

Allee, David J.; Rich, Eldred

**Working Paper**  
**Flood Plain Management**

Staff Paper, No. SP 74-11

**Provided in Cooperation with:**

Charles H. Dyson School of Applied Economics and Management, Cornell University

*Suggested Citation:* Allee, David J.; Rich, Eldred (1974) : Flood Plain Management, Staff Paper, No. SP 74-11, Cornell University, Charles H. Dyson School of Applied Economics and Management, Ithaca, NY,  
<https://doi.org/10.22004/ag.econ.185754>

This Version is available at:

<https://hdl.handle.net/10419/276410>

**Standard-Nutzungsbedingungen:**

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

**Terms of use:**

*Documents in EconStor may be saved and copied for your personal and scholarly purposes.*

*You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.*

*If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.*

FLOOD PLAIN MANAGEMENT

By

David J. Allee  
Eldred Rich

May 1974

No. 74-11

Flood Plain Management -- The Basis for a  
New Ball Game (David J. Allee)

Page 1

Flood Plain Management: A State View  
(Eldred Rich)

Page 8

Flood Plain Management -- The Basis For  
A New Ball Game

by David J. Allee<sup>2/</sup>

Flood risk is an excellent example of the use of this year's Environmental Leaders Forum, "Shared Resources -- Yours, Mine, or Ours?" Individuals and communities that occupy the flood plain, acting as separate decision makers, have many incentives to take actions that actually increase the overall risk of flood damage. In spite of millions of dollars spent on flood prevention, flood damage figures seem to increase over the years. A climax came in 1972 with Tropical Storm Agnes, the Rapid City disaster, floods on the Mississippi and in the Pacific Northwest. Losses were in the many billions, cost several hundred lives and unmeasurable private suffering.

Building in the flood plain not only poses a risk for the individual but often increases the risk for others. Urbanization can increase the amount and speed of runoff by reducing infiltration. Filling and building too close to the river can cause a previously harmless flood flow to back up and flood much more property. Doing with "yours" or "mine" what we choose can make what is "ours" much more of a problem. The solution is to undertake a variety of public and private actions so that together we reduce the risk of flood losses to more tolerable levels.

Broad Strategies -- Relief, Flow, Location

In response to disasters such as major floods the nation has evolved a series of relief measures impressive in scope and generosity. Indeed, some who have studied the provisions seem to conclude that a community can't afford not to have a flood. Obviously, most victims would just as soon not have had the honor to be chosen, thank you. But the outpouring of assistance to put things back the way they were is one way we spread the risk. Indeed, the cost of flood recovery has been an important incentive to find ways to avoid flood damage.

---

<sup>1/</sup> Extension of Remarks. Environmental Leaders Forum III, "Shared Resources -- Yours, Mine or Ours?" April 17 and 18, 1974.

<sup>2/</sup> Professor of Resource Economics and Associate Director, Cornell University Water Resources and Marine Sciences Center, Ithaca, New York.

The 1936 Federal Flood Control Act began a response that put primary emphasis on changing the flow of water. Dams, channel improvements and levees have been installed to give partial protection to most of the cities in the nation. Some argue that the result is to encourage more and unreasonable occupancy of the protected flood plains. Every structural measure has its limits. Millions in damages from floods that are below those limits have been avoided. The protection is taken for granted and those limits are felt to be underestimated by developers and local officials alike. Nonetheless, short of redevelopment and relocation, there is little else to be done for many of our existing urban areas.

The major long run solution must be to locate, and relocate, our activities so that they are sensitive to the risk of floods. Some activities are more prone to damage from high water than others. Parks and open space are needed by every urban area -- floodways can provide such amenities. Buildings can be built to minimize water damage, often within the range of existing good construction and design practice. But these adjustments to flood risk apparently won't happen without quite different local knowledge of risks, financial incentives and regulations than we have had. Several recent changes in the politics of water development and resulting program changes give some promise that a new "ball game" is in the making.

What is clear is that no single approach to the problem will "work." Technically, no single approach does it all. Economically, we cannot afford to put enough resources into any one solution. And politically we can't expect to develop enough support for any one program. Perhaps the biggest problem to be faced is the political problem of risk awareness. Right after a major flood many are aware, but the push is to recover, to get back to normal. As the memories fade, the public will to act fades. The course of action left is to seek to build sensitivity to flood risk into as many of our public actions as possible. For this to happen, private and public advocates of flood prevention are needed at every level of decision making.

#### The New Politics of Water Resources

Water development projects have traditionally been fueled with the energy of local support. Even though national agencies -- the Corps of Engineers, the Bureau of Reclamation and the Soil Conservation Service -- are the major purveyors of such projects, an examination of their structure of decision making shows that they depend heavily upon local inputs. Local leaders provide much of the information required to define the project and certainly depend upon them to obtain the several essential Congressional approvals required. In the past one Congressman would be reluctant to get involved in the project of another; most participants worked hard to move each project along as all had a positive stake in the process. With many more projects in the pipeline than could be built -- the backlog of authorized projects is well over a decade's investment -- strength of support and lack of local conflict were essential to a priority status.

This has changed with profound effects for flood risk management. Environmental groups in particular are now legitimate participants in the decision-making process. An environmental issue calls forth a constituency that cuts across project areas and Congressional districts. The threat of escalation to a national issue hangs over the simplest traditional project. And environmentalists are unlike more traditional interests who have participated in the past -- the water agencies have had little to offer that they want.

At the same time local leaders and Congressmen have a much wider range of federal programs in which they can participate to do good things for their community. Also more and more state and local agencies are developing the capacity to bring technical expertise to bear on water problems. The water agencies have less of a monopoly in judging the alternatives.

The easy water development choices have been made. As in many of our natural resources, further development along traditional, limited purpose lines can only take place by affecting other interests. Third party or externality effects are increasing. If someone's current use of the resource is not adversely affected, there is now the clearer perception of the prospect of some future option being affected. Many more are affected by resource development decisions. Many more want access to these decisions. The result is increasing levels of conflict surrounding traditional water development projects and lower rewards for many of the participants in the decision process. Congressional interest has fallen off. Budgets have either been static or at least not expanded as fast as have the problems needing solutions.

The prescription for this state of affairs has three parts -- all of which seem to be coming about. First, a broader bargaining arena would allow more interests to be accommodated. Flood control must be a part of a process that looks at many other concerns -- more than those that can be satisfied by multiple-purpose dams. Second, potential conflicts must be identified earlier. Environmental problems must be surfaced even before the impact statement is written for them to be accommodated successfully. Third, if the agency program mix is expanded it will be easier to find combinations of actions which will attract the necessary support.

#### A Realistic Federal Approach to Flood Plain Management Projects

In section 73 of the Water Resources Development Act of 1974, signed by the President in March, the Congress has signalled that it is willing to seriously consider putting federal funds into non-traditional approaches to flood risk management. It strengthened this signal by authorizing two projects that had not been recommended by the Office of Management and Budget. Essentially, any means to reduce flood risk that can pass the benefit to cost test is now eligible for at least 80 percent funding.

The two unconventional projects authorized are worth thinking about. They represent just the sort of long run solutions that local governments have been unable to implement without outside incentives. Such approaches

have been advocated for years but only rarely accomplished and then only with unusual leadership. It is perhaps time to make them the more usual approach.

The Charles River Project is simple enough in principle, prevent the loss of the natural flood storage in the 15,000 acres of wetlands upstream from the flood areas. Filling, draining and building on these wetlands not only reduces the capacity to hold back water, it actually increases the amount and speed of the runoff. But how to keep such development from taking place? Exhortation to local governments to use their land use control powers to protect downstream communities doesn't have much promise. Buying development easements or simply the whole title is a surer approach. Some \$8 million is now authorized to purchase about half of the wetland acreage with the remainder to be acquired by the State of Massachusetts.

In 1970 I wrote the following about the second project authorized:

Prairie du Chien is one of several demonstration projects being developed by the U. S. Army Corps of Engineers that does not involve reliance on conventional structural approaches. In this case it was clear that no structural measures could be justified to protect the some 1,000 Prairie du Chien residents who live on a low-lying island and adjacent mainland areas flooded regularly by the Mississippi River. This project has the potential of developing new federal relocation policies.

Interestingly most of the people involved are either enthusiastic supporters of the concept or at least accept it. The Congressmen, the local officials and many others responded in this way as a result of a carefully developed participation program. Careful step-by-step exploration of the problems of implementation and liberal doses of imagination and hoped-for funding seem to have produced a successful nonstructural project. If the Congress approves, the city will develop a relocation area on higher ground with assistance from the project. Further the project will spend up to \$1.1 million to move some houses onto new foundations and to buy others for razing. Owners of the houses that will be taken down will be reimbursed to obtain equivalent new homes.

Prairie du Chien's flood plain will become a recreational area with a historic site and two marinas remaining on it. No more disaster relief or flood damage claims or demands for flood control works should stem from this community. Appropriate controls to zone the flood plain against further development are now required and have been since 1 January 1968 when a Wisconsin law was passed to that effect. Indeed, if a local community does not now zone a flood plain, the Wisconsin Natural Resources Department is empowered to write such an ordinance.

This type of approach with its solid program development characteristics and adequate attention to implementing details

and compensation is what is needed. But for this to be a real alternative we have to be as equally willing to spend money to achieve it as we are to build dams and channel works. Once we have established that, then the existing rules to require a nonstructural plan and the demonstration that structures recommended are superior to feasible nonstructural approaches will take on some meaning.

It is encouraging to note that at this time the flood problems of the Binghamton area are being reviewed with these approaches in mind. Had Tropical Storm Agnes dumped its 15 inches of rain upstream from Binghamton, only a few miles from Elmira and Corning, the damage would have been much greater. The number of urban blocks inundated would have been several times greater, perhaps 600 rather than about 200. The prospect of relocating the activities on that many urban blocks is a bit staggering, but the hope at least is that the limits of relocation will be seriously explored.

#### A New Prospect for Small Watersheds

Section 73 of the Water Resources Development Act of 1974 should not be limited to the large project and large problem setting. Small watershed projects usually carried out under PL 566 by the Soil Conservation Service also have the potential of using this authority. Perhaps the Congressional strictures to emphasize farm flood problems in this program can now be eased and some of the untapped potential of the small watershed approach can be realized. County Small Watershed Protection Districts and the technical and organizational assistance available from SCS and the County Soil and Water Conservation Districts could be used to deal with many vexing small flood situations. These problems are certainly not confined to small rural communities. Broome County, for example, even under the more limited authorities, has found this to be an effective tool in the Binghamton region.

But the small watershed offers another possible flood-mitigating opportunity. New York is a headwater state. The rivers begin here and flow elsewhere with the exception of the Great Lakes and the Saint Lawrence. The problem this produces is in having adequate warning that a flood is coming. On many major rivers the Federal Weather Service is able to provide many hours of warning. But where the physical situation is such that six hours or less is the best you can expect, the federal system offers only limited help. A local self-help program using local observations and interpretation is not difficult to design. The few successful efforts -- Olean, for example -- indicate the value of such a system. The problem is getting such a system organized and sustained over the years. Watershed organizations are called for, to make use of available technical assistance from New York State Department of Environmental Conservation, the Weather Service and others such as the Susquehanna River Basin Commission.

Flood Insurance -- The Community Sensitizer

Recent changes in the federal flood insurance program and complementary state legislation should make many more aware of the risks they face as well as encouraging more effective flood plain regulations. Existing development can be covered through private companies by subsidized insurance. Once the detailed data is available to set the rates, all new building must be covered by insurance at full actuarial rates. Before the detailed data is made available by the Federal Insurance Administration, the community must adopt a permit procedure for the designated high risk areas and then the subsidized insurance is made available. Insurance will be required for any mortgage issued on improvements in the high hazard areas by federally regulated or insured financial institutions. Also federal aid for construction, including flood relief payments, in these hazard areas will be limited unless the community qualifies for the program. Qualification requires the adoption of regulations that specify how construction will be made sensitive to the flood risk shown by the detailed data.

The sanctions on individual mortgages and on federal aid to communities, as well as expanded coverage, were added to the program in late 1973 in response to the 1972 flood costs. Available for some years the voluntary approach had attracted only a few communities and very few property owners. While they promise to make the program more effective in discouraging risky use of the flood plain, they will also put the program under very substantial pressure. Particularly the mortgage provisions may raise considerable uncertainty in the land market that will not be dispelled at least until the program is well understood, perhaps not until the final detailed data are made available. It will take at least a decade for the data to be generated. Communities, like land owners, have been reluctant to label their real estate with the levels of risk calculated by the hydrologists. Also many communities have had major conflicts over the adoption of the kinds of controls called for.

The federal program is more likely to be successful if it is complemented by an active state effort. The legislature has before it bills that would direct NYSDEC to provide technical assistance to local governments and give the counties a role in taking the necessary qualifying actions if towns, villages and cities fail to do so. While this is important in getting the program going, it may prove to be even more important in its long run effectiveness. Local governments rarely have the capacity to make the technical evaluations necessary to judge whether variances requested will have a significant effect on the capacity of the flood flow system. The possibility that a series of small decisions will subvert the intent of the controls is very real. Thus, part of the challenge is to design an inter-governmental system that will keep flood plain management effective.

The existence of flood plain information and controls should stimulate interest in other approaches to flood risk management. Dams and channel work should be easier to translate into perceived benefits. Relocation and flood proofing should make more sense to more people.



Flood Risk Management as an Example of Step-by-Step Policy Development

Public policy changes come in a series of incremental steps, rarely in large sweeping reforms. It is easier to get agreement for proposals for limited changes where the remedy is well defined and clearly linked to a particular problem. A national land use policy act or a comprehensive state land use control program is much more difficult. Uncertainty about who will be affected and how is enough to cut the chances for support. Agricultural Districts, or protection for tidal wetlands, or a Stream Protection Act, or a flood plain management bill, offer approaches that attract support. Several problems are posed by this process that should be recognized by community and environmental leaders.

First, this is a remedial process of diagnosis and prescription. Changes in programs are made and their effect should be assessed -- not only on the direct objective but on side effects as well. The response to the changes will first come from those who have a direct, immediate and tangible stake. Those who are affected less directly, in smaller ways, and less tangibly, will react more slowly if at all. And in today's fast moving world the "turn around time" for revising program changes is much shorter. This increases the burden on those who would represent the broader, more diffused interests.

Second, it is increasingly difficult to see how these many programs fit together, where they complement each other and where they counteract each other. It may be harder to do this at the higher levels of government than at the lower; the system is so complex, and responsibilities so specialized. Yet the local community seems to have so many constraints placed upon it from outside. Again a special challenge is put to our community and environmental leadership to know their local situation and to take responsibility for getting it reflected and understood at higher levels of decision making.

Flood Plain Management: A State View

by Eldred Rich<sup>1/</sup>

We define flood plain management as a coordinated program to reduce flood losses. Such a program would include:

Public Awareness -- Information and education programs to inform citizens and local officials of existing and future flood hazards.

Flood Protection Works -- Projects such as reservoirs, levees or channel improvements.

Emergency Preparedness -- Warning systems, emergency evacuation plans, temporary housing and other plans that try to anticipate and be ready for floods.

Land Use Controls -- The adoption of ordinances and regulations, permanent relocation and other measures designed to guide use and development of flood hazard areas.

Flood Insurance -- The federal program providing property owners with flood insurance at a reasonable cost.

We believe that any substantial statewide reduction in flood losses will require the use of all available methods. Land use controls, for example, are of limited value for existing developed flood hazard areas, but should drastically reduce the development of future problem areas. Today, I would like to only make some general comments on land use controls for flood loss reduction and some more detailed comments on the National Flood Insurance Program.

Land use controls for management of flood losses seek to accomplish two ends -- 1) protection of the channel and that portion of the flood plain required to pass major floods without unreasonably increasing water depths or velocities -- an area called the floodway -- and 2) requirements that any use or development in the flood hazard area outside of the floodway be reasonably protected from flood damage. Accordingly, flood plain management involves regulation of how the land is used rather than what the land is used for.

---

<sup>1/</sup> Office of Environmental Resources Planning, New York State Department of Environmental Conservation.

The most important, indeed essential, part of a flood plain management program is a building permit system backed by a strong building code. Subdivision regulations are also needed along with either local laws or zoning ordinances. It is important to realize that zoning is probably not necessary for a minimum flood loss reduction program. We have found that a number of New York communities recognize the need for regulation of flood hazard areas, but believe that community-wide zoning is not necessary or desirable at the present time.

I certainly do not want to leave the impression that zoning is not a powerful, needed and useful tool in land use control to reduce flood damage. Of course it is! In addition, even limited single-purpose land use controls have short and long range effects on community-wide development patterns and economic growth. Maximum benefits and minimum adverse effects require that flood plain use-controls be an integral part of total land use planning and regulation for the community.

#### The Flood Plain Insurance Program

Flood plain insurance has been discussed and debated for at least the fifteen years I have been involved in water resources. It was conceived primarily as a method of providing disaster relief. Its main advantages were:

1. Help is available immediately to people suffering flood damages.
2. People subject to flood hazards would pay a share of the program cost through insurance premiums.

The principal disadvantage was that many felt that subsidized flood insurance would only encourage more flood plain development, resulting in more future flood damage. As a result, the National Flood Insurance Program enacted by Congress in 1968 provided that, in order for flood insurance to be made available, a community must agree to adopt a flood plain management program meeting minimum criteria established by the Federal Insurance Administrator. Despite fairly wide publicity few communities joined the Program. At the time of the "Agnes" flood in New York, only 26 communities in New York were eligible for flood insurance, with most of those on Long Island. At the present time more than 200 communities are participating in the Program with more than 20,000 policies in effect.

The Flood Disaster Protection Act of 1973, effective January 1, 1974, added powerful sanctions which will apply to communities having flood hazard areas and not participating in the National Insurance Program. The Act also substantially raised the limits of coverage.

The National Flood Insurance Program provides previously unavailable flood insurance protection to property owners in flood-prone and mudslide areas and offers subsidized flood insurance in return for land use controls.

The National Flood Insurance Program is administered by the Federal Insurance Administrator of the U. S. Department of Housing and Urban

Development (HUD). The Department of Environmental Conservation is New York State's designated coordinating agency for flood insurance information and program assistance.

Flood insurance is purchased by property owners directly from local insurance agents and brokers, but is available only for those properties in eligible communities. A community wishing to receive eligibility to purchase subsidized flood insurance must agree to adopt and enforce adequate land use and control measures consistent with HUD regulations. The program has been broken down into several steps to facilitate initial eligibility and gradual development of the required controls.

The initial step requires a community to regulate construction within its known flood hazard areas to reduce flood damages. Construction materials must be selected carefully and utility lines located properly. Adequate drainage must be provided and sanitary sewer systems must be located so they will not be impaired by or contaminate floodwaters.

As soon as a community begins an accepted program of flood plain management, subsidized flood insurance is made available to owners of property within the community. The maximum subsidized coverage available is \$35,000 for a single family residence and \$100,000 for all other structures. Additionally, contents coverage is available at \$10,000 maximum for a single family residence and \$100,000 for all others.

The subsidized rates are 25 cents per \$100 coverage for all residential structures and 40 cents per \$100 for all non-residential structures. Contents coverage rates are 35 cents per \$100 for residential structures and 75 cents for all others.

After a community comes into the program, HUD prepares, at no cost to the community, an official Flood Hazard Boundary Map for the entire community showing the outer flooding limits and water surface elevations for a 100-year flood. Also provided is sufficient data to determine the outer limits of the floodway. With the completion of this data an Actuarial Rate Study is undertaken to determine the real costs of flood insurance related to the actual flood hazard.

Upon receipt of this material the community is required to regulate its flood hazard areas consistent with this more precise information. The floodway must be kept free of permanent construction and existing structures may not be expanded. However, they may be modified to include flood-proofing features. All new residential construction within the Floodway Fringe must have the first floor (including basement) elevated to or above the level of the 100-year flood. Non-residential structures must be either elevated or flood-proofed to that elevation.

At this time, additional insurance coverage is made available within the community in amounts equal to the initial coverage limits. This additional coverage is purchased at actuarial rates which vary according to the class of structure and the actual flood hazard. New construction started after the receipt of the data from HUD is charged the actuarial rate for the total policy.

The Flood Disaster Protection Act of 1973 amended the Flood Insurance Program in several important ways. It doubled the limits of coverage to those I mentioned before, extended coverage to damage caused by erosion suffered as a result of major floods and added sanctions to insure community participation.

In response to the new legislation, the Insurance Administrator is notifying communities that have flood hazard areas and will be supplying flood hazard area maps. Over 1,000 New York communities are scheduled to be notified by June 30, 1974. We expect additional communities to be added subsequent to that date.

Each community notified is informed that it should promptly apply for eligibility under the Flood Insurance Program or, within six months, appeal the flood hazard designation. Any notified community which has not become eligible for flood insurance before June 30, 1975, or one year from date of notification, whichever comes later, will be subject to the sanctions provided for in the law. The sanctions are:

No federal officer or agency shall approve any financial assistance for acquisition or construction of buildings in the flood hazard area if the community is not participating in the Federal Insurance Program. Banks, savings and loans associations or similar institutions supervised, approved, regulated or insured by the federal government, may not make loans secured by improved real estate or mobile homes in the flood hazard area unless the community is participating in the National Flood Insurance Program and the loan is secured by flood insurance.

To repeat, the sanctions apply only:

1. If the community has been notified by HUD.
2. After July 1, 1975 or after one year, whichever is later.
3. Only to the Flood Hazard Area.
4. Only if the community is not participating in the Insurance Program, or the building or mobile home is not covered by flood insurance.