Universities Council on Water Resources
Journal of Contemporary Water Research & Education
Issue 130, Pages 26-30, March 2005

Nonstructural Flood Damage Reduction Within the U.S. Army Corps of Engineers

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Flood damage reduction basically consists of two approaches: structural and nonstructural. Structural flood damage reduction projects are those that focus on altering the characteristics of the flood, leaving the structures in the floodplain that could be damaged by floods unaltered. Nonstructural flood damage reduction projects are those that focus on altering the characteristics of the structures that could sustain flood damages, leaving the characteristics of the flood unaltered.

The U.S. Army Corps of Engineers (Corps) has long been a major force in flood damage reduction within the United States. Corps involvement began in the early part of the 19th century when Congress gave the Corps authority to improve navigation on inland river systems. This involvement continued to evolve during the remainder of the 19th century and the early part of the 20th century. The Flood Control Act of 1917 was the first official legislation that authorized the Corps to have a significant role in flood damage reduction activities across the nation. Subsequent to that time, the Corps has constructed and currently operates 383 major lake and reservoir projects, constructed and maintains over 8,500 miles of levees and dikes, and built hundreds of smaller local flood damage reduction projects that have been turned over to non-federal authorities for operation and maintenance. Historically, most flood damage reduction projects within the Corps have been considered structural, with a rather narrowly defined focus of removing the threat of flooding from existing floodplain development. This rather narrow focus ultimately led to increased flood damages. In many areas the floodplains that sustained less frequent flooding due to Corps projects were actually developed more extensively than they would have been without the flood damage reduction project. However, this began to change in the Corps in the early 1960's.

Evolution of Nonstructural Flood Damage Reduction Within the Corps

The Flood Control Act of 1960 authorized the Floodplain Management Services Program. With this program, the Corps was able to provide technical assistance to communities enabling them to implement floodplain regulation—a nonstructural flood damage reduction measure. This program was a precursor to the National Flood Insurance Program (NFIP) authorized by Congress in 1968, which set minimum standards for floodplain management on a national basis and made flood insurance available as a mitigation measure.

The national movement toward more nonstructural flood damage reduction implementation continued into the 1970s with the passage of the Water Resources Development Act of 1974 (WRDA 1974) and the issuance of Executive Order (EO) 11988 in 1977. WRDA 1974 required the Corps to consider nonstructural measures on an equal basis with structural measures in terms of flood damage reduction plan formulation. EO 11988 supported the move to more nonstructural measures by requiring all federal agencies to provide more focus on floodplain management by avoiding, to the extent practicable, actions located in or adversely affecting floodplains. It also required agencies to take action to mitigate adverse impacts if avoidance of floodplain-related activities was not achievable. The order solidly complemented the NFIP.

WRDA 1986 and WRDA 1999 continued the national journey of providing more Congressional support to implementation of nonstructural measures. WRDA 1986 required that, prior to any assistance by the Corps in construction of flood damage reduction measures with non-federal interests, the non-federal interest must participate in and comply with the NFIP. WRDA 1999 placed emphasis on nonstructural flood damage reduction by directing the Corps to calculate benefits resulting from a nonstructural flood damage reduction project using methods similar to those used for calculating benefits resulting from a structural flood damage reduction project. WRDA 1999 also directed more focus on nonstructural measures by authorizing the Corps to pursue projects that not only reduced flood damages but also improved the quality of the environment. In this authorization, Congress directed that nonstructural measures be used to the maximum extent practicable and appropriate.

Throughout this period, beginning in the latter half of the 20th century, the Corps has been on an evolutionary path of providing more and more focus on the use of nonstructural flood damage reduction measures. This evolution has been in direct response to Congressional and Presidential direction as well as to the interests of the Nation as a whole. During that time period, the Corps has flood proofed hundreds of homes and structures and has provided technical assistance on nonstructural measures to a multitude of communities. These activities have resulted in nonstructural implementation that has affected thousands of owners in a positive way. The Corps has actively partnered with communities in buyout/relocation programs that have removed many homes and structures from floodplain; in addition, it has implemented flood warning and preparedness projects. These projects all reduced flood damages and were justified economically on that basis. The overall problem, however, was that many other potential nonstructural projects were not implemented because they could not be justified on the narrow basis of economics due to reduced flood damages alone. Because of this narrow focus, many opportunities were left unrealized. The real excitement within the Corps relative to implementation of nonstructural flood damage reduction and realizing associated opportunities is occurring in the 21st century. This excitement is the stronger focus on implementation of nonstructural measures, the accepted use of recreation in floodplains to complement some nonstructural measures, the focus by Corps leadership in environmental sustainability of flood damage reduction, and the resulting ability of nonstructural measures and environmental sustainability to be totally complementary.

Flood Damage Reduction within the Corps Today

The Corps is taking a much different approach to flood damage reduction. Where historically the Corps focused only on reducing risk and loss from flooding using primarily structural measures, the Corps today takes a much broader approach to resolving flood damage problems. Today, the Corps places major effort on the following goals when considering flood damage reduction problems and associated opportunities:

- Reduce risk and loss from flooding
- Achieve no adverse impacts
- Provide sustainable development and integrated management of water resources
- Repair past environmental degradation and prevent future environmental loss
- Achieve environmental sustainability in flood damage reduction

The Corps has always had a major focus on reducing flood damages, as reflected in the first bullet above. The "no adverse impacts" focus of the second bullet supports the national initiative of the Association of State Floodplain Managers (ASFPM) to achieve flood damage reduction without adversely affecting other property that is not protected by the flood damage reduction project. The really exciting part of the major effort in the Corps today is shown in last three bullets. This reflects the Corps' focus on a much broader approach to flood damage reduction than just reducing flood damages. While reducing flood damages is extremely important, Corps leadership knew that many opportunities were not being realized with that narrow approach—thus, the advent of the Corps' seven Environmental Operating Principles, as follows:

1. Strive to achieve environmental sustainability. An environment maintained in a healthy,

diverse, and sustainable condition is necessary to support life
2. Recognize the interdependence of life and the physical environment. Proactively consider environmental consequences of Corps programs and act accordingly in all appropriate circumstances
3. Seek balance and synergy among human development activities and natural systems by designing economic and environmental solutions that support and reinforce one another
4. Continue to accept responsibility and accountability under the law for activities and decisions under our control that impact human health and welfare and the continued viability of natural systems
5. Seek ways and means to assess and mitigate cumulative impacts to the environment; bring systems approaches to the full life cycle of our processes and work
6. Build and share an integrated scientific, economic, and social knowledge base that supports a greater understanding of the environment and impacts of our work
7. Respect the views of individuals and groups interested in Corps activities, listen to them actively, and learn from their perspective in the search to innovative win-win solutions to the nation's problems that also protect and enhance the environment

Flood Damage Reduction Within the Corps in the Future

The vision for the future of flood damage reduction within the Corps is truly exciting because of the much broader focus, which will enable problem resolution and opportunity realization. The vision consists of the following:

- Consider both structural and nonstructural measures equally
- Implement a comprehensive, watershed approach
- Maximize all opportunities to implement flood damage reduction, restore ecosystems, and achieve compatible recreation
- Create no adverse impacts with implementation of any flood damage reduction project
- Maximize all opportunities to partner with other entities/agencies
- Achieve innovation within applicable authorities
- Focus on leadership when solving problems and creating opportunities

With the Environmental Operating Principles and the vision for future flood damage reduction, the Corps is focused on implementing more and more nonstructural measures. Because of the inherent ability of nonstructural measures to achieve flood damage reduction without modifying the characteristics of the flood, nonstructural measures are a "natural" for achieving environmental sustainability in flood damage reduction. The Corps has a specific committee in existence that serves as a center of expertise for implementation of nonstructural measures. This committee, the National Nonstructural/Flood Proofing Committee (NFPC), exists to provide information, expertise, assistance, and so forth to all Corps districts in the area of realizing the opportunities provided by nonstructural measures and how to formulate a feasible nonstructural project. One of the historical problems within the Corps in implementing nonstructural measures, especially floodplain buyouts/relocations, has been economic feasibility. The NFPC, within the Corps' vision of the Environmental Operating Principles, has been very active in promoting the economic power of "new uses of the evacuated floodplain." By using ecosystem restoration and/or recreation as a new use of a floodplain that was previously occupied by flood-damageable structures, the ability to develop an economically feasible floodplain buyout/relocation project has been greatly enhanced. In addition, with this concept, communities that previously were averse to buyout/relocation because of tax base loss are now very interested in buyout/relocation because the alternate ecosystem restoration and/or recreation use of the floodplain creates a very vibrant, attractive public area for community enhancement.

The following four projects are examples of the much broader approach being pursued by the Corps to implement nonstructural projects. These projects are all relocations/buyout of structures in floodplains.

Where historically the Corps would have formulated the projects to either relocate the structures from or buy out the structures in the floodplain and leave the evacuated floodplain as "open space," each of these projects went farther to capture the power of creating a new use of the evacuated floodplain that could help in justifying the nonstructural project. In each of these cases, the project would not have been economically feasible if it had been formulated on the basis of flood damage reduction only. The project at Johnson Creek (Fig. 1) used the evacuated floodplain for recreation, moving the buyout project from infeasible to feasible. This project is being implemented. The other projects—at Little Duck Creek (Fig. 2), Cold Brook (Fig. 3), and the Yellowstone River (Fig. 4)—are in the plan formulation phase. These projects are more innovative than that at Johnson Creek because they incorporate ecosystem restoration as the new use of the evacuated floodplain to help with project justification. The projects have benefit-cost ratios (BCR) ranging from 1.4 to 1.6.

Conclusion

The Corps is moving toward formulating and implementing more nonstructural projects. This does not mean that the Corps will no longer formulate

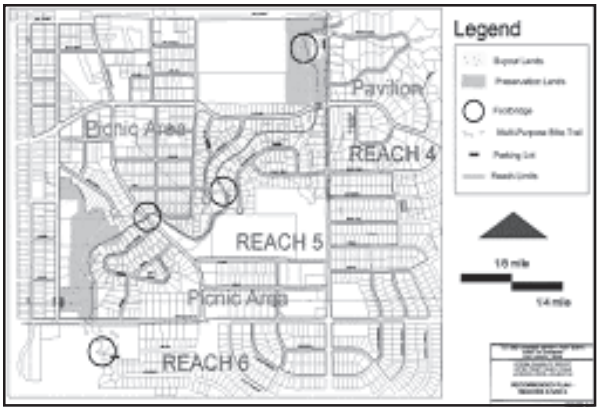

Fig 1. Johnson Creek, Arlington, Texas
Corps District: Fort Worth
Justification (Authority): Flood damage reduction, recreation (General investigation)
Nonstructural measures: Acquisition
BCR: 1.6

Fig 2. Project Little Duck, Fairfax, Virginia
Corp District: Louisville
Justification (Authority): Flood damage reduction, recreation ecosystem restoration (Section 205)
Nonstructural measures: Acquisition
BCR: 1.4

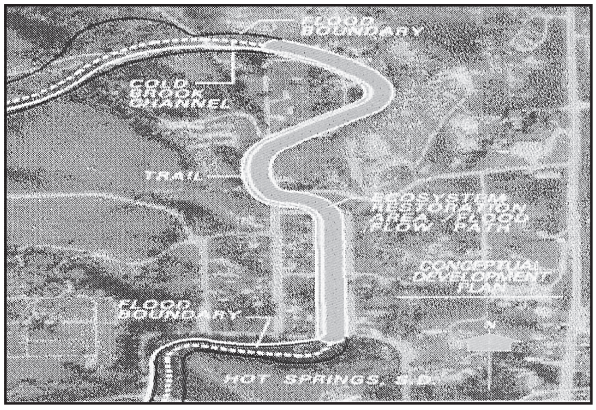

Fig 3. Project Cold Brook, Hot Springs, South Dakota
Corp District Omaha
Justification (Authority) : Flood damage reduction, recreation, ecosystem restoration (Section 205)
Nonstructural measures: Acquisition
BCR: 1.8

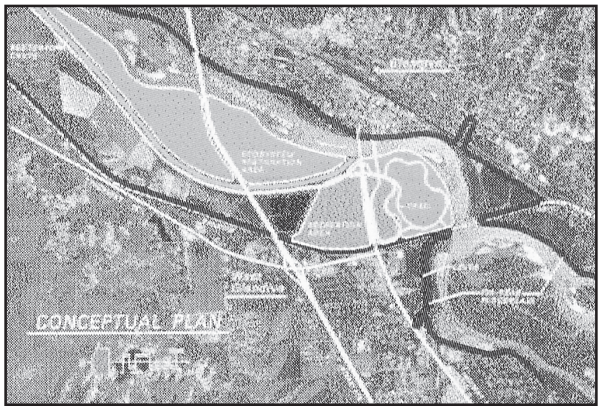

Fig 4. Project Yellow River, Glendive, Montana
Corp District Omaha
Justification (Authority): Flood damage reduction, recreation, ecosystem restoration (General investigation)
Nonstructural measures Relocation, acquisition
BCR: 1.4

and implement structural projects. What it does mean is that the Corps more fully realizes the opportunities that are available in reducing flood damages by using all measures, both structural and nonstructural. It also means that the Corps is responsive to the growing number of communities that are no longer interested in levees, dams, diversions, or channels to alter the characteristics of floods—oftentimes at the expense of the ecosystem and areas unprotected by the flood damage reduction project. More and more communities are demanding projects that reduce flood damages while enhancing the ecosystem and providing recreation opportunities that are compatible with a floodplain setting. This renaissance thinking is exemplified by the Corps' elimination of the use of the term "flood control." The concept of "controlling" floods is past. The future is living with the naturally occurring flood and realizing the beneficial natural uses of the floodplain. Major emphasis on nonstructural flood damage reduction within the Corps is here! The use of these measures will only increase as we move forward in the 21st century!

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