

# Basinwide Flood Control:

*the Waffle*<sup>SM</sup>



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. An obvious need exists to evaluate and implement basinwide strategies to prepare the region for floods of similar or greater magnitude than the 1997 flood. 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). Because of soil conditions, conventional flood control structures, such as dikes, can only provide protection up to 40 feet in Fargo and 60 feet in Grand Forks. The Waffle<sup>SM</sup> would help provide the additional protection needed to make up the difference between structural flood protection heights and probable maximum flood heights. A recent publication from the University of Manitoba estimates that there is a 50% chance that a flood approaching the theoretical maximums will occur in the next 50 years. In simple terms, a comprehensive basinwide flood protection program is critical to the very survival of our communities and the farming sector in the Red River Basin.

The Energy & Environmental Research Center (EERC) received initial funding from the U.S. Department of Agriculture Natural Resources Conservation Service in the spring of 2002 for the first year of a project to investigate temporary storage of springtime runoff to augment existing flood control structures and help mitigate flooding throughout the Red River Basin. The EERC project team is investigating the water storage potential in several types of “depressions” within the basin, including low-relief fields bounded by raised roads, ditches, wetlands, wildlife and game refuges. These preexisting storage areas, supplemented by roads and drainage structures, could act as a network of channels and control structures to slowly release stored water into the Red River as the flood crest passes. Work is under way to develop a comprehensive basinwide model. The advantage of a basinwide approach is to provide flood relief to both rural areas and municipalities.

Preliminary Year 1 modeling efforts have indicated that sufficient potential storage areas are present to significantly reduce flooding if temporary storage is employed. Year 2 modeling has started to develop the subbasin models needed for further identification of potential storage areas. Ultimately, the models that are developed will help stakeholders of the region better understand the hydrology of the basin, including the effects of microstorage on flooding events.

The EERC technical team is also interacting with stakeholder groups and the public to inform them and involve them in the project work. Two advisory boards were formed during Year 1, an Agency Advisory Board (AAB), consisting of representatives from local, state, and federal agencies, and a Citizen’s Advisory Board, consisting of members of the local community, including farmers and landowners. The AAB will take on a technical role by advising EERC personnel on issues related to temporary water storage. The CAB will serve as the counterpart to the AAB by advising the EERC on landowner concerns and issues. Year 2 efforts also include planning for a field trial expected to serve as a water storage demonstration. The field trials will involve the participation of area landowners.

The Waffle<sup>SM</sup> project will provide the following benefits to residents of the Red River Basin:

- A nonstructural flood mitigation tool that will provide essential augmentation to existing structural flood control systems throughout the Red River Basin.
- Water management options for both flooding and drought.
- A database of information, such as detailed road elevation data, that would have many uses to stakeholders in the basin—above and beyond flood mitigation and water management.
- A model able to predict the hydrologic response of the basin or a subbasin based upon multiple scenarios, such as wetland or dry-dam storage, riparian restoration, or culvert resizing.

*“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<sup>SM</sup>” project.*

The concept of temporarily storing water in low areas has been previously investigated in the Bottineau region of North Dakota. The Create-A-Wetland Project, established by the North Dakota State University Extension Service and the Wetlands Trust during the 1990s, was originally developed as a way to reduce downstream flooding by temporary water storage in fields. One aspect of the study compared grain yields between fields that had temporarily stored water and those that had not. Average grain yields were 74.5% higher in the fields that had stored water, and in one storage section, a 141% yield increase was observed. A more recent study in the Pembina River Basin investigated the utility of temporary surface water storage for flood control. The study quantitatively evaluated potential surface water storage in the Mowbray Creek watershed and concluded that the reduction of peak flows is possible with relatively few changes in infrastructure.

Using temporary springtime microstorage to manage water throughout the Red River Basin could provide benefits in both wet and dry years. On average, nearly a third of the water that flows down the Red River each year comes during 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 the most. For example, during dry years, rather than allowing water from snowmelt to run off, this (low-dissolved-solids) water could be stored to help farmers retain soil moisture. Water captured in storage areas during the spring could also be used to recharge aquifers that are depleted by droughts and pumping for irrigation. This is currently being done along the Assiniboine River in Manitoba.

The Red River Basin has always been subject to extreme fluctuations in water quantity and will continue to battle either too much or too little water. Recent evidence from research conducted by the EERC and the University of North Dakota’s

Regional Weather Information Center indicates that weather phenomena in this region follow a 170- to 175-year cyclic pattern. According to the studies, we may be in the midst of a wet cycle that could last 15 to 20 years. Although floods of significant magnitude can occur at any time, statistically they are much more likely to occur during wet cycles, like the one we appear to be experiencing.

Effective water management options and strategies that will be developed by this project are fundamental to the long-term economic viability of the region. The ultimate goal of this project is not implementation by the EERC, but the development of a flood mitigation procedure to augment existing flood control measures, such as dikes and diversions. The results of this project will be made available to policy makers in the basin for possible implementation. Implementation will require voluntary participation of landowners and local water management agencies, as well as coordination by state and regional entities. We believe that if the EERC can demonstrate that this project has benefits to all parties within the basin—farmers, small towns, and cities, implementation will be possible. 🐟

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