EERC
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the Waffle®

Basinwide Flood Control: the Waffle®

Flooding on the Red River of the North in 1997 was severe and established the need for a new approach to flood protection in this region to augment existing flood control measures. The theoretical maximum flood levels in the Red River Basin (RRB) are considerably higher than the levels of protection provided by structural systems such as dikes. Given the severe flooding that has occurred in recent years, an augment to these structural systems must be found to ensure long-term security from flooding for the citizens of the RRB.

To address this need, the Energy & Environmental Research Center (EERC) is conducting an objective evaluation of an innovative, nonstructural, basinwide flood and drought mitigation concept for the RRB called the Waffle. Although many flood-related studies have been conducted in the past, a comprehensive evaluation of the viability of a basinwide approach for the reduction of main stem flooding in the Red River has never been accomplished. The EERC's goal is to investigate the technical and economic feasibility of such an approach through the evaluation of the Waffle concept.

Although the data gathered by this project will prove useful for many flood mitigation options and other resource management activities, the ongoing project's main goal is to determine the feasibility of developing a basinwide system for temporary storage of springtime floodwater in the RRB. The Waffle flood mitigation effect will be accomplished utilizing existing depressions within the basin, such as low-relief fields bounded by county roads, ditches, and/or wetlands. The storage areas, raised roads, and drainage structures will potentially act as a network of channels and control structures to temporarily store water until the Red River flood crest passes. Because only a fraction of the land in the basin should be needed, it is possible to avoid land with houses or other structures.

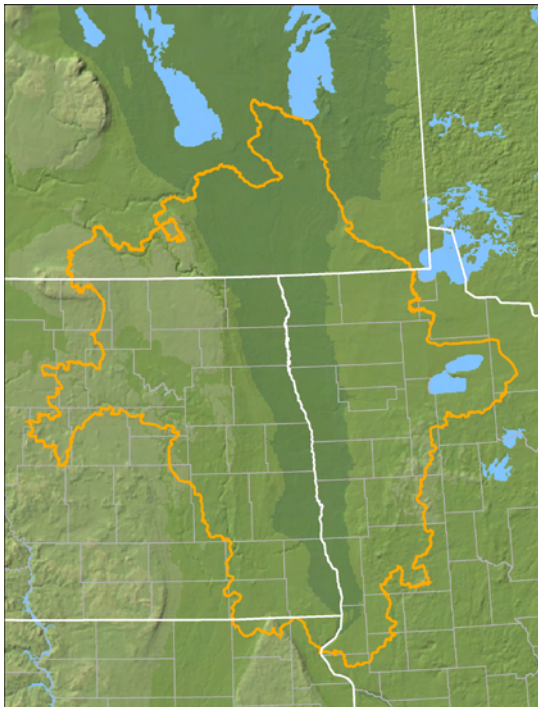
Although by no means a natural system, the Waffle will work with existing infrastructure to mimic a natural system by slowing the progress of water to the main stem. This flood mitigation concept addresses excess runoff before it enters the Red River and becomes a problem, thereby lessening the volume of water needed to be retained by dikes or redirected by diversions downstream.

In addition to helping reduce costs associated with flooding, the Waffle project could benefit farmers in both wet and dry years. On average, nearly a third of the water that flows down the Red River each year comes in April. Therefore, in most years, the problem is not that there is too much water, but that water is not available when it is needed most. For example, rather than allowing water from snowmelt to run off, it could be stored to help farmers increase soil moisture. Water captured in the Waffle during the spring could also be used to recharge aquifers depleted by droughts and pumping for irrigation and municipal use.

The results of the technical and economic evaluation of the Waffle concept will be provided to policy makers in the basin. Because it has potential benefits to both urban and rural residents, the Waffle plan represents the best chance to cooperate on water management throughout the basin and, for the first time since European settlement, provide true long-term security from flooding.

The proposed work is proceeding in a series of six main tasks. Task 1 is a proof-of-concept assessment. Fundamental calculations and topographic assessment are being performed to determine the theoretical volumes of water that could be retained in various flooding events and the storage volumes necessary to minimize damage from large, springtime floods along the Red River. Task 2 focuses on the construction of the models needed to develop, evaluate, and test the Waffle concept, first on test subbasins and, eventually, basinwide. Task 3 consists of gathering existing and new data needed to support the models and constructing a database to support the project. The goal of Task 4 is to communicate project activities, outcomes, and potential to stakeholders. The outreach activities in Task 4 will serve to ensure the project is understood by the public and that public input is obtained. Task 5 involves a pilot-scale evaluation of the Waffle concept at field trial sites, which will serve to assess the effectiveness of the mitigation effort and provide the data needed to refine and improve the procedure. Task 6 will provide an assessment of the economic impacts of the Waffle as compared to past flooding events and other flood control measures or inaction.

"Do the right thing. It will gratify some people and astonish the rest."
—Mark Twain



A shaded relief map showing the area included in the Red River Basin.

Over 300 people attended a waffle breakfast at the EERC to publicly launch a 3-year study of the Waffle project.

Waffle Products

The models and tools developed by the Waffle project will have multiple benefits, including:

- Development of a comprehensive water management tool with applications for flood and drought mitigation, water quality, wetland restoration, riparian restoration, and erosion control.
- Development of a detailed basinwide model to assist decision makers in addressing nonstructural and structural water management scenarios.
- Compilation of existing natural resource-related data into a user-friendly database that can be used and updated by stakeholders of the RRB.
- Collection of new data to fill in gaps, such as collection of detailed elevation data in various areas of the RRB.
- Development of coupled hydrologic/hydraulic models for each of the tributaries of the RRB. These models will contain a high level of detail and incorporate factors such as land use, cultivation practices, soil type, and slope.

Funding for the project is provided by the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS).

This project is consistent with the international trend toward nonstructural basinwide approaches to flood control and could become a model for flood control strategies in the new millennium. Although the Waffle concept is compatible with the integrated watershed-based approach recommended by the National Research Council (*New Strategies for America's Watersheds*; National Academy Press: Washington, DC, 1999), it has been widely discussed and debated. The feasibility of establishing such a large-scale project raises many important questions. It is the goal of this project to evaluate the feasibility of the Waffle concept as a cost-effective means of providing basinwide security against flooding for the RRB.

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