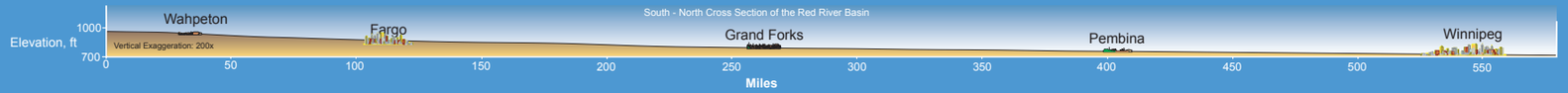
Final Products

- An evaluation of the technical, economic, and socioeconomic feasibility of a Waffle-type concept for application in the RRB.
- Development of a comprehensive water management tool with applications for natural resources management, including flood and drought mitigation.
- 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 database that can be used and updated by stakeholders of the RRB.
- Compilation of a strategic document summarizing landowner concerns and issues related to the use of private land for flood mitigation.

For more information, check out our Web site at www.undeerc.org/waffle or call Bethany Bolles at (701) 777-5050, John Harju at (701) 777-5157, or Gerald Groenewold at (701) 777-5131.

The Red River Basin Elevation



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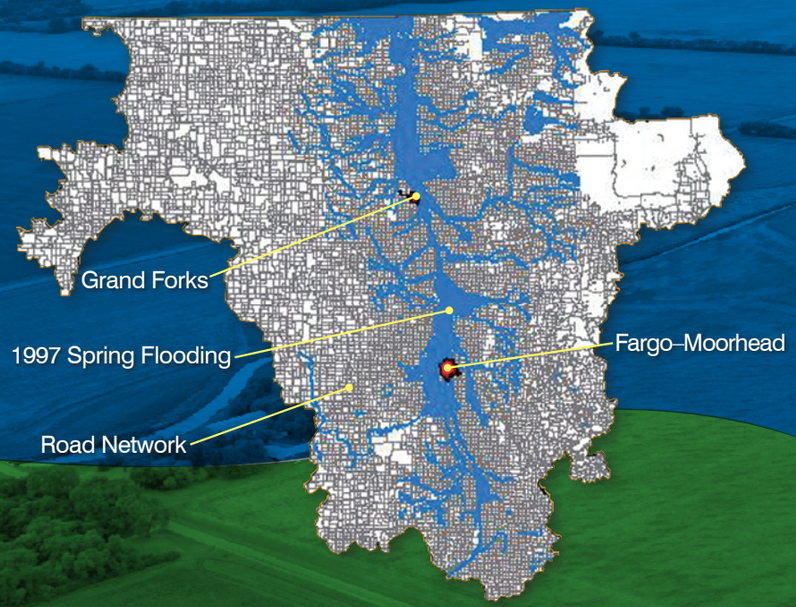
A Solution: The Waffle

The Waffle is a 4-year project being conducted by the University of North Dakota Energy & Environmental Research Center (EERC). After the 1997 spring flood in the Red River Basin (RRB), the EERC sought funding to determine the feasibility of storing water temporarily in areas such as rural ditches and fields bounded by raised roads to augment conventional flood protection measures and alleviate spring flooding problems. Funding for this project was allocated by Congress and provided through the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service in the spring of 2002.

EERC Energy & Environmental Research Center
UND University of North Dakota

the Waffle®

Spring Flooding – 1997



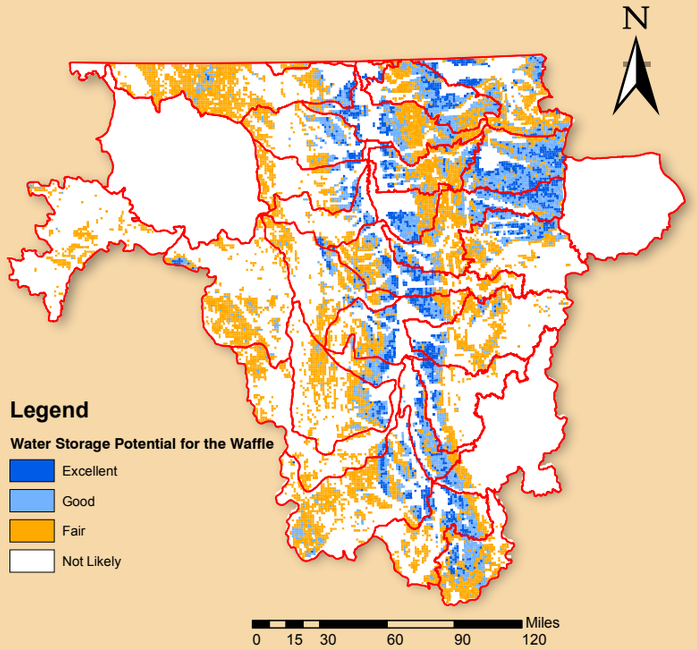
The extent of the 1997 spring flooding in the RRB is shown in blue. To mitigate this flooding disaster, the Waffle project explores distributed microstorage in the vast basinwide road network displayed in gray. Much like syrup contained by waffle ridges, water could be contained by fields bounded by raised roads.

What is the Waffle Concept?

Just like syrup pooling in the squares of a waffle, water may be temporarily stored in existing depressions throughout the RRB, such as low-relief fields bounded by existing roads. The Waffle concept entails:

- Temporary storage of snowmelt to mitigate large springtime floods.
- Water storage wherever possible throughout the entire RRB, including "upstream" areas.
- Providing a means of controlling runoff before it becomes a problem downstream and causes flooding.
- Reducing road damage by providing a means of controlling flows in ditches.
- Reducing flooding to both urban and rural areas.
- Supplementing the protection provided by conventional flood mitigation measures, such as dikes, diversions, and dams.
- Providing a means for landowners to increase soil moisture during dry years.

Spring Flood Mitigation with the Waffle



The EERC has identified potential Waffle storage areas throughout the entire U.S. portion of the RRB. The classification system of excellent, good, fair, or not likely is based upon terrain relief. Blue areas indicate the smallest changes in elevation, providing the most ideal storage areas. Potential water storage volume is higher in large, flat parcel of lands bounded by raised roads.

The map indicates all potential storage areas that could be utilized in the Waffle system to mitigate springtime flooding. During an actual springtime flood event, only a portion of the potential storage areas would be recommended for storage—the volume required to mitigate an anticipated springtime flood in a given year.