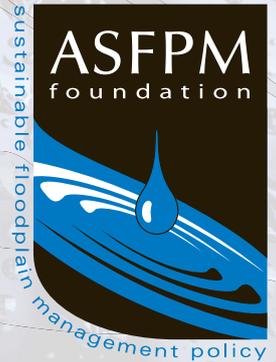


# A Path to 2050

Reducing Flood Losses and  
Protecting Floodplain Resources  
for the United States of the Future

Second Assembly of the  
**Gilbert F. White National Flood Policy Forum**  
“Floodplain Management 2050”





## ABOUT THE GILBERT F. WHITE NATIONAL FLOOD POLICY FORUMS



The ASFPM Foundation has established a periodic gathering of leading experts in flood policy and floodplain management to facilitate national discussion of important floodplain management issues. These Forums develop policy and research recommendations and establish an ongoing record of flood policy issues and directions for the future. The Forums have been named in honor of Gilbert F. White, the most influential floodplain management policy expert of the 20th century. The Forums are not only a tribute to his work, but also a recognition of the success of his deliberative approach to policy analysis and research.

Periodically the Forum explores one pressing national flood policy issue by assembling and facilitating a dialogue among topical experts who represent various stakeholders from government, industry, and academia. The goal of each Forum is to identify needed research and policies that will reduce the human casualties and economic losses associated with flooding, as well as protect and enhance the natural and beneficial functions of floodprone areas.

The discussions and recommendations for action and research formulated at each Forum are summarized and distributed as a report by the ASFPM Foundation. It is anticipated that policymakers and their constituent groups will review these reports to determine which actions could be undertaken to reduce flood losses in the nation. Furthermore, these reports are expected to provide the bases and priorities for conducting the research necessary to improve policy or program implementation.

## THE 2007 ASSEMBLY OF THE FORUM



The second assembly of the Gilbert F. White National Flood Policy Forum was held November 6–7, 2007, at George Washington University in Washington, DC. It addressed the question of the long-term future of floodplain management and its role in shaping the United States of 2050. The assembly comprised 92 nationally and internationally known experts, invited specifically for their knowledge and experience in resource management; engineering; economics; demography; land use; insurance; local, state, and federal government; environmental sciences; planning; risk analysis; the law; building and construction; emergency management; finance; communication; transportation; and policy analysis. They used their considerable wisdom to consider what the future of floodplain management could look like under both a business-as-usual scenario and also under an alternative scenario of carefully crafted and aggressive action. This report summarizes the policy, program, and research needs that were identified as a result of that dialogue.

## THE SITUATION AS THE EXPERTS SEE IT



In spite of the heavy investment of public and private dollars and decades of management, the United States has not been able to curb its continually increasing flood losses, now averaging over \$6 billion annually. An unprecedented set of conditions facing the nation at the outset of the 21st century makes it apparent that flood losses will increase even more quickly in the near future and, if they are not managed more pro-actively than in the past, could accelerate out of control. Population growth and migration, changes in climate, and serious degradation of water-based resources are the new realities superimposed upon the ongoing dilemma of continual flood losses. These realities are colliding with the cumulative impacts of the last century's well-meaning but outdated policies, which improperly suggested that the federal government would solve everyone's flooding problems (largely through engineered measures) and also used national development policies that failed to recognize the finite nature of such resources as floodplains, wetlands, coasts, and estuaries. The impending collision likely will overwhelm existing efforts to reduce flood losses and to protect floodplain functions and resources. Without dramatic shifts in our approaches and actions, by 2050 flood losses are likely to be far greater, ecosystems may well collapse, the nation's quality of life will be diminished, and all hope of sustainable communities will be lost.

### **Instead . . . .**

Imagine the United States in 2050 . . . in spite of a growing population and a changing climate, both flood risk and land and water resources are being managed towards sustainable outcomes.

- 💧 The nation views land and water as precious resources, and therefore protects the natural and beneficial functions of floodplains, wetlands, and coastal areas.
- 💧 Because naturally floodprone areas have been preserved—and restored where necessary—a maximum amount of natural mitigation of flooding takes place continually. A wide network of

## THE SITUATION AS THE EXPERTS SEE IT



green infrastructure protects natural resources and functions and provides open space and recreational opportunities.

- Integrated water management is an accepted practice.
- All new development is designed and built so that it has no adverse impact on flood levels, sedimentation, erosion, riparian or coastal habitat, or other community-designated values.
- The free market strongly favors sustainable development, so floodprone construction rarely occurs.
- Private and public losses due to floods are indemnified through a government-backed but private system of universal insurance coverage that encourages mitigation of damage.
- Management of floodplains is funded through fees charged for development impacts, a highway trust fund, or other secure sources.
- Risk communication has become advanced enough that local decisionmaking is well informed. Individuals and households understand both the risks and resources of natural flooding processes.
- Policy decisions about the use of land and water resources are based on sound data, science, and models.

The road we are following today does not lead to this visionary future, however. Existing programs and policies at all levels are short-sighted, fragmented, focused on economic development at the expense of sustainability, and insufficiently grounded in science. Further, the legacy of decades of these approaches is overtaking us even as new conditions make meticulous planning and long-term management even more critical. Experts at the Second Assembly of the Gilbert F. White National Flood Policy Forum agreed that several crucial issues are raised by our current path, and must be remedied immediately if we are to reach the optimal future.

## ACTION NEEDED



## ISSUE

Existing policies and programs for managing flood hazards and water resources in the United States are not strong enough to keep damage at bay or to ensure healthy ecosystems in the face of the pressures that will accompany 125 to 160 million additional people over the next several decades. Further, we are facing significant uncertainty about coping with a shifting climate unless we make essential investments in related science and data collection.

## POLICY AND PROGRAM ACTION

- 💧 We need to make room for our water and its related natural functions and resources, both inland and along the coasts. We need to begin a pattern of gradual and voluntary resettlement of those portions of communities that already have been located in the highest-risk or most ecologically sensitive areas, including behind levees and within the downstream influence of dams.
  - ◆ When infrastructure anywhere in the nation is repaired or replaced, it should be removed from the floodplain if at all possible.
  - ◆ New and replaced levees should be set farther back from the edges of waterways.
  - ◆ No local, state, or federal funds should be spent that could foster development or infrastructure in high-risk and/or environmentally sensitive areas.
  - ◆ States and communities need to incorporate into their hazard mitigation and comprehensive plans some strategies to change significantly the uses to which high-risk or environmentally sensitive lands can be put.

*Continued on page 8*

## ACTION NEEDED



### POLICY AND PROGRAM ACTION

- 💧 We must make it a national priority to reclaim our lost riparian and coastal resources wherever possible, including dunes, bottomland forests, riparian habitat, estuaries, and marshes.
- 💧 We must question our national policy of water resources “development” and ask whether a policy of water resources “sustainability” that balances human and ecosystem needs is a wiser approach.
- 💧 A “no adverse impact” approach must be implemented widely, to limit human actions in watersheds and coastal zones that would alter those areas’ natural and beneficial functions.
- 💧 *De facto* no-build zones should be established in coastal areas, similar to existing floodway zones along rivers and streams.
- 💧 The President should invigorate Executive Orders 11988, Floodplain Management, and 11990, Protection of Wetlands, and enforce them strictly, thereby eliminating federal activities that foster new or replacement development in floodplains.

## ACTION NEEDED



### RESEARCH NEEDED

- 💧 We need a nationwide inventory of the nation's floodprone structures and flood risk.
- 💧 In light of changing watersheds and climate, we need widespread evaluation of cumulative future conditions in terms of flood flows, flood levels, riverine and coastal erosion, sedimentation, barrier and shoreline migration, sea level rise, subsidence, and other attributes.
- 💧 Our stream gage data collection system needs to be restored, expanded, and made readily available to its many local, state, federal, and private-sector users.
- 💧 To identify missed opportunities and evaluate existing activities, it would be useful to compare Gilbert White's original human adjustments to flooding and the new adjustments offered by the Forum against existing policies and programs that purport to carry out those adjustments.

### OUTCOMES

The *avoidance* of floodprone and/or ecologically sensitive areas will be an accepted practice whenever new development is contemplated. Gradual and voluntary resettlement of communities in the nation's highest-risk and most ecologically sensitive areas will reduce the vulnerability of the population to flood damage and also give waterways and coastal regions the space they need to maintain natural functions and nourish natural resources. By 2050, over two-thirds of all development in place would be safe and sustainable.

## ACTION NEEDED



### ISSUE

The United States' aging and poorly maintained dams, levees, bridges, surfaced roads, and stormwater and sewer systems are more vulnerable to flooding, hurricanes, and rising sea levels than ever before. The easy transfer of digital data for business, finance, and communications has created a new "digital infrastructure" with its own vulnerability to water-related hazards and the impacts of climate change.

### POLICY AND PROGRAM ACTION

- 💧 A substantial investment needs to be made in the inspection, repair, redesign, rehabilitation, and maintenance of highways, roads, bridges, dams, and levees.
- 💧 New policies are needed to specify removing infrastructure and critical facilities from floodplains wherever possible, applying stricter standards for siting and retrofitting replacement facilities, and applying a much longer perspective when designing or siting infrastructure.
- 💧 The business plans of public and private organizations should include measures to limit vulnerability if a flood or coastal storm damages a supplier or interrupts a vital digital linkage.

### OUTCOMES

Aging engineered infrastructure will have been relocated, rehabilitated, or removed. New infrastructure and critical facilities will be constructed out of floodprone and ecologically sensitive areas and then only when maintenance funding is guaranteed. Digital linkages would be protected and insured.

## ACTION NEEDED



### ISSUE

A history of insufficient attention to our natural environment's vulnerability to human development has resulted in the degradation of water-based natural resources and ecosystems and the loss of natural protective buffers. As the U.S. population grows and climate shifts, acceleration of this trend appears inevitable and ultimately will strain not only local and regional economies that depended on these resources but also wider economies because of higher prices and the scarcity of products.

### POLICY AND PROGRAM ACTION

- The natural and beneficial functions of floodprone areas need to be acknowledged throughout all federal, state, and local programs as worthy of protection, restoration, and enhancement.
- Restoring and improving our green infrastructure—riparian areas, vegetative cover, water bodies, coastal zones, habitat—should be a national priority.

### RESEARCH NEEDED

- We need to establish accepted, reliable methods for quantifying water-based resources and ecological services so that they can be incorporated into benefit/cost analyses and other decisionmaking tools.
- Methods need to be identified for collecting the data that are needed to set appropriate values on floodplain and coastal resources.

### OUTCOMES

The natural resources and functions of floodprone areas and the water itself—both inland and coastal—would be protected from human impacts, now and into the future. Riparian corridors, estuaries, shoreline ecosystems, vegetative cover, greenways, parks, wildlife habitat, and shade trees would be planned for, funded, preserved, and restored.

## ACTION NEEDED



### ISSUE

Expected impacts from changes in climate, especially sea level rise and more frequent and/or more severe storms, are likely to overwhelm in-place coping mechanisms.

### POLICY AND PROGRAM ACTION

- Consensus needs to be reached on the general trends in flood severity, flood frequency, population movement, and impacts on riparian and coastal ecosystems that we expect to see associated with climate change and sea level rise.
- We need a fully integrated and modeled scenario of flood hazards and resources nationwide that projects several decades into the future.

### RESEARCH NEEDED

- We need to make a major investment in basic analysis of region-by-region climatological trends. Data are needed that can capture the anticipated impacts of climate change on major urban areas and their surroundings.
- Existing sources of data on precipitation, streamflow, sea level, and other factors need to be monitored so we can identify the impacts of climate change as soon as possible.
- We need to incorporate reliable climate change data into the information bases on which floodplain management relies.

## ACTION NEEDED



### RESEARCH NEEDED

- A work group could analyze the gaps in technical and scientific information that must be filled to conduct a meaningful nationwide assessment of U.S. vulnerability to climate changes and sea level rise.
- Intelligible scenario-based models are needed to help regions and communities grasp and plan for climate change and work towards sustainability of the natural resources and functions of their waterways, coastlines, and adjacent lands. These models and related national databases should be accessible to local governments to assist their decisionmaking.
- We must develop ways to incorporate economics and flood risk into long-range scenario-based plans.

### OUTCOMES

Scenario-based modeling will enable society and decisionmakers to understand the consequences of taking any given action. Pertinent federal, state, and local programs would be able to adapt quickly to account for the collision of intensified human development and climate change, especially those impacts likely to be most severe.

## ACTION NEEDED



## ISSUE

Current national policies and decisionmaking processes for water resources, flood hazard management, flood insurance, disaster relief, and resource preservation operate at cross-purposes and are far too short-sighted to guide the nation to an optimal future.

## POLICY AND PROGRAM ACTION

- 💧 Congress should formally establish twin national goals: (1) reduce the vulnerability of our population to flood damage, and (2) improve our stewardship of the natural and beneficial functions of our floodprone areas. The goals statement should establish unequivocally both the value to the nation of these resource areas and their natural functions, as well as their inherent hazards.
- 💧 A comprehensive legislative package should be passed to support the twin goals and incorporate national policies for the management of floodplains and riparian and coastal areas. The legislation would be coordinated with and implemented through states, local governments, tribes, governors, and others.
- 💧 A decisive statement is needed that it is U.S. policy to achieve and maintain environmental, social, and economic sustainability.
- 💧 A high-level, central point of coordination and implementation needs to be established, dedicated solely to ensuring that all water-related laws and programs at all levels of government are seamlessly aligned and integrated.
- 💧 Congressional oversight of federal (and state) water-related programs needs to be consolidated, rather than scattered among many committees and subcommittees.
- 💧 The rules and policies of all federal and state programs that subsidize development need to be reconciled with programs for mitigation funding so that they reinforce instead of undermine each

## ACTION NEEDED



### POLICY AND PROGRAM ACTION

other. This applies to the Departments of Agriculture, Energy, Housing and Urban Development, Interior, and Transportation; the Economic Development Administration; the Environmental Protection Agency; the Federal Emergency Management Agency; the Tennessee Valley Authority; the U.S. Army Corps of Engineers, and others.

- 💧 The science arms of federal agencies need ongoing funding that is sufficient to meet the expanded future need for science-based information and models.
- 💧 Secure funding sources—such as service fees or earmarked tax revenues—are needed to ensure the future of floodplain management programs, infrastructure maintenance, resource protection, flood map updates, and mitigation of the repetitive flood loss problem.

### RESEARCH NEEDED

- 💧 The National Water Assessment, last conducted in 1976, needs to be updated. Reliable data on streamflow, reservoirs, groundwater, and withdrawals are critical to crafting nationwide policy that is both far-seeing and grounded in science.
- 💧 An independent, comprehensive review is needed of all federal water-related programs, all programs that subsidize or promote development, and all grant programs. It should determine how these authorities can be integrated, how their Congressional oversight could be consolidated, and what policies, coordination, and leadership are missing.

### OUTCOMES

The United States will share a nationwide vision and policy for the sustainability of its water resources and the reduction of flood losses. A unified strategy to manage the flood hazard and protect water resources would be in place and be grounded in public/private partnerships, performance, and outcomes rather than in regulations.



**ISSUE** Responsibility for the costs of flooding and the damage to ecosystems is spread inappropriately

**POLICY AND PROGRAM ACTION**

- 💧 We must eliminate the incentives embedded in government programs that encourage short-sighted, unwise use of floodprone or environmentally sensitive lands. In their place, we need positive incentives that encourage appropriate actions and require payment for inappropriate ones. Under this new scheme, localities that do not manage their flooding risks and resources wisely cannot externalize the resulting losses and costs onto the federal taxpayers, nor can they obtain related federal benefits.
- 💧 For the non-federal share of the cost of disaster relief and recovery, a sliding scale is needed that will reward communities that act to mitigate risks and protect or restore resources. Preference in the award of federal grants, loans, and other benefits also should be given to communities that act wisely.
- 💧 A sunset date needs to be established for subsidized and grandfathered flood insurance premium rates, because subsidized rates encourage development in hazardous areas.
- 💧 Exemptions from the flood insurance purchase requirement must be eliminated.
- 💧 We need more rapid movement toward mandatory, actuarially based flood insurance (or all-hazards insurance) for all properties, nationwide. The coverage should have features to drive loss reduction (mitigation) and also include a pooling mechanism for coping with catastrophic losses.
- 💧 No adverse impact management strategies should be implemented universally, with an eye towards environmental, economic, and social sustainability.

## ACTION NEEDED



### RESEARCH NEEDED

🔹 An independent, comprehensive review is needed of all federal programs that fund, subsidize, license, or promote development or redevelopment (including disaster relief, the tax code, housing grants, small business loans, and many others). The aim would be to identify any incentives for making unwise decisions or for taking inappropriate action with regard to our water resources

### OUTCOMES

A framework will be in place that fosters local responsibility for dealing with flood risk, sustaining water-related resources, and making wise use of floodprone lands. Institutionalized incentives will reward communities and individuals that make wise decisions and prevent those that make unwise decisions from reaping benefits from federal taxpayers. A cultural and behavioral shift will take place so that individuals, property owners, and local governments understand and accept personal responsibility for flood risk and for the protection of water and related natural resources. Externalizing costs will no longer be acceptable.

## ACTION NEEDED



### ISSUE

Current levels of public awareness of flooding processes, flood hazard, risk, ecosystem balance, and the importance of natural resources are too low to ensure a sustainable relationship between society and our land and water resources and their hazards.

### POLICY AND PROGRAM ACTION

- Communication, education, and outreach efforts need to be intensified immediately. All available means should be used to bring about increased awareness and accompanying changes in behavior, including work through schools, the media, watershed councils, and other local groups.
- We need to capitalize on technological advances in communication to help people understand flood hazards, the exposure and vulnerability of people to those hazards, and the fragility of water resources. Visual depictions need to be disseminated digitally showing the impacts of development on flooding and also of the adverse impact of different development scenarios on other property and on natural resources.

### RESEARCH NEEDED

- The specific human and organizational behaviors that must be changed to reduce vulnerability and protect resources need to be identified.

### OUTCOMES

The nation's historical ethic of land and water stewardship will be revived. Society will consider not just flood *hazards* but also the *benefits* of natural flooding functions, the environmental sensitivity of water and related resources, and the hydrologic/ecologic system upon which humans rely. Water resources, flood problems, impending climatic impacts, and natural resource degradation will be recognized as being intertwined with human activity.

## HOW THESE RECOMMENDATIONS WERE GENERATED



### Procedures followed for the 2007 Assembly of the Gilbert F. White National Flood Policy Forum: “Floodplain Management 2050”

Before the 2007 Forum, dozens of invited experts prepared short papers giving their perspectives on “Floodplain Management 2050,” covering anticipated changes in flood risk by 2050; the question of human occupancy of the floodplain; flood insurance and its economic implications; understanding, delineating, and communicating flood risk; building standards, infrastructure, and flood control; vulnerability reduction; and improving the ways in which we adjust to flooding. (*See Experts look at Flooding and Water Resources in 2050, posted at [http://www.floods.org/Foundation/Files/2007\\_GFW\\_Forum\\_Background\\_Reading.pdf](http://www.floods.org/Foundation/Files/2007_GFW_Forum_Background_Reading.pdf).)*

This background reading informed the participants about each others’ thinking in advance. At the Forum, four speakers surveyed the principal changes that will influence floodplain management for the future.

- 💧 Human Factors in 2050: Population Trends, Growth, Urbanization
- 💧 Environment & Natural Resources in 2050: Climate Change, Ecosystem Degradation, Land Use
- 💧 Government and other Factors in 2050: Devolution Upwards and Downwards
- 💧 Scenario-based Planning to Guide Future Adjustments: The Foresight Flood and Coastal Defence Project of the United Kingdom.

Then, in facilitated, small-group sessions, the human adjustments to flooding listed by Gilbert F. White in his 1942 dissertation provided an analytic tool for discussion. The participants debated the relevance of each adjustment in today’s world and whether additional adjustments, not foreseen by White, should be added in order to strengthen floodplain management and bring about an optimal 2050. These discussions were summarized for the whole group. This procedure was repeated twice, and culminated in a list of needs, changes, priorities, and action items. Those professional judgments were assembled into a full report of the Forum, *Floodplain Management 2050: A Report of the Second Assembly of the Gilbert F. White Floodplain Management Forum*, available at <http://www.floods.org/Foundation/Files/GFW%20Forum%20Report.pdf>. Salient issues and action items were gleaned from that report to create this summary pamphlet.

## FOR MORE ABOUT FLOODPLAIN MANAGEMENT 2050



More details about the issues discussed and remedies offered by the experts who made up the second assembly of the Gilbert F. White National Flood Policy Forum can be found in a 62-page report, *Floodplain Management 2050*, available on the ASFPM Foundation website at [www.floods.org/Foundation/Files/GFW%20Forum%20Report.pdf](http://www.floods.org/Foundation/Files/GFW%20Forum%20Report.pdf). Bound copies are available for \$15 by phoning the ASFPM Executive Office at (608) 274-0123 or by sending an email to [memberhelp@floods.org](mailto:memberhelp@floods.org).

## FOR MORE ABOUT THE ASFPM FOUNDATION



One of the goals of the Association of State Floodplain Managers Foundation is to further research and education to help reduce flood losses and achieve sustainable floodplain management throughout the United States. Facilitating the identification of gaps in knowledge and its implementation is one means by which the Foundation seeks to fulfill this mission.

To find out more about the history, activities, and accomplishments of the ASFPM Foundation, see the website at [www.floods.org/Foundation](http://www.floods.org/Foundation).

## FOR MORE ABOUT REDUCING FLOOD LOSSES AND PROTECTING FLOODPLAIN RESOURCES



See the Association of State Floodplain Managers website at <http://www.floods.org>.



ASFPM Foundation  
2809 Fish Hatchery Road, Suite 204  
Madison, WI 53713  
phone (608) 274-0123 / fax (608) 274-0696  
<http://www.floods.org/Foundation>  
[asfpm@floods.org](mailto:asfpm@floods.org)

THANK YOU



### Sponsors

AMEC Earth & Environmental  
Dewberry  
Mrs. J.W. Hershey  
Reznick Group, P.C.  
The Widgeon Foundation

Black & Veatch  
Greenhorne & O'Mara  
Michael Baker, Jr., Inc.  
URS Corporation

CDM  
H2O Partners  
PBS&J  
Watershed Concepts

### Planning Team

Doug Plasencia, Michael Baker, Inc. &  
Chair, Events Committee of the  
ASFPM Foundation  
Larry Larson, ASFPM Executive Director  
Jacquelyn Monday, JLM Associates, Inc.  
Bruce Baird, ASFPM

Diane Brown, ASFPM  
Gerald Galloway, University of Maryland  
Dale Lehman, URS Corporation  
Edward Thomas, Michael Baker, Jr., Inc.  
Pamela Pogue, CFM  
Rhode Island Emergency Management Agency

### Speakers

Arthur C. "Chris" Nelson, Virginia Tech–Alexandria Campus  
William H. Hooke, American Meteorological Society  
G. Tracy Mehan III, The Cadmus Group, Inc.  
Colin Thorne, Professor of Physical Geography, University of Nottingham

### Logistical Support

Staff of the Keck Center, George Washington University  
Debbie Pond, ASFPM

The ASFPM Foundation pays tribute once again to Gilbert White's enduring influence and inspiration. The continued interest and support shown by his family in the Foundation's efforts to carry on his work after his death is deeply appreciated.



