As part of the Red River of the North Rural Nonstructural Flood Risk Management Feasibility Study the Corps has been investigating nonstructural flood risk management measures for rural individual farmsteads and structures along the main stem of the Red River and Bois de Sioux River. Results of the nonstructural assessments have resulted in a positive benefit cost ratio. The study area has been broken into three study reaches with three different levels of information and detail. Figure 1 shows the three study reaches and the flood outlines that were used to determine the extents of the study area. The non-federal sponsors for the study are the Minnesota Red River Watershed Management Board and the North Dakota Red River Joint Water Resource District. The project, once implemented would be voluntary and cost shared between the Corps, the non-federal sponsors and the landowner.

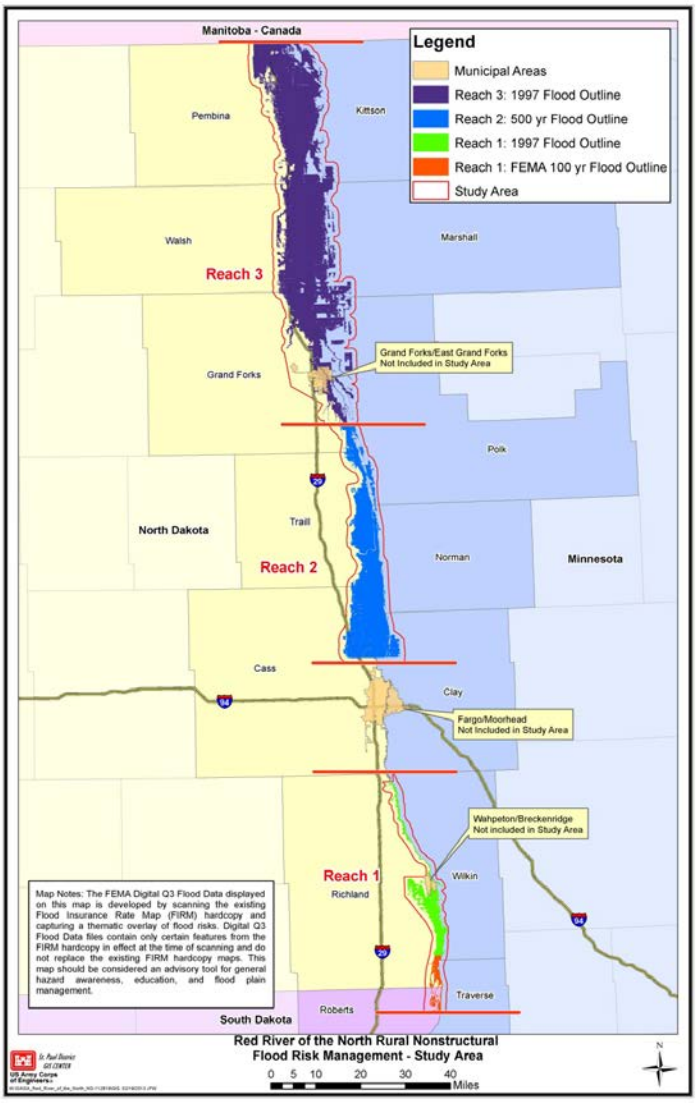

Figure 1 Red River of the North Study Area

The highest level of detail was completed for Reach 2 of the study area which is the portion of the river downstream of the Fargo-Moorhead metro and extends to the southern limits of Grand Forks-East Grand Forks. This nonstructural assessment was completed as part of the Fargo-Moorhead Metro Feasibility Study. The results of the assessment indicate that there are 308 structures, or 28% of all structures, within the reach that are economically justified for implementation of nonstructural flood risk management measures. The benefit-cost ratio for this reach is 1.75 for feasible structures. Table 1 provides the economic summary of justified structures within Reach 2. The majority of the structures with a positive economic benefit would be eligible for nonstructural berms. The average cost for a nonstructural berm in Reach 2 is $43,700. The cost to implement all 308 justified structures for Reach 2 is $2,439,000.

Table 1 Reach 2 Economic Summary for 100-Year Flood Plain

Economic Unit	100-Year Estimated Annual Cost ($)	100-year Estimated Annual Benefit ($)	Benefit to Cost Ratio
Reach 2	110,700	193,400	1.75

Reach 3 of the study area underwent a medium level of detail, with a sample of structures undergoing a nonstructural assessment. Reach 3 extends from approximately Grand Forks-East Grand Forks to the U.S.-Canadian border. The sample included 184 structures, approximately 3.4% of the total structures in the Reach 3 study area. Of the 184 structures in the sample, 86 were found to be economically justified, which is approximately 47% of the structures being justified. 11 nonstructural berms and 2 raises to existing berms were determined to be the justified measures for the 86 structures. The average cost for a nonstructural berm in Reach 3 is $42,000. Table 2 provides the economic summary for the sample of Reach 3. The net benefits for the Reach 3 sample are $21,400. The total cost to implement the 11 berms and 2 berm raises for the sample structures is approximately $546,000.

Table 2 Reach 3 Sample Economic Summary for 100-Year Flood Event

Economic Unit	100-Year Estimated Annual Cost ($)	100-year Estimated Annual Benefit ($)	Benefit to Cost Ratio
Reach 3 Sample	24,300	45,700	1.88

Using the results from the sample, it can be assumed that 47% of the total structures in Reach 3 would be economically justified. The benefit-cost ratio is assumed to be the same as the sample, 1.88. In Reach 3 there are a total of 9,076 structures and it is assumed that 3,206 structures would be economically justified. It is also assumed that nonstructural berms would be the primary justified nonstructural measure. Once again, using information from the sample, the total cost would be approximately $20,682,000.

The Reach with the lowest level of analysis is Reach 1, the outlet of Lake Traverse and extending north to the southern extend of the limits of the Fargo-Moorhead Metro Project. Within Reach 1 there are approximately 670 structures. Information and results from Reach 2 have been used to assess the potential for nonstructural measures in Reach 1. The study team determined that the river and flooding characteristics were most similar and the Reach 2 results should be used for Reach 1 to determine the percent of justified structures and costs for nonstructural measures. The information in Table 3 provides a summary of what is anticipated for Reach 1.

Table 3 Reach 1 Summary for 100-Year Flood Plain

Economic Unit	Total Structures	Percent Justified	Justified Structures	Total Cost
Reach 1	670	28%	187	$1,480,000

Based on the three levels of detail and assessment of the study area, it is assumed that approximately 3,755 structures would be justified for nonstructural flood risk management measures. The cost to construct the measures is estimated to be $24,600,000. Table 4 provides information on each reach.

Table 4 Nonstructural Assessment Results - Summarized

	Total Structures	Percent justified	Justified Structures	Total Cost
Reach 1	670	28%	187	$1,480,000
Reach 2	1,145	28%	308	$2,439,000
Reach 3 Sample	184	47%	86	$546,000
Reach 3	6,975	47%	3,260	$20,682,000
Total			3,755**	$24,601,000**

** Does not include Reach 3 Sample

The study team is currently evaluating other costs associated with implementation and administration of the project. It is anticipated that the feasibility study will be released for public review and comment in late spring 2013. Questions related to the study can be directed to the Study Manager, Katie Opsahl at 651-290-5259 or Katie.m.opsahl@usace.army.mil.