

Responding to the 1993 Flood: The Restoration Option

Leonard Shabman

Virginia Polytechnic Institute and State University

There have long been warnings that public policies promoting floodplain occupancy and wetland drainage may have unanticipated adverse consequences (For example see: 89th Congress 2d. Sess., H. Doc. 465, 1966). So when the flood of 1993 captured the attention of the nation, the Congress, the White House and the scientific community, many asserted that we had gone too far in developing floodplains and wetlands. The 1994 annual meeting program of the American Association for the Advancement of Science (AAAS) contains a statement that is typical of this view (page 12).

"The enormous losses of the floods of 1993 revealed failures of the nation's floodplain management program involving expensive structural approaches and flood insurance." (emphasis not in original)

How can public policies fail? If the basis for assessment is goal achievement, then national policies which have sought to expand the economic productivity of floodplains and wetlands have been a success, not a failure. Rich midwestern farm land on former wetlands contributes to the nation's strong world position in food and fiber production. Most of the cities in the Midwest now incorporate areas that were frequently flooded before protection works were built. Still, it is unlikely that damage costs from the 1993 flood are greater than all past, and all possible future, benefits from wetland and floodplain development.

The failure assertion, as made in the AAAS program, seems to reflect a contemporary rejection of both the historical goal of land development and the policy means by which the development goal was encouraged. Critics of the policy goal argue that development is achieved with hidden, and unacceptable, environmental costs. Critics challenge the policy means by arguing that financial cost-shifting from private landowners to taxpayers is unacceptable.

In this essay I will describe how the nation's goals for its wetlands and floodplains have changed over time from development to preservation and, now, to ecosystem restoration. I will then comment on analytic and financing challenges for advancing a national restoration agenda.

Creating the Midwest Landscape: A Public Policy Goal Achieved

Mainline levees, navigation locks and storage reservoirs on the Upper Mississippi and lower Missouri Rivers and their tributaries were intended to promote and did result

in urban development. When the large and infrequent (although not unprecedented) 1993 flood occurred, the flood control structures that made this urban land use possible worked well. Some parts of protected urban areas suffered damages. Dislocations caused by events such as the flooding of the Des Moines, Iowa, water treatment plant suggest the need to increase protection for some public infrastructure. However, most cities, most manufacturing capacity and most public facilities were, at worst, inconvenienced by this massive flood.

Flood damages in 1993 occurred away from the urban centers, where the landscape is heavily altered for agricultural use. In the upper tributary areas, water is drained from wetland soils and shifted downstream. Low lying fields in downstream areas are drained and then protected from frequent flooding with thousands of miles of levees. This network of drains and levees is the result of decades of investments by individuals acting alone, acting through cooperative levee and drainage districts, and acting through government agencies. The wetlands would be drained and farmed, or a levee would be built whenever yearly gross farm sales for a landowner were greater than annual costs of farming. The annual costs of farming included the occasional damages to the land and to standing crops from high water tables and flooding and the annualized capital costs (public and private) of land development.

However, the land's income producing potential resulted from more than market prices and government water projects. Federal and state provision of technical and financial assistance to land owners, as well as favorable treatment of expenses for wetland development in the tax code, encouraged draining wetlands and building private levees on the floodplains. General agricultural price and income support programs (payments from taxpayers to farm operators and land owners) provided a general profit floor on farming and may have encouraged expanded farming operations. Meanwhile, Federal flood and drought disaster aid and partially subsidized crop insurance premiums indirectly reduced the cost of locating farm production on wetlands and floodplains.

These programs, together with the water project construction programs, were designed to shift costs of wetland and floodplain development to the nation's taxpayers. Financial cost shifting was legitimized by the widely held beliefs that government support was needed to "jump start" and then maintain a profitable agricultural sector and that the economic prosperity of the region and the nation

would be advanced if these lands were fully developed. Indeed the programs did help to establish the impressive agricultural production potential of today's midwest.

This agricultural landscape, including the small communities and towns that grew to support it, bore most of the flood damages in 1993. Crops were lost, farm drainage systems were destroyed and levees were breached or overtopped. Although only a small fraction of the total population of the basin was severely affected, individual homes and infrastructure in small communities, many of which were behind agricultural levees, were inundated. Flood damages to this highly dispersed population and temporary farm income losses occurred because the levees that were exceeded by flood flows were simply not built to hold under the extreme stresses of the 1993 flood. In other areas high water occurred when the volume of the rainfall overwhelmed the capacity of the land drainage systems.

Still, the additional agricultural income (i.e., reduced damages) that may have been possible from additional or bigger levees could not justify the added costs of protecting against a low probability event like that in 1993. While additional protection might not be justified, this does not also mean that the land uses and protection measures that were in place (and resulting damages) were inappropriate, again in recognition of the low likelihood of the 1993 event. It is likely that most (not all) of the floodplain and former-wetland agricultural land use was economically rational for the landowners, in the presence of the historical and current public policy incentives.

Restoring the Midwest Landscape: A New Goal For Public Policy

Tax, spending and regulatory policies that shifted the costs of river engineering, floodplain occupancy, and wetland drainage are now under intense scrutiny. Incentives to drain wetlands have been replaced by disincentives and penalties. Water quality improvement control programs administered by the US Environmental Protection Agency have displaced the water control programs of Federal construction agencies as the focus of national water policy. Indeed, Federal water project construction spending has been sharply curtailed and required cost sharing by non-federal beneficiaries has been increased. Today's policies are expected to protect and preserve the remaining wetlands and floodplains.

However, protecting what is still left and improving the chemical quality of the waters may not be enough. Fish populations, waterfowl numbers and other indicators of species diversity are in decline. Efforts to reverse these declines are now being advocated by a call to go beyond resource protection and preservation to ecosystem restoration. Restoration may mean removing engineering structures to re-open floodplains to the river to store flood waters,

to trap land runoff of sediments and nutrients and to re-establish habitat for native biological species. Restoration may mean re-flooding former wetland areas for creating habitat, trapping sediment and nutrients and modulating timing and variability of river flows for habitat and flood storage retention (National Research Council, 1992). For example, today the Conservation and Wetland Reserve Programs pay farmland owners to return cropland to its original natural state.

Restoration turns the historical goal of national water policy to promote the development of wetlands and floodplains up side down. Therefore a restoration goal also must reverse the historical acceptance of, indeed promotion of, the financial cost shifting that resulted from Federal funding of levee construction, disaster aid, and insurance and agricultural price and income support. However, a restoration policy extends the meaning of cost shifting beyond direct financial transfers. Levee removal, levee setbacks and wetlands' restoration may reverse costs shifted to users of environmental services as reduced fish and wildlife habitat or diminished water quality. Also, those who benefited by their own land development may have pushed flood waters, and then flood damage costs, onto their upstream and downstream neighbors.

These off-site costs do not show up directly in the government's financial accounts and so may have been neglected in the design of past programs. However, some of the national costs for disaster aid are for lands that may have had floodwaters pushed on to them. The rapidly increasing national investment in environmental protection and fish and wildlife habitat management may be, in part, made necessary by the past development of floodplains and wetlands.

Justifying and Implementing Restoration

Restoration advocates often assert that the opportunity costs to the nation of floodplain and wetland restoration the values lost from less farmed land, less livestock grazing and less residential and commercial use are not significant. Their argument may be made by citing the vast acreage of alternative lands where these activities might occur. Their argument may suggest that if financial cost transfers and off-site costs were recognized, then the economic justification for continued farming of wetlands and floodplains would be undermined. For some land parcels this restoration argument may be valid. For other parcels restoration will not be warranted.

Therefore, effective policy analysis must go beyond the easy rhetoric of saying that the 1993 flood revealed "failed policies." Analyses must demonstrate that continued agricultural land use imposes costs on others, that these costs are greater than the values from the current land uses and that the society is willing and able to implement policies to

restore the lands. Such an analysis of restoration must be carefully constructed for each proposed restoration site.

The Economic Value of Restoration

When the goal of national land, water and agricultural policy was to increase occupancy and the economic productivity of floodplain lands, damages avoided served as a practical way to measure the benefits of particular flood control projects (Shabman, 1988). Flood damages are a cost of locating any economic activity on a floodplain land parcel. Historically, flood water control projects reduced these damages (location costs), increasing the net economic return at that parcel. Using this logic, estimates of avoided damages were equal to the increased economic return to a landowner from floodplain land use. (For a comprehensive discussion of economic damage assessment see: Howe and Cochrane, 1993).

Unfortunately the use of avoided flood damages for benefit measurement has come to be the basis for measuring the successor failure of national flood control programs. Therefore, the Corps of Engineers and Soil Conservation Service make claims about the damages that have been prevented by all their projects when defending or seeking to expand their construction programs. Critics note that inflation adjusted flood damage costs have been rising each year, and conclude that the programs have been a failure because they have not minimized damages.

However, a policy debate focused on minimizing flood damages forces a choice between two extremes: increasing structural protection through more dams and levees or not allowing floodplains to have any development use, including agriculture. Only with more and more structures, or with no development at all, will damages approach zero, that is be minimized. Clearly how to minimize damages should not be the question the concern of public policy. Public policy should be concerned with achieving the "best" uses of floodplains and wetlands, however difficult it may be to define "best" use. This means that the evaluation of any restoration must compare the net benefits to a landowner from a particular parcel's land use with the benefits to the larger society.

This general perspective indicates why damages avoided is not a measure of benefits when a site is evacuated and restored. Certainly, restoration removes the possibility for damages, but it also removes the net income from the economic activity that was susceptible to damage. Indeed this foregone net income, after accounting for the possibility of damages, is one cost of restoration. (As will be noted this net income calculation may be adjusted for government payments.) A second cost of restoration is the direct financial outlays made to remove a levee or fill a drainage ditch. The benefits of restoration include the water quality and habitat improvements that may result. Another possible

benefit is the increased income at other land parcels if the restored parcel helps to store or convey flood waters. If restoration reduces damages away from the restored site, then reduced damages at the remote site are a restoration benefit, because damages reduced is a proxy for increased economic return.

Setting Restoration Priorities: A Simple Approach.

After the 1993 flood a restoration analysis may begin with many different questions. In some places the question may be whether a damaged agricultural levee should be repaired. If no repair is made the land may be left unprotected and still farmed or may be abandoned. In other places levees were overtopped, but they were not damaged. In these cases the restoration question is whether levees should be breached. In still other places there are no levees. There the question is whether wetlands' drains should be removed and the land returned to wetland status.

Consider the case of a currently farmed wetland to illustrate how priorities for restoration might be established. A first priority may be established by a financial returns analysis adopting the accounting stance of the government. This would begin by determining whether the agricultural income, net of expected transfer payments from farm and other federal programs, from the area is greater than zero. Calculation of the adjusted net return requires computation of net on-farm income and then adjusting that income by i) subtraction of the sum of the expected value of crop price and income support payments (this adjustment is complicated by the different forms the programs take for the different crops), ii) subtraction of annual expected value of disaster aid from all programs and insurance payments above premiums paid and iii) the addition of the tax payments on the income from the land. Such calculations can be made by knowing the yield and cropping history of the land parcel and the structure of the various Federal programs.

A parcel which fails to have a positive net income after the adjustments is one where government payments are the source of farm profitability. If public policy favors restoration over development, a case could be made that the same cash payments now being made to support farming can be redirected to restoration with no change in budget outlays. The landowner should be indifferent between farming to earn the government payments and accepting payments in return for restoration.

Restoration might be achieved by not rebuilding a levee that was damaged in the flood. In analyzing this possibility the cost of levee reconstruction would need to be subtracted from the result of the on farm financial analysis. If the net result was less than zero the levee might not be rebuilt. However, the avoided cost of levee reconstruction would need to be made available to the landowner, just as the program benefits would be for the landowner to be indifferent between continued farming and restoration.

Failure to justify restoration using this financial analysis means restoration must be warranted by the possibility of off-site benefits. If levees constrict river channels pushing water downstream and back upstream to exaggerate damages away from the protected land, and if wetland drainage accelerates runoff and flooding downstream then restoration may reduce the level of flood damages imposed on others. Careful analysis must establish a link between specific wetland or floodplain restored and specific locations where reduced flood risk would be realized. Models to accomplish this analysis are still poorly developed and before a rigorous conclusion can be reached, a professional consensus on appropriate models and data is required. In the interim a ranking procedure should be developed and employed for setting restoration priorities. Those sites which have low, if not negative, adjusted net returns can be ranked for their flood damage reduction potential in terms of factors such as topography and landscape position in relation to potential damage centers.

Improved modeling capability also is needed to establish how restoration of a site might yield improvements in water quality and wildlife habitat in the larger watershed. Here too a ranking procedure might be developed to relate landscape location to the level of sediment and nutrient trapping potential, potential use as a wildlife corridor, or the possibility for restoration success due to the presence of favorable hydrology and colonizing species. Lessons in using rating systems might be learned from the policy studies done for the design of the Conservation and Wetland Reserve programs.

Paying for Restoration. Restoration redistributes the benefits from of the nation's floodplains and wetlands. For example, almost all of the land to be restored is private property with market values that reflect the expected continuation of federal policy support for farming. To withdraw this support in the name of restoration is to diminish the market value of the land. Restoration can also mean a redistribution among land owners. For example, using former wetlands in the north to store flood waters may result in less flooding of farmland in the south; what happens is that farm production is relocated.

Today, restoration choices are not implemented without community and land owner consent, which in most cases means that financial payments are made to offset any loss in property value. A recent report on improving soil and water quality calls for a program to purchase use rights from landowners through long term easements when land can not be profitably farmed without soil degradation or adverse water quality effects (National Research Council, 1993). The problem confronting all such programs is the lack of adequate revenues for making the payments. Indeed, the Conservation Reserve Program will soon expire and new funds will be needed for its continuation.

In those places where positive net income from farming depends entirely on transfer payments it may be possible to use these same payments to pay land owners to restore rather than farm their land. In other cases the savings in these programs will not be adequate to "buy" restoration and new funds may be needed. There are several barriers to be overcome before a redirection of funds, as well as new funds, can be secured. First, redirection of funds presumes that payments to farmland owners would be continued even as farm programs are being cut in the federal budget. Farm program cost savings from restoration are more likely to be used to cut the program's budget than to make landowner payments. Second, the revenues for making these purchases must come from savings in highly diverse multi agency programs (agricultural price and income support, disaster aid, Farmers Home Administration loan programs, levee repair and rebuilding funds, etc.). Tapping this diverse revenue stream will require budgetary flexibility and fund transfer rules that do not now exist. Third, financing restoration by using these cost savings would require borrowing savings expected in future years to make cash payments to land owners today. Arguments which are based on spending today to avoid future costs have not been well received in recent Federal budgeting.

Even if all these savings and transfers can be made, funds for restoration may still be inadequate when the on-site benefits of continued farming are positive. In these cases additional funds will be needed because the savings in program costs at the site, even if fully realized, will be inadequate to persuade landowners to cease farm activities. Perhaps the assumption that we need to "buy back" these restored sites will ultimately need to be challenged.

Conclusion

The policy question posed by the 1993 flood is whether the nation wishes to reverse the long standing policies that have encouraged the occupancy of floodplains and the drainage of wetlands and pursue a restoration agenda. If restoration has become a new national priority, a restoration agenda must be carefully developed using: i) compelling analyses based on yet to be developed economic, hydrologic, and environmental models and ii) financing through captured savings in other Federal (and perhaps state) programs.

Notes

1. Despite the commonly held view, the goal of our national policy toward floodplains has not been to reduce flood damages. As will be noted later, reduced flood damages are a proxy for measuring the increased economic return to floodplain development.

2. More recently, the distribution of disaster aid and implicit subsidies to flood insurance premiums, which have been growing at a rapid rate in recent years, may have expanded incentives to locate in flood prone areas.
3. The remainder of this paper will focus on agricultural land restoration, although the evacuation of small towns and the movement of infrastructure (such as changing the placement of a road or bridge in order to restore the connection of a wetland to the river) may also be warranted in selected instances. My discussion also ignores the many other dimensions of floodplain and wetland management that are treated elsewhere in this issue of *Update*.

References

Howe, C. and H. Cochrane. 1993. *Guidelines for the Uniform Definition, Identification, and Measurement of Economic Damages From Natural Hazard Events*. Institute of Behavioral Science, The University of Colorado, Program on Environment and Behavior. Special Publication No. 28.

National Research Council. 1992. *Restoration Of Aquatic Systems: Science Technology and Public Policy*. Washington DC: National Academy Press.

National Research Council. 1993. *Soil and Water Quality: An Agenda for Agriculture*. Washington DC: National Academy Press.

Shabman, Leonard. 1988. "The Benefits and Costs of Flood Control: Reflections on the Flood Control Act of 1936", in H. Rosen and M. Reuss, eds. *The Flood Control Challenge: Past Present and Future*. Chicago: Public Works Historical Society, pp. 109-123.

U.S. 89th Congress 2d Session. 1966. *A Unified National Program for Managing Flood Losses*. House Document 465.

Leonard Shabman is Professor of Resource and Environmental Economics, Department of Agricultural and Applied Economics, Virginia Polytechnic Institute and State University, Blacksburg, VA.