution. He and his family, like millions of other Chinese citizens, were profoundly influenced by historical events.

Zhang's father was a university history professor until 1949, when Mao Tse Tung came into power. From 1966 to 1976, China was in the throes of the Cultural Revolution. All Chinese universities were closed. In 1977, the universities reopened as

China adopted a "normalization" policy, just as Zhang was preparing to enter college.

For better career opportunities, Zhang decided to study sanitary engineering, a field with applications primarily in urban areas. He received a B.S. in civil engineering from Wuhan Polytechnic University in 1982 and an M.S. in environmental engineering from Beijing's Tsinghua University in 1985.

Zhang continued studying part-time toward a doctorate and was hired by the university's environmental engineering department as an instructor. He also took classes at Beijing Agricultural University, 30 minutes away by bicycle.

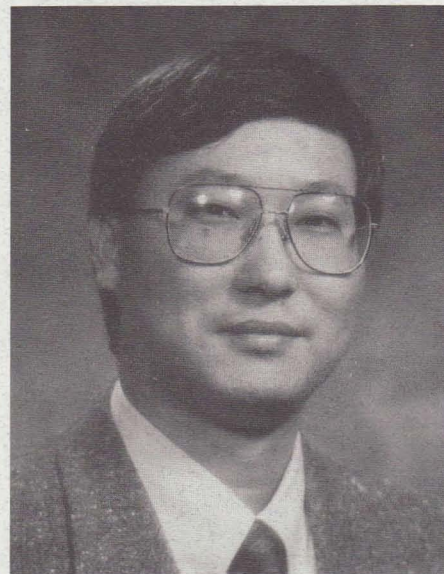
From 1987 to 1989, Zhang was a visiting scholar in the pollution control program at Japan's Tohoku University, where he studied anaerobic digestion processes concerning the comparison of single and two-phase digesters.

**"You can solve real problems in the state by working with industry."**

— Tian Zhang

Zhang completed his doctoral studies at the University of Cincinnati in March 1994. His thesis, "Influence of Biofilm Structure on Transport and Transformation Processes in Biofilms," received the 1995 Outstanding Doctoral Thesis Award cosponsored by Parsons Engineering Science and the Association of Environmental Engineering Professors.

Through a U.S. Geological Survey 104 grant funded by the Water Center/Environmental Programs unit and the Center for Infrastructure Research, UNL, Zhang is looking at sulfur-limestone autotrophic denitri-



Tian Zhang

fication (SLAD) systems to treat groundwater contamination. Although this process has been studied extensively in Europe, little research has been conducted in the United States. UNL graduate students Dave Lampe and Lara Zawaideh are assisting Zhang in collecting data to demonstrate the process can be used for above-ground and underground treatment.

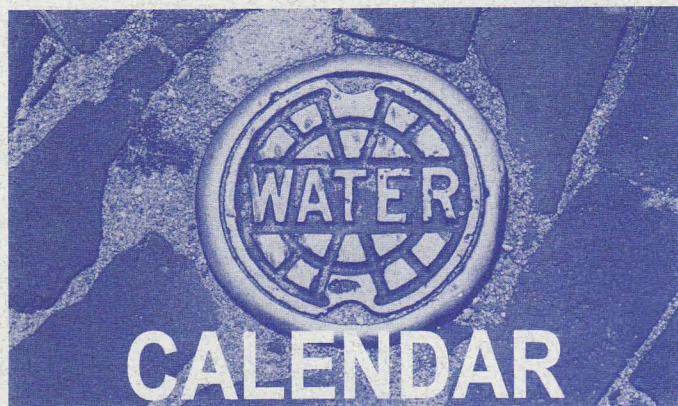
"The treatment method is completely new in the United States," Zhang said. "It is simple, reliable and cost-effective, particularly for small communities or individual farmers."

Zhang's research interests also include water and wastewater treatment, hazardous waste remediation, pesticide and nitrate contamination and soil and microenvironmental conditions. He wants to do basic and applied research and seeks industry partners for collaborative projects.

"You can solve real problems in the state by working with industry," he said.

— by Deb Derrick, Communications Specialist, Center for Infrastructure Research, University of Nebraska





## FEBRUARY

**Feb. 7:** "A Nebraska Perspective," Jim Cook, Nebraska Natural Resources Commission. 3 p.m., 116 L.W. Chase Hall, UNL, and via satellite. Water Resources Seminar Series. Contact Mike Eckert, (402) 472-0891.

**Feb. 14:** "Irrigation and Power Production Management." 3 p.m., 116 L.W. Chase Hall, UNL, and via satellite. Water Resources Seminar Series. Contact Mike Eckert, (402) 472-0891.

**Feb. 15:** Deadline for communities to enter the 1996 Groundwater Guardian program. Contact The Groundwater Foundation, Lincoln, at 1-800-858-4844.

**Feb. 20-21:** Nebraska GIS Symposium. Cornhusker Hotel, Lincoln. Sponsored by the Nebraska GIS Steering Committee and the Professional Surveyors Association of Nebraska. Contact Larry Zink, (402) 471-3206.

**Feb. 21:** "Endangered Species Act Enforcement," 3 p.m., 116 L.W. Chase Hall, UNL, and via satellite.

Water Resources Seminar Series. Contact Mike Eckert, (402) 472-0891.

**Feb. 27-28:** Platte River Basin Ecosystem Symposium. Holiday Inn, Kearney. Sponsored by Cooperative Extension Platte Watershed Program, Water Center/Environmental Programs Unit, UNL, and U.S. EPA Region VII. Contact Mike Eckert, (402) 472-0891.

**Feb. 28:** "Ecosystem Management," 3 p.m., 116 L.W. Chase Hall, UNL, and via satellite. Water Resources Seminar Series. Contact Mike Eckert, (402) 472-0891.

## MARCH

**March 5:** Children's Groundwater Festival, Grand Island. Sponsored by The Groundwater Foundation, Lincoln. Contact The Groundwater Foundation at 1-800-858-4844.

**March 5-6:** The Great Plains Symposium: The Ogallala Aquifer. Colby, KS. 13th Annual Water and the Future of Kansas Conference. Call 1-800-432-8222 or (913) 532-5569.

**March 6:** "Instream Flow Rights," 3 p.m., 116 L.W. Chase Hall, UNL, and via satellite. Water Resources Seminar Series. Contact Mike Eckert, (402) 472-0891.

**March 11-13:** "The Mighty Missouri — Past and Future." Annual Nebraska Water Conference, Red Lion Hotel, Omaha. Contact Water Center/Environmental Programs, UNL, (402) 472-3305.

**March 14:** "Benchmarking for the Water Industry." AWWA Satellite teleconference. Contact Heide Burback, AWWA, 1-800-559-2885.

**March 22:** Earth Wellness Festival. Southeast Community College, Lincoln. Contact Arlene Hanna or Soni Erickson, (402) 441-7180.

**March 27:** "Conjunctive Use Implications," 3 p.m., 116 L.W. Chase Hall, UNL, and via satellite. Water Resources Seminar Series on Platte River Management, UNL. Contact Mike Eckert, (402) 472-0891.

## APRIL

**April 3:** "Flood Plain Development Issues," 3 p.m., 116 L.W. Chase Hall, UNL, and via satellite. Water Resources Seminar Series on Platte River Management, UNL. Contact Mike Eckert, (402) 472-0891.

**April 8-11:** "Toward Achieving a Sustainable Environment." Nonpoint Source Pollution Work-

shop. Sponsored by the Nebraska Department of Environmental Quality. Lied Conference Center, Nebraska City. Contact Elbert Traylor, NDEQ, P.O. Box 98922, Lincoln, NE 68509-8922, (402) 471-4700.

**April 10:** "Economic and Municipal Impacts," 3 p.m., 116 L.W. Chase Hall, UNL, and via satellite. Water Resources Seminar Series on Platte River Management, UNL. Contact Mike Eckert, (402) 472-0891.

## MAY

**May 1-5:** Symposium: Applications of Hydrogeology in Agricultural Water Quality Studies. In conjunction with North Central GSA Meeting, Ames, Iowa. Contact Geological Society of America, Meetings Department, P.O. Box 9140, Boulder, CO 80301.

**May 2-3:** North Central Section, Geological Society of America, 30th Annual Meeting, Ames, Iowa. Contact GSA Meetings Department, P.O. Box 9140, Boulder, CO 80301.

## SEPTEMBER

**Sept. 22-25:** Rivertech '96. First International Conference on New/Emerging Concepts for Rivers. Chicago. International Water Resources Association. Contact Rivertech '96, IWRA, University of Illinois, 1101 West Peabody Drive, Urbana, IL 61801-4273. Fax: (217) 333-9561. Email: nbarrett@uluc.edu.





# Nebraska Water News

## Kamble receives national award

Shripat T. Kamble, pesticide assessment specialist in the Water Center/Environmental Programs unit and the Department of Entomology at the University of Nebraska-Lincoln, won the 1995 national award for Distinguished Service to the Board Certification Program.

The award is sponsored by the Entomological Society of America. Kamble is chair of the National Examining Committee for Board Certified Entomologists and serves as state liaison for Pesticide Impact Assessment and IR-4 program (minor use of pesticides) at UNL.

## Conference flier mailed to readers

A registration flier for the Annual Nebraska Water Conference March 11-13 in Omaha has been mailed to all Water Current readers.

The theme is "The Mighty Missouri — Past and Future." Registration deadline is March 4.

## Program pays to enroll pivot corners for habitat

Grand Island — Signup, on a first-come, first-served basis, began Jan. 8 for a program to convert a limited number of pivot irrigation corners to wildlife habitat areas within four Natural Resources Districts (NRDs).

Landowners in the Central Platte, Lower Elkhorn, Tri-Basin and Upper Big Blue NRDs may participate. They can receive from \$30 to \$75 per acre per year for enrolling their pivot irrigation corners that have marginal

productivity, depending on the type of cover practice they will maintain for the five-year contract period.

The program began last year as a pilot project in Central Platte NRD by Pheasants Forever, using a grant from the Nebraska Environmental Trust Fund to help pay for the program.

Based on the success of the pilot program, another grant was obtained by Pheasants Forever to expand the program this year.

Seed and trees will be provided by Pheasants Forever, but landowners are generally responsible for the ground preparation and planting.

For more information, contact the Central Platte NRD at (308) 385-6282.

## Pesticides plentiful in gardening, lawn care

The National Gardening Association estimates that 30 million households buy chemical fertilizers and that home gardeners spend \$1.5 billion on pesticides each year. About 73 million pounds of pesticides were applied to lawns and gardens in 1993, according to the U.S. Environmental Protection Agency.

*Source: National Forum on Nonpoint Source Pollution*

## Nebraska field days influence participants

During 12 field days in 1995, 665 people toured Mid-Nebraska Water Quality Demonstration project sites. Last year, 340 of these participants were surveyed. Of those, 74 percent said they had been influenced by the field sites. Survey questions asked for behavior changes since 1990, when the project began.

Of the participants surveyed, 48 percent said they took deep soil samples to credit residual nitrogen before 1990, and 68 percent said they have used deep soil samples since 1990.

Prior to 1990, 32 percent of those surveyed use water flow meters on wells. That percentage increased to 38 percent for current flow meter usage.

The survey also estimated the reduction in nitrogen application that has occurred since the project began. For those surveyed who reduced application by crediting residual nitrogen, the average reduction was 26 lbs/acre on an average of 463 acres.

*Source: Water Monitor, Winter 1996.*

## WEF announces speciality conference

Alexandria, VA — The Water Environment Federation (WEF) is seeking abstracts of technical papers for presentation at its first European specialty conference, "Beneficial Reuse of Water and Solids." The conference will take place in 1997 in Marbella, Spain. The abstract submission deadline is March 8, 1996.

For more information, contact WEF at 1-800-666-0206 or [dtrouba@wef.org](mailto:dtrouba@wef.org).

## Correction

James Brandle, associate professor in the Department of Forestry, Fisheries and Wildlife at the University of Nebraska-Lincoln, is a member of the research team investigating buffer strips ("Buffer strips trap contaminants," *Water Current*, December 1995). His name was omitted in the listing of investigators.



# Research, teaching intersect as students design sampler

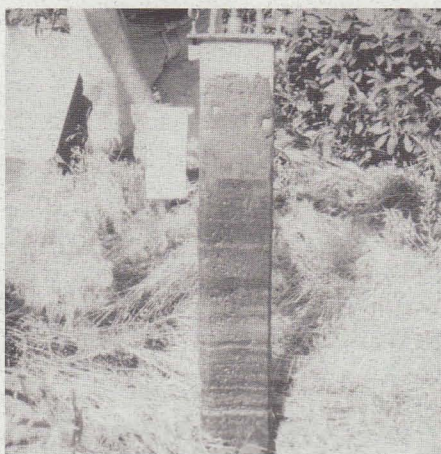
Researchers and professionals often need to take samples from wetlands, lagoons and hazardous waste sites. But conventional augers or coring devices easily get stuck in the murky, muddy sediment, and the sample is disturbed.

Students at the University of Nebraska-Lincoln came up with a solution to this problem by designing a device for sampling these sites and obtaining an undisturbed sediment sample.

David Parker, a doctoral student in biological systems engineering and recipient of a USDA National Needs Water Science Fellowship, initiated the design. Parker had previously worked at a consulting firm in Idaho, where the staff had developed a crude sampler that seemed to have promise under those conditions. He brought the idea with him when he came to Lincoln.

"The Idaho sampler was, to our knowledge, the only one ever built," said Dennis Schulte, biological systems engineer and Parker's adviser.

Sophomore engineering students took on the design of an improved sampler as a class project. Parker



The flat-plate freeze sampler works well in murky, muddy sediment.

assisted them by providing what he remembered from the Idaho sampler, and the students refined the design.

The resulting hollow stainless steel sampler was filled with dry ice and isopropyl alcohol. The sampler is pushed into the sediment, allowing the sediment to freeze to the outside sampler wall. After the sampler has been removed from the ground, individual layers are easily subdivided while still frozen to the outside of the sampler.

"The students made theoretical

calculations about material and refined the design," Schulte said. Later, the Biological Engineering Shop built the sampler based on the students' plan.

The sampler was used successfully to sample sludge from the bottoms of both a sedimentation basin and a storage pond at a beef cattle feedlot, according to Schulte. The sludge at these sites was too soft for conventional sampling methods.

The flat-plate freeze sampler proved to be an effective method for obtaining an undisturbed, visual representation of soft sediments and sludge, Schulte said. "

I think it has a fair amount of application in wetlands, sediment bottoms of rivers and lakes and lagoons, or wherever we have soft sediments or soil that can't be sampled accurately with conventional augers and boring equipment," he said.

Now other UNL researchers are using and modifying the sampler.

"There is a fair amount of engineering in this, surprisingly, though it doesn't look like it," Schulte said. "It's a nice example of where teaching and research intersect."

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