

## Field Trial – The Waffle Concept Hits the Ground Running!

**T**he Energy & Environmental Research Center (EERC) is testing the Waffle<sup>SM</sup> concept near Shelly, Minnesota, to determine the effects of Waffle-type storage on agricultural lands on a small scale. EERC researchers first surveyed and modeled the 560-acre test area, then added gates and standpipes to existing culverts in order to store water during spring snowmelt. The standpipes automatically allow the water to drain if it gets too high, so no roads are threatened. Portions of the test site were covered with water from 6 inches to 4 feet deep for about 2 weeks.



*EERC Senior Research Advisor Ed Steadman describes how test equipment works for local media.*

In preparation for the test, the EERC installed test equipment and sensors last fall that report soil moisture and temperature as well as weather conditions. Water quality and flow data were also collected. These data will help evaluate how farmland reacts to short-term water storage as well as hydrologic, economic, and agricultural effects of Waffle storage. Data and results will be reported later this summer.

While some landowners speculate that holding water will delay planting, EERC Senior Research Manager Bethany Bolles believes the delay will be minimal. On the positive side, she says, more soil moisture could help increase crop yields and, in areas with sandy, porous soil, recharge underground aquifers. For now, Bolles says she hopes that “most farmers are willing to remain neutral until they’ve evaluated the test results.”

This spring’s field trial will only give researchers a localized picture of floodwater storage and its effects downstream. More extensive field trials in the future will allow a broader analysis of impact on different kinds of soil and crops. For next year, larger test sites in North Dakota with differing soil types will be evaluated.

## Flood of 1997 – 7 Years Ago

**I**t’s hard to believe that 7 years have passed since the flood of 1997. The “little water event,” as EERC Director Gerald Groenwold says, emphasized the need for basinwide cooperation to handle spring flooding. Data from the 1997 flood are being utilized to calibrate and verify the models for the Waffle concept, along with data from other historical floods, including 1966, 1969, 1975, 1978, and 1979.



*A flooded Grand Forks neighborhood in 1997.*

Flooding on the Red River of the North in 1997 was severe, establishing the need for a new approach to flood protection in this region to augment existing control measures. According to the U.S. Army Corps of Engineers, the theoretical maximum flood height at Fargo is 60 feet (39.6 feet in 1997) and 67 feet at Grand Forks (54.4 feet in 1997) (U.S. Army Corps of Engineers, 1985). In simple terms, a comprehensive basinwide flood protection program is critical to the very survival and economic vitality of the towns and farms in the Red River Basin.

Continuing to evaluate basinwide strategies presents decision makers with more options to prepare the region for floods of similar or greater magnitude than the 1997 flood.

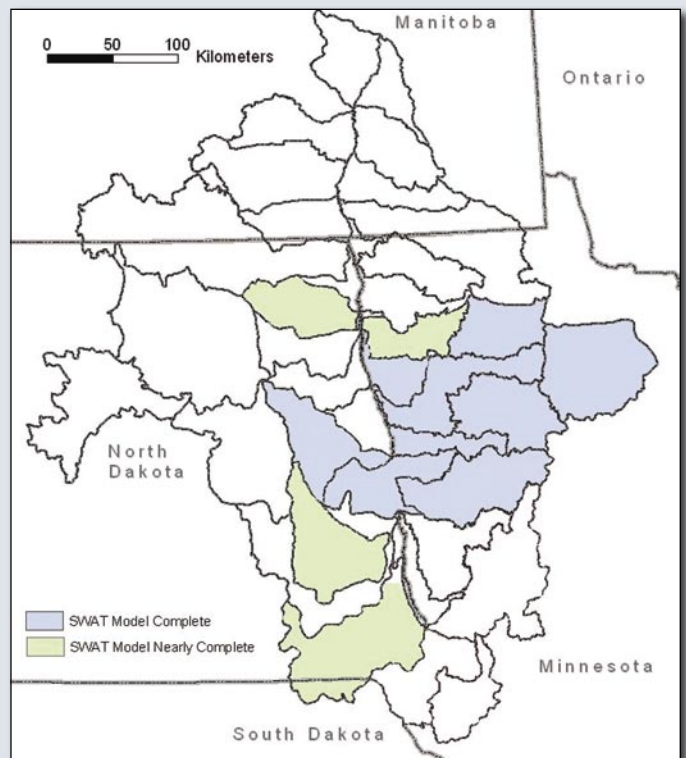
## Modeling Update

EERC Research Scientist Xixi Wang is leading the Waffle project modeling effort. He received his training in Agricultural Engineering at Iowa State University and gained experience developing flood analysis disaster tools at a civil engineering consulting firm in the Washington, D.C., area. Initially, the modeling team created a preliminary model to determine how much water should have been stored upstream of key locations along the Red River to have maintained the river level below flood stage during 1997. In order to refine these preliminary storage estimates, the next step is the development of detailed models for the watersheds in the Red River Basin (RRB).



The key model used for the study is the Soil and Water Assessment Tool (SWAT), developed by the U.S. Department of Agriculture (USDA) Agricultural Research Service (ARS) and the U.S. Environmental Protection Agency (EPA). These models will allow estimation of the reduction in large springtime flood events by temporary water storage in Waffle sections throughout the RRB. Although the Waffle study is focusing on water quantity, the SWAT models developed by the EERC can be used for other basinwide investigations, such as the impact of land management practices on water quality.

Currently, SWAT models have been developed and calibrated for nine watersheds, including the Elm, Goose, Eastern Wild Rice, Marsh, Sandhill-Wilson, Red Lake, Thief, Clearwater, and Grand Marais-Red. Models were



Map showing SWAT modeling area.

first developed in the Eastern Wild Rice Watershed in Minnesota, the area of the field trial. Throughout the course of the study, the goal is to model all of the subbasins within the RRB, excluding the Devils Lake subbasin because it does not contribute water to the Red River. The results will be available to the public at the end of the study. These models will prove useful to anyone involved in water management in the RRB. All of the watershed models will be developed by the end of 2004.

## New Waffle Team Member



Douglas R. Davidson recently joined the staff of the EERC to work on the modeling effort in the Waffle study. Davidson will be developing computer models for drainage of subwatersheds in the RRB and other soil and water assessment tools. Originally from Grand Forks, North Dakota, Davidson earned his bachelor degrees in Environmental

Science and Geology from Bemidji State University while farming near Bemidji, Minnesota. He also gained experience with the U.S. Geological Survey in Mounds View, Minnesota. After earning his degree in 1993, Davidson moved to Idaho to work as a hydrogeologist for the past 11 years at the Idaho Department of Environmental Quality and the Idaho Soil Conservation Commission. While at the Idaho Soil Conservation Commission, he worked on a TMDL (total maximum daily load) program for a 300,000-acre watershed. Davidson's expertise is in groundwater quality and modeling.



## Web Site Up and Running!

Check out our new Web site, where you can find project updates, Citizens' and Agency Advisory Board members, FAQs, links, information, and publications. The address is [www.undeerc.org/waffle](http://www.undeerc.org/waffle). We like to hear from you—there's a feedback form to submit your thoughts and ideas on our Web site, so send us a note to let us know what you think!

## Landowner Frequently Asked Questions (FAQs)

### Is participation in the Waffle voluntary?

The first thing to keep in mind is that the Waffle project is a feasibility study. It's an innovative attempt to understand spring flooding in the entire RRB. The key to the Waffle approach is that it is a basinwide water management strategy, not just a means of protecting Grand Forks or the Red River Valley. If the study shows favorable results, potential implementation would involve a coordinated effort throughout the entire basin. The Waffle study results will be provided to decision makers to determine implementation scenarios.



*Aerial view of the Red River Basin.*

Every township, county, city, and landowner deals with water issues. Because only a small portion of land would be needed for temporary storage, we believe that landowner participation would be strictly voluntary. We are still studying how much land would be needed and how long the water would be stored.

### I saw a lot of water in fields this spring; isn't the Waffle already in place?

Yes and no.

To some extent the Waffle concept is already working. In the springtime, the existing road network does hold back water to some degree. This is encouraging to researchers, who are investigating road stability. However, current drainage strategies are not coordinated on watershed or basinwide scales. This lack of broad-scale coordination can result in roads and culverts being washed out and flooding. The Waffle feasibility study is determining the amount of water and the length of retention needed to protect the entire basin from flooding problems. The models and detailed maps provided by the study will prove useful to anyone dealing with water management issues in the RRB.

### What are benefits of the models developed in the Waffle<sup>SM</sup> study?

The Waffle feasibility study will result in the first comprehensive, detailed database and hydrologic model for the entire RRB. The feasibility study results will include land use and agricultural economics data, along with drainage information in a user-friendly GIS (geographic information system) format that will be shared with state and local governing bodies and agencies. The application of this global model will be very beneficial to decision makers charged with the wise management of our resources. The Waffle project is a national model for resource management in agricultural regions.

Please send your questions to [bbolles@undeerc.org](mailto:bbolles@undeerc.org) or call (701) 777-5050.

## Waffle Team in the Red River Basin Morning, Noon, and Night

The Waffle team is out in the RRB almost daily meeting with groups and agencies in both North Dakota and Minnesota to communicate the Waffle concept and project activities.

Team members visit with watershed districts, water boards, county FSA offices, soil and water conservation districts, township officer associations, and service clubs, such as the Kiwanis.

Agency meetings are often held over breakfast or lunch and sometimes in the evening. EERC Research Engineer Lynette de Silva says, "We enjoy meeting with groups in the area and learning from them. The idea is to build on the existing knowledge base and experience and to communicate our approach to basinwide distributed storage, so constructive comments are always welcomed. This kind of interaction and exchange will benefit all of us, especially our modeling efforts."

Participating in and presenting at meetings is useful to the Waffle study to learn from the citizens, landowners, and leaders in the RRB. People who would like to know about the Waffle concept or have questions are in regular contact with the Waffle team. If you would like to schedule a Waffle presentation at one of your meetings, call Kim Dickman at (701) 777-5109.



## Did you know?

- On average, nearly a third of the water that flows down the Red River each year comes during April (EERC progress report).
- The Waffle team has given presentations at 130 gatherings this year, including township board meetings, soil and water conservation meetings, and service clubs. If you know of a group that would like to know more about the Waffle concept, please call us.

Thank you to everyone who responded to the landowner survey of the Wild Rice Watershed. The response rate was more than 10%. The survey results are being compiled and will be summarized in the near future. The winners of the Waffle landowner survey drawing were as follows:

- Waffle iron, Hazel Hutton, Ulen, MN
- Cabela's gift certificate, Richard Delaney, Twin Valley, MN
- Digital camera, Jeff Borgen, Perley, MN



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## For Questions or Comments

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