

# Improving the Effectiveness of Flood Damage Reduction Policies through an Integrated Approach to Watershed Management

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The Coalition to Restore Aquatic Ecosystems convened in March, 1993 to advance the implementation of the National Research Council's recommendations in their 1992 report, "Restoration of Aquatic Ecosystems: Science, Technology and Public Policy". This report recommends the development of a large-scale aquatic ecosystem restoration program in the United States to regain and protect the physical, chemical, and biological integrity of surface water. The report recommends that this program should seek to correct nonpoint source pollution problems, arrest the decline of wildlife populations, and restore all types of wildlife habitats with priority to endangered species habitat. The NRC report further recommends that federal policies and programs aimed at accomplishing these goals should use a landscape perspective in restoration efforts and employ adaptive planning and management.

The coalition serves as a mechanism for information exchange among a wide range of federal agencies, academicians, and nonprofit organizations. The representatives meet quarterly in Washington, D.C., to discuss restoration policy and develop cooperative strategies that can be pursued by those who are interested. The Coalition does not act as an independent entity, but provides the opportunity for member organizations to align their activities to maximize their effectiveness. The coalition focuses on influencing national policy and its application in specific ecosystems. We discuss and analyze a broad range of legislative and administrative programs, both existing and proposed. World Wildlife Fund coordinates the coalition, with input from several participating organizations.

Members of the coalition have been deeply involved in the upper Mississippi River post-flood policy debate, and some worked closely with the Clinton administration during the drafting of *Sharing the Challenge*. The coalition met with representatives of the White House and with General Galloway several times during the project to comment on topics under consideration by the inter-agency committee charged with drafting the report. The final report contains many of the recommendations made or endorsed by the individual members of the coalition, including re-establishment of the Water Resources Council or a similar inter-agency coordinating body, revision of the Principles and Guidelines, required flood insurance for structures behind 100-year levees, and others. Coalition members generally support the findings of the report, and want to move forward with revisions to flood damage reduction policy that will meet the objectives of a wide range of interests and be

economically and environmentally sustainable.

## Integration of Multiple Objectives

The report advocates two extremely important concepts: the necessity of integrating floodplain management with watershed management and of integrating flood damage reduction goals with other benefits that society desires from its water resources. These two concepts are fundamental to the formulation of a flood damage reduction strategy that is environmentally and economically sustainable.

To integrate flood damage reduction and environmental benefits, we must monitor the quantity, quality, timing, and location of surface water throughout the watershed and manage these parameters to optimize results. In a flood damage reduction context, solving this equation would mean that, given the delivery of a certain quantity of water at a certain time, managers must determine the rate of movement and distribution of the water throughout the watershed that will result in the lowest total damages. In many river basins, for example, we have constructed flood control systems that minimize the spatial distribution of water by concentrating it in storm sewers, channelized streams, and other conveyance structures. These structures also minimize the length of time required for a raindrop falling somewhere in the watershed to enter the river channel. Retention time in the river channel is also minimized through clearing, snagging, and dredging operations. Levees are then erected to prevent the resulting torrent from damaging floodplain property. By concentrating the water in time and space, these structures increase its destructive capacity and, thus, the risk of substantial flood damages when the levees fail.

A rapid conveyance approach also has damaging environmental implications. Drainage systems throughout the watershed destroy wetlands and the wildlife habitat, water quality, and groundwater recharge functions associated with wetlands. Stream channelization eliminates aquatic habitat important to fish. Stream alterations may also destroy riparian zones that filter out pollutants and feeding areas, calving grounds, winter habitat and migration routes to wildlife. Levee construction can interrupt the natural flood pulses that maintain spawning grounds for fish and feeding areas for waterfowl.

In contrast to a rapid conveyance approach, a natural storage approach mimics the natural hydrology of a watershed by

retaining water on the landscape and using the floodplain for surface water storage and conveyance. This approach maximizes the spatial distribution of water throughout the watershed and the length of time between the raindrop's contact with the earth and its arrival in the river channel. The resulting slow delivery of water minimizes flood damages throughout the watershed. Overland runoff becomes less erosive; river channel overflows occur at lower and less destructive stages. The reduction in damages is even greater in those parts of the watershed where floodplain development has been prohibited or relocated in order to provide storage area for the stormwater.

Once environmental benefits are added as objectives to the water management equation, the advantages of a natural storage approach become clearer. By holding water on the landscape, we increase its opportunity to infiltrate into soil and groundwater, thus increasing the productivity of the soil for plant regeneration and crop production, and increasing groundwater supplies and dry season stream flows. The use of vegetation and wetlands to slow the runoff rate increases water quality in receiving streams and provides wildlife habitat. The creation of seasonal wetlands in the floodplain where the floodwaters are temporarily stored provides spawning habitat for fish, feeding areas for wading birds and waterfowl, and additional water quality benefits.

Flood damage reduction strategies will not be economically or environmentally sustainable until they address the root causes of exacerbated flooding in the basin, rather than the symptoms that occur on the floodplain. For large portions of the basin, the root causes will most likely be found on the watershed, where hydrology has been manipulated to speed water off of the landscape and into streams.

Unfortunately, while the text of *Sharing the Challenge* emphasizes the importance of interagency coordination and a watershed approach, the recommendations fail to fully integrate the concepts of flood damage reduction and environmental quality. The report recommends, for example, that the Fish and Wildlife Service conduct an "ecosystem needs" assessment while the Corps of Engineers maintains responsibility for flood control, implying that the issues of ecosystem stability and flood damage reduction are unrelated. The report cites the importance of soil and water conservation and wetland restoration to flood damage reduction, and discusses the importance of managing floodplains as watershed components, but does not recommend that the Corps consider watershed management impacts and opportunities when designing flood control strategies for the floodplain.

#### Inter-agency Coordination

Coalition members strongly agree that inter-agency

coordination and collaboration must occur at all levels of government in order for sustainable water resource management to occur. This means that federal, state, tribal and local governments must work together to achieve environmental and economic objectives within the Mississippi River basin.

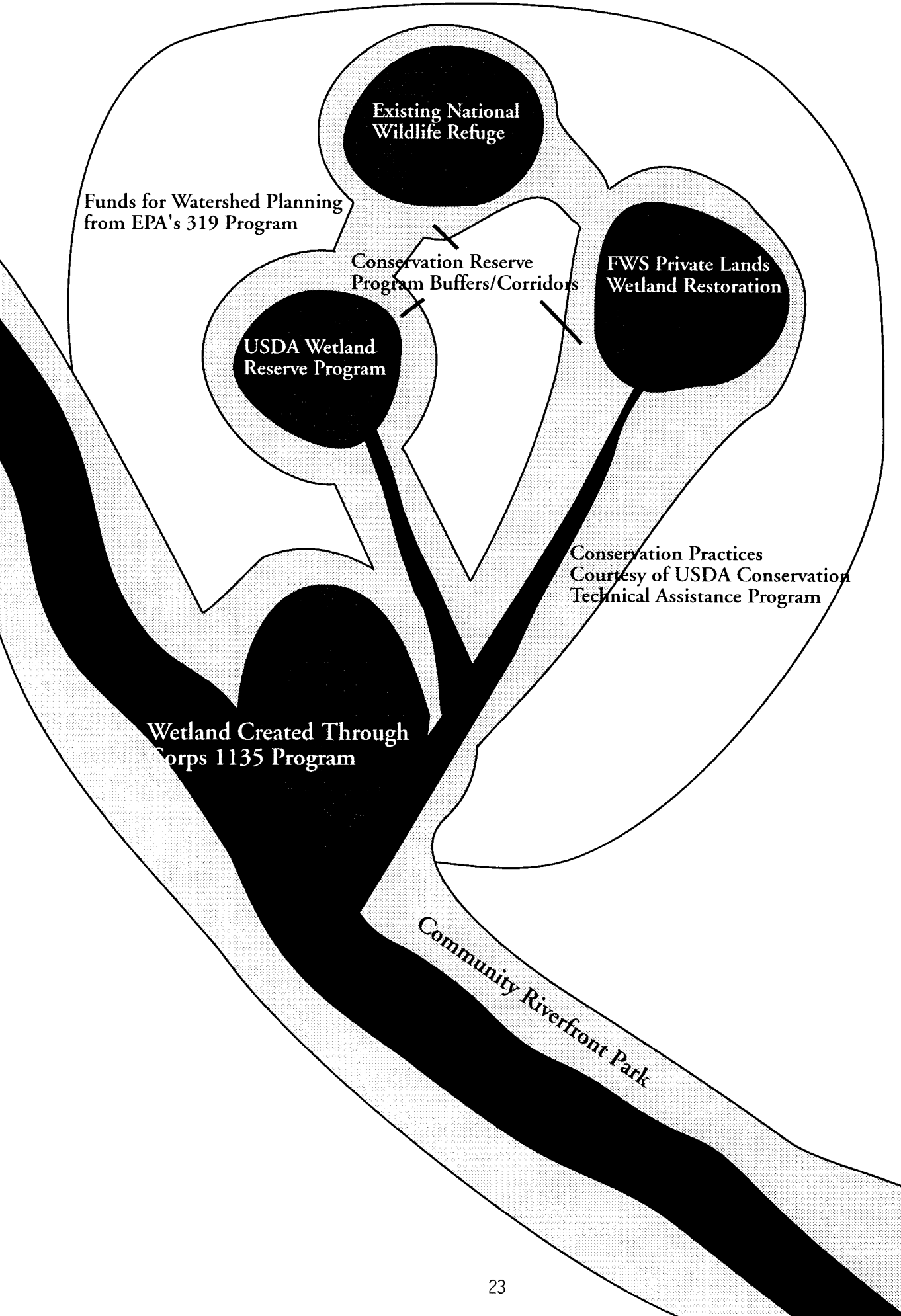
Inter-agency coordination does not, however, require federal agencies to abandon their traditional roles or areas of expertise and develop new ones. We do not expect, for example, Fish and Wildlife Service to become experts in hydrologic engineering any more than we expect the Corps of Engineers to manage wildlife refuges. Rather, each agency must bring its own statutory authority, human and financial resources, and agenda of priorities to the table in designing a management system for the upper Mississippi River basin. Each agency, in addition, must be willing to apply its efforts to help achieve the priorities of other agencies, and may have to yield portions of its specific agenda to optimize the total results of combined efforts. The Corps of Engineers, for example, could work collaboratively with the Natural Resources Conservation Service and U.S. Geological Survey to identify subbasins within the upper Mississippi watershed where soil and water conservation practices and wetland restoration projects would contribute most significantly to flood damage reduction. A combination of programs, including the U.S.D.A. Wetland Reserve Program, P.L. 566, the Fish and Wildlife Service Partners for Wildlife program, and the EPA's Section 319 nonpoint source pollution program, other federal, state, local, and non-governmental programs, could implement these practices and projects (**Figure 1**). As a result, the Corps could reduce the frequency and intensity of its dredging operations downstream of the restored watershed, downsize planned flood control projects, and install backwater habitat restoration projects that will have a higher chance of success because of decreased silt loads.

#### Local Control

Community involvement and support is absolutely essential to the success of an integrated river management system. The coordination of federal and state agency activities on a watershed basis should be organized to achieve community priorities. Federal and state agency staff, therefore, must at a minimum provide opportunities for input to the affected communities. The optimal watershed management effort places community leaders in the driver's seat so that residents of the community can design and implement watershed and floodplain management plans with technical assistance provided by state and federal agencies.

#### Coordination Mechanisms

The central challenge currently facing "stakeholders" in the river management debate is how to



design a coordination mechanism that can include federal, state, tribal and local organizations as well as nongovernmental organizations and citizens.

The priorities for coordination at the national level include the development of updated water resources management policies that integrate environmental objectives and an ecosystem or watershed-based approach with the traditional utilitarian functions of the federal water resources agencies. *Sharing the Challenge* recommended the revision of the federal Executive Order on Floodplain Management and a new Floodplain Management Act as vehicles for these policies. Such policies should not prescribe specific standards, techniques, procedures or projects for either federal agencies or states, but should place inter-agency coordination, economic and environmental sustainability, watershed-based management, and local involvement and direction high on the agendas of federal agencies.

A structure to ensure federal agency compliance with and implementation of the updated policies is also a priority. The report recommended that the Water Resources Council be reconvened to serve this purpose. Largely because of political resistance to this concept, the Clinton administration is considering instead convening a "Water Resources Coordinating Committee" that would be chaired by either the Office on Environmental Policy or the Council on Environmental Quality. Members of the coalition support this concept. In addition to reviewing projects and programs for compliance with national policy goals, the Committee should serve as an agency coordinating mechanism to ensure that federal programs complement each other to the maximum extent possible, do not work at cross purposes, and avoid duplication of effort.

The report also recommends the establishment of an inter-agency watershed management task force. The task force, as described in the report, would help develop legislation to implement multiple-objective, incentive-based watershed management programs and to target federal programs on a geographic basis. The task force should also facilitate intra-agency assessments of existing barriers to inter- and intra-agency coordination, such as incentive systems that reward large numbers of discrete actions or criteria for selecting implementation projects that do not consider the contributions of other offices, agencies, or non-governmental organization. Recent discussions within the administration indicated that the watershed management task force would form as a subgroup to the Water Resources Coordinating Committee. We believe that the watershed management task force should be established immediately.

Of at least equal priority are mechanisms to coordinate the application of national policy to achieve regional, state, and local objectives. To achieve this purpose, the report recommends reinstating the River Basin

Commissions that were disbanded under the Reagan administration. Coalition members generally do not support this recommendation, because the commissions have historically served as advocates for large and environmentally damaging structural alterations of rivers. Many coalition members prefer the inter-agency task force models in effect in the Pacific Northwest and South Florida because they rely on coordination between existing agencies with a range of established missions. They are therefore more likely to recognize and objectively address potential conflicts between flood control, environmental, and other objectives.

These inter-agency task forces can perform regional scale analyses of river basins to target priority areas for management. In the upper Mississippi River basin, for example, the Corps of Engineers could work with the Natural Resources Conservation Service to identify those subbasins which, if much of the natural hydrology was restored, would substantially contribute to a reduction of flooding and flood damages both within the subbasin and downstream. Models could be designed to set peak flow reduction targets for a number of tributaries and predict resulting reductions on the mainstem. At the state and local level, federal agencies could then work with communities to achieve these target reductions and other community objectives.

#### Conclusion

Within the coalition, there exists general consensus that flood damage reduction strategies need to be fully integrated with strategies for achieving other objectives. Communities should take the lead in the development and implementation of these multi-objective strategies for their subbasins while considering information on the relationship between their subbasin and the rest of the watershed. State and federal agencies should work at a regional level to develop the larger watershed context in which these strategies will operation, and provide data and technical and financial support to these local efforts. With a well-integrated framework for making decisions on water resource management, we can realize economic and environmental objectives on a sustainable basis and cut the costs of flood control.

#### Reference:

National Research Council, 1992. Restoration of Aquatic Ecosystems: Science, Technology and Public Policy. National Academy Press, Washington, DC. 552 pp.

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