

Landowners Put Waffle to the Test in Field Trials

Several landowners did their part to make the 2005 Waffle field trials a reality. The field trials utilized temporary water storage on several parcels of land to investigate how the storage reduces downstream flooding and how the land is affected.

Four parcels of land were involved with the field trials. Three are located in Minnesota and one in North Dakota. For each parcel of land, the landowners and the neighbors were intimately involved in the field trials and watched the progress. Thank you to everyone who participated in the study this year!



Agassiz Site at Full Storage

One Minnesota field trial site is located near the Agassiz Wildlife Refuge. Landowner Terry Beich initially heard about the Waffle project on TV. He said that he decided to give the EERC a call to get more information. Beich said, “We’ve had a lot of flooding in this area, and I thought maybe it’s my chance to step forward and do my part.”

“I can’t say enough about working with the EERC. They were extremely easy to work with,” said Beich. “I was real impressed. Marc Kurz (EERC researcher) was so accommodating and provided frequent updates. When he put out the different gadgets for studying, he explained what they planned to use them for.”

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Waffle Team Compiling 2005 Field Trial Results

The water storage of the spring 2005 field trial demonstration, which began in late March, was completed during the month of April. The field trials provided data to determine the technical feasibility of the Waffle concept. EERC Senior Research Manager, Bethany Bolles said, “The purpose of the Waffle study is to investigate the technical and economic feasibility of small-scale, temporary water storage for mitigating springtime flooding. The data collected through the field trials will help in the evaluation of both the technical and economic components of the study.”

Associated with the water storage, additional testing was performed at each site to evaluate potential impacts to water quality, soil chemistry, and soil moisture and temperature. Crop yields and Conservation Reserve Program grasses will also be evaluated in the upcoming quarter through both on-the-ground monitoring and aerial infrared photography monitoring to determine vegetative health on flooded and nonflooded portions of the sites. The results of all monitoring activities related to the field trial will also be compiled and interpreted during upcoming months and reported in the next newsletter.



Shelly Site at Full Storage Capacity

Field Trials, continued

Beich went on to say, “Something has to be done (about flooding). Now we have an option that we can look into with the feasibility study. The reason I stepped forward is to do my part to work toward a solution.”

Norma Nelson, whose land is located near Lake Bronson, Minnesota, said she and her husband Floyd thought it was “a very interesting project, and it will be interesting to see it again next year.” The Nelsons will be participating in the last field trial in the Waffle feasibility study in spring 2006.

One early morning this past spring, Norma Nelson was out in the truck at 6 AM taking pictures. She was watching the site daily. She said, “We had about 300 geese on the land. It was a beautiful sight.” Terry Beich also mentioned that the ducks and geese took advantage of the Waffle field trial area.

Virgil and Joyce Poole, also residing in the Lake Bronson area, live northeast of the project, so they didn’t always have a chance to watch the daily activities on the land. Joyce is quite interested in the results, “It’s an experiment, and to know if it’s going to work or not, we’ll have to see how the project turns out.”



Lake Bronson Site in the Early Morning

In the Gilby, North Dakota area, John Scott watched the progress of the Waffle field trials on his land. “I thought that it worked out quite well. We were very favorably impressed,” said Scott. “I think it’s a very good idea for a lot of reasons not just for the flooding, but also for years where there isn’t enough water.”

Scott’s land near Gilby is enrolled in the Conservation Reserve Program (CRP), but he has occasionally stored water on farmland too. “We’ve retained water on farmland in past years, and we didn’t see any adverse results from it. We noticed that if we held the water for a couple of weeks, then the crops were better for 2 or 3 years after that. That is what we observed on our soil type.”

Speaking about the Waffle concept, in general, Scott added, “I think it’s a good idea, and I hope it goes forward.”

Potential Waffle Storage Capacity Investigated by Waffle Modeling Group

One of the key activities of the Waffle team has been the identification of potential Waffle storage areas through the entire U.S. portion of the Red River Basin. Using existing and newly collected topographic information, this task is now complete. Potential storage areas were classified on a 1-square mile basis according to the degree of terrain



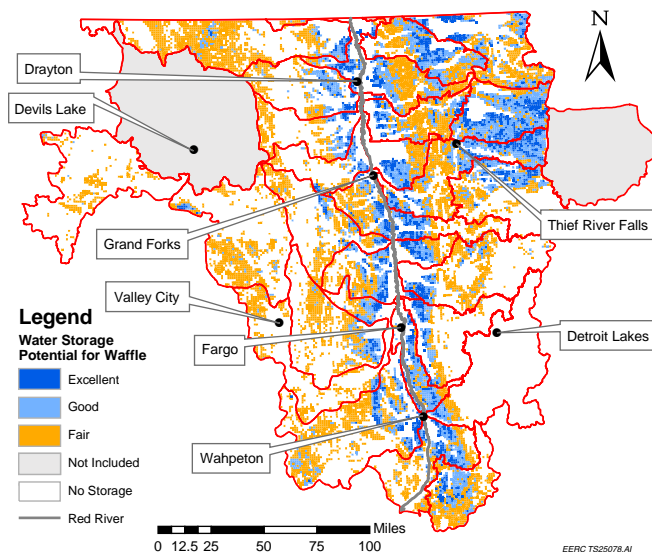
Aerial Photo of Gilby Site

relief in each section. The final classification classes were labeled as excellent, good, fair, or not likely. Blue areas in the accompanying map indicate the smallest changes in elevation across a section, providing the most ideal storage areas. Potential water storage volume is higher in flat parcels of land bounded by raised roads.

In addition to determining potential storage locations, EERC researchers also estimated average storage volumes. Topographic data were used to estimate average storage volumes for each of the classes. Average volumes varied depending on which watershed the sections were located in.

The preliminary storage volumes estimated by EERC researchers were then reduced to account for natural storage and to allow for freeboard against the surrounding roads. Natural storage is the water that would already be ponded within a section of land during the spring melt and would not normally drain. In addition, any sections of land that fell within the 1997 floodplain were removed from consideration because emphasis was placed on land that did not flood.

Accounting for freeboard and natural water storage provides a conservative model of water storage. The map on the right, of potential storage areas that could be utilized in the Waffle system to mitigate springtime flooding, is currently being used in conjunction with computer models to determine what impacts water storage in these areas would have on springtime flood mitigation.



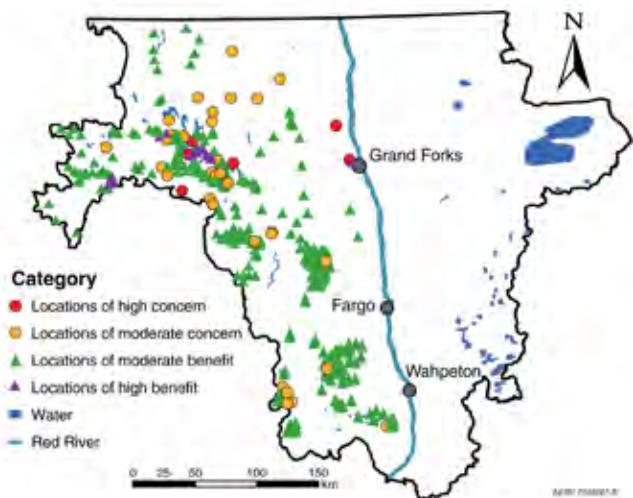
Water Storage Potential for Waffle

How Does Water Storage Impact Soil Salinity in the Red River Basin?

As many farmers in our region know, saline soils can be an enormous problem since excess salinity may prevent seed germination, retard plant growth and, ultimately, adversely affect crop yields. Saline soils are defined as soils containing high amounts of soluble salts and are commonly the result of evaporation from a shallow water table. Water movement toward the surface due to capillary rise provides a continuous supply of salts, which accumulate in the root zone or at the soil surface. Since lowering the water table is the generally accepted approach to salinity management, storing water on the land can be a hindrance to mitigation where water tables are high. However, salt concentrations in the soil can be potentially reduced by storage where the water table is already low and the soil fairly permeable. Therefore, a map was created to determine where water storage may be of concern or benefit to lands with saline soils.

Various sets of data were compiled to produce the desired outcome. Historical water levels were retrieved from the U.S. Geological Survey (USGS) Ground-Water Data for North Dakota and Minnesota databases. Groundwater data from the North Dakota State Water Commission (SWC) were included as well, and an average water level for each site within the basin was derived. Capillary reach values for various soil types were subsequently identified and correlated to an existing EERC database of permeability classifications for the basin, assigning a reach value for each location of groundwater datum. The data were sorted to portray sites where conditions may be favorable for capillary waters to reach the soil surface. Finally, soil salinity data were acquired from the State Soil Geographic Database and incorporated. Salinity is primarily an issue in the North Dakota portion of the basin; therefore, sites in Minnesota were not evaluated. In addition, areas with salt-impacted soils can be very localized, and it is not uncommon for one field to have salt-impacted soils while an adjacent field does not.

The final product is displayed in the figure at the left, “Potential Soil Salinity Effects of Temporary Floodwater Storage in the Red River Basin of the North.” Areas of concern were defined as those with a capillary reach to a saline soil surface, whereas areas with a reach considerably below the surface of a saline soil are assumed to benefit from water storage. Based on these assumptions, only 1.5% of the sites show cause for serious concern and should be studied further, prior to water storage. A large majority of sites, 91%, show the potential for benefit from water storage with respect to salinity issues. “Our study results indicate that the storage of water will likely not exacerbate salinity problems in most areas and may benefit lands with saline soils in some areas,” EERC research engineer Kerryanne Leroux concludes.



Potential Soil Salinity Effects of Temporary Floodwater Storage in the Red River Basin of the North

Waffle Advisory Board Members and Friends Visit the Field Trial Sites

During the spring of 2005, as the field trial sites were approaching their full storage capacity, a group of Waffle watchers hit the road to check out the progress. They toured the Shelly, Minnesota, and Lake Bronson sites. In addition to the Waffle team at the EERC, Agency Advisory Board and Citizen's Advisory Board members were invited to join the Waffle team to visit the field trial sites.

Citizen's Advisory Board member Dale Stenerson said, "It was fun to get out there with the crew. I wish more people could be a part of what is happening with the Waffle study. I feel very enthused about the project and the applied knowledge we are getting to address our flooding concerns."



Field Trip Participants Observing the Overflow Standpipe at the Lake Bronson Site

For more information

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