

THE NATIONAL FLOOD INSURANCE PROGRAM AS A NONSTRUCTURAL MITIGATION MEASURE

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Abstract. In 1968, the United States Congress passed the National Flood Insurance Act which created the National Flood Insurance Program (NFIP). Nearly 30 years later the NFIP has become entrenched in the United States as the major institutional vehicle through which nonstructural floodplain management is accomplished in the country. This paper reviews the rationale behind creation of the NFIP, describes the purposes of the program and how it operates in some 18,000 communities, highlights issues of concern about the program that impact its effectiveness, and recommends research that would result in information that could improve the NFIP's ability to reduce vulnerability to flood damages.

1. WHY A NATIONAL FLOOD INSURANCE PROGRAM

Flood policy in the United States between 1850 and 1950 was dominated by a structural approach. Levees, dams, reservoirs, and other engineered improvements were used extensively throughout the country to control flood waters and protect flood prone lands from inundation. For a century, the nation spent billions of dollars responding to floods with the philosophy that floods were something that should and could be controlled. The underlying premise of the approach appeared to be that flood prone lands needed to be reclaimed in order to allow farms and cities to occupy them. Gilbert White in his 1942 dissertation described the policy (White, 1942, pg. 33)

...in essence [it] is one of protecting the occupants of floodplains against floods, of aiding them when they suffer flood losses, and of encouraging more intensive use of floodplains

By the mid-1950's it was recognized that both damage from floods and the costs of providing structural protection were increasing. Disaster relief costs were rising as well. Some were beginning to see the need to consider alternative approaches to controlling flood damages. For example, in the 1950's the Tennessee Valley Authority instituted a program to address local flood problems by adjusting land use to the flood risk. Likewise, the 1960 Flood Control Act authorized the U.S. Army Corps of Engineers to provide technical and planning assistance to local communities for the wise use of floodplains.

There was also a rising interest in flood insurance. The private insurance industry had never covered losses from flood damage because of the nature of the flood hazard. It is spatially confined and so the risk to insurers could not be widely spread. As a result, the high premium insurers would have to charge for flood insurance made the product unmarketable. Congress considered and dismissed two different proposals to provide federally backed flood insurance in the 1950's, and serious consideration of the topic did not rise again until 1965 after a series of severe storms and hurricanes (including Donna, Carla, and Betsy) caused extensive damage on the gulf coast and eastern seaboard (Ooms, pg. 3-5).

At that time, two government reports, one prepared by the Department of Housing and Urban Development and one by a task force appointed by the Bureau of the Budget, called once again for consideration of a federal flood insurance program (Moore and Moore, pg. 70-72). Spurred by these reports, in 1968, Congress passed the National Flood Insurance Act which created the National Flood Insurance Program (NFIP). The NFIP originally was designed to be a voluntary program whereby communities that agreed to regulate new development in flood prone areas would make their citizens eligible for low cost, federally subsidized flood insurance. (A 1973 amendment to the Disaster Relief Act removed many of the voluntary aspects of the program. In particular, the purchase of flood insurance was made a condition of any federally regulated mortgage. Communities that did not participate in the NFIP limited the availability of financing for its citizens who needed to borrow money to buy a house). The fundamental idea behind the NFIP was that new development would be safe from floods of a certain magnitude and owners of existing flood prone development could purchase insurance, thereby bearing more of the cost of using risky lands (Whiteman, pg. 2).

2. OPERATION OF THE NFIP

The NFIP was established to fill in some of the gaps created by the traditional adjustments to floods (structural control and disaster relief). The goals of the program are to provide affordable flood insurance to owners of existing development in flood prone lands and to promote wise use of floodplains by requiring local regulation of new development in flood prone areas. Hence, the NFIP is a two-sided program: insurance on one side, and regulations on the other.

The two goals of the program are linked in the way the program operates. The NFIP provides flood insurance only in communities that agree to adopt and enforce land use regulations that guide new development and substantial improvements to existing development in floodplains to ensure it will be free from damage in the event of a 100 year or 1% chance flood. It was envisioned that all new floodplain development would be protected to a certain degree and that eventually, (in perhaps 50 or 60 years) the existing development in flood prone areas would be replaced with properly constructed buildings.

Before a community enters the NFIP, the Federal Insurance Administration, a division within the Federal Emergency Management Agency (FEMA), conducts detailed hydraulic and hydrologic analyses of the community's floodplain. This detailed study, along with maps, called Flood Insurance Rate Maps or FIRMs, are then provided to the community, which identify the community's flood problem. The study includes a description of the flood hazard, an explanation of the engineering methods used to analyze the hazard, and flood profiles for the 10, 50, 100, and 500-year floods (or those having a 10, 2, 1, and 0.2 percent chance, respectively, of being equal or exceeded in any given year).

The maps identify the community's "Special Flood Hazard Areas" or SFHAs. The SFHAs comprise the limits of the 100-year or 1% chance flood (also called the base flood). The maps also display the 500-year or 0.2% chance flood, and the floodway. Finally, the maps indicate the elevation of the 1% chance flood at various cross sections.

Once a detailed flood study has been completed, a community that wishes to make flood insurance available to its citizens must adopt and enforce an ordinance regulating new development within the 1% chance floodplain. There are two main objectives to the regulations that must be adopted:

- ensure that new development does not increase flood damages elsewhere, and
- protect new development from damages from the 1% chance flood.

The ordinance communities enact must institute a floodplain development permitting system. Before a permit for new construction or substantial improvement in SFHAs is granted, local building officials review the permit application to ensure the objectives are met.

In order to meet the first of these objectives, the minimum standard established by FEMA requires that no new development in the Special Flood Hazard Area may cause more than a one-foot rise in the base flood elevation. To ease the burden on the local regulating official, who would need a detailed engineering study for each and every development proposal to determine its impact on flood heights, the maps provided to communities by FEMA divide the Special Flood Hazard Areas into two zones: the floodway and the floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. As noted above, the minimum federal standards call a 'substantial' increase a one-foot increase. In computing the floodway boundary, full encroachment of the floodplain is assumed. When that encroachment reaches a point where it causes a one-foot increase in flood heights, the floodway boundary is drawn. No development is allowed then, within the floodway, unless it can be demonstrated that the development would cause no new rise in flood heights.

In order to meet the second objective, the regulations require that new or substantially improved buildings:

- Be anchored properly to prevent the hydrodynamic and hydrostatic pressures associated with flooding from moving the building off its foundation. The anchoring requirement also applies to mobile homes. This requirement has proven useful for mitigating damages from hazards other than floods. For example, in my home state of Colorado, there are not any statewide tie down requirements for mobile homes. When a tornado devastated the small town of Limon a few years ago, the mobile homes that were anchored in compliance with the minimum NFIP rules did not blow away, where those outside the floodplain did.
- Have utilities (for example, the furnace, electricity, and water and gas lines) elevated above the level of the 1% chance flood.
- Use construction materials and methods that minimize potential flood damage. Because floods can cause damage in many ways (hydrostatic pressure can push foundation walls in, hydrodynamic pressure from waves can destroy walls, uplift can float buildings, or cause floors to crack and break, and of course contact with water can warp or damage walls and

floors) the general guidance from FEMA is to use materials and methods that limit such damage.

More specifically, to meet this third requirement, the minimum standard for new buildings in Special Flood Hazard Areas require that the lowest floor of any residential structure be at or above the base (or 100-year) flood level. For nonresidential structures, the standards require that they have the lowest floor at or above this base flood level, or be structurally dry-floodproofed to that level.

Essentially, there are three ways new buildings can be floodproofed to meet this requirement:

- Be constructed on fill.
- Be elevated on foundation walls or pilings. In this case, areas below the base flood elevation can be utilized for parking or temporary storage, but they cannot be completely closed in. Flood waters **MUST** be able to pass through them.
- Or, be structurally dry-floodproofed. In other words, they must be designed, engineered, and constructed so that they can withstand the hydrostatic and hydrodynamic forces of a 1% chance flood, and remain flood free. This type of protection is allowed only for non-residential buildings.

To ensure buildings meet the above criteria, the regulations further require that the community keep on file an "as-built" elevation certificate form (completed by a licensed surveyor or engineer) for each new or substantially improved structure that certifies that the lowest floor is at or above (or structurally dry-floodproofed to) the base flood elevation.

Once such an ordinance is in place in the community, citizens then may purchase federally backed flood insurance. Policies are sold separately for damage to a structure and damage to contents. The amount of coverage available has changed over the years. Currently, a person can insure his or her home for up to \$250,000 (and \$100,000 for contents). For nonresidential structures, the limit is \$500,000 each for structural and contents coverage.

The cost of an individual insurance policy reflects a community's status in the National Flood Insurance Program and a building's susceptibility to flooding. For buildings that existed prior to the adoption of an ordinance in compliance with the NFIP the rates are subsidized. For buildings that were built after a community's land use regulations went into effect based on detailed flood data, the rates are actuarial-based on the structure's risk to flooding. In this way, owners of existing flood-prone property can protect themselves with affordable insurance (and because they pay some money in premiums, the taxpayer does not have to bear the entire burden of disaster relief). New properties, on the other hand, are properly regulated (i.e., built in such a way so as to be safe from flood damage) so that actuarial rates are low. If a new building is noncompliant, however, the flood insurance rates reflect the risk and the premiums paid by the property owner are very high. The average annual premium for a flood insurance policy is \$300.

3. ISSUES OF CONCERN

In the past 27 years the NFIP has had a profound effect on floodplain management in the

country. Of the estimated nearly 22,000 flood prone communities in the U.S., now over 18,000 (more than 85%) of them participate in the program (Simmons, page 62). According to the Association of State Floodplain Managers (the only national organization of professionals responsible for managing flood-prone areas in the United States), the NFIP has meant that hundreds of thousands of land use and development decisions have considered the flood hazard, resulting in just as many new buildings that are either located at flood-free sites or constructed so as to minimize flood damage (U.S. Congress, pg. 130). In 1993, FEMA reported that the floodplain management regulations enforced by local communities save the nation more than half a billion dollars annually and concluded that structures built in compliance with the regulations suffer 83% less damage than those built before the standards were in place (U.S. Congress, pg 78).

Yet, the ability to state more conclusively as to how effective the NFIP has been as a nonstructural mitigation tool is difficult. A federal Interagency Task Force undertook a massive review of the effectiveness of the nation's floodplain management program and published its report in 1992. Floodplain Management in the United States: An Assessment Report is a 600 page volume that listed several key findings many of which were quite obvious. They included such findings as: people are unaware of flood risks, people like living in floodplains and coastal areas, flood damages are increasing, private interests often think of short-term economic gains rather than long-term economic and natural resource losses in development decisions, and most state and local governments lack the resources and technical capabilities to deal with the flood problem in a comprehensive way. The report also came to the sobering conclusion that floods account for more losses than any other natural disaster in the United States and that annual growth in flood prone areas of the country is twice that of non-flood prone lands (Johnston, pp. 3-1 and 3-2).

There are several key issues of concern regarding the National Flood Insurance Program that undermine the effectiveness of the program:

3.1 MINIMUM STANDARDS

In reviewing the criteria that have been put in place to meet the two major objectives of the regulatory side of the NFIP, the astute person will quickly pick up on the fact that they are designed to allow flooding of new development to a depth of one foot. The standards that have been adopted by 18,000 communities are "minimum" standards; standards that were chosen and agreed upon because they were deemed politically acceptable and not too disruptive to desired economic development. Now, these minimum standards are often thought of as the only standard (Lord, pg 36-37). And, it turns out, if full development of the floodplain occurs, they are standards that cause flood damage the exact opposite of the original intention of the NFIP.

3.2 SUBSTANTIAL DAMAGE/SUBSTANTIAL IMPROVEMENT

According to the rules of the NFIP, floodplain structures that are substantially damaged (i.e., the cost of restoring the structure to its pre-damaged state equals or exceeds 50% of the market value of the structure) are supposed to be rebuilt in compliance with the NFIP regulations that stipulate the lowest floor be at or above the 100-year flood level. Substantial improvements (e.g., additions) to non-damaged structures are also to meet this requirement. It is this part of the regulations that were intended to ensure that eventually, all existing development in flood prone areas would be protected as it was replaced. Unfortunately, this rule has not been uniformly enforced. From my own personal experience of working with community officials in North Dakota

and Illinois, this rule was one of the most frequently ignored NFIP criteria. Further, if damage to a structure or an improvement to it is only 20% or 30% of the value of the building, then the property owner could make such repairs or improvements year after year without ever protecting it from future flood damage. Improvements to a building are not regulated on a cumulative basis.

Evidence that the substantial damage requirements are not being enforced was further supplied by a study carried out by FEMA to review insurance claims paid on substantially damaged structures from 1978-1988. More than 18,500 such claims were paid in the 10 years, and the study also revealed that

...it was not uncommon to find structures which experienced repetitive substantial damage. In fact, some of these structures were substantially damaged from three separate events (Davison, pg. 3).

The report pointed out the obvious question: why were these structures not elevated or floodproofed as required after the first substantial damage? Five possible explanations were suggested, two of which pointed to improper ordinance enforcement, though no detailed study was done to determine the exact reason for this apparent conundrum.

3.3 LOW INSURANCE PARTICIPATION

There are an estimated 9-11 million structures located in SFHAs in the United States (Kunreuther and White, pg. 32). As of June 30, 1995, there were only 3.1 million flood insurance policies in force (Wetmore). In other words, only 25-30% of buildings at risk have proper insurance coverage. Why is this so? There are many reasons. A major one is lack of compliance with the mandatory flood insurance purchase requirement that is supposed to be a condition of any mortgage for structures in floodplains. Financial and lending institutions have not been conscientious in ensuring mortgagees maintain flood insurance as a condition of their loan. This was pointed out in a study conducted by the U.S. General Accounting Office in 1990 that examined disaster assistance requests for properties that should have had flood insurance in two states (Maine and Texas), but did not. In Maine 22% of the properties were found to be lacking the coverage while in Texas 79% were uninsured! Reasons for this were listed as: inadvertently overlooking the insurance purchase requirement, improper classification of the properties as being outside the SFHA, and properties that had allowed the insurance policy to lapse after the original loan was made (U.S. General Accounting Office, pg. 2). This problem of lender compliance may be solved because of recent amendments to the National Flood Insurance Program which will be addressed later in this paper.

Another reason for low coverage is the change in direction the program has taken. From 1968 to 1980, it was assumed that over a long period of time (some 50 to 60 years), existing flood-prone property would slowly be replaced with flood protected property, thus eventually eliminating the need for a federal subsidy for flood insurance. But for the time being, it was considered important to keep the subsidized rate low so that people would purchase it. Indeed, the number of policies in force did grow in 12 years to a little over two million. In 1981, however, significant changes in the policy were made: the first of many rate increases were implemented and the coverage provided by a policy was limited while deductibles were increased. These changes were put in place by the Federal Insurance Administration in an attempt to meet a self-imposed goal to

make the NFIP self-sustaining and actuarially sound by 1988, some 20-30 years earlier than originally presumed. While that effort has been successful (Simmons, pg. 64), the last 15 years have seen a much slower growth rate in the number of policies in force. There are now only 3.1 million policies, or less than 3% growth per year since 1981.

3.4 RELATION TO DISASTER RELIEF

Another reason flood insurance coverage is low is because some people believe that the growth of federal involvement in disaster relief has caused the public's expectations of the federal government to grow resulting in discouraging individuals and local and state government from taking any action to prepare for, respond to, and recover from disasters, including purchasing insurance coverage (U.S. Congress House of Representatives, pg. 7). Again, there is no detailed evidence to support this supposition, but there is anecdotal indication that such is the case. Imagine the frustration of a flood victim who has flood insurance coverage as she waits for the adjuster to visit her damaged home to adjust her claim, while her neighbor who has no flood insurance receives a check from FEMA for repair, with few if any strings attached. What reason would the first victim have to renew her flood insurance policy?

3.5 100-YEAR STANDARD

Very much tied to the previous discussion of minimum construction standards, another issue of concern with the NFIP is that it implements its regulatory and insurance purchase requirements only in the 100-year or 1% chance floodplain. For many years, the U.S. has relied on the 100-year standard as a basis for many of its flood management programs. What has been forgotten however, is that from the first, the 100-year standard was regarded as only a minimum standard for these programs. In using this standard, by default there seems to be widespread belief that if a building is protected from a 1% chance flood (through elevation or floodproofing) or is located outside of a mapped SFHA, then it is "safe" and not at risk from floods (Myers, pg.441).

This, clearly, is not the case. Floods of greater magnitude can and do occur; flood protection measures (e.g., levees) can and do fail; and flood maps, while useful for planning purposes, do not supply sufficient detail to determine flood risk on a lot by lot basis.

This latter point is particularly problematic for a local official trying to implement a floodplain ordinance. Again, I refer back to my experience in working with communities in North Dakota and Illinois. I cannot tell you how many times I have seen a line on a map and gone to find that line in the field and then tried to explain to the developer, the building official, or the property owner why the land on one side of the line is subject to regulation while the land on the other side is not.

The problems with the maps provided by FEMA are numerous. Philipsborn, in a yet to be published paper, sites several:

- the maps are based on "clear-water" flooding which is nearly never the case. Debris blockages often create flooding conditions in unexpected areas.
- the maps do not identify flood prone areas that have less than a one-square mile drainage area, so the majority of stormwater flows are not mapped.

- the maps are based on anticipated full development of the SFHA, but not on full development of the entire watershed. Consequently, the extent of flood prone areas is often underestimated.
- changes in development patterns or lack of stream maintenance often contribute to inundation of presumably non-flood prone areas.

Lord has suggested that

The federal 1% standard does not necessarily make sense as a local floodplain management standard because it is unrelated to the specifics of the local flood problem. The definition of the hazard zone.....should depend upon each community's own unique hydrologic, topographic, economic, and demographic characteristics.... An appropriate goal at the local planning level would be to maximize net benefits of floodplain land uses (Lord, pg. 37).

4. PROMISING DIRECTIONS

The preceding discussion suggests the operation of the National Flood Insurance Program is not perfect. However, it is an evolving program and it has been modified and improved throughout the years. While I will not review each and every change that has been implemented to fine tune the NFIP, there are two relatively recent significant improvements to the program that I believe hold great promise for increasing the effectiveness of the NFIP to reduce vulnerability to flood damage.

4.1 COMMUNITY RATING SYSTEM

Every scholar or practitioner of natural hazards and disasters is fully aware that the best way to manage that hazard is with a comprehensive approach that utilizes all the tools and strategies available to reduce susceptibility to a particular natural phenomenon. Dealing with floods is no different. Prior to 1991, the NFIP did nothing to recognize or encourage community activities to reduce flood damages to existing buildings, to manage development in areas not mapped by FEMA but that may be flood prone, to protect buildings beyond the minimum NFIP regulations, or even to help people obtain flood insurance. Because activities like these can reduce flood damages (and, consequently, flood insurance claims and disaster relief payments), in 1991, FEMA began encouraging communities to adopt a broad range of flood loss reduction strategies through its program known as the Community Rating System or CRS.

The three main goals of the CRS are to reduce flood losses, facilitate accurate insurance rating, and promote the awareness of flood insurance. The CRS is designed to give flood insurance premium rate reductions as an incentive in communities that implement comprehensive flood damage reduction programs. The CRS is modeled after the U.S. fire insurance rating scheme (whereby property insurance rates in a community depend very much on how good a community's fire department is). Community participation in the CRS is voluntary. Those that wish to qualify for flood insurance rate reductions (ranging from 5%-45%) can submit an application to FEMA documenting one or more flood loss reduction activities that the CRS recognizes as effective. The types of activities a community can get credit for include (Federal Emergency Management Agency, pp. 8-19):

- Public Information (e.g., flood hazard disclosures made by community realtors and establishment of a flood protection library).
- Mapping and Regulatory (e.g., mapping and regulating floodplain areas with less than one square mile of drainage and implementing higher regulatory standards such as requiring freeboard of one or more feet for new structures).
- Flood Damage Reduction (e.g., developing and implementing a plan to deal with existing flood prone structures through, for example, retrofitting or acquisition and relocation).
- Flood Preparedness (e.g., establishing a system to detect floods and warn people about them or implementing levee maintenance and dam safety programs).

As such, the Community Rating System has provided a basis for communities to examine how a wide range of activities (not just the regulation of development and insurance) such as education and awareness, flood-proofing of buildings, and integration of warning systems might reduce a community's vulnerability to damage. To date, about 900 communities have taken advantage of this opportunity and are participating in the CRS. This represents about two percent of the total number of communities eligible. However, these 900 communities also represent 60% of the total number of flood insurance policies currently in force (Wetmore, personal communication).

4.2 RECENT AMENDMENTS TO THE NFIP AND DISASTER RELIEF LAWS

The issues of concern identified above have been recognized for quite some time as problems with the NFIP. To address some of these issues, last year, the Congress passed and the President signed into law Title V of the Riegle Community Development and Regulatory Improvement Act of 1994. The various provisions of the act are now being implemented and, if successfully done, should go a long way toward reducing the nation's vulnerability to flood damages. In particular, the act addresses two major issues: how to solve the problem of existing flood prone development and low insurance coverage.

For the former, existing development, the Act creates a grant program through which funds become available to states and communities to undertake mitigation projects to deal with repetitive loss structures (those that have been damaged by flood more than once in a 10 year period). To qualify for the grants, states and communities must first prepare comprehensive mitigation plans and implementation strategies. Once these are approved by FEMA, states and communities can then receive up to 75% of the cost of implementing technically feasible and cost-effective projects, including such activities as elevation, relocation, demolition, or retrofitting of flood prone structures. The Act also amends the flood insurance policy itself by providing coverage for the increased cost of compliance with land use and control measures for properties that have suffered repeated flood losses or that are substantially damaged. In this way, funds to retrofit a flood prone structure can now be provided through a flood insurance policy.

As for the second issue, low insurance coverage, two parts of the Act should serve to increase the number of policies in force. One is that anyone who has received federal disaster assistance in the past and has been required, but fails, to obtain and maintain flood insurance will not be eligible to receive additional relief payments in subsequent disasters. The second part addressing low insurance coverage deals with mandatory insurance purchase requirements. Lending institutions that are regulated by the federal government, since 1973, have been required to make the purchase of flood insurance a condition of any mortgage for a property in the SFHA of participating NFIP communities. However, until the passage of the Riegle Act, there was no penalty

for lending institutions that did not follow this rule. Now, lenders can be fined up to \$100,000/year for violations of this rule. Further, if a lender normally escrows funds for other purposes (e.g., for property taxes or other property insurance), the Act requires escrow for flood insurance (Association of State Floodplain Managers, pp 6-7).

5. RESEARCH NEEDS

While it appears that the NFIP is, indeed, heading in promising directions, we still could use additional knowledge to reduce social vulnerability to flood damages. I suggest the following for priority research recommendations:

- **DATA NEEDS.** An unfortunate fact is that the United States lacks basic information about the costs of disasters and the cost of disaster relief (see, for example, Executive Office of the President, pp. 155-156, or Natural Hazards Research and Applications Information Center, pg. 8). We do have some information regarding the costs. For example, when a Presidential Disaster declaration is made, it is possible to document the amount of disaster relief that is paid. In flood disasters, it is possible to document insurance claims that are settled for structures that carry insurance. But, neither of these figures present the total picture. This is especially true, for example, in instances when floods occur that do not receive a Presidential disaster declaration. There is no systemic collection of data on a nationwide basis of the dollars spent by local and state governments or nongovernmental organizations for response to and relief of flood disasters.

Further, and perhaps more importantly, there is no comprehensive data on the cost, or the benefits, of various mitigation strategies. While some reports have been prepared that detail the 'average' cost of elevating or otherwise retrofitting (see, for example, U.S. Army Corps of Engineers or National Floodproofing Committee) flood prone buildings, little has been done to document such costs in the field and also document the savings that result because the mitigation strategy was put in place.

Specific research needs dealing with this issue are the development of a methodical data collection system for comprehensively assessing damages, disaster relief costs, and the cost of mitigation. Only with this system in place can the base information needed about the true costs and benefits of occupying flood prone lands be acquired and analyzed, enabling citizens and government officials alike to make reasoned decisions about floodplain development.

- **FLOOD LOSS REDUCTION AND BROADER RESOURCE MANAGEMENT.** I mentioned earlier that any scholar or practitioner of hazards knows full well that multiple strategies to dealing with disaster is fundamental to success in limiting societal vulnerability to hazards. I suggest that even more than a comprehensive approach like this is needed before we are significantly successful reducing such vulnerability. Rather, the research community must identify and explain how dealing with floods and floodplain management can be integrated into a broader resource management context. Recent floods, such as those in the summer of 1993 clearly showed us that floodplains are meant to be shared; that there is a need to balance human use of floodplains with the natural components of the landscape. The floods were a reminder that conventional wisdom about how we do or can deal with floods is changing. There is an emerging recognition that the sustainability of our communities, our regions, our states, and our country is dependent on how well floodplains are managed as part of a whole. This is a

challenge that must be met with the understanding that flood loss reduction efforts must be a day in and day out process, and not as a disaster strategy. It is a process that must consider "quality of life" as well as the protection of health, safety, and welfare.

This challenge cannot be met without the advice of the research community of how policy can be formulated and implemented that incorporates broad thinking that considers how every decision made every day by local and state governments, by developers, and by individuals either increases or reduces the likelihood that flood damages in the future will be worse.

- POST AUDITS. Finally, I borrow an often-expressed concern of Gilbert White.

One of the sad features of the history of floodplain management...is that while thoughtful and probably positive proposals were made for improvement...there was pitifully little effort at either the Congressional or executive level to keep track of what actually happened as a consequence on the nation's floodplains and why there was miscarriage of good intentions (White, pg. 54).

There are many examples of where this occurred and the National Flood Insurance Program is but one of them. While one could speculate as to the major reasons for the failure of various aspects of the program, for example, the low number of flood insurance policies in force, speculation should be replaced with careful analysis of why people who occupy flood prone lands do or do not purchase insurance protection. With such knowledge in hand, programs can be adjusted and policies fine-tuned to better enable them to meet their original goals. Several other parts of the National Flood Insurance Program could also benefit from careful evaluation and analysis: how adequately do the minimum standards for new construction in flood prone areas protect those buildings from flood damage? how effective has the Community Rating System been in promoting comprehensive flood damage reduction programs in the U.S. and what has been the cost to the national flood insurance fund in terms of reduced income because of rate reductions? how effective have the provisions of the recently passed NFIP reform legislation been in increasing compliance with the mandatory flood insurance purchase requirement and in promoting retrofit of existing flood prone development?

Another area in need of careful evaluation and assessment is an analysis of actions taken in the post-disaster "window of opportunity" time frame following floods. The 1993 Mississippi floods presented a tremendous opportunity for national policy changes in regard to flood loss reduction specifically and water resources generally, and it would be instructive to document what actually occurred and review the effect on future flood loss potential. Shortly after flood waters receded from that event, Gilbert White and I identified several possible questions that might be examined including, for example, what effect will raising, lowering, or abandoning damaged levees have on the long-term quality of natural landscapes and human communities in the region; can we improve methods for comparing the evaluation of levees with other adjustments to floods; and what is the effect of extending federal disaster relief to people who elected not to carry flood insurance (Myers and White, pp. 7-8)? Now, more than two years later and after the 1995 floods in much of the same region, it would be important to review the success of mitigation measures put in place after 1993 to determine how effective they were in reducing vulnerability to damage this year. A careful look at this would be very useful in identifying the most successful mitigation projects.

6. SUMMARY

In 1995, nearly 30 years after the creation of the National Flood Insurance Program, it is evident that the program has had some very positive effects in reducing the nation's susceptibility to flood damages. Thousands of communities regulate new development in floodplains; hundreds of communities recognize the need to implement broad floodplain management programs that exceed minimum national standards; affordable flood insurance is available and it helps spread the financial risk of floods and lowers the burden on tax-supported disaster relief programs. Yet, floods continue to be the most costly natural disaster in the United States. The research identified above, if carried out, should help provide the much needed knowledge to reverse that trend.

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