



**ON BORROWED LAND**  
Public Policies for Floodplains

by Scott Faber

# ON BORROWED LAND: PUBLIC POLICIES FOR FLOODPLAINS

This report is one in a series of policy focus reports published by the Lincoln Institute of Land Policy to address timely land-related questions of concern to policymakers, scholars and citizens. Each report is based on a workshop or conference designed to bridge the gap between theory and practice. Participants typically represent a range of academic disciplines, political views, levels of government and types of communities.

The Lincoln Institute conference "Community Land Policy and River Flooding: The Great Flood of 1993" was held in Cambridge, Massachusetts, in September 1994. Officials from the following 33 municipalities in nine upper Midwest states shared their firsthand experiences:

*Illinois:* Aurora, Godfrey, Quincy, Valmeyer, Wheaton;

*Iowa:* Ames, Dubuque, Fort Madison, Iowa City, Muscatine;

*Kansas:* Lawrence, Manhattan, Pittsburg;

*Minnesota:* Rochester, St. Paul;

*Missouri:* Chesterfield, Hannibal, Independence, Jefferson City, St. Charles, St. Louis, Ste. Genevieve;

*Nebraska:* Columbus, Omaha;

*North Dakota:* Bismarck, Fargo, Valley City;

*South Dakota:* Madison, Parker, Watertown;

*Wisconsin:* Brillion, Darlington, Madison.

Speakers also included professionals in planning, economics, geography, law, ecology and engineering:

*Raymond Borby*, DeBlois Chair of Urban and Public Affairs, University of New Orleans, Louisiana

*Ron Flanagan*, Principal Planner, Flanagan, Packard & Associates, Tulsa, Oklahoma

*Brigadier General Gerald Gallowsry*, Executive Director, Floodplain Management Review Committee, and Dean of Faculty, Industrial College of the Armed Forces, Fort McNair, Washington, DC

*Louise Gardner*, Mayor, Jefferson City, Missouri

*Chuck Hazama*, Mayor, Rochester, Minnesota

*Jack Kartez*, Director and Associate Professor, Environmental Science and Policy Program, University of Southern Maine, Gorham, Maine

*Jerold Kayden*, Associate Professor of Urban Planning, Harvard University Graduate School of Design, Cambridge, Massachusetts

*Jon Kusler*, Executive Director, Association of Wetlands Managers, Berne, New York

*Rutherford Platt*, Director, Land and Water Policy Center, University of Massachusetts, Amherst, Massachusetts

*Leonard Shalman*, Professor of Environmental and Resource Economics, Department of Agricultural and Applied Economics, Virginia Polytechnic Institute and State University, Blacksburg, Virginia

*Holly Stoerker*, Executive Director, Upper Mississippi River Basin Association, St. Paul, Minnesota

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## EXECUTIVE SUMMARY

The Great Flood of 1993 along the Upper Mississippi River and its tributaries was, like all floods, largely a product of weather and topography. But its human costs were very much the result of what people had put in the river's way. This report summarizes key points from a conference of policy experts and local elected officials held by the Lincoln Institute to draw land-related lessons from the disastrous experience of flooding.

Participants in the conference concluded that, although governments may not yet be able to manage the weather, they can improve the management of floodplains to reduce the damages caused by flooding. Many of these conclusions apply not only to floodplains but to land in other unstable natural environments—along earthquake faults, in the paths of hurricanes, or in fire-prone forests and grasslands.

Human uses of land increase flood risks in two ways. First, the filling of wetlands, dredging or channelizing of rivers, and urban development anywhere in a watershed increase the speed and force with which rainfall flows across the land and into rivers. Second, the intensive use of floodplains for agriculture, transportation, and residential development exposes more, and more valuable, property to damage from flooding. Since virtually all of the earth's surface is in some watershed, all land use decisions have some potential impact on flooding.

One difficulty for policymakers is to demonstrate that those living upstream or uphill bear partial responsibility for the flooding of properties in other towns, counties, states or even countries downstream. Then the challenge is to distribute the costs of flood damages or their prevention among all these responsible parties. Past severe flooding produced calls for more protection of (usually) private property at (usually) public expense.

Yet levees, dams, and subsidized flood insurance have not effectively warned private landowners or governments to use floodplains wisely. Instead, protective measures have made floodplains appear "safe for development," ironically increasing the cost of damages from the next flood.

The very language we use to define floodplains illustrates these ironies. Just because there was a so-called "50-year flood" last year does not mean there will not be another such flood for 49 more years. In addition, these probabilities should be, but seldom are, updated continuously to reflect land use changes. Land that was in a 50-year floodplain when only 10 percent of the watershed was urbanized may be in a 20-year floodplain when urban development covers 25 percent of the region.

How can local communities, states and the federal government foster less risky and more productive use of floodplains? In the first place, communities need to practice "tough love": to educate themselves and their

citizens about the inevitable—and generally increasing—risk of flooding anywhere along rivers and streams. Those who live or work in a floodplain must bear part of that risk and should not be able to count on public funding to rebuild repeatedly. This stance will be tough not only on flood victims, but on their neighbors and elected representatives. All hearts go out to people standing on rooftops or being evacuated by helicopter, even if to some extent they "brought it on themselves."

Some land uses, such as certain kinds of agriculture, railroads that must load and unload freight from barges, or water treatment plants, may always have to be located in floodplains. But governments should only ensure against flood damage those floodplain uses that are clearly in the broad public interest.

Structural protection against flooding still has an important role, but floodproofing and the financing of flood-control structures should not be allowed to produce a false sense of security that will encourage even more intensive land uses. Instead, these programs should be used as tools to educate citizens and governments about the continuing and often escalating risks of flooding.

Watershed-wide planning, or at least watershed-wide monitoring of land use changes, is critical to fairly sharing both the risks and responsibilities of floodplain management. Participants in the Lincoln Institute conference called for "inverting the pyramid" of intergovernmental relations. Rather than spend national tax dollars on flood control structures and post-disaster aid, the federal government should provide continuously updated information about changing flood risks and land uses across whole watersheds.

State governments should help local governments share this information effectively, and find ways to help those living upstream to take responsibility for the downstream effects of their land use decisions. Local governments should use federal and state support to educate their citizens about the ever-changing causes and risks of flooding, and to regulate or tax flood-prone lands appropriately.

One conference participant called the past system of floodplain management "the public subsidy of private folly." Inverting the pyramid so that land use decisions flow up from the bottom but information flows down from the top would allocate both the benefits and the costs of "borrowing land from the river" more fairly and ensure more sustainable land uses in the future.

Alice E. Ingerson  
Director of Publications  
Lincoln Institute of Land Policy

# 1. WHAT CAUSED THE GREAT FLOOD OF 1993: NATURAL DISASTER OR PUBLIC POLICY?

Until the summer of 1993 in the Midwest, the risks of living near a river's edge seemed insignificant compared to the advantages of water-borne commerce and rich agricultural bottomlands. But the Great Flood of 1993, the most destructive flooding event in the United States in more than 50 years, changed the way many people calculate the economic and social costs of floodplain development.

To a large extent, the 1993 floods were simply the result of an unusual weather pattern. From June through August, the area from the northern plains into the central Corn Belt received between 200 and 250 percent of its normal summer rainfall. The results were devastating—38 deaths and nearly \$16 billion in damage.

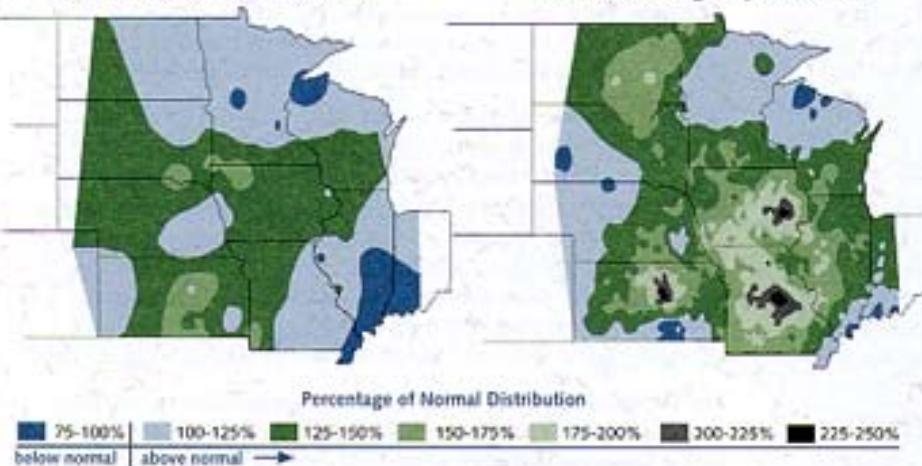
On July 11, 1993, a *New York Times* article titled "Dams and Levees: Restraint on Nature or Talisman for Flood-Prone Areas" noted that "billions have been spent but the cost of floods still climbs." The article asked whether the \$25 billion spent by the U.S. Army Corps of Engineers to build 500 dams and 10,000 miles of levees nationwide had been a "huge pork-barrel boondoggle that fooled only the taxpayers?" The *Times* wondered if a less costly approach, like tougher building and insurance regulations in flood-prone areas, might be wiser.<sup>1</sup>

The *Chicago Tribune* invoked Mark Twain, who thought the Mississippi could never be tamed, and asked "whether the precautions have been worth the cost, or whether they have made matters worse." The *Boston Globe* concluded that the situation had been made worse "because the river has been confined to narrow banks, preventing floodplains from absorbing the overflow." In early July, the paper said, "Higher levees will be demanded, built and topped once again by some future flood. The tug of war continues. This week has shown that it will never be won."<sup>2</sup>

## Distribution of Precipitation in the Midwest

October 1992 through May 1993

June 1993 through September 1993



*When God made the world, He had a large amount of surplus water which He turned loose and told to go where it pleased; it has been going where it pleased ever since, and that is the Mississippi River.*

— Botkin

*A Treasury of Mississippi River Folklore*

Source: Scientific Assessment and Strategy Team, *Science for Floodplain Management into the 21st Century*, p. 48.

The Midwest experienced higher than normal precipitation in the months before the peak rainfall of July 1993. The already saturated soil accelerated severe flooding throughout the summer.

Yet much of this damage was fully predictable, not from the weather but from public policies that had encouraged intensive use of land along the region's rivers and streams. In some cases, practices intended to reduce flood losses actually seemed to have made things worse. Land that had once absorbed rainfall had been engineered to drain quickly. Water that once slowly trickled was now coursing downstream, getting higher and faster as it moved towards major population centers.

The national news media drew attention to these ironies, both during and after the 1993 floods. Three of the nation's largest newspapers—the *New York Times*, *Wall Street Journal* and *USA Today*—featured lengthy articles asking whether the nation's reliance on structural flood controls, such as levees, channels and dams, had actually increased flood heights by confining rivers within man-made barriers.

Many Midwestern papers came out in favor of relocation after the flood. The *St. Louis Post-Dispatch*, the largest circulating newspaper in the flooded parts of the Midwest, editorialized in late July 1993 that the Corps of Engineers should "give the rivers places to spread out" and called for limits on development in floodplains. The *Post-Dispatch* also produced two special reports on the failure of federal flood control policies. One section, based on the work of a hydrologist, concluded that large parts of St. Louis were spared catastrophe only because levees below the city had failed, permitting floodwaters to keep moving.<sup>4</sup> The *Post-Dispatch* also linked higher flood heights with "levee anarchy"—the uncontrolled building of levees—and the loss of wetlands.<sup>5</sup> Other Midwestern papers, including the *Des Moines Register*, *Minneapolis Star-Tribune* and *Chicago Tribune*, raised similar concerns.

The floods of 1993 forced the nation to question assumptions and government responsibilities that had been established over decades. For the preceding 150 years, the federal government had gradually assumed more responsibility for flood control and the risks of land uses in floodplains—by building and repairing levees, paying disaster relief, and providing subsidized flood insurance. While these measures helped to protect many homes, businesses and farms, they also indirectly encouraged state and local officials to permit new development in flood-prone areas, as well as other land use decisions that eliminated many of the natural flood control functions of floodplains and wetlands.

A flood of supposedly biblical proportions ultimately shattered the region's faith in these long-established policies. Rather than return to the river's edge, some 20,000 Midwesterners voluntarily relocated more than 8,000 homes and businesses to higher ground. It was the largest, voluntary post-flood relocation in U.S. history; one out of every ten homes that was damaged was moved. More than 50,000 acres of flooded farmland were voluntarily converted to wetlands. And, for the first time, upstream and downstream communities began to work together to develop watershed-wide water management strategies to catch the water where it falls rather than dump floodwaters on their downstream neighbors.

The challenge for policymakers, according to participants at the Lincoln Institute conference, is to make federal and state programs respond to local circumstances and initiatives. Local plans must allow for a variety of uses—from flood control to water quality—and reflect local political, social and economic conditions. Conference participants agreed that local jurisdictions need new tools, above all else more continuous and complete information, so they can better share this challenge. In the end, local decision makers must incorporate flood loss reduction into their everyday activities.

*"We're not prepared for this. We've never seen anything like it," said Lou Hinman as she and her daughters watched the waters rising. "Someone said a few days ago we were going to flood, and I said, 'Well, should I build an ark?' Lord, I'd love to be able to retract that."*  
— Applebome,  
*New York Times*

For the first time in American history, Congress cut spending for other programs to pay for 1994 flood damages in California and Texas. In the past, Congress simply added the cost of such disaster relief to the spiraling national debt.

Some federal programs have already been changed in response to the Great Flood. Crop and flood insurance programs were revised to ensure wider participation, and disaster relief law was amended to help relocate more homes and businesses.

## The Flood Region



It remains to be seen whether further changes in federal flood control programs will give local communities the tools they need to make the best use of their floodplains. But many of the officials from flooded towns and counties in the Midwest who attended the Lincoln Institute conference agreed that a first priority must be "tough love"—that governments must require people living in the floodplain to share some of the risks and costs of that land use.

Promising policy responses to these problems include:

- Developing watershed management plans among state and local partners to manage water movement to meet flood loss, economic and environmental objectives. Federal programs should be tailored to facilitate and meet the needs of locally driven watershed management plans.
- Encouraging local responsibility by requiring more floodplain property owners to purchase and maintain flood and crop insurance. Expanding the purchasing requirements under the National Flood Insurance Program (NFIP) or reducing post-disaster support for repetitive loss to buildings or other structures might discourage future floodplain development and encourage other decisions to reduce the number of homes and businesses already in harm's way.
- Incorporating flood loss reduction into local planning decisions. Although disaster preparedness, floodproofing and elevation have all reduced flood losses on a case-by-case basis, local leaders must create incentives for land use decisions that maintain the capacity of river systems to contain their own flood waters, and reduce flood losses and the cost of disaster assistance.



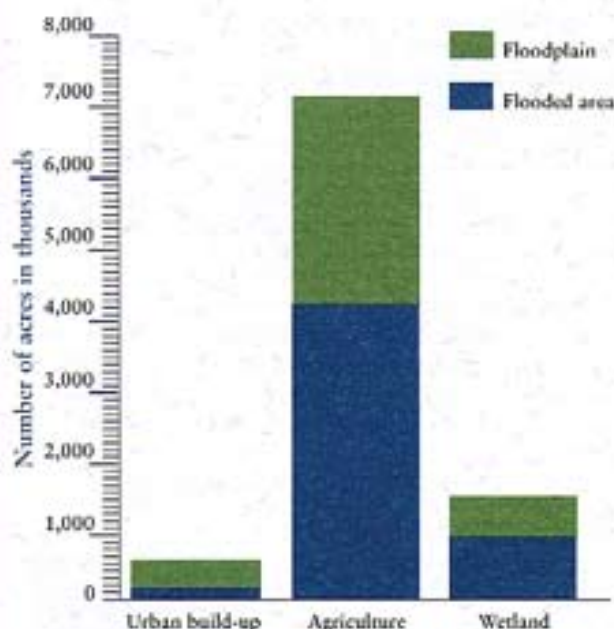
## 2. LAND USES AND RIVER FLOODING

The floods of 1993, though the product of extreme weather, were also the result of thousands of seemingly unrelated decisions to increase the rate at which water moves off the surface of the land toward towns and cities downstream. By itself, a single decision to drain and till a farm field, fill a wetland or build a parking lot has little measurable impact on flooding. But when combined with thousands of similar decisions over decades the impact can be devastating.

In evaluating the Great Flood, federal experts explicitly linked increased flood losses to the past century of land use change, levees and channelization. Some federal experts found that the Great Flood of 1993 was an extreme meteorological event, but a special White House task force noted that floods of this magnitude "have been seen before and will be seen again. Flood flows similar to those can occur at any time." The task force concluded, "human activities in the floodplains of the Midwest over the last three centuries have placed people and property at risk." It called for less reliance on dams and levees, more voluntary relocation, and better floodplain and watershed management.<sup>4</sup>

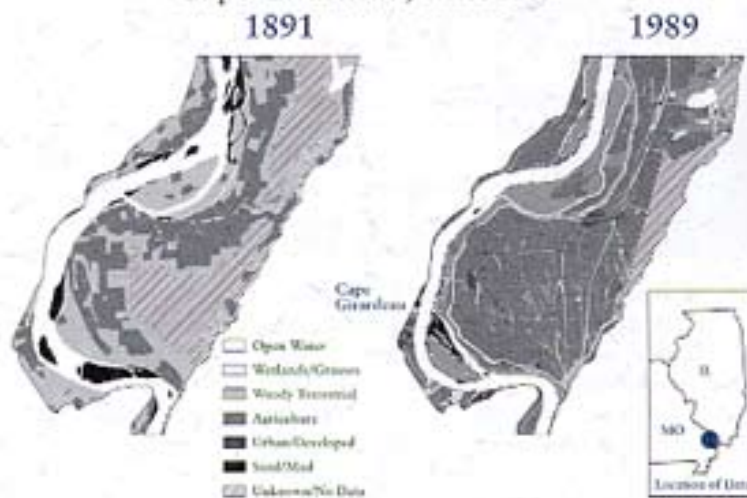
At the Lincoln Institute conference, local officials from the flooded region voiced suspicions that upstream land use decisions had made flooding worse in their own communities. Many thought the loss of wetlands, the increase in impervious surfaces like parking lots, improved drainage from agricultural lands, and the channelization of tributary streams had increased the rate at which water now flows into streams and rivers.

Land Use and Land Cover in the Floodplain and Extent of Flooding in 1993



Source: Based on Interagency Floodplain Management Review Committee, *Sharing the Challenge*, p.7.

### Changes in Land Use and Land Cover Cape Girardeau, Missouri



Source: Based on a map prepared by Geospatial Applications Division of the Environmental Technical Center, National Biological Service, for Scientific Assessment and Strategy Team, *Science for Floodplain Management into the 21st Century*, p. 121.

Changes in land use between 1891 and 1989 at Cape Girardeau show a decrease in forest and agriculture land and an increase in developed areas in the Mississippi River floodplain.

### Making Floodplains Safe for Farming

In the nineteenth century, the Missouri River was narrowed to one-third of its original width to ease navigation. Farmers were legally able to claim and cultivate newly created bottomlands—land that had been open river and backwaters just a few years earlier. Between Sioux City, Iowa, and St. Louis, Missouri, the Corps of Engineers used structures called wing dams—dikes perpendicular to the river's bank—to capture sediment and force the river's energy into a narrower channel. As the average width of the Missouri narrowed from 2,363 feet to 789 feet, farmers began to cultivate 180,000 acres of formerly open water, meandering islands and sandbars.<sup>7</sup>

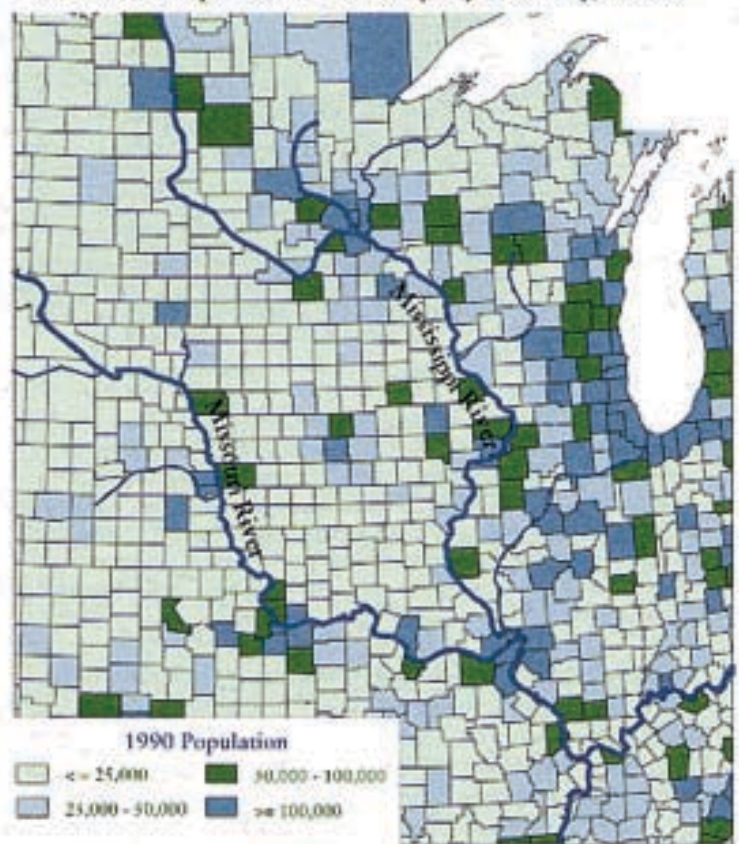
Farmers also created many acres of agricultural land by draining wetlands and water-saturated soils that were not directly next to rivers. Surface depressions or potholes occur throughout the glacial landscapes of north central Iowa, east central Illinois, Minnesota, eastern South Dakota and North Dakota. When these depressions fill, surface waters flow from pothole to pothole through an ill-defined drainage network, eventually finding an outlet to a surface stream. This intricate network of depressions slows the amount and speed of runoff.

A different pattern of runoff occurs in the remainder of the basin. There, surface water flows through an open network of streams, with only minor areas of surface storage. Historically, shallow wetlands, wet prairies and prairie potholes all served the same functions, with varying efficiency.

Between 1780 and 1980, an estimated 53 percent of the nation's original 221 million acres of wetlands were drained. The Swamp Land Acts of 1849, 1850 and 1860 resulted in the transfer of nearly 65 million acres of wetlands in 15 states from federal to state administration for the purpose of expediting their drainage. In the nine Midwestern states affected by the 1993 floods, 57 percent of the region's original wetlands have been converted to other uses. Between the mid-1950s and 1970s, an average of 458,000 wetland acres were lost each year in the contiguous United States. By far the bulk of this land use change—87 percent was draining, filling, and otherwise converting wetlands to cropland. Wetlands loss nationally is now estimated to be 250,000 acres per year.<sup>9</sup>

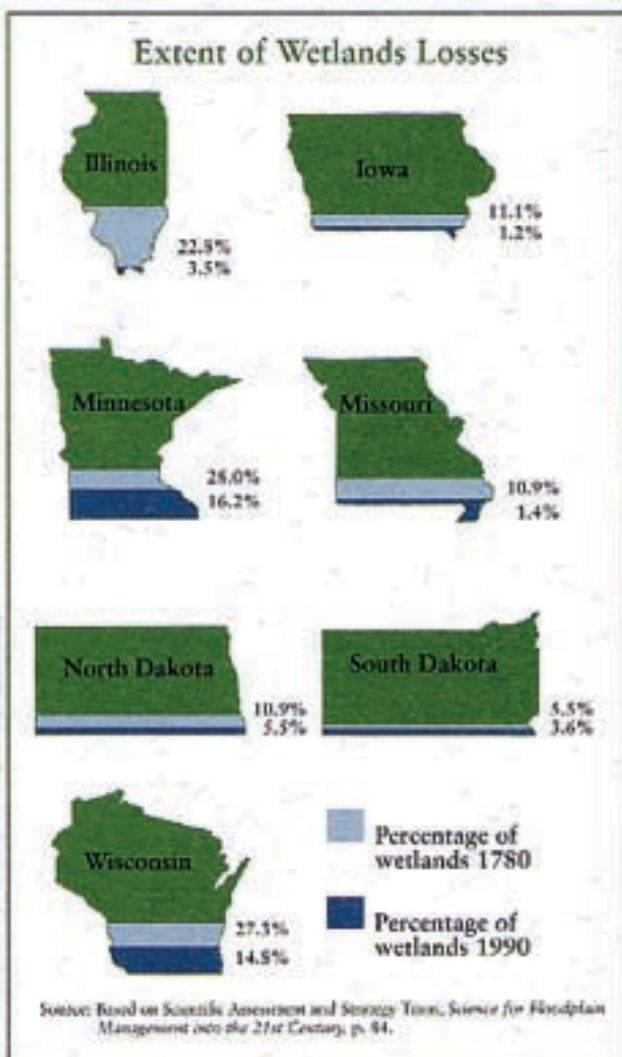
The special White House task force that reviewed the causes of the 1993 floods ultimately concluded that "the modification of the landscape throughout the basin over the last century and a half" to support agriculture had indeed significantly increased the rate of water runoff into river bottoms. Most of the landscape change, the task force found, occurred prior to 1930, but some involved more recent drainage, flood damage reduction and navigation development. The task force estimated that the restoration of upland and bottomland wetlands probably would have made little difference to the magnitude of the Great Flood, but suggested that these natural sponges could significantly reduce losses from smaller, more frequent floods.<sup>9</sup>

### Midwest Population Density by County, 1990



Source: Based on Scientific Assessment and Strategy Team, *Science for Floodplain Management into the 21st Century*, p. 193.

Most highly urbanized Midwest counties are located in or near the floodplains of the Missouri and Mississippi rivers and their tributaries.



### Taming the River: Levees and Floodwalls

For floodplain farmers, protection from the river's vacillations meant the difference between

plenty and poverty. But for cities and towns that were centers of river-borne trade, location at the river's edge was a necessity, not just an option. River transportation and later rail and road transportation linked to the river were these communities' economic lifeblood. As communities began to grow by taking advantage of this expanding transportation network, demand for flood protection increased.

The debate about various methods of flood protection began as early as the 1850s. The federal government supported the construction of levees, typically earthen walls built parallel to the river, shortly before the Civil War. Structural flood control quickly became its own justification as governments began building one flood-control structure to compensate for the side-effects of another. When the earliest levees continued to fail during high flows, flood control reservoirs were built upstream to store flood waters. When those reservoirs overflowed, landowners downstream demanded even higher levees.

*A river [has a] liberating influence . . . River towns are winged towns.*

— Henry David Thoreau, from his journal, 2 July 1858

## Levee Failure



Source: Jared Schneidman Design, in *Newsweek*, 26 July 1993, p. 24.

A river responds to seasonal flooding naturally by eroding its banks and widening to make room for the higher volume of water. Human intervention narrows and straightens rivers, builds levees and protective walls, and eliminates islands; all of these actions accelerate water flow. When fast-moving floodwaters reach channelized areas, the water rises and often overtops levees or breaches them when the water pressure becomes too great. When levees fail, a powerful wave crashes over the adjacent floodplain.

This cycle of failure and expansion has continued in the twentieth century. In the words of William Anderson, a local official from Ste. Genevieve, Missouri, "anything you do to help one person could hurt others." Like most local officials at the conference, Anderson strongly supported intergovernmental watershed planning for the region. But in the meantime, he said, Ste. Genevieve is going to build another—and bigger—levee.

When a team of federal scientists randomly sampled ten private Missouri River agricultural levees that had been damaged by the Great Flood of 1993, they discovered these levees had failed once every five years, on average. One levee had failed ten times between 1945 and 1993. A second levee had failed five times since its construction in 1982. The scientific team found that three-fourths of levee failures occurred where levees had been constructed along or across recently active river channels and backwaters. Another recent study found that the very same volume of water in the Missouri River now crests an average of six feet higher than it did before the river was channelized.<sup>13</sup>

The reasons for levee failure are both natural and human. When a river like the Mississippi or Missouri overflows, the floodplain acts as "flood storage" in addition to whatever capacity is available within the river channel itself. Levees and floodwalls restrict or even eliminate this storage capacity, putting the so-called protected areas at risk of greater-than-normal flood damage for several reasons.

For one thing, levees increase river height because they restrict the width of the river and eliminate temporary storage of water in the floodplain. Given the same volume of water, the Mississippi River at St. Louis, for example, now crests ten feet higher than it did prior to 1927. The Mississippi at Chester, Illinois, now reaches sixteen feet higher than it did before the river was altered for flood

*You wouldn't pitch your tent in the path of traffic on I-44, and you shouldn't build your house in the path of the river. [Flooding] is 100 percent manmade. There wouldn't be flood damage if people didn't build on the floodplain.*

— Downs, *St. Louis Journalism Review*, no. 160

control and navigation. Corps of Engineers studies along the lower Mississippi River also show a rise in the river stage as compared with previous years.<sup>14</sup>

A levee breach or floodwall failure, like a dam break, can release a large wave of flood waters with high velocity. After a breach, the downstream portion of the levee system may also act like a dam, catching water and prolonging flooding of the once-protected area. Levees partially constrain flood flows and force the water through a narrower cross section. This constriction creates higher flood levels for a measurable distance upstream, increases that are identified by the Corps of Engineers during engineering studies and minimized as much as practical. Cumulative effects of induced flooding are not well understood but are generally thought to range from a few inches to two feet for most floods, with maximum effects of about four feet at constricted locations like St. Louis.

Ironically, when a levee "fails" at one or several places, it may actually lower flood stages, both upstream and downstream. In Prairie du Rocher, Illinois, for example, the Corps of Engineers deliberately opened a 400-foot section of the primary levee to reduce pressure on a secondary levee downstream, and ultimately increased the breach to 1,000 feet. Unlike Ste. Genevieve, Prairie du Rocher was not flooded.

There were several other examples of flood heights being lowered when levees failed, thus giving the river more room to spread. A study commissioned by the *St. Louis Post-Dispatch* found that large parts of St. Louis may have been spared heavy losses by levee failures above and below the city's floodwall. In contrast, the floodwall is thought to have increased flood heights upstream and downstream of St. Louis.<sup>15</sup>

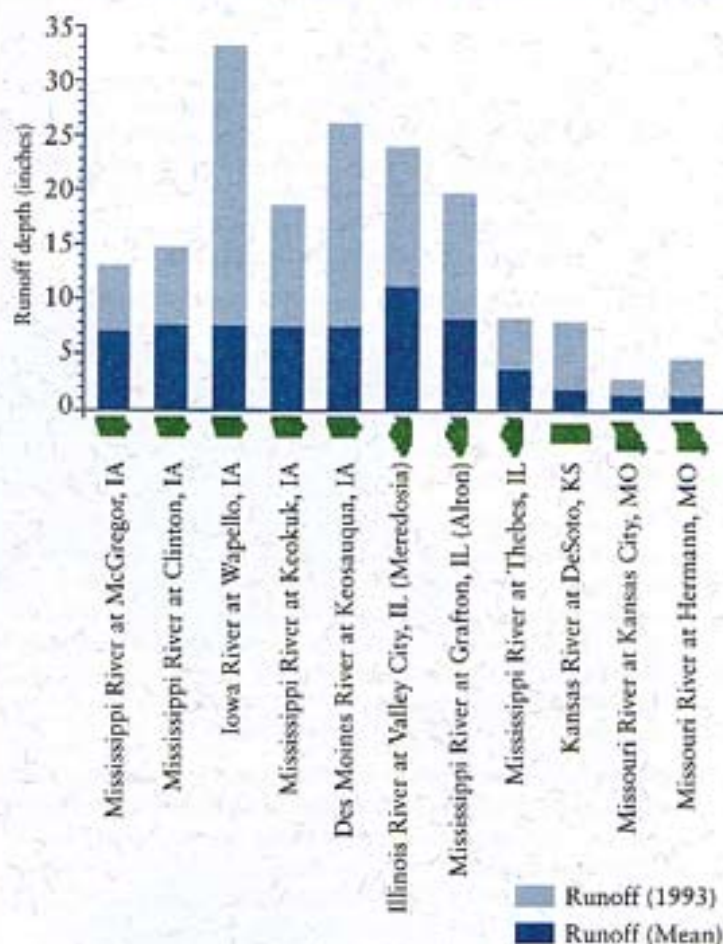
**Paving Paradise:  
The Effects of Urbanization on Water Flow**

Flooding in urban areas is increasing at a greater rate than in less developed portions of the nation. This is not only the result of a rapid increase in surface runoff associated with urbanization. A study by the Land and Water Policy Center at the University of Massachusetts at Amherst found that the inadequate capacity of local stormwater drainage systems was cited as a "critical" or "serious" problem by 16 of 52 (31 percent) metropolitan counties surveyed.<sup>13</sup>

Urban development, particularly the paving of roads and parking lots, increases flood damage in several ways. Forested land releases water slowly because trees create resistance or friction to water on its way to the ground. Once rain reaches the surface of the land, it can follow several pathways before reaching a river or groundwater reservoir. Soil can absorb rainfall at some maximum rate, called "infiltration capacity" by scientists. The rate at which water percolates into the soil diminishes over the course of a storm. Rain that penetrates the soil reaches groundwater, from which it discharges to streams slowly and over a long period of time. When the water-holding capacity of the soil reaches its limit, excess rainfall accumulates on the surface and flows overland. Parking lots and other impervious surfaces prevent water from percolating into the soil and flowing into groundwater reservoirs.

By the late 1970s, 3.5 million to 5.5 million acres of floodplain land had been developed for urban use nationally, including more than 6,000 communities with populations of 2,500 or more. Annual population growth in these floodplain areas was between 1.5 percent and 2.5 percent during the 1970s, roughly twice that of the country as a whole. More than 500,000 acres of Midwestern floodplain had been urbanized by 1993, putting more than 70,000 homes and businesses in harm's way.<sup>14</sup>

**Comparison of 1993 and Mean Annual Water Runoff**

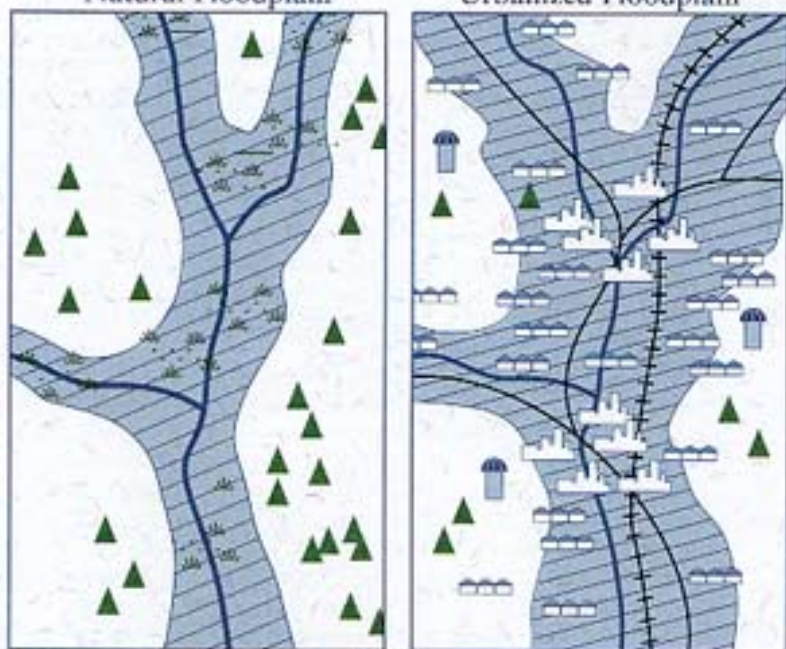


Source: Based on Scientific Assessment and Strategy Team, *Science for Floodplain Management into the 21st Century*, p. 31.

**Effects of Urbanization on Floodplains**

**Natural Floodplain**

**Urbanized Floodplain**



Wetland Forest Farm Sprawl City  
Extent of "100-YEAR FLOOD" Railroad Highway

Source: Lincoln Institute of Land Policy.

When most of a watershed is forested and natural wetlands border the river, the "100-year floodplain" is generally narrow and follows the contour of the landscape. When human activity clears the watershed for agriculture, drains or fills wetlands, and gradually sprawls urban development across the region, the "100-year floodplain" expands in size.

### 3. FLOODPLAIN SEMANTICS: HOW LANGUAGE DEFINES RISK AND SHAPES LAND USE DECISIONS

The human reasons for levee anarchy and increasing flood damages start with the very language of "flood control." Many floodplain residents take their levee protection literally, feeling confident that nature is under control behind the man-made walls. They fail to use prudent precautions and even continue or accelerate development in areas designated as "protected."

The terminology used to define the costs of living near the river's edge—terms like "floodplain" and "100-year flood"—do not accurately reflect the variable risks of living in flood-prone areas, with and without levees and reservoirs. Rather than suggest that flooding is a regular phenomenon, the term "100-year-flood" suggests to many that there will be 99 dry years between floods.

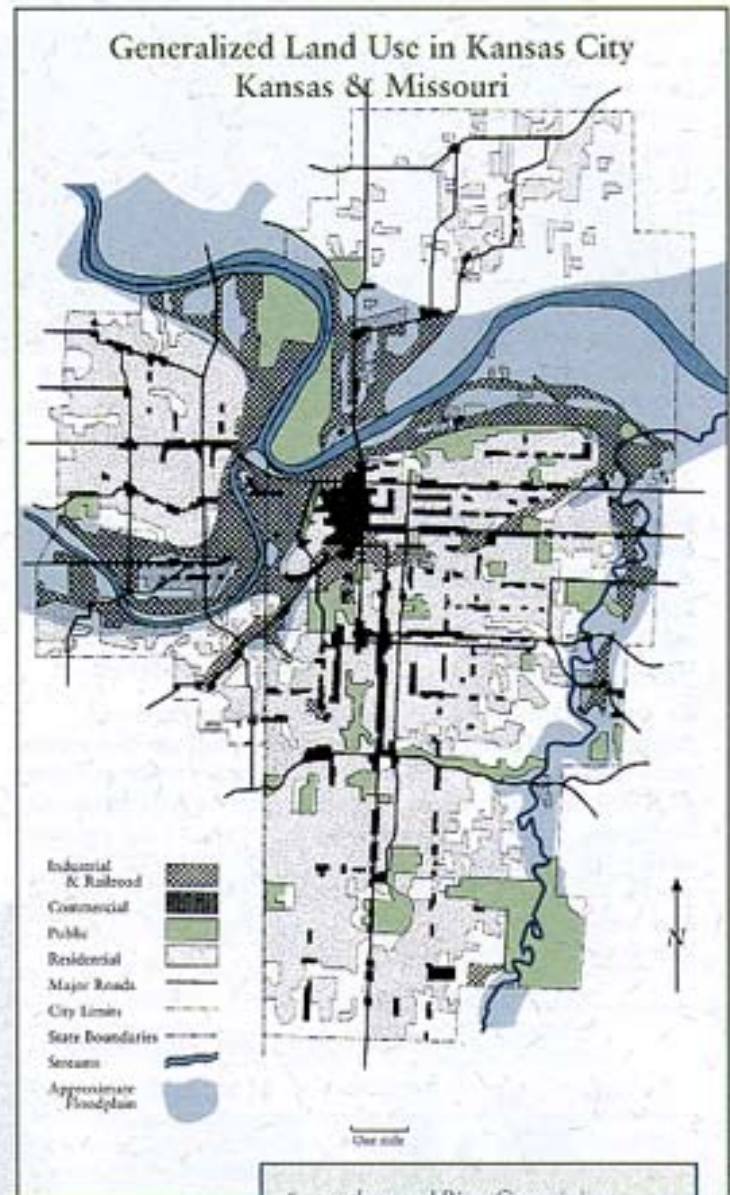
These apparently stable terms also disguise the process of continuous change in floodplains. Over time, as developers and governments clear trees or wetlands and replace them with roads and parking lots, water moves faster and faster over the land and into river bottoms. Today's 100-year floodplain becomes tomorrow's 50-year floodplain, as homes and businesses built near rivers slowly but surely become more vulnerable to flooding.

How risky is floodplain development? The term "100-year floodplain" is meant to identify places that have a one-percent chance of being flooded each year. The term measures risk, not frequency. In other words, living in the 100-year-floodplain means there is roughly a one-in-four chance that a catastrophic flood could inundate your home at least once over the life of a 30-year mortgage. Thinking in terms of a "one percentage chance" flood each year may be a better way of conveying the sense of continual risk.

Moreover, floodplains are not composed of distinct zones. One level of risk gradually shades into the next, increasing as you move closer to the water. In fact, each individual property has a different level of risk. A house in the 20-year floodplain is also in 50-year and 100-year floodplains. Scientists can estimate but do not actually capture all the risks of floodplain development. Experts say that current floodplain maps could simply be off by as much as 45 percent. More than half of the damages associated with flooding are actually outside any officially mapped floodplain.<sup>13</sup>

Another common misconception is that levees are guaranteed to repel floodwaters. Like floodplain maps, levees are classified as providing protection from 100-, 50- or 20-year floods. The National Flood Insurance Program (NFIP) uses the same language to set premiums or impose floodproofing requirements. But the law specifically exempts the owners of homes protected by a 100-year-flood levee from purchasing flood insurance at all. As a result, these homes are often exposed to catastrophic damages when a big flood does occur.<sup>14</sup>

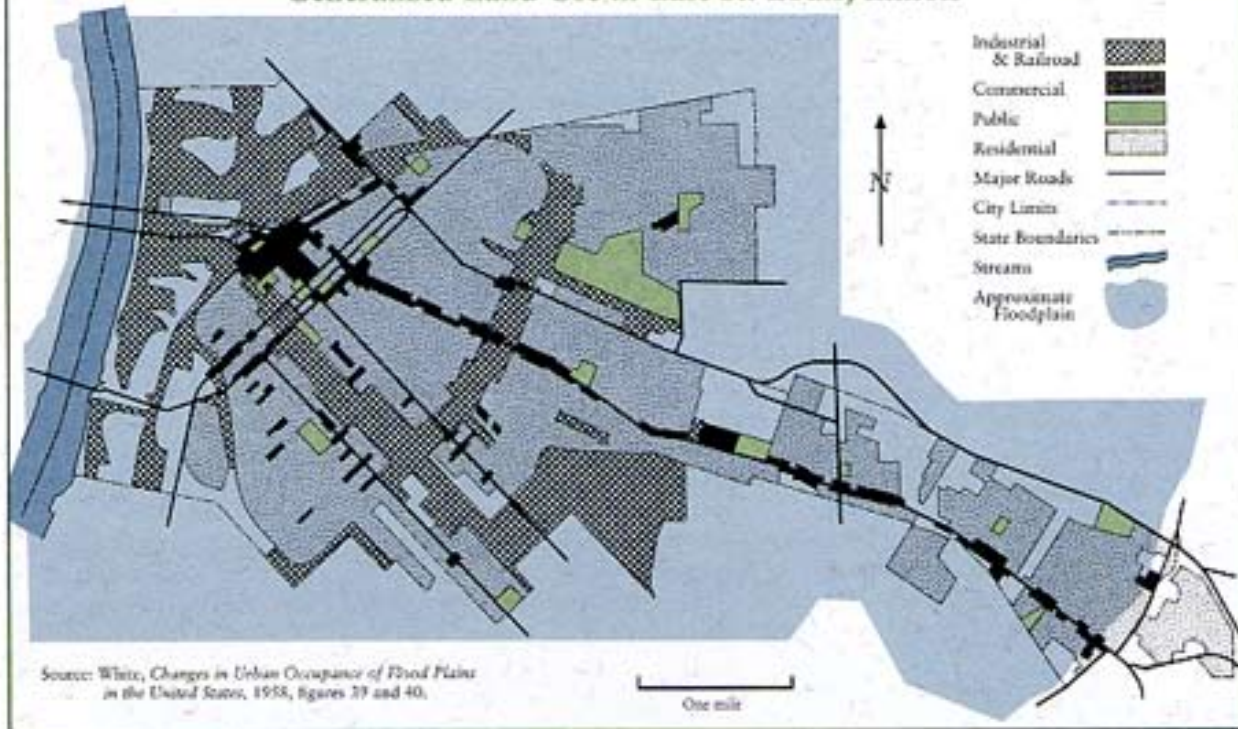
By using this apparently precise language, floodplain maps, levees and flood insurance premiums have all created



*"...ten thousand River Commissions... cannot tame that lawless stream, cannot curb it or confine it, cannot say to it, 'Go here,' or 'Go there,' and make it obey, cannot save a shore which it has sentenced; cannot bar its path with an obstruction which it will not tear down, dance over and laugh at."*

— Mark Twain, writing in 1883, quoted in Weisberger, *American Heritage*

## Generalized Land Use in East St. Louis, Illinois



These 1958 maps indicate floodplain boundaries defined as "the area covered by the maximum flood of record and in some instances extended to higher ground in accordance with estimates of magnitude of flood of probable frequency of not more than 200 years."

a false sense of security. By trying to quantify the risks of flooding, governments have encouraged taxpayers and landowners to see hard lines and guarantees where nature sees only flexible environments and shifting probabilities.

What language would better capture the real risks and benefits of land use in floodplains? Rip Sparks, an expert on large floodplain rivers like the Mississippi River, describes floodplains as time-share condominiums, in which the river owns certain months and people rent the others. Most of the time, he explains, floodplains are dry and accessible to people. However, twice a year, in the spring and fall, water covers some portion of the Mississippi's floodplain. Sparks compares this twice-yearly flood cycle to the ebb and flow of the world's oceans—but instead of twice a day, the tide comes in twice a year.<sup>17</sup>

One Missouri farmer offered perhaps the best explanation of life along the river. He compared it to a bag containing 99 clear marbles and 1 black marble: every time you pull out one of those marbles and it's black, you have a 100-year-flood. After each draw, you put all 100 marbles back into the bag and shake it up. You could pull the black marble out two or even three times in a row.

In this parable, floodplain development actually increases the number of black marbles in the bag. Local jurisdictions or landowners up and down the river system must take turns pulling out and putting back one marble. Anyone who fills a wetland, improves field drainage, builds or raises a levee, paves a parking lot, or channelizes a stream is essentially pulling out a clear marble and returning a black one, gradually increasing everyone's chances of getting a black marble. In the real world, the accumulation of uncoordinated land use decisions across a watershed means that a house considered likely to flood once every 100 years when first bought may be likely to flood every 50 or 30 or 10 years by the time the mortgage is paid off.



*The market is saying you're nuts to live in a floodplain, but the Federal government is saying it's not only OK, but we'll make it affordable.*

— Participant,  
Lincoln Institute Conference

#### 4. "TOUGH LOVE": PROMOTING LOCAL RESPONSIBILITY

Many participants at the Lincoln Institute conference suggested that the federal government should restrict post-disaster support for communities that fail to plan ahead for floods. Some participants extended the principle to local governments and nongovernmental organizations as well, calling for all sources of disaster assistance to practice "tough love." They compared federal, state and even private disaster assistance to an addiction from which floodplain communities and residents would not recover if it was always easier to ask for help after a flood than to get out of harm's way ahead of time.

*I don't think you're doing any favors by leaving them (floodplain residents) there... so being compassionate by making it easier for them to stay when they can't afford to get out isn't really doing them any favors.*

— Participant,  
Lincoln Institute Conference

Elected local officials at the conference recognized, however, that such a policy would be as tough on them as on property owners and taxpayers. They agreed that local, state and federal governments should lead by example—

locating schools, hospitals, armories and roads outside the floodplain whenever possible. But such locations are likely to cost more or create some inconvenience. Elected officials proposing these locations would have a challenge convincing taxpayers that the costs of more distant development would be lower in the long run than the apparently cheaper and more convenient locations in flood-prone areas.

In addition, elected officials would have to turn a relatively deaf ear to constituents who clamored for special relief during a flood, even after ignoring incentives or other information designed to publicize those risks ahead of time. Maintaining such discipline would be far more difficult for local officials, who saw flood victims daily, than for most state or federal officials.

Finally, argued conference participants, "tough love" policies raise important questions of fairness among the residents of floodplain towns and counties. Many small-scale landowners live in floodplains because land and housing costs are lower there. In some communities, there simply is no housing with a comparable combination of quality and price in areas beyond reach of the river. Moving such residents out of floodplains may significantly increase their housing costs, or require providing subsidized housing, or some combination of both.

Nevertheless, conference participants who had benefited from state and federal disaster relief all agreed that taxpayers could not be expected to continue paying indefinitely to rebuild any and all structures in floodplains. At the very least, any group that was expected to help pay for compensation or reconstruction after a flood should be consulted ahead of time, before vulnerable land uses were located in floodplains.

##### RELOCATION FROM THE TOP DOWN: ST. CHARLES COUNTY, MISSOURI

Located at the confluence of the Mississippi, Missouri and Illinois rivers and above a bottleneck on the Mississippi River, St. Charles County experienced more flooding in 1993 than any other community in the Upper Mississippi and Missouri River basins. According to the Federal Insurance Administration's Office of Loss Reduction, St. Charles County had 2,044 repetitive loss structures in 1990—homes that had been damaged by flooding and repaired at federal expense three or more times. Despite its perilous location, the area is the fastest growing county in Missouri. The 1990 census shows a 48 percent increase in population since 1980 (to 212,907) and projects an increase of 18 percent by the year 2000.

While most of the county's residents live outside the mapped floodplain, 28 subdivisions were approved and constructed in flood-prone areas in the 1950s and 1960s. Many residents

have had some experience with flooding, due to the county's precarious geographic position. About 43 percent of the surface land area, or 242 square miles, is considered "flood-prone" with some areas being flooded, on average, once every 2.5 years. In all, 108 miles of county land border the Mississippi and Missouri rivers.

At the height of the Great Flood, nearly 200 square miles of the county were under water from the Mississippi and Missouri rivers, as well as back-flooding on the Peruque, Daredenne and Femme Osage creeks and the Cuivre River. The confluence of the Mississippi and Missouri rivers moved 24 miles upstream, overtopping levees and completely inundating the communities of West Alton and Portage Des Sioux. Total losses in St. Charles County are thought to have surpassed \$65 million.

For example, if the taxpayers of a single local jurisdiction were the only ones expected to provide disaster assistance, then traditionally local land use planning would be fair and adequate for floodplains. If the taxpayers of an entire state or the nation were expected to contribute to disaster relief and compensation, however, then river-related land uses of critical importance to those broader constituencies—such as major railways or roads that must connect with river transport—should be given first priority in floodplains.



Source: Mayor Jack Leonard, Chesterfield, Missouri.

The town of Chesterfield, Missouri, was seriously flooded but remained undaunted in 1993. The Smokehouse Restaurant printed T-shirts with the message "What Flood?"

### Rebuilding or Relocating: New Choices for Flood Victims

Going all the way back to Noah, relocation has always been a part of human response to flooding and other natural disasters. In 1812, Congress set the earliest precedent for national assistance for relocation after a natural disaster, in response to earthquakes in Missouri. The earthquakes permanently altered the course of the Mississippi River, damaging much land in the New Madrid area. Congress authorized the federal government to exchange up to 160 acres of public land with each owner of private land that had been damaged by the disaster.



*Steve Adams, communications consultant, said that moments after he stood up from his labors at midday Sunday and exclaimed, "We've licked it!" he turned to see the river inundate the only home he ever owned.*

—Mydans, *New York Times*

Despite the use of 33,000 tons of sand and 2.2 million sandbags, 4,300 homes were damaged by flooding and nearly 2,000 families were evacuated. In response to the flood, St. Charles County developed a damage assessment procedure that has since become a model used across the nation. Even so, inspectors were forced to travel in pairs and even be accompanied by Sheriff's deputies for protection from irate property owners. Ironically, the Assessment Office was located in a bomb-proof section of the county jail.

More than 2,000 homes were found to be either uninhabitable or condemned, leaving property owners three options: demolish, elevate or prove that the damage was less than 50 percent of market value. These requirements were imposed by the "substantial damage clause" of the National Flood Insurance Program (NFIP), which provides subsidized insurance for communities that meet certain requirements, including the elevation or acquisition of "substantially

damaged" homes and businesses. Proof of the repair cost was determined by submitting bids from contractors or from the owners, who were allowed to charge only \$4.35 per hour for their own work, which greatly reduced their costs. Ultimately, the national office of FEMA eased the burden on homeowners by using replacement value instead of market value to calculate whether a home was substantially damaged.

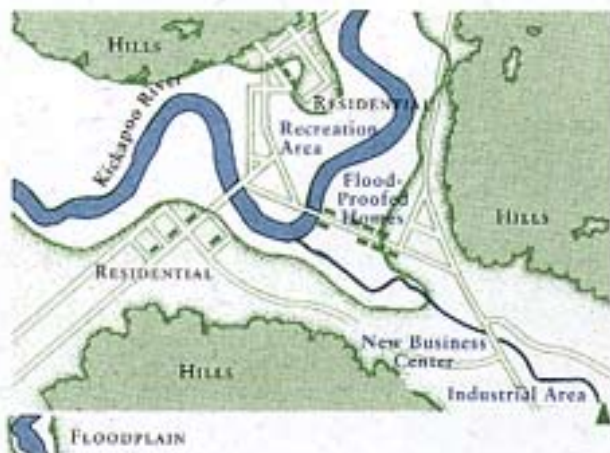
In the meantime, the county applied for and received nearly \$20 million in grants from FEMA's Hazard Mitigation Grant Program and from HUD's Community Development Block Grant Program to purchase and demolish 450 homes and three mobile home parks. By the time the 1995 floods arrived, more than 1,500 homes and businesses had been relocated or acquired and more than 1,000 additional structures were slated to go. In addition, the county has begun to review existing land use policies and has created a citizen's committee to develop goals and objectives for the use of the floodplain.<sup>20</sup>

## Post-flood Relocation

### Soldiers Grove, Wisconsin BEFORE Relocation



### Soldiers Grove, Wisconsin AFTER Relocation



Source: U.S. Department of the Interior, *A Casebook in Managing Rivers for Multiple Uses*, 1991, p. 28.

During the floods of 1993, Midwestern members of Congress, led by Representatives Richard Gephardt (D-MO) and Harold Volkmer (D-MO) sensed the growing demand for relocation assistance and responded by introducing the Hazard Mitigation and Relocation Assistance Act of 1993. The act ultimately set aside 15 percent of all disaster relief for relocation and other forms of mitigation, such as flood-proofing. In addition, Congress set aside \$375 million in relocation block grants for communities. For the first time in the nation's history, most flood victims had a financially affordable choice between rebuilding and relocating to higher ground.<sup>15</sup>

After the 1993 flooding subsided, an unprecedented number of land and property owners chose to relocate rather than rebuild in the floodplain. This choice reflected both a change in local attitudes toward the river and changes in federal policy intended to minimize future losses. In Missouri alone, 2,042 homes and businesses have been relocated or acquired since 1993, and 753 homes are still slated to be moved. More than half of these relocation projects—1,500 projects—were undertaken in St. Charles County, one of the nation's most flood-prone communities.

In neighboring St. Louis County, where the Federal Insurance Administration identified 498 repetitive loss structures, 259 homes and businesses had been relocated or acquired and 70 more were slated to be moved when the floodwaters returned in May 1995. Other large relocation projects were undertaken in Valmeyer, Illinois,

After the 1993 floods, the town of Soldiers Grove relocated its central business district outside the floodplain.

### RELOCATION FROM THE BOTTOM UP: VALMEYER, ILLINOIS

Lying in the Mississippi River floodplain about 35 miles southeast of St. Louis, Valmeyer had remained relatively free from flooding until 1993. The community experienced some flooding in the early 1900s and then again in the 1940s, but it had been successfully protected by an agricultural levee constructed by the Army Corps of Engineers between 1947 and 1950.

When that levee failed in 1993, however, floodwaters covered portions of Valmeyer with sixteen feet of water and left many parts of the village under water for more than two months. Over 90 percent of Valmeyer's homes and businesses were "substantially damaged"—damage greater than 50 percent of the structure's market value—leaving few options for the town's 900 residents if they wanted to continue to receive subsidized flood insurance from the federal government.

Elevation of the structures would have been an option, but it seemed impractical to elevate 325 structures twelve feet into

the air. Relocation was a more attractive alternative, but the community wanted to remain intact and not become scattered through Illinois.

Within six weeks after the first floodwaters reached Valmeyer, village officials led by part-time Mayor Dennis Knobloch organized a group of citizen-led committees to research, plan and implement the relocation of the entire town. Among the key elements of success were giving citizens the primary role in the decision to relocate and keeping federal and state agencies in the "disaster mode" until the relocation was complete. Ultimately, the entire town moved to a location on the bluffs one-and-a-half miles from the original site.

Valmeyer's success was contingent upon the residents' ability to convince federal and state agencies to revise and amend normal policies, and on property owners being able to respond quickly. Once the emergency was perceived to be over, many agency officials slipped back into their normal

Chelsea, Iowa, and Arnold, Missouri. In Hannibal, Missouri, the boyhood home of Mark Twain, 150 homes had already been bought or moved and 50 more were slated to go before the 1995 flood season. Federal officials expected disaster relief costs would be substantially lower than during the 1993 flood due to these relocations. In all, more than 8,400 homes and businesses had been acquired or relocated by the new federal programs.

In a May 1995 article on "The Big Flood Buyout Program That Worked," the *St. Louis Post-Dispatch* reported that "the water got nearly as high . . . and nearly the same amount of land was covered. But most of the people who fled to motels, government trailers and emergency shelters in 1993 were gone this time. Many of them accepted government buyouts and moved out of the floodplain." Officials with the Federal Emergency Management Agency (FEMA) concluded that thousands of homes that would have been flooded again in 1995 were high and dry thanks to the relocation effort.<sup>17</sup>

#### A Fair Allocation of Risk: Rethinking Flood Insurance and Floodplain Regulations

In most communities, the National Flood Insurance Program (NFIP) is currently the only means by which government discourages inappropriate floodplain development. Like private insurance, the program is a mechanism for spreading the cost of losses both over time and over a relatively large number of similarly exposed

*"The losses are minimal," Mrs. Benavidez said. "I haven't lost my family. Hey, this is Mother Nature. You can't tell it to stop."*  
— Mydans, *New York Times*

risks. Until 1969, insurance against flood losses was generally unavailable. Under NFIP, initiated in 1968 and expanded in 1973, the federal government made flood insurance available for existing property in flood-prone areas in exchange for the enactment and enforcement of floodplain management regulations designed to reduce future flood losses.<sup>22</sup>

Few eligible property owners originally purchased the insurance at all. Rather than discourage floodplain development, the program has instead acted as a financial safety net to encourage development in flood-prone areas. In June 1993, the chief actuary of the Federal Insurance Administration compared flood insurance as then implemented to "an 80-year-old man buying life insurance" subsidized by federal taxpayers.<sup>23</sup>

Flood insurance rates have been increased several times since 1974, but the premium base is still too small to allow FEMA to charge actuarial rates. Applying rates that reflect the risks of floodplain development, according to economist Leonard Shabman, will lead to better decision making. Allowing markets to govern floodplain land uses will encourage floodplain landowners to make rational decisions about those uses. Conference participants agreed that until floodplain property owners were required to share in the full costs of floodplain development they would continue inappropriately risky uses of the floodplain.



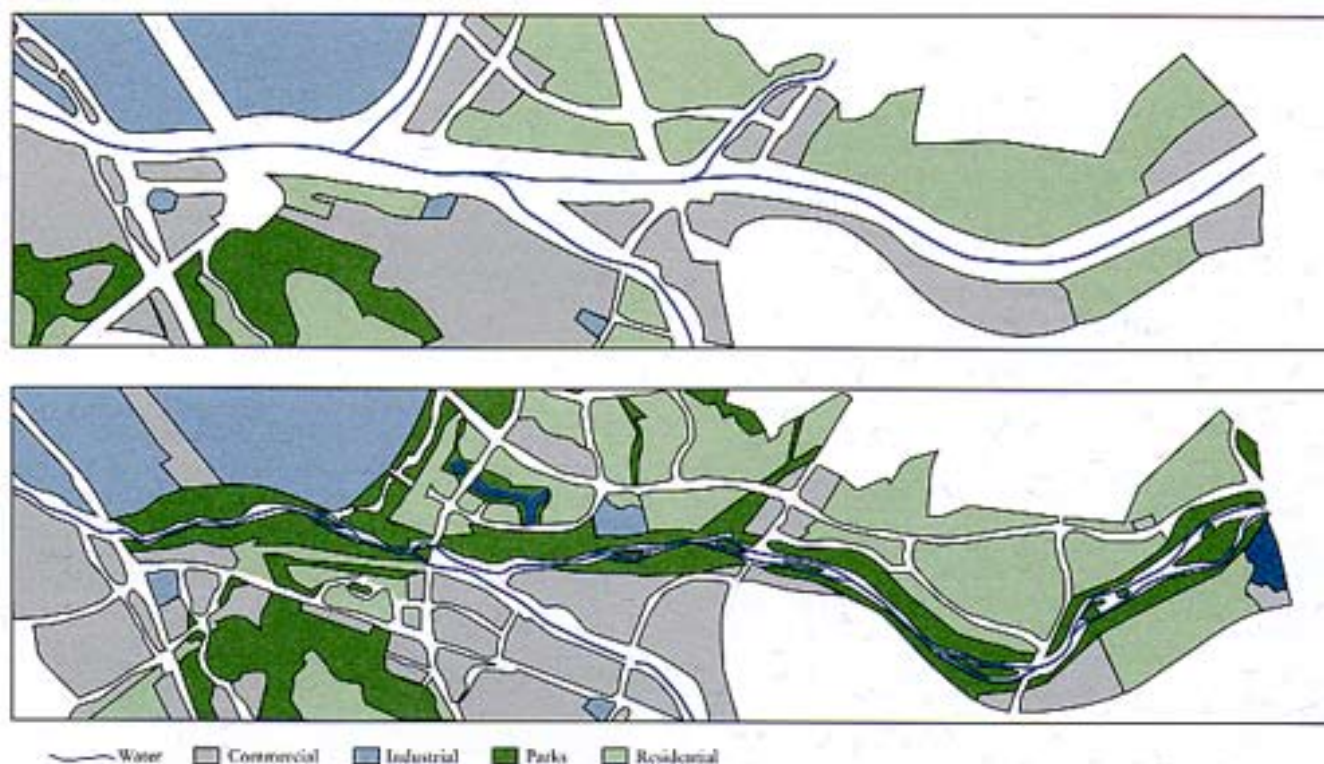
Source: Scott Dine, *St. Louis Post-Dispatch*, in U.S. Department of Commerce, *Natural Disaster Survey Report*, 1994.

rouines. For citizens, too, the perils of flooding quickly became little more than faint memories, making the idea of abandoning one's home an even tougher decision. In fact, some residents moved back into their homes to find some sense of stability even though it meant tremendous cleanup and repair costs, in addition to the threat of future flooding.

The FEMA buyout process in Valmeyer was not quick and efficient. Mayor Knobloch and his team had to keep federal and state officials alert to the strong possibility that residents would become impatient and would simply move to available housing still within the floodplain. Business owners in particular were not able to tolerate long delays. Keeping motivation high at all levels was the key to successful relocation.<sup>24</sup>

The Mississippi River drives a wedge of water through the Fountain Creek levee just north of Valmeyer, Illinois. Residents, National Guard troops and volunteers had fought for 24 days to reinforce the levee.

## Linking Natural River Management with Flood Control



Source: Based on Valencia Company, Valencia Master Plan, in *Urban Land* (June 1993) pp. 62-63.

In Valencia, California, a Natural River Management Plan for the Santa Clara River meets flood control objectives by leaving the natural river channel as the major flood control device. As a result, natural river processes, including sediment transport, groundwater recharge and vegetation, remain virtually unaffected. In addition, stakeholders concerned about the environment, private property rights, development and government all benefit from this management strategy. The bottom map is an updated version of the original master plan (top) and reflects changes made to adapt the natural river management approach to the existing conditions.

The National Flood Insurance Act, passed by Congress in 1973, provided that property owners must purchase flood insurance when they obtain a loan "made by a federal agency or by a federally regulated, supervised, or insured financial institution." In the ensuing years, however, a number of problems arose in implementing this requirement. First, federal agencies did not fully enforce the mandatory purchase requirement. Often, federal agencies providing relief in the wake of natural disasters waived the requirement that uninsured recipients purchase flood insurance as a prerequisite for receiving disaster assistance. Consequently, some recipients of federal disaster assistance remain uninsured, and some have received repeated disaster assistance without ever purchasing flood insurance.

In addition, NFIP includes an increasing proportion of extremely high-risk policy holders who live in areas of highest flood potential. This obviously increases the likelihood that the program will have to pay high claims, and that the total amount of claims will exceed the total collected in premiums over time. Combined with the program's low overall rate of participation among eligible property owners, many of whom are high-risk, insurance premiums have become too high for lower-risk property owners and serve as a disincentive to purchase flood insurance in the first place. In short, NFIP faces a classic "catch-22"—it can only lower premiums by lowering its total risk, but it can only lower its total risk by enrolling more low-risk property owners, who will only enroll if premiums are reduced.

Finally, the insurance program covered the repair of damages, but not measures such as relocation and floodproofing that would reduce the likelihood of future loss. Thus, NFIP provided no incentives for floodplain management and probably even encouraged development in flood-prone areas by lowering owners' risk that floods would ruin them financially. Nationwide, only about 1.7 million of 10 million structures in flood-prone areas are covered by insurance.

Congress passed the National Flood Insurance Reform Act of 1994 to address these problems. The act sought to ensure that those who should have flood insurance would be more likely to obtain and maintain it. Increased compliance and participation would increase income for NFIP and provide a broader base of policyholders, which in turn would allow the program to reduce premiums.

To codify these intentions, Section 201 of the Reform Act "clarifies that lenders and federal agencies may not waive the mandatory purchase requirement for any purposes or provide any amount of financial assistance without enforcing the mandatory purchase requirement."

## Top 20 Repetitive Loss Communities by Number of Losses January 1980-December 1989



Source: Based on Federal Emergency Management Agency, Federal Insurance Administration, 1990.

Section 202 explicitly links the purchase requirement with the loan securing process, so that the primary lender holds responsibility. The section specifies that "Each federal entity for lending regulation shall direct regulated lending institutions not to make, increase, extend or renew any loan secured by improved real estate or a mobile home located or to be located in area with special flood hazards unless the building or mobile home is covered for the term of the loan by flood insurance in an amount at least equal to the outstanding principal balance of the loan."

Section 202 clarifies that this regulation extends to the Federal National Mortgage Association (Fannie Mae), the Federal Home Loan Mortgage Corporation, and the Government National Mortgage Association, as well as other federal entities for lending regulation. In cases of failure to implement the requirements, the law imposes a fine of \$350 per violation up to a maximum of \$100,000 per year for "a pattern and practice of failure to require flood insurance."<sup>23</sup>

Under the NFIP's new Community Rating System, communities that exceed the minimum standards are rewarded with lower premiums. Basic NFIP standards include:

- permitting for all new development
- reviewing subdivision proposals to assure that they will minimize flood damage
- anchoring and floodproofing structures to be built in known flood-prone areas
- safeguarding new water and sewage systems and utility lines from flooding
- enforcing risk zone, base flood elevation and floodway requirements after the flood insurance map for the area becomes effective

To meet these requirements, local governments adopt specific floodplain management or stormwater management ordinances and incorporate floodplain management provisions into building codes and zoning and subdivision regulations.

Participants in the Lincoln Institute conference discussed at length the comparison between community ratings for floodplain management and those for fire protection. Local elected officials pointed out that property owners once doubted it would ever be possible to enforce community-wide building codes and zoning to improve fire ratings. However, the combination of individual incentives and public education has gradually paid off. Not only do individual property owners now pay less for insurance in communities with high ratings, but whole communities take pride in their collective ratings. Local governments see strong or improving fire insurance ratings as important tools in the competition for new economic development. In the future, and for similar individual and collective benefits, communities may compete for the best possible record of floodplain management.<sup>24</sup>

Regulations have a potentially greater impact on flood loss reduction than any other single floodplain management tool and have been widely used in the last 25 years. Stringent building codes for new construction in floodplains have diverted significant development away from flood-prone areas, according to Ray Burby, a professor of urban and public affairs at the University of New Orleans.<sup>25</sup>

In a study of ten cities, Burby found that attitudes toward floodplain occupancy had changed significantly and that communities' adoption of building code requirements under NFIP had clearly affected floodplain development. The data showed, however, that floodplains in many of the communities were continuing to attract residential development. Burby believes that the most important reductions in floodplain development can be achieved only through land use controls.

Local governments already have various tools other than NFIP at their disposal: normal land use regulations and plans, zoning, utility or infrastructure investments, disaster preparedness, floodproofing and elevation, and land treatment measures. As flood losses have continued, in spite and perhaps because of NFIP, many communities have begun to adopt more stringent ordinances that restrict development in extremely flood-prone areas or have refused to extend publicly funded infrastructure into flood zones.

Some participants at the Lincoln Institute conference suggested that tax or development credits should be awarded to developers who preserve the natural functions of floodplains. Effective enforcement of regulations can require more training, personnel and financial resources than many communities can provide. But federal programs, in particular, the Mitigation Assistance Program run by FEMA—which uses federal insurance premiums to pay for relocation projects—and the Floodplain Management Services Program run by the Army Corps of Engineers can supplement local funds and resources.<sup>14</sup>

#### Balancing Private Property Rights and Regulatory Takings

Many local governments worry that tightening land use regulations might expose them to claims of having “taken” private property in the floodplain, and require them to, in effect, purchase the land in order to regulate it.

The Fifth Amendment of the U.S. Constitution states, “nor shall private property be taken for public use, without just compensation.” This provision has never kept local, state or federal governments from regulating land uses in a wide variety of ways, at first with building and fire codes and later through zoning and planning. But several Supreme Court decisions in the late 1980s and early 1990s seemed to suggest that property owners were finding it easier to obtain compensation for regulation, especially for regulation that reduced the market value of their land.

According to constitutional law expert Jerold S. Kayden, however:

“As applied, the constitutional hurdle for the property owner remains high. First, owners are not entitled to the most profitable use of their land. Second, substantial diminutions of value caused by government regulations are uniformly tolerated. Third, virtually all public interests sought to be achieved by typical land use and environmental laws are legitimate in the eyes of the Constitution. Fourth, the mechanisms embodied in such laws are usually found to substantially advance the articulated public interests.”

The case of *Dolan v. City of Tigard* is of special interest to local governments in floodplains. In that case the Court argued that land use restrictions, such as denying a permit to pave a parking lot in a floodplain and setting aside part of the lot as a public bike path, must not only prevent a demonstrable public harm but must be “roughly

proportional” to the harm that the proposed land use would otherwise have caused. The Court did not deny the local government’s right to regulate land use to prevent future flooding, but did require local governments, according to Kayden, to “do their homework” to make sure that regulations did not impose an unfair burden on a particular landowner or land use.<sup>15</sup>

Legal scholar Eric Freyfogle suggests that land use regulations are most easily defended when they “rest upon a settled, supportable finding that the proposed land use in the proposed location is harmful to the larger social or natural community,” and when they apply to “all or nearly all owners of ecologically similar parcels. Equal protection . . . is a particularly essential feature in the law of takings.”

In other words, no one landowner can be asked to set aside enough land from development to make up for the runoff attributable to years of previous development in the same floodplain. Yet, as Freyfogle acknowledges, “the tougher cases” are those in which “the underlying land use will not be bad in isolation,” but only the straw that breaks the camel’s back of cumulative harm from years of that same land use.

Freyfogle recommends that land use regulators avoid backing into such tough situations by “looking ahead and spreading burdens widely.” In other words, “landowners caught in mid-development will have a legitimate complaint” about new regulations, but that complaint “is long familiar to land use law and . . . easily accommodated” by allowing projects to be finished if they are already past a certain point in their financing or actual construction when the regulation comes into effect. With such protections in place, “it is the long-term speculator who faces the greatest risk—here, as in other areas of the law, and as in the market economy generally.”<sup>16</sup>

Ironically, this principle may mean that communities subject to severe flooding actually have an advantage over other communities in regulating environmentally sensitive lands. Local governments in floodplains can simply let the river itself restart the regulatory clock. Without condemning or eliminating existing land uses, the community can offer individual landowners ample warning that they will not be allowed to restore or rebuild certain land uses if those uses are removed by the next flood.

*It is clear that the construction of a levee often is a selfish act. It is an attempt to protect one's property by flooding one's neighbors, the essence of which was captured by the Illinois farmer who, fearing the levee protecting his cropland was near breaking took a boat across the Mississippi to ram the levee on the Missouri side. He hoped to break the Missouri levee to relieve pressure on his own.*

— Downs, *St. Louis Journalism Review*, no. 159

## 5. DEVELOPING REGIONAL STRATEGIES

Participants at the Lincoln Institute conference agreed that communities must work together to develop watershed-wide strategies to reverse the effects of decisions that have eliminated natural flood control functions. The current approach to reducing flood losses—an uncoordinated combination of levees, building codes, floodproofing and federal relief—has failed and may have instead increased loss of life and property.

Local land use regulations, though an important tool in managing floodplains, have a limited impact on existing buildings and infrastructure in flood-prone areas. In addition, regulations enacted one local jurisdiction at a time, such as regulations developed in response to the incentives or standards set by the National Flood Insurance Program, can do little to protect the natural resources of floodplains. By allowing even carefully controlled development in floodplains, such regulations may actually eliminate natural flood storage capacity. Floodplain regulations typically stop at political boundaries, which have little or no relationship to floodwater movement. Communities clearly need planning and regulatory tools with the same reach as the river itself.

Watershed management can occur at a range of geographical scales, from the drainage basins of major river systems to small urban or rural watersheds. Over the past century, national policy commissions have consistently recommended a comprehensive, multipurpose, river basin approach to water planning and management. From the mid-1930s through the 1960s, most large-scale water resources development projects used structural means to meet economic objectives—flood control, navigation and water supply—on a basin-wide basis.

Under President Franklin Delano Roosevelt, comprehensive development of river basins was seen as a means to promote social and economic progress. As public concerns shifted to water quality and environmental protection, the federal government again adopted the river basin approach, creating a series of basin planning commissions after World War II. Although the 1980s saw the decline of federal river basin planning, multiple-objective watershed planning has continued to evolve and influence the management of public and private resources.<sup>39</sup>

From the early 1970s to the 1990s, the requirements of the national Clean Water acts have led communities to manage water quality across entire watersheds. It stands to reason that many of the tools used to improve water quality can also be used to reduce flood losses. After all, both goals require managing the same shared, mobile resource that crosses jurisdictional boundaries. Water-quality techniques such as soil conservation practices, the acquisition of buffer strips or grazing restrictions can also be used to manage the rate at which water moves off the surface of the land. But watershed planning to reduce flood losses is a recent innovation, and its principles are not yet widely accepted.

Some states, for example, have adopted laws that hold landowners liable for actions that flood their neighbors' land. But many states continue to give landowners only one choice when flooded by an upstream neighbor—to pass the floodwater to a downstream neighbor. Many Midwestern states still subscribe to the "common enemy doctrine," which allows individual landowners to take any action to avoid flood waters—from building levees to digging ditches to installing pumps—without liability for how those actions might affect their neighbors.

In successful watershed management case studies, changing the management of agricultural lands is often the key to success. In heavily cultivated areas like the Midwest, farm fields have typically been engineered to drain quickly, to minimize crop damage. Reducing or filtering agricultural runoff is one way to improving water quality. Thus many agricultural land treatment measures reduce the quantity of overland runoff from agricultural lands to streams or other waters by improving infiltration of rainfall into the soil, slowing and minimizing runoff, and reducing the sedimentation that can clog stream channels or storage reservoirs.

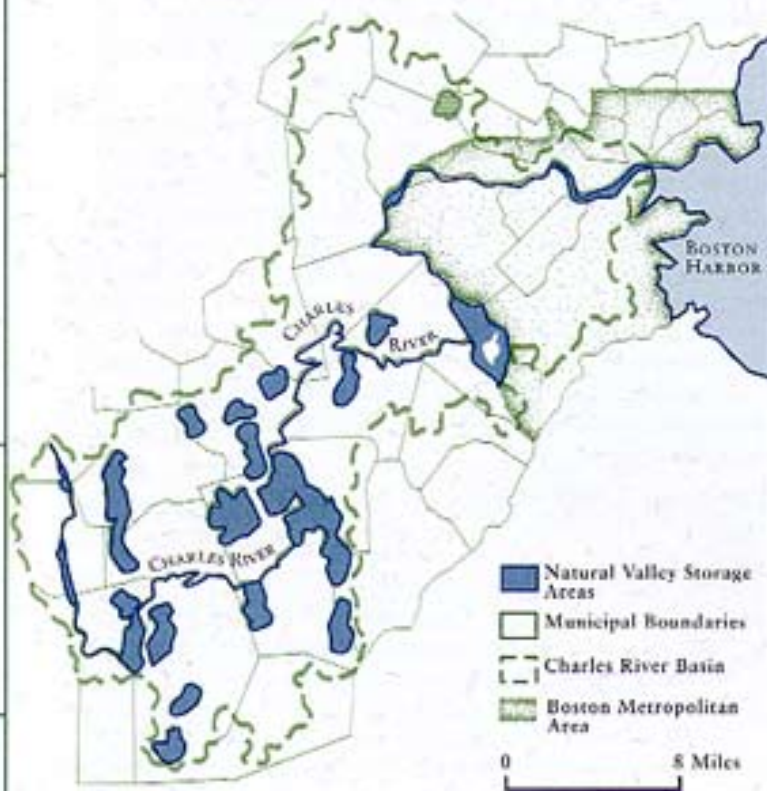
Techniques include maintaining trees, shrubbery and vegetative cover, terracing, stabilizing steep slopes, using grass waterways, and contour plowing and other tillage practices. Some measures involve building structures to retain or redirect runoff. The economics of these practices make them easy to sell; many involve little additional cost to the farmer, and some, such as no till or minimum tillage, actually reduce costs.



Source: John Sloczes, *Kansas City Star*, in U.S. Department of Commerce, *Natural Disaster Survey Report*, 1994.

Suburban Kansas City, Missouri, was inundated in 1993 by floodwaters from streams draining into the Missouri River.

### Charles River Basin and Natural Valley Storage Project



Source: U.S. Department of the Interior, *A Casebook in Managing Rivers for Multiple Uses*, p. 4.



### The Natural Valley Storage Project: Watershed Planning in the Charles River Basin, Massachusetts

Relatively few places have adopted basin-wide strategies to manage floodplain land uses as a way of minimizing flood losses, but the Charles River is one such area.

Most citizens and journalists associate the U.S. Army Corps of Engineers with the levees, dams and channelization projects partially discredited by the floods of 1993. But along the Charles River watershed, the Corps manages 17 wetlands designated by Congress in 1974 as the Natural Valley Storage Project. The storage areas are protected from development either by outright federal ownership or by federal "flowage easements" that prohibit any land use that would interfere with natural water storage.

The Charles River, winding 80 miles from central Massachusetts to Boston Harbor, is the most densely populated river basin in New England. The headwaters area is gradually suburbanizing, while the lower portion is surrounded by highly urbanized Boston and Cambridge. When Hurricane Diane struck in 1955, the existing dam at the mouth of the river could not handle the raging floodwaters. The hurricane caused over \$5 million in damage in the lower, urbanized part of the watershed; damages in the more rural middle and upper portions were minimal.

In the aftermath of Hurricane Diane, the U.S. Congress authorized the Corps of Engineers to study flood protection strategies for the Charles River. In its initial report in 1968, the Corps recommended construction of a new dam and pumping station near the mouth of the Charles that could release flood flows into Boston Harbor. The dam was completed in 1977. The Corps also posited that additional structural controls would be needed in the upper basin within the next several decades, costing an estimated \$100 million.

In its 1972 final report, the Corps took a new direction by recommending wetland preservation as a strategy to prevent flood damage. The study revealed that upstream wetlands played a critical role in reducing downstream flooding, and that maintaining such wetlands could eliminate the need for costly flood control structures. The Corps explained that, "nature has already provided the least-cost solution to future flooding in the form of extensive wetlands which moderate extreme highs and lows in stream flow. . . it is both prudent and economical to leave the hydrologic regime undisturbed." By allowing wetlands to serve as natural reservoirs, temporarily storing floodwater and gradually releasing it downstream, the dependence on structural controls such as dams and levees could be avoided.

The Natural Valley Storage Project evolved from this final report. Criteria established to identify the wetland areas to be protected eventually targeted 17 individual sites, ranging in size from 118 to 2,340 acres. Of these, three lie on the main stem of the Charles, while the others are situated on tributaries, where they delay the flow of floodwaters into the main stem.

The planning process involved residents through a Citizens' Advisory Committee that sought public input at each phase of project development and contributed to a cooperative atmosphere without major opposition. Authorizing legislation for the project was embodied in the federal Water Resources Development Act of 1974, requiring that "all future federal flood protection projects consider non-structural alternatives."

Originally, the wetland areas were held by more than five hundred owners. The Corps proceeded to purchase the parcels at fair market value, based on real estate appraisals. Owners who did not wish to sell their land could alternatively grant easements to the Corps, agreeing not to alter the land in any way that would affect its flood storage potential.

In addition, the Massachusetts legislature authorized reimbursements to local communities for the loss of tax revenues from lands transferred to federal ownership for flood protection. In the end, the Corps purchased 3,250 acres outright, or 57 percent of the total area, and acquired easements on 4,680 acres. The process of acquisition and easement designation was completed in 1984, at a total cost of \$10 million, only 10 percent of the estimated cost of constructing the alternative dam.

The project was tested by near-record flooding in 1979 and 1982, and the wetlands performed effectively each time. The Corps of Engineers estimates that the wetlands provide storage for approximately 50,000 acre-feet of water, the volume of a typical New England reservoir. Not only do the wetlands carry out the primary objective of flood hazard reduction; they continue to provide wildlife habitat and outdoor recreation opportunities, and they capture sediment and pollutants to improve water quality.<sup>11</sup>

#### From Water Quality to Water Quantity: Watershed Planning in Bucks County, Pennsylvania

Following passage of the 1978 Pennsylvania Stormwater Management Act, requiring that counties prepare stormwater management plans for all watersheds, the Bucks County Planning Commission developed and adopted a plan for an area that included 34 municipalities on 237 square miles of mixed urban and rural land.

The landmark legislation required that counties prepare the plans, including special stormwater management standards and criteria, and that local municipalities implement these new standards by adopting the necessary ordinances and regulations. The watershed included 27 different municipalities within Bucks County, as well as seven municipalities in neighboring Montgomery County.



Cooperative watershed planning and stormwater management on the Pennsylvania side of the Delaware River involved the participation of 27 municipalities in Bucks County and seven in Montgomery County.

Adoption of a stormwater management plan was further complicated by the fact that land use planning and control in Pennsylvania is exclusively a local affair; each municipality had a different set of zoning ordinances, subdivision regulations and other land use criteria.

The project had several objectives—reduce downstream flooding, increase the recharging of groundwater, and reduce pollution—although the state's primary focus in creating the program was on flooding. In the case of the Neshaminy River, an extensive network of multi-purpose flood control projects was constructed during the 1960s and had already prevented significant flooding. Nevertheless, water quality in the reservoir system was a concern. Increased runoff and decreased amounts of precipitation being infiltrated into the groundwater were growing concerns as well.

As new development increased in the watershed, point- and nonpoint-source pollution had increased, degrading streams and seriously reducing water quality in the artificial lakes and reservoirs that provided substantial recreation. The watershed was heavily developed, and the rural areas that remained were increasingly being converted to urban uses.

Because both water quantity and water quality were considered important, stormwater managers used a variety of techniques—including the development of an elaborate hydrologic model—to measure and manage water. They used infiltration technologies designed to increase groundwater recharge and a minimum disturbance/minimum maintenance approach to new land development. A geographic information system (GIS) model helped evaluate different management practices both for their ability to handle peak runoff and to reduce nonpoint-source pollution. Although political willingness has proved to be the most important resource for incorporating and enforcing these regulations in each municipality, the model has provided a useful method for planning land uses across an entire watershed.<sup>22</sup>



### Regional Planning:

#### The Case of the Upper Mississippi River

Until the early 1980s, the federal government supported a number of regional commissions committed to basin-wide planning for America's rivers. Among these were commissions for New England, the Ohio River, the Great Lakes, the Missouri River, the Pacific-Northwest rivers and the Upper Mississippi River. Even though funding for these organizations has been terminated, the significance of the commissions' work has not lessened. If anything it has become more important as the nation continues to grapple with flood disasters, levee and structural control failures, and other options for floodplain management. In the Upper Mississippi River Basin, for example, state and local efforts are maintaining a regional planning approach, despite the loss of federal support.

The Upper Mississippi River Basin Association (UMRBA) was formed in December 1981 as a successor to the Upper Mississippi River Basin Commission, which was terminated by a Presidential Executive Order. The governors of Iowa, Illinois, Minnesota, Missouri and Wisconsin signed a joint resolution calling for "the continuation of an interstate organization to maintain communication and cooperation among the states on matters related to water planning and management."

As of 1996, UMRBA continues to coordinate state floodplain management responsibilities, advocate federal actions consistent with state policies, and offer opportunities for federal and state agencies to develop better integrated policies and programs for floodplains in its region. More specifically, UMRBA aims to:

- serve as a regional interstate forum for discussion, study and evaluation of river-related issues of common concerns to the member states
- facilitate and foster cooperative planning and coordinated management of the region's water and related land resources
- create opportunities and means for the states and federal agencies responsible for management of water resources in basin to exchange information, and
- develop regional positions on river resource issues and serve as an advocate of the basin states' collective interests before Congress and the federal agencies.<sup>23</sup>

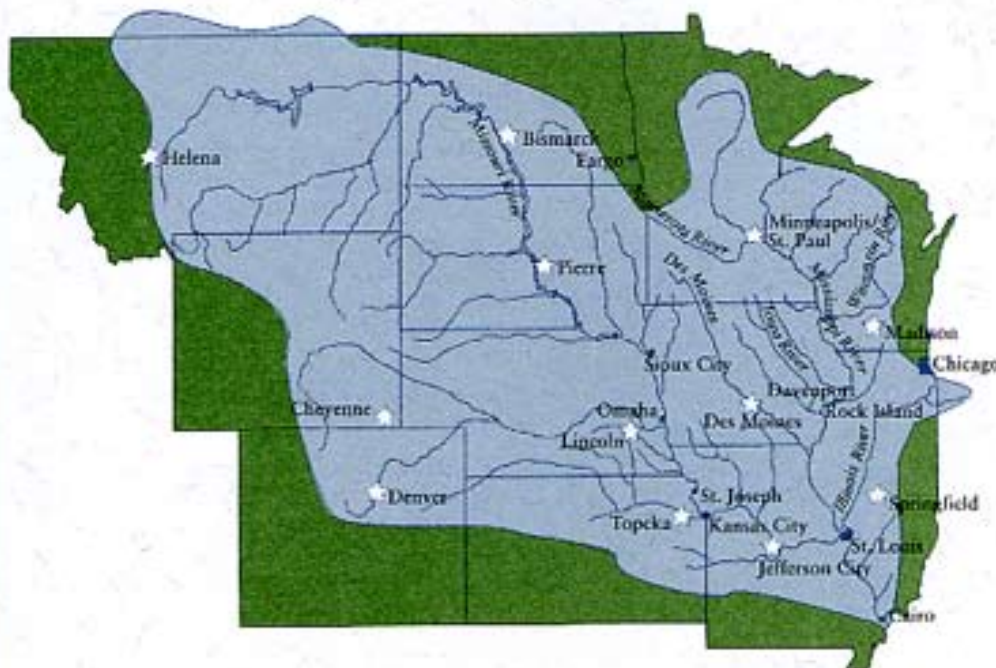
The association undertakes a wide variety of river-related activities, including information services, advocacy for the member states, reviews of federal agency studies through the State Floodplain Management Work Group, and organization of workshops and other special projects. The association developed a position statement in response to the 1993 Midwest floods, offered additional recommendations on the National Flood Insurance Program, and has implemented the Wetlands Reserve Program (WRP) throughout the basin.

UMRBA's position statement, released almost immediately after the 1993 flooding, called for communities to explore flood damage reduction in both the short and long terms, possibly through state or federal assistance for local planning and floodplain management. In addition, the statement encourages public purchase and demolition of flood-prone structures and the conversion of flood-prone land to flood-compatible uses to meet the long-term regulatory goal of eliminating all habitable structures in the 100-year floodplain.<sup>14</sup>

UMRBA also supports enforcement of restrictions on floodway encroachments and recommends integrating enhanced flood protection with improved ecosystem management. Finally, the position paper calls for the preparation of new flood routing models by federal and state agencies to simulate more accurately current levee overtopping conditions and to guide levee modifications.

In the spring of 1994, UMRBA provided a set of recommendations to the Interagency Floodplain Management Review Committee. The key principles included establishment of a mitigation insurance program to provide incentives for actual flood reduction measures, revision of the insurance premium structure, stricter enforcement of lender compliance, and limitations on multiple-disaster payments. Finally, the association called for enrolling more floodplain wetlands in the Wetlands Reserve Program, which pays farmers for permanent easements that allow their land to be used for reserve flood storage and forbid the construction of improvements that would interfere with that function.<sup>15</sup>

### Upper Mississippi River Basin



Source: Interagency Floodplain Management Review Committee, *Sharing the Challenge*, p. 5.

## 6. A CHANGING ROLE FOR STRUCTURAL FLOOD CONTROL

The effects of flood control structures are questioned every time a large flood occurs, and the 1993 floods were no exception. Contrary to the impression given by the media, most structural alternatives—levees, dams and floodwalls—operated as designed. All of the areas covered by structures designed to protect areas from flooding at levels like those in 1993 were protected. In fact, many levees designed for less severe flooding performed beyond expectations with the help of additional emergency flood-fighting measures. If not for existing federal flood control structures, the 1993 floods would have caused an additional \$19 billion in damage, more than twice as much as total damage from the flooding.<sup>24</sup>

Another way of measuring the success of these structures is to compare their costs to the benefits received. The total expenditure on flood-control structures throughout the history of the United States is estimated by the Corps of Engineers to be between \$25 and \$30 billion. In the past ten years alone, the Corps estimates that flood damages have been reduced by around \$170 billion. In addition, the case is often made that the entire flood-reduction system pays for itself once every 18 months, based on the last decade of flooding.

*A better approach, according to the emerging new wisdom, is to get the river to work for you rather than against you.*

—Stevens, *New York Times*, 1993

However, the Great Flood of 1993 also raised new questions about the performance and general fairness of structural flood control programs. The costs of flood control, like the costs of disaster relief, are not always distributed to exactly and only those people who receive the benefits of the programs. Levee or floodwall overtopping or failure is involved in approximately one-third of all flood disasters.

Many private or locally built structures provide a low level of protection suitable only for agricultural purposes, yet these structures clearly encourage expanded use of floodplain land. The owners of this land who suffer flood losses often receive compensation from state or federal sources, as well as from the private or local sources that built the levee or floodwall in the first place. In the same way, the taxpayers of whole states or the nation pay to build or maintain some flood control structures, without clear evidence that the entire state or nation benefits from these structures in proportion to their costs.

For reasons ranging from local communities' loss of faith in engineering, to scientists' improving knowledge of river ecosystems, to shrinking federal budgets, structures can no longer be the primary solution for floodplain management. As the Corps of Engineers' budget shrinks to meet deficit reduction targets and the cost of running and rehabilitating aging projects increases, few resources will be available for large water projects.

The Clinton Administration has proposed increasing cost-sharing requirements for future flood control projects and has sought to focus scarce resources on "national" projects—that is, projects that reduce flooding on inter-jurisdictional rivers. What is more, the Corps found in the Floodplain Management Assessment completed in 1995

that raising the height of existing levees on the Mississippi and Missouri rivers would actually increase flood losses in St. Louis and other urban areas and would cost more than \$6 billion.<sup>25</sup>

### Flood Warning, Floodproofing and Education

Limiting development in flood-prone areas and relocation may be the best ways to reduce public costs of flood control, both in economic and environmental terms, but they are not the only ways. Governments may also provide early warning systems or incentives and technical assistance for floodproofing homes and businesses.

Clearly many local officials and property owners still do not understand either the risks associated with floodplain development or that flood-control structures and disaster assistance are, in the words of one conference participant, "the public subsidy of private folly." Projects linked to flood warning and floodproofing can be good opening wedges for longer-term education about the variability of flood risks, the inevitability of floods, and the natural functions of floodplains and wetlands.

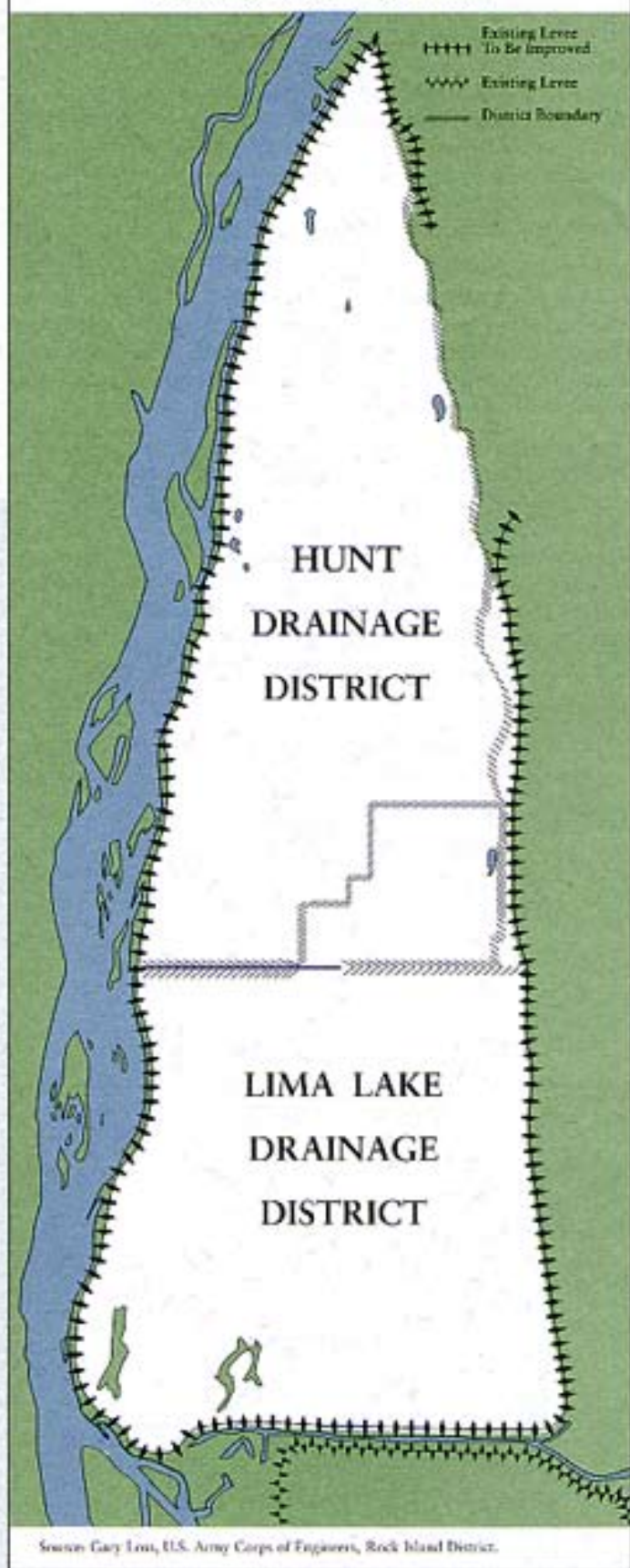
There are several federal programs for disaster preparedness, and every state has an integrated emergency management plan and an agency responsible for flood preparation. Warning systems and emergency response plans have seldom been used to raise the level of general public awareness about the natural functions and extent of floodplains, but these programs have long been used to save lives and reduce flood damages in flood-prone areas.

The National Weather Service conducts research and provides specific flood forecast and warning services to over 3,100 communities. However, only 900 communities have local flood warning systems, and only about half of the states are involved in flood warning. The more extensive such systems become, the more often people will be warned of floods, and the more they will recognize whether floods are increasing in intensity or frequency.

Some communities have sponsored floodproofing programs for new or existing buildings which encourage water-tight seals or barriers, building with water-resistant materials, relocating vulnerable contents, or raising buildings (on fill or pilings) above the most frequently expected flood levels. Flooding in 1982, 1985, 1986 and 1987 led state officials in Illinois to promote floodproofing aggressively. Those property owners who elevated their buildings are now reminded, each time they look at those buildings, that they live or work in a floodplain.

Floodproofing and elevating are not a substitute for tough decisions about land uses and watershed-wide planning. These nonstructural approaches should be incorporated into a broad program of public education about the continuing and often increasing risks of building on the floodplain. In the past, levees and dams have often encouraged people to believe they can re-engineer river systems to provide benefits without risks. In contrast, flood warning and floodproofing programs, like snow removal budgets in northern localities or evacuation drills on hurricane-prone barrier islands, can remind residents that floods are an inevitable aspect of life along the river.

## Hunt and Lima Lake Drainage Districts, Illinois



Source: Gary Lutz, U.S. Army Corps of Engineers, Rock Island District.

### Protecting Agriculture:

#### The Illinois Hunt and Lima Lake Levee Drainage District

Many farmers are able to remain in the floodplains of the Mississippi and Missouri rivers because the Army Corps of Engineers pays 80 percent of the cost of repairing many private, agricultural levees. The Hunt and Lima Lake Levee Drainage District consists of 28,553 acres of contiguous cropland on the floodplain of the Mississippi River just north of Quincy, Illinois. The 15,294-acre Hunt Drainage and Levee District was formed in 1879; the 13,259-acre Lima Lake Drainage and Levee District was organized the following year. Across the river, the Gregory and Mississippi Fox Drainage Districts fall within Missouri's jurisdiction. Although all these districts remain politically distinct, the Army Corps of Engineers treats them as a single unit.<sup>28</sup>

Dominated by corn and soybeans, the Illinois districts are protected by 33 miles of earthen levees. Two small towns fall within the district—a relatively undeveloped portion of Warsaw and the town of Meyer. The vast majority of the bottoms is occupied by crops, interior levees, farm roads, utility lines, drainage canals and farm buildings.

The Corps first strengthened the levees of the Hunt district in 1922 and upgraded Lima's levees between 1922 and 1930. The districts were first treated by the Corps as a single project after the passage of the Flood Control Act of 1954, which allocated \$5.4 million to provide levee protection against 50-year floods, after flooding in 1944 and 1947. These levees have been repaired by the Corps seven times—1944, 1948, 1950, 1952, 1953, 1960, 1968 and 1993—at a total federal cost of \$13.9 million, when adjusted for inflation. The benefit-cost ratio for the 1993 repair, which must by regulation be greater than 1 to 1, was just 1.1 to 1, according to the Corps. Nationally, taxpayer willingness to cover the cost of such repairs to protect local landowners is dwindling.

### Protecting Urban Land:

#### Tulsa, Oklahoma

Tulsa, Oklahoma, has a long history of serious flooding. It is subject to high intensity rainstorms that can strike with little warning and dump as much as fifteen inches of rain in eight hours. Much of the city was built within the floodplain of the Arkansas River or one of its tributaries, with over 25,000 homes and businesses in flood-prone areas. Between 1970 and the mid-1980s, Tulsa County led the nation in the total number of federal flood disasters and was declared a federal disaster area ten times.

Mingo Creek drains an area of 61 square miles in the eastern third of the city and accounts for about two-thirds of the flood damage in Tulsa. In the wake of the Mother's Day Flood of 1970, the city joined the National Flood Insurance Program and developed floodplain regulations which, according to local interests, were not well enforced. A subsequent flood caused \$18 million in damage and led to the relocation of 33 homes. It also resulted in a channelization project that simultaneously increased downstream flooding and destroyed wetlands and bottomland hardwoods.

The Memorial Day Flood of 1976 had the greatest impact in the Mingo area, causing three deaths and \$34 million in damages citywide. Unlike the Mother's Day Flood of 1970, this disaster revolutionized local thinking about floodplain management strategies and led to a renewed emphasis on regulating new development. More money was spent to remove 30 additional homes in the Mingo Creek watershed, and the city initiated plans for a series of detention basins.

In 1980, the Corps completed an interim feasibility study to control flooding along Mingo Creek, leading to congressional authorization of a \$162 million Flood Protection Project in 1986, targeted to be completed in 1996. The concept plan called for channelizing nine miles and constructing 23 stormwater detention sites in developed and urbanized areas of the city.

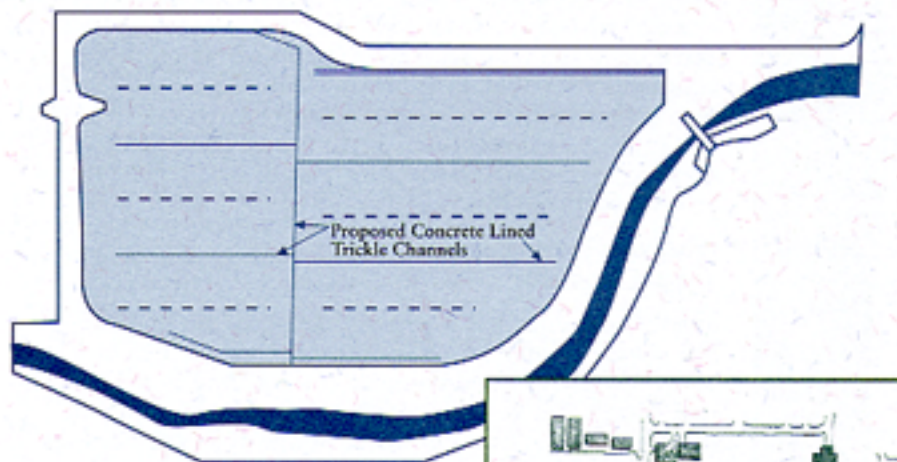
A series of dry years followed, and the program lost momentum and support. But in 1984, Tulsa had the worst flood in its recorded history, with 13 deaths and \$180 million in damage. Five of the deaths and over \$125 million in property damage occurred along Mingo Creek. Once again, the disaster renewed local interest in reducing flood losses and stimulated greater support for reexamining past approaches to floodplain management. The City of Tulsa and the Corps of Engineers signed a cooperative agreement in 1987 to implement the local

flood control project. In February 1989 the Corps submitted designs for five detention sites along Mingo Creek. Because the detention basins were located close to established neighborhoods in Tulsa, it was quickly recognized that development of these facilities, unless they were carefully designed, could have significant impacts on the community. The Corps' original design also proposed that the sole purpose of these basins would be to retain floodwaters once every five to twenty years. Construction of the basins would destroy two community parks, as well as the remaining wetlands and bottomland hardwoods in the Mingo Creek watershed.

In response, the city organized a team of civil engineers, landscape architects and urban planners to develop design alternatives. The team's charge was to develop a design that would provide stormwater detention benefits while at the same time meeting community concerns regarding ecological, aesthetic and recreational impacts.

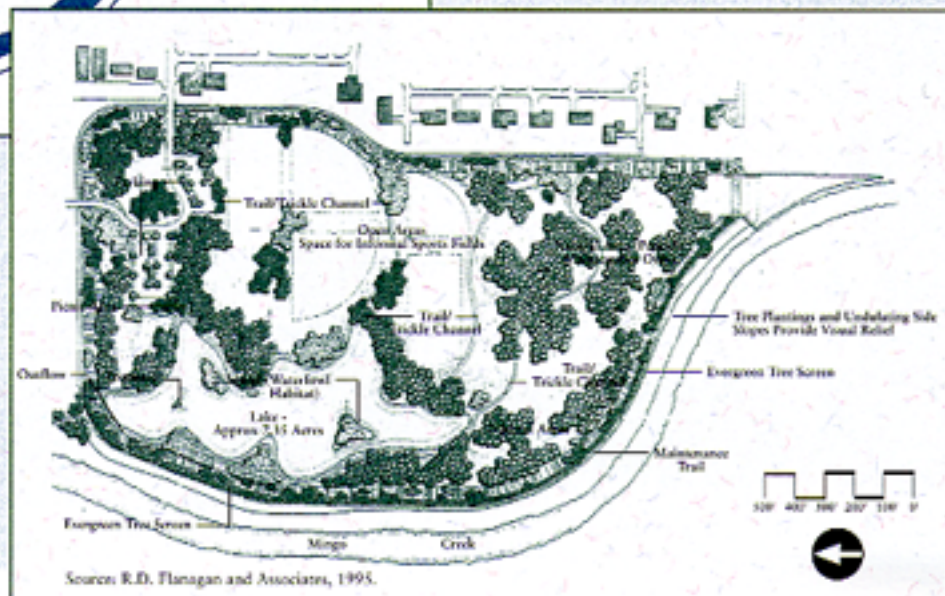
Ironically, 60 years earlier, in 1924, the City of Tulsa had proposed a similar plan to acquire and set aside land for a trail network and parks. This early plan called for redesigning the detention sites as multi-purpose flood control and recreational facilities, and for linking the sites through a system of trails. In addition to building on the 1924 plan, the approach developed by the design team was also an outgrowth of the city's successful waterfront revitalization efforts along the Arkansas River. This alternative, which included a series of permanent lakes combined with some relocation, would have cost the same as the Corps' 1989 design, while meeting a broader range of objectives.<sup>27</sup>

## Mingo Creek Stormwater Detention Plans, Tulsa, Oklahoma



Source: Based on U. S. Army Corps of Engineers, 1989.

The U.S. Army Corps of Engineers detention plan (above) contrasts sharply with the plan developed by Tulsa's design team (right), which focuses on multipurpose flood control activities and incorporates landscaped open spaces for recreational uses.



Source: R.D. Flanagan and Associates, 1995.

## 7. INVERTING THE PYRAMID: NEW EXPECTATIONS FOR INTERGOVERNMENTAL RELATIONS

Many participants in the Lincoln Institute conference called for "inverting the pyramid" of floodplain management. In other words, they suggested that local governments should make policy decisions by drawing on their intimate knowledge of local politics and geography. Federal and state governments should provide primarily consistent standards and technical assistance in reaching them. Local officials also thought this approach would encourage more local responsibility—more "tough love"—by linking disaster relief to strong predisaster planning. Communities that allow floodplain development should be prepared to pay the costs, as long as federal and state officials have made those costs clear from the start.

At the same time, Congress should equip state and local government with the planning and technical assistance they need to be effective watershed and floodplain managers. Some conference participants felt local communities

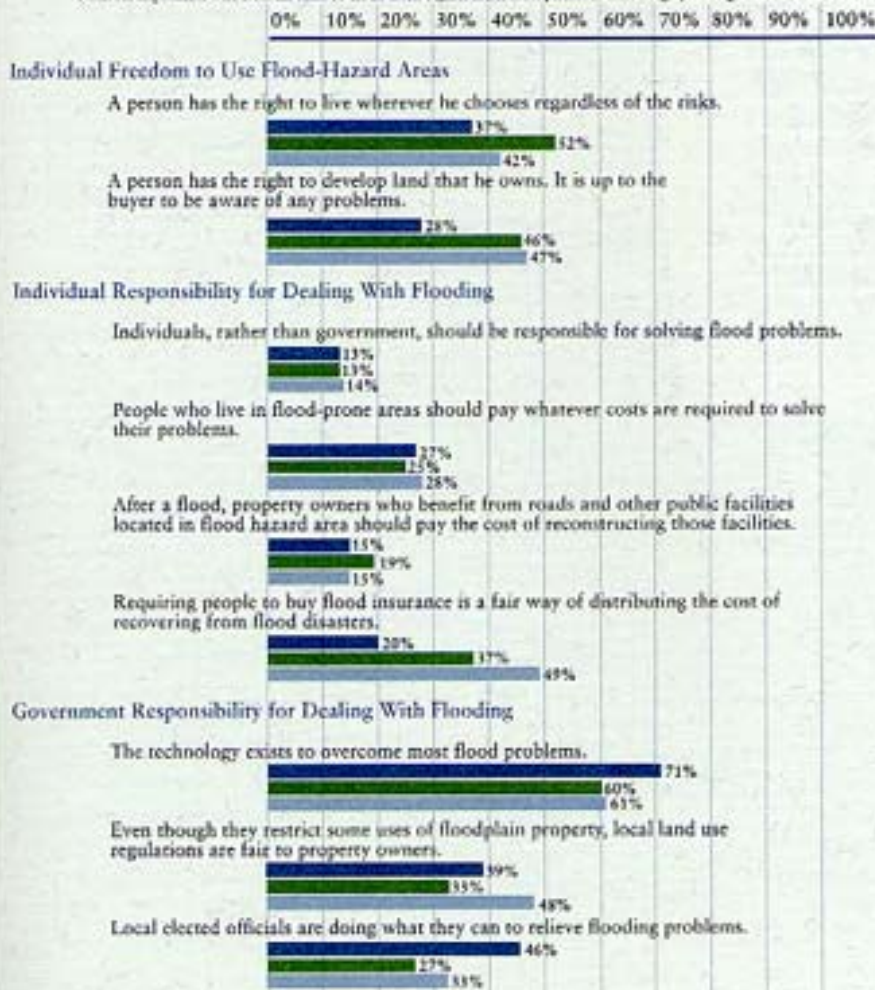
would be willing to get fewer levees, dams and disaster relief dollars from the federal and state levels if these higher levels of government would instead provide up-to-date floodplain maps to support local land use planning and flood warning systems to support local disaster planning.

Rather than build levees and drain wetlands in isolation, people living within a single drainage basin must begin to share responsibility for their land use decisions. New planning must be done for entire river basins, linking communities together in watershed-wide economic and environmental strategies. Federal roles need to be tailored to encourage the development of regional strategies, including the development of physical information about rivers and their watersheds. The states—not the federal government—should serve as umbrellas for interjurisdictional cooperation among local governments, resolving disputes and facilitating the creation of basin and sub-basin plans.

### Attitudes About Responsibility for Dealing With Flood Hazards

- Developers and builders considering construction in floodplains.
- Landowners of vacant land in floodplains.
- Owners of residential or business structures built in floodplains within the previous ten years.

Note: All respondents were from the same 10 urban areas. Figures indicate the percent in each category who agree with each statement.



Source: Based on Borby, *Cities Under Water*, 1988.

All of these recommendations were consistent with the conclusions of the federal Interagency Review Committee formed to evaluate responses to the 1993 floods, chaired by Brigadier General Gerald Galloway. In its report, entitled *Sharing the Challenge: Floodplain Management into the 21st Century*, the committee proposed reforms to give all levels of government a stake in properly managing floodplains. "All of those who support risky behavior, either directly or indirectly, must share in floodplain management and in all costs" of those risks, or the benefits of reducing risk, the report said. The federal government can lead by example, but state and local governments must ultimately manage their own floodplains.<sup>49</sup>

To encourage responsibility, the nation's flood control experts proposed linking post-disaster support to flood insurance purchasing requirements. Other proposed actions include predisaster planning, revising the Corps of Engineers planning regulations, and flood and crop insurance reform. In general, the task force supported the ideas of avoiding inappropriate use of floodplains and minimizing flood damages through both structural and nonstructural measures.

In fact, the floods of 1993 ignited intergovernmental collaboration never before seen by Midwesterners leaders. Emergency preparedness expert Jack Kartez told the Lincoln Institute conference that the flood had produced strong collaboration between federal and state agencies and a new commitment to long-term mitigation. More than dependence on funding or coordination, the collaborative partnerships created during and after the flood, Kartez said, allowed communities to link recovery from the flood to planning for reduced losses from future floods. He pointed out that it was up to local communities to prepare for the next flood by building on these successful partnerships.<sup>42</sup>

To do this, local governments must develop innovative new strategies to encourage economically and environmentally sustainable land uses. Tax reform is one way to shape land use decisions through incentives rather than mandates. Currently, most federal, state and local tax codes are designed to encourage development, taking little or no account of ecological systems that either pose risks or perform services valuable to human communities.

Tax-based incentives include reductions in property taxes, abatement or deferral of taxes, and the establishment of enterprise zones or other special business zones to promote development and employment in economically depressed areas. These often make locating businesses, homes and other development in some flood-prone areas financially feasible and even attractive.

In addition, the federal Internal Revenue Service Code and many state codes provide casualty loss deductions on income taxes to those suffering flood losses. After floods, many states and localities provide additional types of tax relief, reducing or temporarily suspending real estate taxes or business taxes for those affected by flooding. After flooding in 1982, the state of Connecticut, for example, enacted special flood relief legislation that included a provision for tax abatements for floodplain property owners.

The same tools, however, can be reversed to discourage rather than encourage floodplain development. In 1987, the city of Des Plaines, Illinois, began a permit surcharge of \$200 for floodplain development projects to help finance city flood protection activities. The City of Stamford, Connecticut, has required developers of projects constructed in the floodplain to contribute funds for the operation and maintenance of its automated flood warning system.<sup>43</sup>

BE IT RESOLVED THAT THE PARTICIPANTS AT THE 1994 CAMBRIDGE CONFERENCE ENTITLED "COMMUNITY LAND POLICY AND RIVER FLOODING: THE GREAT FLOOD OF 1993" GATHERED AT THE LINCOLN INSTITUTE OF LAND POLICY ON THIS 26TH DAY OF SEPTEMBER, 1994, DO HEREBY GO ON RECORD AS STRONGLY SUPPORTING THE CONCEPTS SET FORTH IN THE INTERAGENCY FLOODPLAIN MANAGEMENT REVIEW COMMITTEE'S REPORT, *SHARING THE CHALLENGE: FLOODPLAIN MANAGEMENT INTO THE 21ST CENTURY* [THE GALLOWAY REPORT].

WE ACKNOWLEDGE THAT NO ONE MUNICIPALITY, COUNTY, OR STATE CAN POSSIBLY CARRY OUT EFFECTIVE PLANNING OR IMPLEMENTATION ALONE. COORDINATION AND COLLABORATION ON A REGIONAL WATERSHED BASIS REQUIRES FEDERAL, STATE, AND LOCAL COMMITMENT.

IN THIS SPIRIT WE RESPECTFULLY REQUEST THAT THE PRESIDENT OF THE UNITED STATES ISSUE AN EXECUTIVE ORDER THAT WILL INSTRUCT FEDERAL AGENCIES TO DEVELOP A CLOSE AND COLLEGIAL WORKING RELATIONSHIP WITH ALL LEVELS OF GOVERNMENT (LOCAL, REGIONAL, TRIBAL, AND STATE) TO ACCOMPLISH THIS END.

WE ACKNOWLEDGE THAT ALL LEVELS OF GOVERNMENT MUST COMMIT RESOURCES TO ACHIEVE THE GOALS OF THE GALLOWAY REPORT. AS LOCAL OFFICIALS WE COMMIT OURSELVES TO WORK TOWARDS THIS END.

## 8. CONCLUSIONS: LAND USE PLANNING FOR UNSTABLE ENVIRONMENTS

The land use and planning problems presented by floodplains are not unique. They are also associated with many other natural environments subject to what geologists and geographers call "natural disturbances" and most of us call "natural disasters."

Before human beings dammed or diverted them, rivers regularly flooded the land along their banks. Before human beings stabilized or renewed coastal barrier beaches and islands, these areas migrated, slowly every year and faster during hurricanes. Before human beings built skyscrapers and expressways along fault lines, the earth's tectonic plates regularly readjusted themselves. Before human beings began preventing or putting out forest and grassland fires, much of the arid western United States burned, a little every year and a lot every few years.

Vegetation and wildlife and landforms have all evolved and adapted to these events. Floods renew floodplain soils. Barrier islands protect sensitive tidal wetlands, while still allowing them to migrate. Hurricanes rebalance moisture and temperature between tropical and temperate zones, between oceans and continents. Wildfires make room in forests for new species and new growth.

Yet many land use and investment decisions assume that these same events can and should be prevented. When the United Nations declared the 1990s the "International Decade for Hazard Reduction," the U.S. Congress followed suit with the United States Decade for Natural Disaster Reduction. The public announcements of these programs focused on reducing property losses and loss of life, better disaster forecasting, and faster response and recovery programs.

The ultimate lesson of the Great Flood of 1993 may be that we should revise these assumptions, if only because they are prohibitively expensive. Human attempts to stabilize landscapes have often had exactly the opposite effect—forcing nature to postpone and combine many routine annual readjustments into truly disastrous floods, landslides, or fires. The more money and lives we stake on controlling nature, the more we must spend to succeed. The more levees, floodwalls, seawalls and firefighting equipment our taxes buy, the more property owners invest in these "protected" areas. These property owners have a reasonable case for compensation and subsidies when disasters strike. "How can you," they ask governments, "claim to protect us from natural risks but refuse to bail us out when that protection fails?"

This report, like the conference on which it was based, does not argue for simply eliminating all such protection. "Giving the floodplain back to the river," pure and simple, is not the answer. However, the taxpayers who will be asked to compensate landowners whose property is in harm's way should participate in planning the use of those lands before disasters strike. This argument applies equally to floodplains, coastal beaches, fire-dependent landscapes and earthquake zones.

Superficially, such a policy seems to embody simple common sense and fairness. In practice, however, it has always been difficult to implement. Americans have a deep-rooted respect for private property and are reluctant to interfere with owners' use rights.

Americans also react to disasters with outpourings of empathy and neighborliness. Most of the time, we reward rather than punish our elected and appointed representatives for bending the rules to help out people who have lost their homes and possessions and perhaps their livelihoods to floods, hurricanes, fires, and earthquakes that, as individuals, they did little or nothing to cause.

Ironically, the sum total of land use decisions by individual property owners, local governments, and state governments has clearly exacerbated the human and property costs of natural disasters. Regulating and planning individual land use decisions to avoid socially unbearable costs will require, as the midwestern mayors at the Lincoln Institute conference recognized, less construction and more information sharing, less empathy and more "tough love."

When funds for emergency planning are reduced, the first work cut is often the research and public education that can help voters and governments see how their individual land use decisions produce collectively undesirable results. What often survives funding cuts are the very public works that feed the spiral of public protection, private investment and public compensation.

Changing this policy will be tough in all senses, on all parties. Rationing disaster aid and protective public works will bring some hardship to people whose homes and businesses are located in floodplains (or hurricane or fire zones). But it will also be tough for voters to maintain their support for shifting public funds away from levee construction and disaster assistance, when the television news shows their neighbors standing on the rooftops of their flooded homes.

Finally, without strong taxpayer and voter support, it will be tough if not impossible for elected and appointed officials to enforce flood insurance requirements, restrict aid for rebuilding and repair, or collect taxes and fees in advance of disasters to pay for public education about floodplains or for post-disaster relocation. In short, all levels of government and the taxpayers themselves must "do more as we say and less as we have done" to manage floodplains and other unstable environments responsibly.<sup>11</sup>

*Some things kind of make your life go by in front of you . . . . When you finally recognize the destruction of something your life is really brought into focus. You just keep looking at things, saying "Oh, God". And you watch the skies for the next sign of storm clouds or a rainbow.*

— Gibbs, *Time Magazine*

## NOTES

1. McNeil/Lehrer Newshour, "Controlling Flood Damage," 21 September 1994. Ed Yotter of Louisa County, Iowa, inspired the title of this report when he commented that he and other floodplain farmers had only borrowed their land from the river and that the river could always take the land back.
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Design and Production: Mosaic Design, Inc.

Printing: Kirkwood Printing

Product code: PF003



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