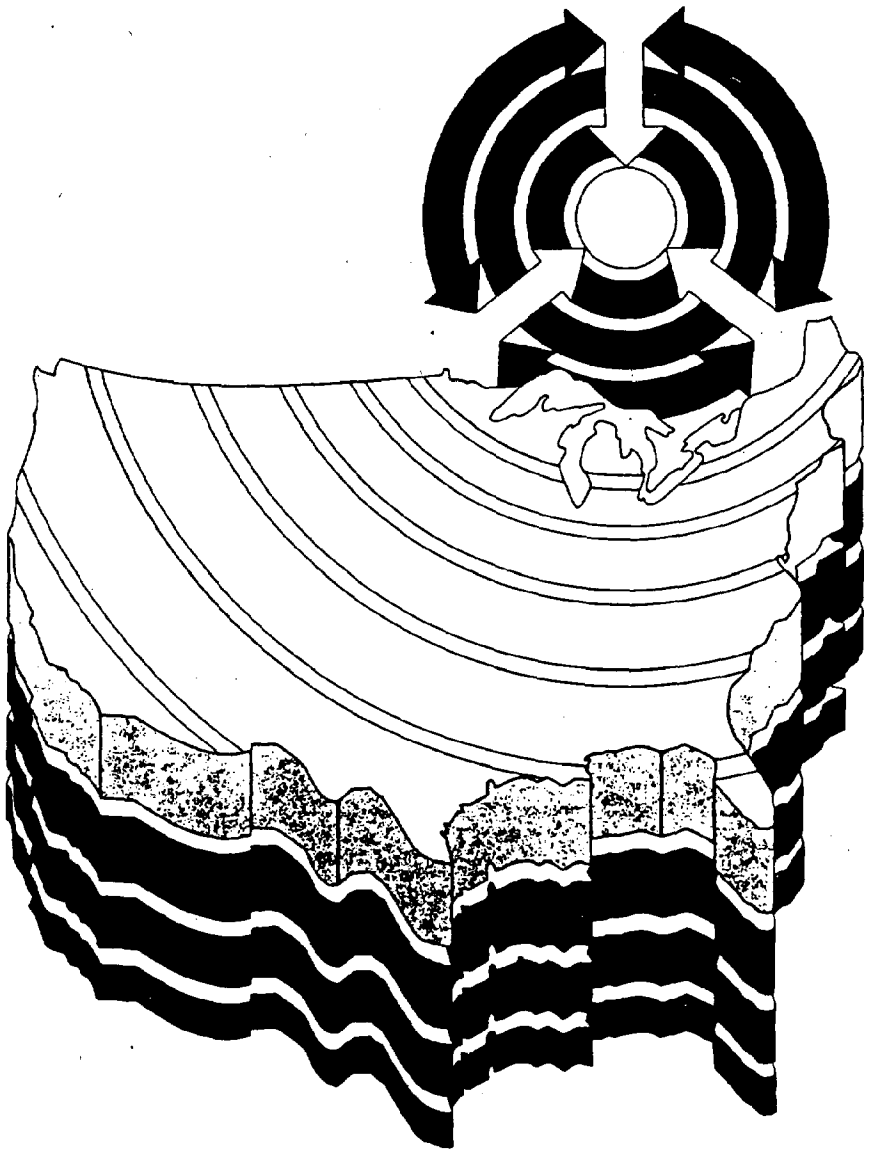
FEDERAL EMERGENCY MANAGEMENT AGENCY FEMA 100/March 1986

A Unified National Program for Floodplain Management



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The Interagency Floodplain Management Task Force was established in 1975 to carry out the responsibility of the President to prepare for the Congress a Unified National Program for Floodplain Management. Since 1982 the Task Force has been chaired by the Federal Emergency Management Agency. Membership of the Task Force consists of the Departments of Agriculture, Army, Commerce, Energy, Housing and Urban Development, Interior, Transportation; the Environmental Protection Agency; and the Tennessee Valley Authority.

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FEDERAL EMERGENCY MANAGEMENT AGENCY

A Unified National Program for Floodplain Management

March 1986

Federal Emergency Management Agency

Interagency Task Force on
Floodplain Management

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Dear Mr. President:

In response to Section 1302(c) of the National Flood Insurance Act of 1968 (P. L. 90-448), I am pleased to commend to you for transmission to the Congress the report "A Unified National Program for Floodplain Management." This report updates a 1979 report of the same title concurred in by the eight cabinet level agencies constituting the Water Resources Council and forwarded to the Congress. The report sets forth a conceptual framework and identifies strategies fundamental to implementing a balanced approach to floodplain management. It appraises the implementation of current programs and recommends Federal and State and local actions needed to achieve a unified program of planning and action at all levels of government to reduce flood losses and losses of floodplain natural values. The revised report has been prepared by the Interagency Task Force on Floodplain Management, concurred in by member agencies, and has benefited from the advice and suggestions of recognized authorities in the field of floodplain management.

Respectfully,

Julius W. Becton Jr.
Director

The President
The White House
Washington, D.C. 20500

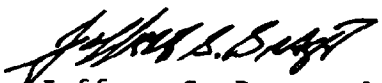
Enclosures

FOREWORD

During the past two decades, recognition of unacceptably high losses of lives, property and natural values in the Nation's floodplains has led all levels of government to provide new and more effective floodplain management tools through legislative and administrative program initiatives. Risk assessment programs generally are completing initial hazard identification activities and are moving toward an information maintenance phase. Loss reduction programs are proceeding more slowly because many of the new tools require a period of assimilation by all affected parties before their full potential can be realized. Also, these tools generally have not been articulated within an overall coordinated loss reduction effort. Thus, the current status of floodplain management indicates a need for the improvement and more effective application of existing tools and little need for new legislation.

This report recognizes the goals of floodplain management to be wise use, conservation and development of the interrelated lands and waters of the Nation's floodplains subject to the constraint of reducing loss exposure to an acceptable level. It offers a conceptual framework to guide local, State, and Federal decisionmakers toward a balanced consideration of alternative goals, loss reduction strategies and tools. It provides recommendations for each level of government to improve and coordinate floodplain management. It should lead to better decisions affecting the use of our Nation's floodplains, reduced losses of life, property and natural values, and a reduced burden upon governments to compensate for losses caused by unwise decisions of individual citizens as well as governments.

This report asserts that a unified national program only can be achieved through a partnership among all levels of government wherein each carries out its responsibilities under the Federal and State constitutions. The recommendations in this report are directed at each level of government with the intent of moving the Nation toward a more effective Unified Program. I urge all who make decisions affecting floodplains to pursue implementation of these recommendations in the spirit of partnership as we continue to progress toward achieving a unified approach to floodplain management.



Jeffrey S. Bragg, Administrator
Federal Insurance Administration

PREFACE

Section 1302(C) of the National Flood Insurance Act of 1968 (Public Law 90-448, 82 Stat. 476) stipulated that "the objectives of a flood insurance program should be integrally related to a unified national program for floodplain management and...the President should submit to the Congress for its consideration any further proposals necessary for such a unified program..." Responsibility for the development of the Unified National Program was first assigned by the Office of Management and Budget to the Water Resources Council which in 1976 adopted and in 1979 revised the report "A Unified National Program for Floodplain Management." In 1982 this responsibility was reassigned to the Federal Emergency Management Agency. The 1979 report became dated by the relative success and changes in Federal programs and by the strengthening of floodplain management capability at the State and local government levels. The status of Federal, State and local floodplain management activity as of mid-1985 is reflected in the following revised report and in its findings and recommendations. Like its predecessors, the revised report does not seek to provide specific guidance for meeting Federal program requirements.

This report seeks wise decisions and management for the Nation's floodplains to reduce losses of life and property from flooding and losses of natural and beneficial floodplain values from unwise land use. A conceptual framework is set forth to provide general guidance for the decisionmaking processes of Federal, State, and local officials as well as for private parties. The strategies and tools for flood loss mitigation and for the preservation and restoration of natural floodplain values are presented in detail. Actions are recommended to facilitate the coordination of management programs dispersed among all levels of governments.

For their contributions to this report, we are indebted to the many public officials, private consultants, and agency staff members whose conscientious and dedicated efforts were responsible for the 1976 report and to the members of the Federal Interagency Floodplain Management Task Force under whose auspices the 1979 revision was prepared. A special recognition is due to the members of the drafting team listed below who carried the primary burden of preparing this revision.

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CHAPTER I

DIGEST AND RECOMMENDATIONS

A. Digest

Background. Responding to the magnitude and continued increase in the Nation's flood losses, the Congress enacted legislation in 1968 providing for new tools to cope with flood risk and called for "A Unified National Program for Floodplain Management" (Public Law 90-448, Section 1302). In 1977 the President issued Executive Order 11988, Floodplain Management, which reinforced the need to strengthen Federal policies to reduce the risk of flood loss; to minimize the impact of floods on human safety, health, and welfare; and to restore and preserve natural floodplain values.

This report recognizes subsequent Congressional and Presidential directives and updates the Unified Program transmitted by the President to the Congress in 1979. This report: (1) sets forth a conceptual framework for floodplain management; (2) identifies available management strategies and tools for reducing the risk of flood loss, minimizing the impact of floods on human safety, health, and welfare, and restoring and preserving natural and beneficial floodplain values; (3) assesses the implementation capability and status of existing Federal and State agencies and programs and local units of government; and (4) makes recommendations for continuing efforts toward achieving "A Unified National Program for Floodplain Management." The concepts and strategies of this report are presented from a national perspective and offer guidance to all governmental and nongovernmental interests.

Conceptual Framework. The conceptual framework (Chapter III) contains general and working principles that relate riverine, coastal, and other floodplains to the total natural, economic and social systems of which they are a part. It also describes the potential for flood losses and environmental harm associated with the use of floodplains. Each level of government has legal program responsibilities within this framework. The conceptual framework is developed from and based on accepted, broad national objectives for water and related land resource planning. It recognizes that wise use of the Nation's floodplain must be consistent with (1) an explicit concern for reduction of flood losses and threats to health, safety, and welfare; (2) the preservation and restoration

of natural and beneficial floodplain values; (3) a balanced view that in general promotes consideration of of uses that minimize or eliminate exposure to flood loss rather than floodplain development or abandonment; and (4) careful consideration of all relevant factors and the weighing of all reasonable alternatives. The conceptual framework fills a void previously hindering consistent articulation of programs functioning at all levels of government.

Management Strategies and Tools. The means and tools (Chapter IV) for flood loss reduction are organized around three strategies directed at modifying (1) susceptibility to flood damage, (2) the impacts of flooding, and (3) flooding itself. Each of the means is comprised of a wide variety of tools that range from land acquisition, land use and development regulations, and floodproofing, to flood control works. These tools are evaluated to assist in selection of the appropriate means to reduce flood losses while achieving the desired management goals. The array of means and tools available is deemed generally adequate for an effective unified national program. It should also be noted that some of these strategies and tools operate to protect natural and beneficial floodplain values.

The means and tools (Chapter V) for reducing loss of natural floodplain values support four major strategies: (1) avoiding actions that affect adversely the floodplain whenever there is a practicable alternative; (2) minimizing the adverse impacts of actions that affect the floodplain; (3) restoring previously degraded floodplains to serve their natural functions; and (4) preserving those floodplains whose natural functions are relatively undisturbed. These four strategies are directed at natural and beneficial values associated with the water, living, and cultural resources of floodplains. A variety of examples are included to provide general guidance in serving this program goal.

Implementation. Assessment of the development of Federal programs (Chapter VI) and the institutional framework for implementing a unified program (Chapter VII) reveals significant progress since the first unified program was set forth in 1976. Of major significance, a minimum national standard for delineating flood hazard hazard -- the 100 year base flood -- and a procedure for evaluating flood hazard and minimizing

flood loss potential -- Federal Executive Order 11988, Floodplain Management -- have been established and accepted. The conceptual framework of the Unified Program has become more widely accepted as have nonstructural loss reduction strategies and tools. Almost all States have established floodplain management programs and most have gained experience and are becoming more effective in achieving program goals. Almost all flood prone communities have at least established floodplain regulatory programs and are beginning to develop program experience. Consequently, the relative role of the Federal government is decreasing as States and local governments become more self reliant in dealing with the problems of flooding. This assessment, however, also reveals that achievement of a unified program still requires considerable additional progress.

Assessment of the institutional framework concludes that many of the necessary facets of the conceptual framework exist and have been functioning at all levels of government, but coordination and effectiveness needs improvement. Effective implementation of a unified national program requires of all levels of government: (1) a review of and renewed commitment to existing policies that contribute to such a program, (2) appropriate rearrangement of priorities in existing organizational and operational policies, and (3) a continuous coordination effort.

Recommendations. The recommendations which follow are directed toward recognition, acceptance and implementation of the conceptual framework at all levels of government. They should provide the basis for achieving the institutional coordination necessary to carry through" A Unified National Program for Floodplain Management."

B. Federal Level Recommendations

Actions are required to establish coordination at the national level for floodplain management activities, specifically for research, data collection, and information dissemination; to strengthen management tools; and to support State and local programs. The Federal level recommendations follow. (Pertinent pages from the text and Appendix D where the recommendations from another study are presented are noted in parentheses. (For example, in recommendation 1 below, the cross references refer to Chapter VII, pages 5, 6, 7 and 23, and to Appendix D, Strategy A, item 14.)

1. Assure that all Federal programs for water, land, and related resources support and implement the precepts of Executive Order 11988; Floodplain Management and of "A Unified National Program for Floodplain Management", as enunciated in this report. RESPONSIBILITY - All Federal agencies. (VII-5, 6, 7, 23; DA-14).

2. Improve Federal support of States as they exercise their primary role in floodplain management. RESPONSIBILITY - All Federal agencies.

   Continue to:

   a. Encourage well defined State roles in Federal program activities. (VII-5, 10, 20; DA-8).

   b. Provide States with clear incentives for establishing the necessary legislative and administrative provisions and staff assignments for carrying out statewide floodplain management activities. (VII-5, 10; DA-8).

   c. Provide basic information and analysis supported by expanded basic and specific technical and planning assistance and guidance commensurate with agency expertise and the particular needs of the State and local agencies. (VII-5, 10; DC-4, 6-7, 8, 9, 10).

   d. Provide support for improving programs and capabilities to implement them at the State level as authorized by statute. (VII-5, 10, 22; DA-8).

   e. Work directly with the States in dealing with local entities to assure consistent administration of floodplain management activities. (VII-5, 10; DA-8).

3. Centralize floodplain data sources at the State level. RESPONSIBILITY - The Federal Insurance Administration and the Geological Survey should take the lead. (VII-16).

4. Improve Federal support of local government's role in floodplain management. RESPONSIBILITY - All Federal agencies.

Working with the States:

a. Provide local governments with incentives for enactment and enforcement of floodplain management regulations and other flood loss reduction measures. (VII-12; DA-18; DB-1; DC-1).

b. Encourage and assist local governments in establishing and carrying out comprehensive floodplain management programs. (VII-12; DA-8; 19).

c. Provide basic information, technical and planning assistance and guidance commensurate with agency expertise and the particular needs of local government. (VII-12, 13; DA-15, 19; DC-8, 10).

5. Accelerate floodplain and hazard studies and improve dissemination of information to States and local users through:

a. Completion of the flood insurance studies initial study program and establishment of a system for periodic updating and maintenance of the data base. RESPONSIBILITY - Federal Insurance Administration. (VII-14, 15).

b. Provision of updated floodplain and hazard information studies, especially for the hydrologic and hydraulic conditions associated with the major sources of flooding, the impact of development on flooding levels, and more effective, simpler methodologies for delineating flood hazard areas. RESPONSIBILITY - Corps of Engineers, Federal Insurance Administration, Soil Conservation Service, Tennessee Valley Authority, and Geological Survey. (VII-17; DA-5; DC-4, 6, 7, 9).

c. Provision of floodplain management and technical assistance programs. RESPONSIBILITY - Corps of Engineers, Federal Insurance Administration, Soil Conservation Service, Tennessee Valley Authority, and Geological Survey. (VII-14).

d. Provision and interpretation of detailed soil survey data to assist in tentative identification of flood prone areas and in planning appropriate uses of floodplains, especially

in rural areas. RESPONSIBILITY - Soil Conservation Service. (VII-14).

e. Support of increased social research on floodplain occupancy, hazard perception, and response as recommended in House Document 465. RESPONSIBILITY - All Federal agencies. (VI-3; VII-15; DA-19; DC-6, 7).

6. Support cost sharing policies and project evaluation procedures that facilitate achievement of a desirable mix of structural and nonstructural approaches to flood hazard adjustment. RESPONSIBILITY - All Federal agencies. (VII-19, 20; DA-12, 15; DB-2).

7. Require appropriate non-Federal segments of floodplain management programs, including regulations or control measures and local stormwater management plans as a prerequisite to Federal expenditures for the modification of flooding or of the impacts of flooding. RESPONSIBILITY - All Federal agencies. (VII-12; DA-1, 6; DB-1; DC-1).

8. Continue to evaluate the nature, size and trend of the Federal subsidy to the National Flood Insurance Program and develop policies and procedures to decrease or eliminate the subsidy in high hazard areas after repetitive losses have been experienced. RESPONSIBILITY - Federal Insurance Administration. (DC-2, 5).

9. Improve flood and flash flood forecasting and warning systems to include -- but not be limited to -- real -- time data collection, forecast preparation and dissemination, and public education in the use of system outputs. RESPONSIBILITY - The National Oceanic and Atmospheric Administration and the Federal Emergency Management Agency. (VII-14; DA-11, 17; DC-3).

10. Utilize the Federal Interagency Floodplain Management Task Force under the auspices of the Federal Insurance Administration to:

a. Facilitate communication and encourage consistency among Federal programs including the Delaware and Susquehanna River Basin Commissions. (VII-6).

b. Establish a mechanism for a periodic (as necessary) national conference/workshop of Federal, State, local, and regional officials for the purpose of fostering coordination of floodplain management activities. (VII-16).

c. Provide evaluation of floodplain management activities with periodic reporting to the public and to the Congress on progress toward implementation of "A Unified National Program for Floodplain Management." (VII-23).

d. Establish mechanisms whereby State and local officials can report periodically on the status of floodplain management programs and the use of Federal resources in their programs. (VII-11, 13).

e. Provide overall assistance for State program development and liaison with the responsible State floodplain management offices. (VII-7).

f. Provide for coordination of and encourage integrated Federal floodplain, wetland, and coastal barrier island management activities affecting the same geographic areas. (VII-3, 23; DA-2, 9, 13, 20).

g. Assist the Federal Emergency Management Agency in carrying out the Office of Management and Budget's directive to provide implementation guidance for Executive Order 11988, Floodplain Management. (VI-18; DA-3, 7).

h. Coordinate with and support the efforts of the Federal Interagency Hazard Mitigation Team Task Force to evaluate and improve the effectiveness of Federal pre- and postflood disaster mitigation planning. (VI-20; DA-16).

i. Coordinate with and support the efforts of the Federal Hydrology Committee to standardize the techniques for collection and analysis of hydrologic data, especially through regionalization of streamflow characteristics, so that recorded data may be applied at ungauged sites. (VII-17, 23).

j. Develop and promote standards for the collection, analysis, and reporting of experienced flood loss data and projected flood loss data. (VII-16).

k. Assess the amount, location, and condition of the Nation's floodplain lands to provide a basis for establishing national and regional policies to guide their preservation, restoration, and their optimal use. (VII-16).

l. Assess the extent of community needs for assistance in the adoption and administration of floodplain management measures, and identify the appropriate Federal-State-local relationships that would best fulfill these needs. (VII-11, 12, 16; DA-19).

m. Assess the need for and identify the level of detail for floodplain data relating to the inter-relationships between land, water, and related resources, and environmental values. (VII-15; DC-6, 7, 8).

n. Cooperate in periodic assessments of research needs and, when appropriate, in the review of ongoing research projects and programs. (VII-18; DA-6, 19, 20; DC-11).

11. Utilize the Federal Interagency Post-Flood Hazard Mitigation Task Force, under the auspices of Federal Emergency Management Agency's State and Local Programs Directorate to:

a. encourage the preparation of pre-disaster plans for reducing future flood losses and encouraging wise use of floodplains;

b. provide assistance in the preparation and review of post-disaster plans.

c. assist agency efforts to develop and implement hazard mitigation teams' recommendations.

C. State Level Recommendations

Actions are required for State governments to more fully achieve their pivotal role working with both the Federal and local governments toward a unified national program.

Recommended actions follow.

1. Enact enabling legislation specifically addressing floodplain management programs and regulations in those States where such legislation does not

exist or is inadequate for the purpose. (VII-10; DA-1).

2. Establish or designate a single State agency (or another effective mechanism of coordination) to assure responsibility for floodplain management and to issue State standards as floodplain management guides for State agencies and local entities. (VII-7, 10; DA-8).

   a. Maintain liaison with a designated Federal coordinating body. See Federal Recommendation B-10-e. (VII-7).

   b. Establish a program that would annually assess coordination and the establishment of State priorities and budgets related to floodplain management. See Federal Recommendation B-10-d. (VII-10, 11; DA-8).

   c. Maintain an assessment of the status of local floodplain management efforts. See Federal Recommendation B-10-1. (VII-9, 13; DC-7).

   d. Monitor and encourage effective coordination among the offices in each State responsible for coastal zone management, emergency preparedness, wetlands management and floodplain management. (VII-7, 10).

3. Develop an information program to supplement Federal efforts to inform the public and local decisionmakers about flood hazards and floodplain management. (DC-4, 6, 7, 9, 10).

   a. Establish a centralized floodplain data source. See Federal Recommendation B-3. (VII-16).

   b. Publish a floodplain management document to supplement the Floodplain Management Handbook published by the Water Resources Council by describing in detail State programs and regulations for use by local officials in implementing "A Unified National Program for Floodplain Management." (VII-16).

4. Improve management tools by applying the concepts of Federal Executive Order 11988, Floodplain Management to all State agencies and programs. (VII-10; DA-4).

5. Establish a hazard mitigation team mechanism for State agencies similar to the Federal hazard mitigation team for the purpose of improving the effectiveness of pre- and postflood disaster mitigation planning. (VI-20; DA-16).

6. Establish a mechanism to identify and monitor unsafe dams and levees and to provide hazard information to communities subject to potential flooding from failure of unsafe dams and levees. (VI-14; DA-10, 11, 16, 17).

7. Support regional, substate, and local entities in implementing their floodplain management activities. (VII-20, 21).

   a. Provide information, technical assistance, and financial support for improving management activities. (VII-10, 20, 21).

   b. Develop review procedure, to evaluate and support the overall implementation and assure the effectiveness of local floodplain management regulations and ordinances. (VII-10, 13).

D. Local Level Recommendations

Local governments have a primary role in floodplain management because they oversee decisions affecting floodplain use and they act to initiate local, floodplain management programs using State and Federal guidelines and policies. Recommendations to strengthen local government programs follow.

1. Designate a single point of contact with lead responsibility to coordinate floodplain management activities and provide liaison with State and Federal floodplain managment programs. (VII-11).

2. Adopt and enforce floodplain management measures including zoning subdivision and building codes that at a minimum meet standards recommended by national and State code organizations. (VII-11, 12; DA-18; DC-8).

3. Coordinate with adjacent communities to assure that floodplain management practices do not shift the flood hazard to adjacent communities. (VII-7, 11; DA-18).

4. Develop review procedures to periodically assess the effectiveness of the local floodplain management programs. (VII-12; DC-7).

E. Conclusion

Decisionmakers in the appropriate levels and branches of government should give serious and immediate consideration to the preceding action recommendations. Success in carrying out Federal level recommendatons depends upon followup by all Federal agencies. Responsibility for implementing these action recommendations, however, falls most heavily upon those with extensive programs affecting utilization of floodplains, especially the Departments of Agriculture, Army, Commerce, Energy, Interior, and Transporation; the Environmental Protection Agency; the Federal Emergency Management Agency; and the Tennessee Valley Authority. In each case lead responsibility or action required is directed to one or more of the agencies named to the Federal Interagency Floodplain Management Task Force under the auspices of Federal Emergency Management Agency. Success in effectuating State and local government recommendations depends upon followup by each entity acting within its own legal and institutional framework. Appropriate cooperation and support from the concerned Federal agencies as well as State and local government are also important.

CHAPTER II

BACKGROUND AND SETTING

The Unified National Program for Floodplain Management has its origins in the 1966 report of the Task Force on Federal Flood Control Policy known as House Document 465. 1/ It is supported by a continuing recognition of the need for a coordinated Federal-State-local program for managing the Nation's floodplains. House Document 465 recognized that traditional flood control measures alone were not sufficient to achieve flood loss reduction. That document also provided the first major policy level recommendations for alternative techniques including flood insurance, floodproofing, relocation, forecasting and warning, and floodplain regulations.

House Document 465 was accompanied by Presidential Executive Order 11296. This Executive Order directed all Federal agencies to "provide leadership in encouraging a broad and unified effort to prevent uneconomic uses and development of the Nation's floodplains and, in particular, to lessen the risk of flood losses in connection with Federal lands and installations and federally financed or supported improvements."

The National Flood Insurance Act of 1968 (Public Law 90-448) called for the President to develop a unified national program for floodplain management. This responsibility was delegated to the Water Resources Council. The first report on "A Unified National Program for Floodplain Management" was published in 1976. That report set forth a conceptual framework and recommended Federal and State actions with emphasis on reducing losses through floodplain management.

In May 1977 the President issued Executive Order 11988, Floodplain Management, which superseded and greatly expanded upon its 1966 predecessor. The new Executive Order brings together Federal policies that protect against both flood hazards and natural floodplain degradation.

To reflect the increased concern for natural floodplain values enunciated in Executive Order 11988, the Water

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1/ Task Force on Federal Flood Control Policy. A Unified National Program for Managing Flood Losses, House Document 465, 89th Congress, 2nd Session, U.S. Government Printing Office, Washington, D.C. 1966.

Resources Council in 1979 revised its 1976 unified program by modifying the conceptual framework and the recommendations. This document updates the 1979 document to reflect floodplain management progress and modifies associated recommendations.

Since House Document 465 was issued in 1966, State and local governments have increased their awareness of floodplain problems and exercised additional responsibility for flood prone lands. Each State has taken some kind of enabling action allowing local communities to establish floodplain management regulations. More than 17,500 of approximately 20,000 identified flood prone communities have adopted such regulations.

Floodplain management is concerned with the future role of the floodplain as an integral part of a community and of an entire natural river, shore, or coastal system. The list of floodplain uses and management purposes is extensive. These uses include provision for recreation, fish and wildlife habitat, navigation, agriculture, housing, and municipal and industrial water supply. Multiple uses are common, with some uses being incompatible with each other. However, with each use, consideration of losses of lives, property, and natural values is ever present, as are the consequences of adjustment to these losses. Thus, the focus of floodplain management is a wise choice among uses competing for a limited number of locations. Many of these locations are subject to losses that could result in serious disruption of floodplain values. An accounting must be made for the consequences of various adjustments to development in these floodplain impacting locations.

Coastal and riverine floodplains include widespread areas of natural hazard that are present in thousands of communities. Floodplains have been and continue to be under pressure for change to more intensive uses. Pressure to intensify floodplain use is increasing as desirable undeveloped land becomes less abundant, especially near urban areas. At the same time, there is increasing recognition that the natural and beneficial values served by the floodplain represent valuable environmental resources.

The present state of floodplain use and development derives from the period in which full range of impacts of uncontrolled growth were poorly understood. Flood losses are a conscious concern primarily during and shortly after a flood experience. The normal reaction to flood loss has been to attempt to control or modify the flood and to

repair flood damage to preflood conditions. However, the public has become increasingly concerned about floodplain development decisions, the rising exposure to flood losses, and the resultant public costs. These costs have several facets: those measured as flood losses and the costs of protective works and disaster relief; those assessed as threats to life, health, and welfare; and those associated with a loss of natural and beneficial floodplain values. Conversely, there may be an economic cost from not providing for more intensive uses of floodplains to increase employment and income where alternative locations are absent.

It was the concern for rising flood losses that focused national attention on floodplain management through the publication of House Document 465 in 1966. This document emphasized the fact that flood damage continued to grow, having exceeded $1 billion yearly at that time, even though over $7 billion had been spent for flood control works during the previous 30-year period. Since publication of House Document 465, the dollars spent for flood control works have nearly doubled. Average annual flood damages are now estimated to exceed $3 billion and are continuing to rise. The customary sequence of events generally continues to be (1) flooding, (2) flood losses, (3) disaster relief, (4) flood control projects attempting to modify the flood potential through provisions for storing, accelerating, blocking, or diverting flood waters, (5) renewed encroachment and development onto the floodplain and upstream watershed, (6) flooding, (7) flood losses, (8) disaster relief, (9) more projects, (10) more encroachment and development, ad infinitum. Although the construction of dams, levees, and channel projects has saved many lives and prevented billions of dollars of damage, protective works alone have not been able to keep pace with the rate of floodplain development and resultant increases in flood losses. In some situations, flood control works have encouraged additional unsound floodplain development, resulting in further losses.

In his letter of August 10, 1966, transmitting House Document 465, the President said that we can and must reduce flood losses. He also stated: "The key to the problem lies, above all else, in the intelligent planning for the State and local regulation of use of lands exposed to flood hazard." Noting that the Nation would continue to support established programs for essential flood control works, the President said that "...to hold the Nation's toll of flood losses in check and to promote wise use of its valley lands requires new and imaginative

action" (emphasis added). At the same time, the President issued Executive Order 11296.

Subsequently, significant new Federal legislation and activities affected the role of State and local governments in floodplain management.

Preparation of flood hazard maps was accelerated and Federal flood insurance was made available in return for community exercise of floodplain regulation. Funds were made available for flood disaster preparedness planning. Federal planning, technical assistance, and construction grants were made available to States along with areawide waste treatment facility planning. Financial assistance was made available for defining and enforcing permissible land and water uses in the coastal zone. A Federal permit system was utilized to monitor more closely dredge and fill activity, which often affects floodplains. Federal cost sharing was extended in principle to "nonstructural" measures directed primarily at flood loss reduction. "Nonstructural" refers to all actions other than those seeking to modify floodwaters. (See explanation on page IV-1.) Federal water resources planning principles and standards and procedures moved toward a more consistent evaluation of federally funded management measures. The requirements of environmental impact assessments and statements forced consideration and public display of alternative plans affecting floodplain use and development.

On May 24, 1977, the President issued a comprehensive environmental message calling for better management of the Nation's floodplains, wetlands, coastal barrier islands, and marine sanctuaries. The message was accompanied by Executive Order 11988, Floodplain Management, which replaces the earlier, less encompassing 1966 Executive Order. The new Executive Order is a broader and stronger policy directive. It ties together the established objective of protecting lives and property with the objective of protecting natural and beneficial floodplain values. The central thrust of the Executive Order is that the Federal agencies shall provide leadership and take action to ensure the practice of sound floodplain management. The Executive Order was reinforced by the President's Water Policy Message of June 6, 1978, which called for implementation of "nonstructural" measures and water conservation. In 1982, legislation was enacted whereby a system of undeveloped coastal barriers was established and a general prohibition was placed on all Federal activities which might assist development of these barriers. In 1983, the impact of the Executive

Order on more than 50 Federal agencies was reviewed and the Office of Management and Budget reaffirmed the need for the Executive Order. Thus, Federal agencies are placed in the position of leading, by example, other levels of government and public and private organizations. By inference, State and local governments are urged to exercise their own floodplain management prerogatives with new incentives, regulatory tools, and a comprehensive management philosophy.

Since 1966, the philosophy of floodplain management has matured in the following ways: (1) it is explicitly recognized that conditions at one floodplain location are generally interdependent upon locations and events elsewhere in the river or coastal system, and in the total community of which the floodplain is a part; (2) multiple purpose management has replaced single purpose management, even though flood losses and threats to life and health remain priority concerns; (3) evaluation of alternative flood loss reduction strategies following from House Docment 465 has replaced a predisposition to rely upon physical structures for flood protection; (4) the responsibility to preserve and restore natural and beneficial floodplain values is recognized; and (5) the need to provide for public involvement in tradeoffs affecting floodplain use decisions is recognized.

Consideration of alternative intensities of floodplain utilization has replaced automatic assumptions that floodplains should be developed to their highest economic use or that the public interest is limited to flood loss reduction. Thus, the current philosophy of floodplain management indicates a need for a comprehensive unified program which embodies these new management elements. The public interest in floodplain management is the same as for other land and water resource planning. It includes a concern for (1) economic efficiency, (2) environmental quality, (3) individual safety, peace of mind, and social well-being, and (4) economic and environmental health of regions and localities. Preliminary management plans in this context may in fact be alternatives, with some emphasizing one concern and others responding to various combinations to two or more concerns. The time frame -- near future or long range -- for floodplain management and the need for flexibility are also important to program composition and achievement. Decisions affecting floodplains must consider economic development consistent with protecting the environment, compliance with environmental statutes, and the need to protect lives, property, and natural floodplain values.

The constitutional right to reasonable use of private property should be a factor in the public interest review.

In a practical sense, decisionmakers are to test the consequences of proposed actions and assess their findings. The assessment is not to be confined to the floodplain. It must encompass a larger area in order to provide a basis for evaluating actions that might affect the floodplain. Such assessments will evaluate and identify adjustments necessary to minimize the loss of lives, property, and natural floodplain values. The loss of lives and property can be reduced by modifying, to the extent practicable, each of the three aspects of flood hazard -- flooding, susceptibility to flooding, and the impact of flooding on the individual and the community. The overall loss of floodplain values can be reduced by preservation of existing natural functions as well as by restoration of those degraded by prior human actions. In attempting to reduce losses, some combination of adjustments rather than reliance upon a single adjustment will generally be the most effective approach to meeting the problems of a particular situation. With the evolution of floodplain management have come strategies that are needed in all of its phases -- actions to be taken in the interflood period, during the inevitable flood, and in the postflood recovery phase.

Implementation of a unified national program for floodplain management depends on successfully resolving several problems, the more serious of which are the following. The first is fragmented and uncoordinated responsibility for floodplain management at all levels of government. This leads to lack of consistency among public programs designed to meet flood problems within and between areas and among those plans designed to meet the other needs of the affected areas. Fragmentation contributes to inadequately conceived measures to solve flood problems. This results in destruction of resources that the public values and generation of costs that are as undesirable as the damages that they attempt to relieve. Such inadequately conceived measures are frequently accompanied by inadequate and misdirected commitments of program resources.

Overreliance upon public investment to solve all problems is the second difficulty. There has been a national tendency to seek solutions to individual problems in the floodplain through public investment, without adequate consideration of other actions. This trend has developed from an overreliance upon the Flood Control Act of 1936 and subsequent legislation: however, this has been muted

somewhat by a decrease in the authorization and appropriation for new Federal flood control projects since 1976. Nevertheless, emphasis must be placed upon recognizing the appropriate responsibility of all levels of government and of private individuals concerned.

Inability to resolve conflicts of private property rights with local, State, and national interests is the third problem. This tends to prevent implementation of judicious land use regulations enacted in the public interest. Attempts to strike a balance between the public interest and private property rights increasingly have led to litigation.

Insufficient awareness of alternative strategies due to a lack of adequate technical and procedural information available to guide floodplain decisionmakers is the fourth problem. This tends to encourage simplistic, single strategy, or single tool responses to complex floodplain situations. In spite of recent progress, continued efforts to disseminate information and provide floodplain managment technical assistance are needed at all levels of government.

"A Unified National Program for Floodplain Management" calls for continuing efforts that seek to reduce and keep flood losses at acceptable levels while recognizing, preserving, and restoring the floodplain's natural values through wise use of water and related land resources. The program includes planning, research, education, legislation, regulation, administration, construction, and operation and maintenance activities. In the following chapters, the conceptual framework of a unified national program is presented and a system described in which the program can operate.

CHAPTER III

CONCEPTUAL FRAMEWORK FOR FLOODPLAIN MANAGEMENT

This chapter presents a conceptual framework within which public and private floodplain policies are being formulated to implement a unified national program for floodplain management. This basic framework provides decisionmakers with a management perspective that encourages a comprehensive assessment of alternative floodplain uses. Moreover, this framework fosters the judicious selection and application of the many available strategies and tools to promote floodplain use harmonious with flood hazards and natural floodplain values.

The conceptual framework consists of both general and working principles. Aspects of these principles may overlap, reflecting the complex web of interdependencies among land, water, atmosphere, and human activities both off and on floodplains.

A. General Principles

General principles set forth the context and the elements of floodplain management.

1. The Federal Government has a fundamental interest in how the Nation's floodplains are used and managed, but the basic responsibility for regulating use of floodplains lies with State and local government.

2. The floodplain, a definite area of interrelated water and land, must be considered in the context of total community, regional, and national planning and management.

3. Floodplains can be managed to achieve acceptable levels of (a) protection and maintenance of natural floodplain values and (b) reduction of existing and future flood loss potential. Both floodplain values and flood losses must be viewed within the larger context of water and related land resource management.

4. Sound floodplain management embodies:

   a. Goals and Objectives. A decisionmaking process wherein the goals of wise use, conservation, and development of interrelated land and water resources serve the diverse and frequently competitive objectives of economic efficiency, environmental quality, and the quality of life, notably health and safety.

b. Shared Decisionmaking Responsibility. Responsibility distributed under the Federal and State constitutions among various levels of government and private individuals.

c. Image of the Future. Recognition of future needs and the role of the floodplain in the context of the physical, ecological, and socioeconomic systems of which it is a part. An image of the expected and desired future is prerequisite to selection and implementation of management strategies and tools.

d. Unique Decision Constraints. Mitigation of losses of life, health, and property from flooding and losses of natural floodplain values by unwise practices. Decisions affecting floodplains should seek to minimize these losses by evaluating individual strategies and combinations of all alternative strategies for:

(1) Mitigating flood losses by modifying:

-- floods or flooding

-- the susceptibility of people and their property to flood damage

-- consequences of flooding for the individual, the community, and the Nation; and

(2) Mitigating the loss of natural and beneficial floodplain values by modifying or designing actions to:

-- preserve existing floodplain values

-- restore degraded floodplain values

-- minimize harm to or within the floodplain.

e. Accounting. Accounting for (1) public and private, economic, social, and environmental benefits, costs values; (2) interrelated impacts likely to result from actions taken both within and outside the jurisdiction of local governments; and (3) tradeoff procedures used in arriving at decisions.

f. Motivation. Motivation of decisionmakers through use of incentives and disincentives. This includes such management tools as insurance and tax rates, grant and permit conditions, cost sharing ratios, and standards for alterations designed to prevent increased flood hazards, to minimize adverse impacts, and to restore and preserve natural floodplain values.

g. Coordination. Program coordination at and among all levels of government by agencies and their subunits charged with: (1) planning, (2) regulation, (3) implementation, (4) enforcement, (5) different functional areas such as water quality and water supply, (6) pre-disaster, during disaster, and post-disaster responsibilities, and (7) citizen participation and public information.

h. Evaluation. Evaluation of the floodplain management effort through a continuous program of monitoring and periodic reporting to the public and local officials.

B. Working Principles

Working principles set forth definitions and general statements providing guidance for floodplain management.

1. Definitions

a. Floodplains are the lowland and relatively flat areas adjoining inland and coastal waters, and those other areas subject to flooding.

b. Flood or flooding is a general and temporary condition of (1) partial or complete inundation of normally dry land areas from the overflow of inland and/or tidal waters and/or (2) the unusual accumulation of waters from any source.

c. Floodplain values are those natural and beneficial attributes associated with the relatively undisturbed state of the floodplain and include values primarily associated with water, living, and cultural resources.

d. Floodplain preservation is the prevention or modification of the natural floodplain environment or maintenance of the floodplain environment in a condition as close as possible to its natural state using all practicable means.

e. Floodplain restoration is the reestablishment of a setting or environment in which the natural functions of the floodplain can again operate.

f. Flood hazard is the potential for inundation and involves the risk to life, health, property, and natural floodplain values. Two reference base floods are commonly used: (1) For most situations, the base flood is that flood which has a one percent chance of being exceeded in any given year (also known as the 100-year flood); (2) for critical actions, an activity for which a one percent chance of flooding would be too great, at a minimum the base flood is that flood which has a 0.2 percent chance of being exceeded in any given year (also known as the 500-year flood).

g. Flood disaster assistance includes development of comprehensive preparedness and recovery plans, program capabilities, and organization of Federal agencies and of State and local governments to mitigate the adverse impacts of disasterous floods. It may include maximum hazard reduction, avoidance, and mitigation measures, as well as policies, procedures, and eligibility criteria for Federal grant or loan assistance to State and local governments, private organizations, or individuals as the result of the major disaster.

2. General Statements

a. Regarding floodplain use:

(1) Development in or adversely affecting floodplains should be avoided unless it is considered necessary from a public interest standpoint and unless no suitable alternative exists. Avoidance of development in high hazard areas is the preferred approach for minimizing losses to people, property and natural floodplain values.

(2) Existing and new developments should be treated differently. For much of the existing development, consideration should be given to appropriate modification of the flood hazard and restoration of floodplain values. In contrast, proposed development and new uses should be carefully regulated

to insure the harmonious development of floodplains by minimizing the hazards present and preserving the natural values.

(3) In selecting and implementing alternative actions, consideration must be given to immediate and long-term problems of developed and undeveloped floodplains in urbanized as well as rural areas.

(4) There is a moral responsibility upon all levels of government and nongovernmental interests to attempt to minimize the potential environmental and human losses associated with decisions affecting floodplains. Minimize means to reduce to the smallest amount possible using all practicable means.

(5) An acceptable degree of hazard differs with type of floodplain use. Selected uses are or can be made harmonious with certain flood characteristics.

(6) Capital and operating costs of floodplain management programs should be shared equitably among the beneficiaries, with a minimum of shifting of costs from the individual to the public and from local and State governments to Federal agencies.

(7) Consideration should be given to all tools to modify human occupancy of floodplains (nonstructural measures) and to modify flooding (structural measures) in seeking to manage flood losses and floodplain values. Some combination of these tools is often the desirable management strategy.

(8) Water conservation management opportunities should be identified and evaluated as part of the impact analysis for proposed actions that would significantly affect the quantity and quality of floodplain waters.

b. Regarding flood loss reduction:

(1) Complete control of floods is seldom realized -- there is always the threat of floods in excess of design standards.

(2) Severe loss is possible from larger floods of less frequency and from smaller floods of greater frequency than a standard base flood. Determining factors include onsite considerations such as valley shape, level of development, and type of use.

(3) Flood characteristics are likely to change as development and changes in land use take place in the watershed. Actions taken in a floodplain area can affect flood characteristics in other areas. Conversely, actions taken outside the floodplain can affect flood characteristics within the floodplain.

(4) Flooding on developed floodplains produces economic losses not only to the properties inundated but also in areas serving, served by, or accessible through a given floodplain.

(5) A variety of means, including regulatory tools adopted at national, State, and/or local levels, is needed to reduce flood losses and serve other aspects of floodplain management. (See Chapter IV.)

(6) Mitigation of flood disasters is most effective where a coordinated, site-appropriate mix of management tools is fully implemented before, during, and after a flood disaster.

(7) Flooding constitutes a threat to life, health, property, and peace of mind that should be carefully analyzed in planning floodplain use.

c. Regarding natural floodplain values:

(1) Floodplains provide for the natural moderation of floods, the maintenance of water quality, and the recharge of groundwaters.

(2) Floodplains support large and diverse populations of plants and animals which represent important renewable resources.

(3) The wetlands areas of floodplains are biologically very productive, because they contain elements of both terrestrial and aquatic habitats and provide vital breeding grounds for fish and wildlife.

(4) Floodplains contain cultural resources including archeological and historical sites, unique habitats for ecological study, open space, and recreation opportunities.

(5) Floodplains generally provide excellent resources for agricultural, aquacultural, and forestry production.

(6) Esthetic and other intangible attributes of floodplains have important social and economic values.

CHAPTER IV

STRATEGIES AND TOOLS AND ACHIEVING FLOOD LOSS REDUCTION

At a period when the Nation is particularly aware of allocating scarce resources among competing economic, environmental, and social needs, public and private decisions affecting floodplains must give explicit consideraton to the hazards to life and property. Proposed solutions to flood hazard problems must be evaluated in the context of all alternative strategies and of the technical, financial, and legal capabilities of all affected parties to carry out their responsibilities.

Legislative and administrative policies frequently cite two approaches -- structural and nonstructural -- for adjusting to the flood hazard. In this context, "structural" is usually intended to mean adjustments that modify the behavior of floodwaters through the use of measures such as public works dams, levees and channel work. "Nonstructural" is usually intended to include all other adjustments (e.g., regulations, insurance, etc.) in the way society acts when occupying or modifying a floodplain. Both structural and nonstructural tools are used for achieving desired future floodplain conditions. There are three basic strategies which may be applied individually or in combination: (1) modifying the susceptibility to flood damage and disruption, (2) modifying the floods themselves, and (3) modifying (reducing) the adverse impacts of floods on the individual and the community.

Because the land and water resources of the floodplain and the flood-related problems and needs are highly varied, different strategies must be used to achieve desired objectives in different settings. Within these strategies are a large variety of options or "tools" for enabling desired uses or changing the uses of the floodplain. Each situation is different, but the basic objectives of floodplain management cannot be realized without also lowering the direct or indirect adverse impacts of flood losses on the individual and the community to an acceptable level. In almost every community, some combination of strategies and tools is required to achieve the desired management objectives. Provision for each of the three phases of floodplain management -- interflood, during flood, and postflood recovery -- is essential.

Although these strategies and associated tools for floodplain management may be used to guide public and private decisionmakers, there is a prerequisite and perhaps less

obvious challenge, that of understanding the overall area's needs and goals, in identifying the likely role of the floodplain. Meeting this challenge requires formulation of assumptions about the future development of the area and region as well as sensitivity to impacts beyond the immediate consequences of an action. For example, in the past, flood-modifying works frequently failed to account for indirect social costs and environmental values destroyed, although both represent costs passed on to the public.

In recent years, there has been a trend toward increasing reliance on nonstructural measures and less reliance on structural measures. Section 73 of the Water Resource Development Act of 1974 (Public Law 93-251) has encouraged this trend by providing for cost sharing for nonstructural measures. Section 1362 of the National Flood Insurance Act of 1968 (Public Law 90-448) has also encouraged this trend by providing authority to purchase high risk flood damaged properties after a flood. Present actions by Federal agencies to reduce the Federal level of financial assistance and to require non-Federal interests to share more of the costs of implementing structural measures may also tend to encourage local agencies to implement their own nonstructural measures.

It must be realized, however, that some degree of flood loss potential remains, regardless of how carefully floodplain management programs are formulated. Appropriate selection from the following strategies and tools is predicated on these understandings.

A. Modify Susceptibility to Flood Damage and Disruption

The strategy to modify susceptibility to flood damage and disruption consists of actions to avoid dangerous, uneconomic, undesirable, or unwise use of the floodplain. Responsibility for implementing such actions rests largely with the non-Federal sector.

These actions include restrictions in the mode and the time of day and/or season of occupancy; in the ways and means of access; in the pattern, density, and elevation of structures and in the character of their materials (structural strength, absorptiveness, solubility, corrodibility); in the shape and type of buildings and in their contents; and in the appurtenant facilities and landscaping of the grounds. The strategy may also necessitate changes in the interdependencies between floodplains and surrounding areas not subject to flooding, especially interdependencies regarding utilities and commerce.

Implementing tools for these actions include land use regulations, development and redevelopment policies, floodproofing, disaster preparedness and response plans, and flood forecasting and warning systems. Land treatment measures, though discussed as part of the strategy to "Modify Flooding" (Section IV-B-5), can also function to modify susceptibility to flood damage. Different tools may be more suitable to developed or underdeveloped floodplains or to urban or rural areas. Special effort has been made here to increase the public's use, awareness, and understanding of these tools.

1. Floodplain Regulations

Floodplain regulations are efficient tools for modifying future susceptibility to damage both on floodplains that are not fully developed and on highly developed floodplains where older structures are being rehabilitated. By providing direction to growth and change, regulations are particularly well-suited to preventing unwise floodplain occupancy. Land use regulation requires that individuals recognize the general welfare when making decisions. Because extensive legal treatment of floodplain regulations and their adoption is given in prior studies, only the essential ideas are presented here. 2/ A combination of regulatory tools is necessary to control development in floodplains, and regulatory tools are frequently utilized in combination with other techniques.

Floodplain regulations which are part of broader land use regulations can be applied effectively only by State and community action; they are increasingly required under ongoing Federal programs as a prerequisite to other assistance. Administration of floodplain regulations adds only a small incremental cost where other ordinances are already being administered and these costs are characteristically small in relation to the flood damage problem.

To some degree, individual opportunity foregone is a cost of all land use regulations. The net economic cost, i.e.,

2/ Water Resources Council, Regulation of Flood Hazard Areas, Vols. 1, 2, and 3, 1971, 1972, and 1983; Federal Insurance Administration; "Statutory Land Use Control Enabling Authority in the States: (Mimeo), 1975; and Corps of Engineers, A Perspective on Floodplain Regulations for Floodplain Management, 1976.

reflecting externality costs, of reducing the intensity of use may be large or small. This cost depends on the availability of alternatives to a floodplain location.

To be effective regulations must be based on suitable data, must be equitably applied, and should permit reasonable use of the land (not necessarily highest economic return). Nonconforming uses can be handled by recognition in the ordinance, by amortization provisions that lead to removal over a predetermined period, or by purchase.

The regulatory aspects of floodplain management programs are sensitive to political pressures for change in favor of individuals, but they can be effective when equitably reinforced at all government levels. Several types of police power regulation are in use at some State or local levels to regulate land uses in flood hazard areas. A brief discussion of these tools follows.

a. State Regulations for Flood Hazard Areas

A variety of State level regulations for land use in flood hazard areas have been enacted. (Also see pages VII-7-11.) In some States general legislation establishes floodplain regulatory programs that provide the basic framework of guidelines and provisions for local implementation. Under these programs States provide advice, assistance, and model ordinance provisions which may be incorporated into local regulations compatible with statewide objectives and standards. Generally, State programs require a permit from a technically staffed State agency for specified proposed uses that would interfere with the channel or floodplain capacity for passing floodwaters. For these regulations, floodway or encroachment line standards are most significant. Many State boards of health regulate the use of private and public waste disposal systems. Some health boards prohibit private systems in areas subject to high ground water or flooding. Floodplain, wetlands, water quality, and coastal zone management often have common objectives and reinforce each other.

b. Local Regulations for Flood Hazard Areas

The principal local control of flood hazard areas is through zoning, subdivision regulations, building and housing codes, and sanitary codes with specific flood hazard provisions.

(1) Zoning divides a government unit into specified areas for the purpose of regulating (a) the use of

structures and land, (b) the height and bulk of structures, and (c) the size of lots and density of use. Zoning may be used to set special standards for land uses in flood hazard areas including specification of minimum floor elevations. Floodplain zoning may be single district, two-district, or multi-district, but single and two-district are the most common (i.e., "floodway" and "flood fringe").

Administration of riverine floodplain zoning ordinances is simplified by the designation of floodway or floodplain encroachment limits. Floodway limits are designated so that any development which is permitted in the remainder of the floodplain (i.e., within the flood fringe) will not result in a stage increase (i.e., height) over a prescribed amount of a specific frequency flood at any location along the stream. The allowable stage increase that is prescribed is usually the flood having a one percent chance of being exceeded in any given year.

Although the floodway as such does not apply in coastal areas, there is a parallel for high hazard coastal and lakeshore areas where the major forces of tides and waves come into play and where the erosional changes are at a maximum during flooding. The coastal area maps prepared by the National Flood Insurance Program identify such areas as "coastal high hazard areas."

(2) Subdivision Regulations guide the division of large parcels of land into smaller lots for the purpose of sale or building. Often the community's jurisdiction is extended beyond its boundaries by subdivision-enabling legislation. Such extension provides coverage usually unavailable through zoning.

Subdivision regulations guide the process of land division to assure that lots are suitable for intended use without putting a disproportionate burden on the community. They also control improvements such as roads, sewers, water, and recreation areas. Subdivision regulations often require (a) installing adequate drainage facilities, (b) showing the location of flood hazard areas on the plat, (c) avoiding encroachment into floodplain areas, (d) determining the most appropriate means of elevating a building above the regulatory flood height in accordance with

sound engineering practice, and (e) placing streets and public utilities relative to the selected flood protection elevation.

(3) Building Codes regulate neither the location nor the type of development; rather, they control building design and use of construction materials. Building codes can reduce flood damages to structures by setting specifications to (a) require suitable anchorage to prevent flotation of buildings during floods, (b) establish minimum protection elevations for the first floor of structures, (c) require electrical outlets and mechanical equipment to be above regulatory flood levels or to be appropriately floodproofed, (d) restrict use of materials that deteriorate when wetted, and (e) require an adequate structural design, one that can safely withstand the effects of water pressure and flood velocities. General floodproofing requirements (as performance standards) are sometimes included in floodplain zoning ordinances rather than in building codes. Building codes have an added value in that they also may be used to require flood protection to below-ground spaces in areas beyond the regulatory area but still within the zone of sewer backup and flood-elevated groundwater.

(4) Housing Codes, like building codes, set minimum standards for construction, but they also set minimum standards for maintenance of structures. These may be used to require repair of flood-damaged structures in a manner that will ensure the safety of occupants and prevent blight.

(5) Sanitary and Well Codes establish minimum standards for water disposal and water supply. Sanitary codes commonly prohibit onsite waste disposal facilities such as septic tank systems in areas of high groundwater and flood hazards. Sometimes elevation or floodproofing requirements are established for public sewer systems. Well codes often establish special floodproofing requirements for facilities located in flood hazard areas in order to reduce their potential for contamination during flooding.

(6) Other Regulatory Tools are available to reduce flood losses and promote sound management of floodprone lands. Special statutes might require that sellers or real estate brokers disclose flood hazards on marketed lands. For example, the Department of Housing and Urban Development program for Interstate Land Sales Registration now requires

that natural hazards be included in the statement filed with the Department of Housing and Urban Development and that such information be made available to the purchaser or potential purchasers. Official maps might be more widely used to reduce land acquisition costs by designating areas where structural development is planned for reservoirs, dikes, levees, parks, or other public uses.

2. Development and Redevelopment Policies

Other public actions not necessarily employing the police power can modify susceptibility to flood damage and guide development in a manner that takes into account the flood hazard and the natural characteristics of the floodplain. Such actions may be applied at the local, State, and Federal levels through the design and location of utilities and services, through policies of open space acquisition and easement, and through redevelopment or permanent evacuation. These measures are normally required in any viable community, but in this context they should reflect the flood hazard.

a. Design and Location of Services and Utilities reduce flood loss potentials by guiding private and public developments (hence public services and utilities) to low risk areas or areas not subject to flooding. Local governments can exercise discretion in extending roads or sewer and water mains or their access in flood hazard areas. State and Federal agencies also can impose conditions on loans, grants, and permits in order to restrict service in flood hazard areas. Locating libraries, schools, post offices, and other public and government facilities away from the flood hazard area not only lessens the possibility of flood damages to such buildings but prevents them from otherwise encouraging private development in areas prone to flooding.

b. Land Rights, Acquisition, and Open Space Use lessen the potential for flood losses and their consequences. Land is purchased directly, or control is purchased through easements or development rights, for the purpose of precluding future uses incompatible with floodplain management programs and for the purpose of providing open space. In the short run, acquisition may be a costly substitute for regulation but the best tool in certain circumstances, and it may be the only acceptable approach if the proposed use has a specific non-flood-related purpose, such as for public use areas. Easements are being used in some situations to continue agricultural use of the land. Regulations cannot be used to change ownership from private to public.

c. Redevelopment may offer tool for improving floodplain areas blighted for reasons that may or may not include exposure to flooding. Usually the motives for redevelopment are broader than just flood damage reduction. However, the principles of floodplain management can be accomplished in the process. Disaster assistance, urban redevelopment, economic development, and other community development activities as well as flood insurance support should be coordinated in such situations. The opportunities for and justification of redevelopment should not be overlooked. Redevelopment may help to achieve at least some of the floodplain management objectives by improving both economic efficiency and the natural environment.

d. Permanent Evacuation, like redevelopment, of which it may in fact be part, is presently less common than other tools except perhaps for small, isolated sectors of nonconforming uses. To the extent permitted by statute, Federal agencies should provide encouragement for relocation of structures and facilities from floodways and perilous floodprone areas, leaving such areas for open space uses. It is important that existing opportunities are not overlooked. In some instances, permanent evacuation of floodplain areas may be the only economically feasible alternative. At a minimum, this tool provides a means of evaluating the options for using other tools.

3. Disaster Preparedness

Preparedness plans and programs provide for pre-disaster mitigation, warning and emergency operations. Training at all levels, public information activities, and readiness evaluations are all tools available within disaster preparedness. Other concerns include research, review and coordination of Federal, State, and local disaster preparedness plans and programs, and post disaster evaluation. Success of this planning is closely associated with the degree to which individuals, local governments and States protect themselves by taking appropriate hazard mitigation measures and obtaining flood insurance coverage to supplement or replace government assistance. Such plans and programs usually involve the designation by the mayor or county executive of a coordinating officer to work with State and Federal program officials. While it is most desirable to develop preparedness and recovery programs prior to flood disasters the opportunity should be seized when such disasters occur to design recovery and redevelopment activities that will reduce or eliminate future flood hazards.

4. Disaster Assistance

Disaster assistance may be provided by Federal, State, or local governments and certain nonprofit organizations to repair, replace, or restore facilities damaged or destroyed by a disaster. Flexibility may exist after a disaster to construct other needed facilities in lieu of restoring the damaged or destroyed facilities. Post disaster evaluation may provide the opportunity for the implementaton of innovative hazard mitigation strategies. Permanent restorative work to restore damaged facilities should be in conformity with current applicable codes, specifications, plans, and standards. Acquisition of properties that have been frequently or extensively damaged also should be considered.

5. Floodproofing

Floodproofing can provide for development in lower risk floodplain areas by keeping damage within acceptable limits. It can be chosen by an individual, a community, or State or Federal agency for existing structures as well as new construction.

Floodproofing consists of modifications of structures, their sites, and building contents to keep water out or reduce effects of water entry. Such adjustments can be installed when buildings are under construction or during repair, remodeling, or expansion of existing structures. Floodproofing may be permanent (e.g., bricked-in openings) or it may be contingent on some action at the time of flood. The adjustment may be by elevation (on fill or open work such as piling), by appropriately constructed ring dikes or their equivalent, or by waterproofing (closure, seals, pumps, valves or pipes, etc.), or other measures.

Like other methods of adjusting to floods, floodproofing has limitations. It can generate a false sense of security, and residual losses may be very high. A primary purpose of floodproofing structures is to reduce property losses and to provide for early return to normalcy after floods have receded rather than for continuous occupancy. Only very substantial and self-contained structures should be occupied during a flood. Unless correctly used, floodproofing can increase unwise use of floodplains. Applied to structurally unsound buildings, it can result in more damage than would occur without floodproofing. The appli-

cation of economic criteria is more likely to justify floodproofing for commercial structures than for residential structures. Usually it is applied to individual structures, but it is only partially effective unless it is also applied to means of access. Access to buildings should be passable at least in floods up to the magnitude used in setting floodproofing elevations. For example, to meet National Flood Insurance Program criteria, floodproofing of structures must protect against the flood with a one percent chance of being exceeded during any given year. Floodproofing should never protect some property owners while aggravating the hazard for others.

6. Flood Forecasting and Warning Systems and Emergency Plans

Flood forecasting systems have been established for the major river systems in the United States. These systems provide information on the time of occurrence and magnitude of flooding to be expected. On major rivers where the flood crest moves slowly, warnings are provided several days to a few weeks in advance of the event. For smaller tributaries, warning times decrease to a matter of a few hours and probably not more than a day or two at a maximum. On short headwater streams with steep channel gradients, flash flood warnings may be possible only a few hours or even a few minutes in advance of the event. Community warning systems can be established for such conditions, but the short interval available for warning and response demands even tighter advance planning and preparedness than is required areas with longer warning periods.

The effectiveness of flood warnings depends upon the effectiveness of their dissemination to the public, the time available, and the actions taken in response. At a minimum, local officials, police, fire and rescue squads, and radio and television stations are notified. Warnings must be effectively presented.

The success of flood forecasting and flood warning systems depends upon having an emergency action plan and attendant implementing organization in place before a flood occurs. The emergency action plan must be looked upon by the flood prone community as its plan since only the local community can make the plan work. The emergency action plan must recognize that as the length of warning period decreases, the opportunity for emergency action including temporary evacuation diminishes accordingly. In many cases contingency and emergency floodproofing and the removal of goods and inhabitants are possible with sufficient warnings, but flash floods may permit only the evacuation of inhabitants.

B. Modify Flooding

The traditional strategy of modifying floods relies upon the construction of dams; dikes, levees, and floodwalls; channel alterations; high flow diversions and spillways; and land treatment measures. These tools permit changes in the volume of runoff, in the peak stage of the flood, in the time of rise and duration, in the extent of the area flooded, in the velocity and depth of floodwaters, and consequently in the amount of debris, sediment, and pollutants that floods carry. While the effectiveness of these tools in protecting property and saving lives has been demonstrated repeatedly, sole reliance upon a flood modification strategy is neither possible nor desirable.

Flood modification (structural) measures acting alone leave a residual flood loss potential within the remaining floodplain and add the risk of rare but potentially devastating damages from structural failure or from uncontrolled flows of major storms. Unless accompanied by appropriate nonstructural measures, the structural measures could lead to a false sense of security and encourage floodplain landowners to develop inappropriate uses of their lands. For this reason, some form of land use regulations and other appropriate nonstructural measures should accompany the implementation of structural measures.

1. Dams and Reservoirs

Storage of floodwaters in reservoirs causes the broadest range of flood-modifying effects such as reduction in flood flow rate, extent of area flooded, timing, etc. Except in the area immediately downstream from the dam, however, storage may not provide as high a degree of relief from flood damage in specific areas as may be achieved by other more localized tools. Flood storage may function alone, in groups, or with other tools.

Release of water detained by dams may be at a fixed rate, or it may be varied to accommodate changing downstream conditions during a flood. Dams and reservoirs also have potential for wide multiple-purpose uses that more localized measures may not achieve. In some already well-developed valleys, storage provides the only significant means of reducing the flood damage potential for widespread areas short of removing the potential for damage from the floodplain.

In addition to the large areas of land that they occupy, reservoirs may also modify stream behavior and habitat in

both beneficial and adverse ways. These facilities may reduce or contribute to downstream erosion, and sediment accumulation in the reservoir is a significant consideration in engineering design for long-term effectiveness.

2. Dikes, Levees, and Floodwalls

Dikes, levees, and floodwalls protect a portion of the floodplain from flooding, up to a design level. These works may have adverse as well as beneficial effects. They can increase the height of the flood immediately upstream, across the stream, and downstream by reducing the amount of floodplain area available for overbank floodwater conveyence and/or storage. Their appeal lies in their direct and specific results. Sometimes emergency dikes are built following a flood forecast; although they may be effective for the emergency, they should not be considered as permanent flood protection measures.

Dikes, levees, and walls cannot feasibly be built high enough to provide protection against all floods, and the consequences of their overtopping and failure during a major flood may be grave. They may require expensive pumping facilities to handle the storm water collecting behind them. They can cut off river views and access and are not as adaptable to multiple-purpose uses as are reservoirs. Experience shows that levees often have to be increased in height if channel aggradation takes place or if originally planned upstream storage reservoirs are not built because of loss of the sites to development or lack of public support for their construction.

3. Channel Alterations

In some situations channel alterations may be the only feasible structural tool for protecting the area subject to flooding. Because channel alterations can accelerate the quantity and/or velocity of flow through an area, they may increase the flood impacts on downstream reaches. Enlarging a channel and shortening its course disturbs the stream regimen and in turn, the existing ecology. To assure proper channel functioning, snagging and clearing operations may be necessary. Maintenance costs may be high unless the channel and stream banks are stable. Use of concrete or stone where necessary for stabilization increases construction costs and may be esthetically undesirable in some locations.

4. High Flow Diversions

High flow diversions typically redirect excess flows away from developed areas using natural or artificially constructed bypass channels or conduits. Physical opportunities for application of flood flow diversions are limited. Where such measures can be employed, they may be least objectionable from an environmental standpoint if they minimize the destruction of the land-water interface in the natural channel. However, in some circumstances, such diversion may sharply alter downstream flow patterns and discharges, thereby producing unwanted environmental effects. Where communities are not adequately protected from flooding by diversion, additional measures may be required.

5. Land Treatment Measures

Land treatment measures modify floods by increasing infiltration and decreasing the amount and rate of runoff. These measures may also be viewed as modifying susceptibility to flood damage. They include vegetative cover, runoff interceptors and diversions, small detention and erosion control structures, terraces, and cropping management practices (which also serve to modify susceptibility to flood damage). They are effective in small headwater areas and function in combination with other measures to ameliorate flood conditions in larger watersheds. In most respects, land treatment measures produce changes in the broad range of flooding effects, although they become less effective as flood size increases. They can be especially important in reducing erosion and the resulting amount of sediment and pollutants carried downstream.

6. Onsite Detention Measures

Whereas land treatment measures are appropriate primarily in non-urban areas, onsite detention measures can provide temporary storage of urban runoff waters, extending the period of runoff with the intent of reducing flood peaks. The temporary storage of runoff may also result in increased infiltration. These measures may take the form of earthen or paved holding areas integral to or adjacent to the site. A growing number of urban communities are including onsite detention requirements in land development ordinances. Effective implementation of these measures includes providing for continuous maintenance, determining the drainage area to be served by a single structure, and determining the effects of detention on the timing of runoff in different segments of the watershed.

C. Modify the Impact of Flooding on Individuals and the Community

A third strategy for mitigating flood losses consists of actions designed to assist individuals and communities in their preparatory, survival, and recovery responses to floods. Tools include information dissemination and education, arrangements for spreading the costs of the loss over time, and purposeful transfer of some of the individual's loss to the community. The distinction between a reasonable and unreasonable transfer of costs from the individual to the community, as described under the preceeding section on regulations, is a key to floodplain management.

1. Information and Education

Flood hazard information is a prerequisite to sound floodplain management. The development of needed technical information and public education, especially by or for the officials and planners who will have the major task of interpreting and applying it, are essential in an effective floodplain management program. Although available in many forms and from many sources, such information unfortunately is neither of uniform quality nor available for all areas. Vital information includes the hydrology and hydraulics of small, large, and very large floods on the areas subject to inundation, on the floodplain's resource attributes, on the role of the floodplain within its region, and on the potential impact of land use decisions on expected flooding. From this information, alternative floodplain management approaches can be formulated by the responsible government and private decisionmakers. Better information on property at risk and probabilities of various levels of loss can help to translate the hazard into terms that stimulate appropriate local action. Federal, State, and local agencies and private consultants are all providing this sort of information with major emphasis on the more technical aspects of hydrology and hydraulics provided by the Federal agencies.

2. Flood Insurance

Insurance is a mechanism for spreading the cost of losses both over time and over a relatively large number of similarly exposed risks. Until 1969, insurance against flood loss was generally unavailable. Under the National Flood Insurance Program, initiated in 1968 and significantly expanded in 1973, the Federal government makes

flood insurance available for existing property in the flood hazard area in return for enactment and enforcement of floodplain management regulations designed to reduce future flood losses and regulate new development in the designated flood hazard area. Under the 1973 legislation, communities must become eligible under the program within one year after identification of floodprone areas by the Federal Insurance Administration or risk the denial of direct Federal financial assistance for buildings and mobile homes in areas identified as being floodprone. To become eligible for participation in the National Flood Insurance Program, communities must agree to adopt and enforce floodplain management regulations consistent with program criteria.

By emphasizing the long-term advantages of wise floodplain use and by providing a mechanism for widespread risk sharing, the National Flood Insurance Program provides persuasive strength and beneficial emphasis to floodplain management. First layer insurance coverage is made available at subsidized rates to property owners whose location decisions and building construction were completed before identification of the specific nature and extent of their flood hazard. First and second layer insurance coverage is made available at actuarial rates to property owners of new buildings. Insurance may not be sold in areas designated under the Coastal Barrier Resources Act. Specific information is provided to potential owners of floodprone properties about the economic costs of locational decisions, and thus serve to discourage unwise construction in hazardous floodplain areas. The program's floodplain managment provisions help reduce flood losses and the dependency upon public support and should make continuation of its insurance features manageable through cooperating private insurers.

3. Tax Adjustments

Tax adjustments at the Federal, State, or local level can play an important role both in influencing decisions about floodplain occupancy and in providing relief to individuals. Tax provisions can be used to encourage appropriate use and discourage inappropriate use. It is highly important that the tax structure recognize the regulatory aspects of the program so that the latter are reinforced; e.g., low density use achieved by regulations can be supported by low tax for such use. Amortization provisions can be applied to nonconforming uses. Financial relief can be found in provisions for claiming losses in Federal and State income taxes and through special allowances on real estate taxes following a flood.

4. Flood Emergency Measures

Preparation for floods and flood-fighting plans, including contingency and emergency floodproofing, can be completed in anticipation of flooding for areas where flood warning time permits these actions. They must be properly integrated with emergency evacuation plans of the type mentioned previously in Section A.3. Temporary earthen dikes are an examples of an emergency measure. Flood fighting has been effective in helping communities to survive a flood. But opportunities for successful flood fighting are limited by flood characteristics, the physical nature of some flood problem areas, and the large manpower, fiscal, supply, and equipment requirements. It should also be recognized that one of the functions of overall floodplain management is to reduce the need for this type of emergency action, which at best is stopgap.

5. Postflood Recovery

Like other aspects of floodplain management, postflood recovery requires a plan. Public facilities and services are restored and aid given to individuals. Aid from public and quasi-public agencies is often in the form of donations of flood and clothing or grants and loans (which may be counterproductive if used to rehabilitate damaged structures or property located in high hazard areas). Relief may also be in the form of tax adjustments. Although relief does not directly reduce flood losses, it does reduce the overall loss impact by shortening the period of disruption and by accelerating the return to normalcy. Under the provisions of Public Laws 92-234 (Flood Disaster Protection Act) and 93-288 (Disaster Relief Act of 1974), property owners in a flooded community may be required to purchase and maintain flood insurance as a condition for obtaining Federal financial assistance.

Accordingly, a Federal interagency agreement provides that following a presidentially declared disaster, an interagency hazard mitigation team will assess the flooding situation and recommend ways in which Federal program funds should be used to avoid action which will recreate previous high risk conditions and will take advantage of existing long term area and basin plans for reducing flood losses.

In addition, it is essential that plans for post-flood recovery recognize opportunities to eliminate submarginal development and proceed with reconstruction in a way that will minimize future flood exposure. When there is a presidentially declared flood disaster, an

Interagency Flood Hazard Mitigation Team is assigned to prepare a Post-Flood Hazard Mitigation Report. These reports identify opportunities for breaking the cycle of destruction, reconstruction of structures at risk, and destruction again. The plans include suggestions as to how these opportunities can be implemented. Flood disaster and emergency response planning should consider both economic and social disruption and inflated construction costs that may result from a disaster of significant size.

CHAPTER V

FLOODPLAIN NATURAL VALUES, STRATEGIES, AND TOOLS FOR MANAGEMENT

Floodplains, including their land and water ecosystems, have evolved from natural forces over tens of thousands of years. Yet, after two centuries of our Nation's history, the natural values of most of our floodplains have been significantly altered by human actions and in many cases degraded or destroyed. Thus, there is a national concern to carefully manage the remaining natural values of floodplains. However, before careful management can be undertaken, it is necessary to understand floodplain natural values, their vulnerability, the two basic strategies of preservation and restoration, and the available management mechanisms and tools.

A. Natural and Beneficial Floodplain Values

Surface waters, their floodplains and their watersheds must be viewed as parts of one ecological system. This system exists in a state of dynamic equilibrium. If one of the parts of the system is disturbed, the entire system will readjust toward a new equilibrium. This is true of coastal, river, and lake systems. The geological and biological effects of the system's readjustments toward its new equilibrium are often felt far from the original site of the distrubance and can last for decades. For this reason, if for no other, floodplain development and modification should be viewed with caution and with careful assessment of the potential adverse impacts on natural values.

Floodplains in their natural or relatively undisturbed state provide three broad sets of natural and beneficial resources and hence resource values: (1) water resources values including natural moderation of floods, water quality maintenance, and groundwater recharge; (2) living resources values including large and diverse populations of plants and animals; and (3) cultural resource values including historical, archeological, scientific, recreational, and esthetic sites in addition to sites generally highly productive for agriculture, aquaculture, and forestry where these uses are compatible with natural values.

1. Water Resources Values

a. Natural Flood Storage and Conveyance.

The characteristics of the floodplain and of flooding are closely interdependent. Floods shape floodplain topography and soils and influence ecology. In turn, the physical characteristics of the floodplain shape flood flows. Except in narrow, steep valleys and areas of coastal bluffs, floodplains provide a broad area to spread out and temporarily store floodwaters. This reduces flood peaks and velocities and the potential for erosion. In their natural vegetated state, floodplains slow the rate at which the incoming overland flow reaches the main water body. They also accommodate the natural phenomena of stream meander and beach drifting.

b. Water Quality Maintenance.

Floodplains serve important functions in protecting the physical, biological, and chemical integrity of water. Water that runs off quickly over the surface, as on a barren floodplain, is capable of carrying with it large amounts of sediment and debris to the main water body. A vegetated floodplain, however, slows the surface runoff, causing it to drop most of its sediment load on the floodplain. Vegetation also filters incoming floodwaters. Much of the sediment originating on the land drops out, as well as some of that scoured from the channel bank and bed. This filtering process may add rich nutrients to the floodplain soil. However, excess nutrients entering the stream in runoff can accelerate eutrophication in downstream lakes and reserviors.

Some of the specific water quality maintenance effects served by undisturbed floodplain include:

- Pathogens and toxic substances entering the main water body through surface runoff and accompanying sediments are decreased.

- Burial of biologically suitable sand and gravel stream bottoms by silts and clays is less likely.

- Damaging temperature rises caused by absorption of radient energy in muddied waters are reduced.

- Dissolved oxygen levels needed for desirable aquatic species are enhanced.

- The rate of photosynthesis in the stream is improved.

Another example of water quality maintenance is the beneficial shading effect of riparian (streambank) vegetation, which helps to avoid temperature stress on natural biota.

c. Groundwater Recharge

The natural floodplain has surface conditions favoring local ponding and flood detention, plus subsurface conditions favoring infiltration and storage. The slowing of runoff across the floodplain allows additional time for the runoff to infiltrate and recharge available groundwater aquifiers, when there is unused storage capacity. The slowing of runoff provides the additional benefit of natural purification of water as local runoff or overbank floodwater infiltrates through the floodplain alluvium. Natural purification comes from filtration, ion exchange, adsorption, absorption, and aerobic and anaerobic biological action. This value extends into nonflood periods as groundwater discharge acts to naturally regulate the flow in a river or the level of a pond. In other words, during periods of abundant water, the water can enter the groundwater system whenever there is available capacity rather than contribute to seasonal flood peaks; during low flow periods, the water flows from the higher groundwater system into lower surface waters, so that the frequency and duration of extremely low flows is reduced.

2. Living Resources and Habitat Values

The Nation's coastal and riverine floodplains support large and diverse populations of plants and animals. In addition, they provide habitat and critical sources of energy and nutrients for organisms in adjacent and downstream terrestrial and aquatic ecosystems. The wide variety of plants and animals supported directly and indirectly by floodplains constitutes an extremely valuable, renewable resource important to economic welfare, enjoyment, and physical well-being.

The floodplain is biologically important because it is the place where land and water meet and the elements of both terrestrial and aquatic ecosystems mix. The detritus provided by headwater woodlands frequently provides the major source of nutrients and energy that sustain production in woodland streams. Nutrients and energy that enter these upstream areas find their way far downstream into larger rivers and lake via the aquatic food chain. Shading of the stream by floodplain vegetation moderates

water temperatures; roots and fallen trees provide instream habitat, and near stream vegetation filters runoff, removing harmful sediments and buffering pollutants, to further enhance instream environments.

Coastal floodplains are widely recognized for their value to many estuarine and marine fisheries. Here also floodplains, both riverine and coastal, provide much of the nutrients and energy for aquatic estuarine environments. Estuarine wetlands serve as breeding, nursery, and feeding grounds for estuarine and marine fisheries, and coastal floodplains are extremely important to waterfowl, furbearers, and other wildlife species.

It is apparent from the foregoing discussion that floodplain wetlands and other riparian areas play an extremely important role in maintaining fish and wildlife populations in adjacent uplands and in supplying energy and nutrients to riverine, lacustrine, and estruarine systems. Yet, it is probably reasonable to assume that from 70 to 90 percent of all natural floodplain habitats have been extensively altered. To protect those remaining will require the best efforts of all involved in floodplain planning and management.

3. Cultural Resources Values

Floodplains contain cultural resources important to the Nation and to individual localities. Native American settlements and early cities located along the coasts and rivers in order to have access to water supply, waste disposal, water transportation, and transshipment. Consequently, floodplains include most of the Nation's earliest archeological and historical sites. In addition to their historical richness, floodplains may contain invaluable resources for scientific research. For example, where floodplains contain unique ecological habitats, they make excellent areas for scientific study. The bedrock geology of the area may also be exposed in the floodplain. The bedrock geology of the area may also be exposed in the floodplain. Floodplains may provide open space community resources. In urban communities they may provide green belt areas to break urban develoment monotony, absorb noise, clean the air, and lower temperatures. Floodplain parks can also serve as nature study centers and laboratories for outdoor learning experiences.

Because of their scenic value and locational and other beneficial characteristics, some of which are unique, floodplains are attractive for recreation. Water-oriented

sports, boating, and swimming can be based in a natural floodplain park which also may be suitable for hiking and camping. Floodplain wildlife resources can be managed for observation as well as for recreational hunting and fishing. Finally, natural floodplains are valued as constituents of the "wilderness experience" important in the American culture.

It should be noted that most of the natural water, plant and animal, and cultural values of floodplains discussed above do not benefit just one specific site. The natural value benefits extend throughout the river system or coast, affecting many citizens and communities. Further, most of these primary benefits have secondary benefits connected with them.

Floodplains also provide an excellent resource base for agricultural, aquacultural, and forest production. However, the flood risk must be considered for these uses and operations adjusted accordingly. The natural processes of sediment transport and deposition tend to replenish floodplain soils with nutrients. Agricultural operations are made easier by gently rolling terrain, and surface and groundwater supplies are more readily available. Aquacultural operations have grown into a viable industry producing a wide variety of aquatic crops. Bottomland hardwoods and associated species, which flourish in close proximity to water, are important to the timber industry and the overall economy of the country. Thus, sound management of agricultural, aquacultural and forest resources in the floodplain is essential.

B. Vulnerability of Natural Floodplain Values

Natural system processes are not constant. Streams, lakes, and oceans flood adjacent lands. Earthquakes alter land forms and drainage. Much thinking about resource values, specifically floodplain resources, however, fails to recognize the effects of these natural interruptions, but rather is concerned with intervening relatively stable periods when the long-term effects of physical processes tend toward equilibrium and the biological processes of recovery.

Human intervention in the floodplains can be equated in part to these extremes of nature, in that it can lead to major disruptions, largely accelerations, of natural processes. But whereas recovery ordinarily proceeds following natural interruptions, recovery is not likely after human interventions. The major difference is that the changes

brought about by human intrusions and their accompanying works remove conditions under which natural processes can continue. Natural spaces occupied by buildings, roads, farmlands, and various facilities are altered in at least a semipermanent way.

Construction projects on the floodplains cause an acceleration in erosion, as though the floodplains were subjected to large floods and waters were largely cut off thereafter in the manner of a prolonged drought. The trend toward equilibrium between erosion and deposition erosion and deposition in the stream system and from the valley slopes is no longer possible. In the worst case, poisons not found in nature are introduced, but most effects of pollution are untimely contributions of concentrated pathogens, chemicals, and heat.

Nature's extremes are as much a part of its process as are the period of adjustment in between. It is not possible nor desirable from the standpoint of natural floodplain values to eliminate these extremes. It is only where man has invested in the development of floodplain resources that these extremes of nature become important. However, human occupancy can be managed to minimize the effects of natural disruptions and even to help nature heal the wounds of natural as well as manmade disruptions. The following descriptions of resource vulnerability should be viewed in this context.

1. Water Resources

Three general kinds of adverse outcomes from development and modification of natural floodplains bear on the condition or degree of resource vulnerability: (1) increased runoff generally accompanies any activity involving widespread clearing (with or without compaction), wetlands destruction, dune removal, paving, and roofing; (2) runoff is blocked or groundwater movement is interrupted; and (3) pollution loadings on the resources are increased.

Actions that accelerate runoff reduce the amount of water entering the ground unless the ground is already saturated. Frequently, these actions may cause increases in flood peaks, in stream erosion, and in the sediment loading of receiving waters. During warmer months, when water temperature may be critical to oxygen levels, runoff temperatures are raised in flowing over pavement or roofs. Also, the cleansing action of vegetation on runoff is diminished in proportion to these accelerating factors.

Blocked runoff or interrupted groundwater flow may result from deep foundations, buildings, road and other fills, dikes, and dams. To the extent that these structures impede stream flow, they can raise floodwater profiles. If structures retard runoff, they contribute to saturated conditions and "closed" ponding, as well as increased temperatures and pollution loadings. If structures extend deeply into floodplain alluvium, intentionally or not, they can cut off the movement of groundwater (some are intended to do so) and hence interfere with both groundwater recharge and discharge of groundwater into streams or other water bodies. If structures intercept the shorezone, they interfere with the distribution of sediment, which is so important to natural shore development.

Increased pollution loadings further degrade the surface water ecosystem. Fertilizers, chemical and petroleum spills, and leached products of waste disposal areas can go directly into receiving waters either in solution or carried on sediments. They concentrate in ponds and combine with higher temperatures and lowered photopenetration to burden the dissolved oxygen in receiving waters.

2. Living Resources

Development and modification of the floodplain have direct impacts on living resources. In addition to problems related to sedimentation, which may bury food sources and spawning areas; and pollution, which can poison and deprive living resources of oxygen; human use and development can have the following effects. First, human actions typically remove cover, and hence shelter, for game. Second, barriers to movement of animals are inserted between their preferred habitat and water bodies. Third, food sources are eliminated. Some of these impacts may not be localized, but may extend well beyond the site of a development actions. This is so because floodplain wetlands are major sources of flood and breeding habitat for both saltwater and freshwater fish and for many types of wildlife.

3. Cultural Resources

The adverse impacts of floodplain development and modification on values associated with cultural resources have often been overlooked. Accelerated runoff, blocked runoff, interrupted groundwater flow, and increased pollution loadings frequently destroy or degrade educational sites (historical, archeological and scientific) and esthetic qualities (urban open space and sound absorption). Poor agricultural, aquacultural, and forestry land use practices

can be just as destructive of floodplain values as the more obvious structural forms of development.

C. Strategies for Managing Floodplain Natural Values

In some cases, the floodplain is the only practicable location for a proposed activity, as in the case of water intakes and outlets, stream gauging stations, port facilities, and the like.

If such a location is necessary, care should be taken to build, wherever possible, in an area where development has already taken place, so that the remaining natural and beneficial floodplain values will be disrupted as little as possible.

Where location in the floodplain is the only practicable alternative, care must be taken to identify both the beneficial and the adverse impacts to existing natural and beneficial floodplain values and to design or modify the action to avoid or minimize potential harm to or within the floodplain. A floodplain management goal is to minimize the adverse environmental impacts on natural floodplain values, as well as to minimize potential risk to the proposed action itself and to lives and property.

1. Restoration of Natural Values

Restoration, as a strategy for protection of natural and beneficial floodplain values, focuses on conditions existing as a result of prior actions. This strategy calls for proposed actions to provide reestablishment of a setting or environment in which these values can again operate. Where floodplain values have been degraded by past activities, identification and evaluation of the diminished or lost values should be made so that remedial actions may be taken to restore those values.

2. Preservation of Natural Values

The preservation strategy focuses on the immediate impacts of the proposed floodplain actions. This strategy involves prevention of alteration to the natural and beneficial floodplain values or maintenance of the floodplain environment as close to its natural state as possible using all practicable means. This strategy is most effectively applied to floodplains showing little or no previous disruption by man, but may be appropriate for other floodplains. The best strategy for preserving and protecting the remaining natural values of floodplains is avoidance i.e., developing alternative measures or locations.

D. Tools for Managing Floodplain Natural Values

Where it is not practicable to avoid actions affecting floodplains, a selection of tools is available to minimize environmental harm and to carry out the strategies to restore and preserve natural floodplain values. These tools and their application may not be as well documented or understood as those for flood loss reduction, but they should be used to support one another and may be integrated with flood loss reduction tools. Detailed description of the first four of the following tools is provided in Chapter IV and not repeated here.

1. Floodplain, Wetland and Coastal Barrier Resource Regulations

Many State and local regulations for floodplains and for flood hazard areas -- zoning, subdivision regulations, building codes, housing codes, sanitary and well codes -- already contain provisions that indirectly preserve floodplain values. In other instances provisions for preservation and restoration of floodplain values may be added to such regulations. (See pages IV-4-6).

2. Development and Redevelopment Policies

All levels of government can incorporate policies to protect floodplain values in the design and location of utilities and services in open space acquisition and easement, and in redevelopment or permanent evacuation. (See pages IV-7-9).

3. Information and Education

The development of needed technical information and public education is essential to effective planning, public input, and decisions affecting floodplain values. (See page IV-14).

4. Tax Adjustments

All levels of government can seek opportunities to provide positive incentives for the preservation and restoration of floodplain values. (See pages IV-15, 16).

5. Administrative Measures

All levels of government can provide support for the restoration and preservation of floodplain values by

adopting the following administrative measures where agency programs and authority permit:

a. Restrictions or conditions in contract, grants, loans, permits, and licenses;

b. Applications of appropriate encumbrances during land conveyance;

c. Delegation of responsibility for floodplain activities to a specific office with sufficient authority to play an active leadership role both within and outside the agency;

d. Systematic review of existing agency programs to identify opportunities for floodplain value preservation and restoration;

e. Surveys of stream and coastal reaches and sites to identify opportunities for floodplain preservation and restoration; and

f. Cordination within and among agencies to implement unified floodplain management efforts.

E. Examples of Floodplain Natural Values Management

Application of the tools for managing floodplain natural values should be considered for all stages in a proposed action -- planning, design construction, operation and maintenance -- and for each of the floodplain values identified under Section V-A. Some examples of practices to maintain floodplain natural values follow:

1. Natural Flood Storage and Conveyance

--Minimize floodplain fills and other actions that require fills such as construction of dwellings, factories, highways, etc.

--Require that structures and facilities on wetlands provide for adequate flow circulation.

--Use minimum grading requirements and save as much of the site from compaction as possible.

--Relocate nonconforming structures and facilities outside of the floodplain.

--Return site to natural contours.

--Preserve free natural drainage when designing and constructing bridges, roads, fills and large built-up centers.

--Prevent intrusion on and destruction of wetland, beach, and estuarine ecosystems, and restore damaged dunes and vegetation.

2. Water Quality Maintenance

--Maintain wetland and floodplain vegetation buffers to reduce sedimentation and delivery of chemical pollutants to the water body.

-- Support agricultural practices that minimize nutrient flows into water bodies.

-- Control urban runoff, other storm water, and point and nonpoint discharges of pollutants.

-- Support methods used for grading, filling, soil removal, and replacement, etc. to minimize erosion and sedimentation during construction.

-- Restrict the location of potential pathogenic and toxic sources on the floodplain, such as sanitary land fills and septic tanks, heavy metal wastes, etc.

3. Groundwater Recharge

-- Require the use of previous surfaces where practicable.

-- Design construction projects for runoff detention.

-- Dispose of spoils and waste materials so as not to contaminate ground or surface water or significantly change land contours.

4. Living Resources

-- Identify and protect wildlife habitat and other vital ecologically sensitive areas from disruption.

-- Require topsoil protection programs during construction.

-- Restrict wetland drainage and channelization.

-- Reestablish damaged floodplain ecosystems.

-- Minimize tree cutting and other vegetation removal.

-- Design floodgates and seawalls to allow natural tidal activity and estuarine flow.

5. Cultural Resources

-- Provide public access to and along the waterfront for recreation, scientific study, educational instruction, etc.

-- Locate and preserve from harm historical and cultural resources; consult with appropriate governmental agencies or private groups.

6. Agricultural Resources

-- Minimize soil erosion on cropped areas within floodplains.

-- Control use of pesticides, herbicides, and fertilizer.

-- Limit the size of fields and promote fence rows, shelter belts, and stripcropping for improved wildlife habitat.

-- Strengthen water bank and soil bank type programs in a manner consistent with alternate demands for the use of agricultural land.

-- Minimize irrigation return flows and excessive applications of water.

-- Eliminate feedlot type operations.

-- Discourage new agricultural production requiring use of drainage.

-- Retain agricultural activity on highly productive soils where flood risks is compatible with the value of crops grown.

7. Aquacultural Resources

-- Construct impoundments in a manner that minimuzes alteration in natural drainage and flood flow. Existing natural impoundments such as oxbow lakes and sloughs may be used with proper management.

-- Limit the use of exotic species, both plant and animal, to those organisms already common to the area or those known not to compete unfavorably with existing natural populations.

--Discourage mechanized operations causing adverse impacts. Machinery such as dredges, weeders, and large-scale harvesting equipment may lead to environmental problems such as sediment loading in adjacent watercourses.

--Use extreme caution in the disposal of animal waste.

8. Forestry Resources

--Control the practice of clear-cutting, depending upon the species harvested, topography, and location.

--Complement State law governing other aspects of harvest operations; proximity to watercourses, limits on roadbuilding, equipment intrusions, etc.

--Include fire management in any overall management plans. Selective burning may reduce the probability of major destructive fires.

--Require erosion control plans on all timber allotments, roads, and skidways.

CHAPTER VI

DEVELOPMENT OF THE FEDERAL CONCERN

Federal concern with floodplain management has evolved from the coalescence of two kinds of activity, each marked by a major catalytic action during the 1960's. The 1966 report of the Task Force on Federal Flood Control Policy, published as House Document 465, was the catalyst for coordinated flood loss reduction efforts. 3/ The National Environmental Policy Act (Public Law 91-190) prompted efforts to restore and preserve natural floodplain values. These two floodplain management objectives were brought together by the 1977 Executive Order, 11988 Floodplain Management. Since the Order was issued, several administrative and legislative actions have further advanced the development of a unified national program. It is the purpose of this chapter to discuss Federal activity and provide an understanding of the current Federal concern for floodplain management.

A. Flood Loss Reduction Activities

Federal floodplain managment programs prior to 1966 are summarized, followed by discussion of three landlandmark actions toward a coordinated approach: publication of House Document 465; passage of the National Flood Insurance Act, as amended, and associated legislation; and promulgation of the Water Resources Council's Principles and Standards for Planning Water and Related Land Resources (1973).

1. Flood Control Programs Prior to 1966

Congressional acceptance of limited Federal responsibility for flood control began in 1927 following major floods on the Mississippi River. It subsequently expanded geographically to nationwide scope and functionally to include coastal hurricane flooding. Earlier, in 1890, Congress had accepted Federal responsibility for flood forecasting and warning. Beginning with the Flood Control Act of 1936, the Congress accepted national responsibility, and the Corps of Engineeers was assigned responsibility for flood control engineering works and later for floodplain

3/ Task Force on Federal Flood Control Policy. A Unified National Program for Managing Flood Losses, House Document 465, 89th Congress, 2nd Session, U.S. Government Printing Office, Washington, D.C. 1966.

information services. In the early 1930's, Congress created the Tennessee Valley Authority as a regional resource development agency. Flood control, through the construction of dams and reservoirs, was included among its duties. In the late 1930's, Congress expanded Bureau of Reclamation authority to include building reservoirs for flood control purposes. In the 1940's, the Congress authorized the Department of Agriculture to construct 11 specifically authorized projects for flood control, and in the 1950's the department was authorized to carry out a nationwide program for upstream watershed projects.

Despite these programs and rapidly rising Federal expenditures for flood control, flood losses continued to rise rapidly. Federal programs continued to rely predominantly on engineering works for modifying floods, although The Tennessee Valley Authority had initiated a local floodplain management assistance program in the early 1950's and the 1960 Flood Control Act had authorized the Corps of Engineers to provide States and localities with information and technical assistance needed to regulate floodplain lands. Thus it was, that in its review of Federal programs, the Task Force on Federal Flood Control Policy in 1966 urged a policy that emphasized modification of susceptibility to flooding and of the impacts of flooding.

2. House Document 465 - The Foundation

The Presidential Task Force whose recommendations were reported in House Document 465, A Unified National Program for Managing Flood Losses, went a long way toward identifying problems and needs with regard to existing Federal programs and their impact at the State and local levels. The associated Executive Order 11296, issued in August 1966, directed Federal agencies to evaluate the flood hazard before funding construction projects or acquiring or disposing of Federal property. Because of these two documents, progress has been made in alleviating hazards, but other problems identified by the Task Force remain. Further, the Executive Order became dated by enactment of legislation such as the National Flood Insurance Act. These shortcomings were cited in a 1975 General Accounting Office report. 4/

4/ General Accounting Office. "National Attempts to Reduce Losses From Floods by Planning for and Controlling the Uses of Flood-Prone Lands," Washington, D.C. March, 1975.

The Task Force report suggested the need for new planning attitudes and a unified approach for floodplain managment, but it stopped short of describing such a framework. Lack of a framework was judged at least partly responsible for the problems related to agency indecision and nonuniform Federal practices. Chapter III of this report attempts to lay out a conceptual framework.

The "Summary of Findings and Recommendations" of House Document 465 is reproduced in Exhibit 1. Sixteen specific recommendations were directed toward achieving five goals: "To improve the basic knowledge about flood hazard; To coordinate and plan new developments on the floodplain; To provide technical services to managers of floodplain property; To move toward a practical national program for flood insurance; To adjust flood control policy to sound criteria and changing needs." The current status of each recommendation is shown in the right hand column and catagorized as: (A) largely implemented, (B) some progress (often legislated but not implemented), and (C) little or no accomplishment.

Four specific recommendations address the goal of improving our basic knowledge about floods and flood hazards. The first recommendation -- define and outline the flood hazard -- has led to a Federal expenditure of almost $700 million which has resulted in publication of flood hazard maps for more than 20,000 communities of which more than 7,500 have detailed flood hazard studies. The second recommendation -- determination of flood frequencies -- has led to Federal agency adoption of a uniform technique for determining flood flow frequencies and application of the technique in flood hazard studies. The third recommendation -- establish a national program for collecting more useful flood damage data -- has been the object of frequent discussion but little action and the recommendation remains valid today. The fourth recommendation -- establish a program for research on floodplain occupance and urban hydrology -- has been met in part by several national level efforts.

Four specific recommendations address the goal of improving coordination and planning for new floodplain development. The first of these recommendations -- specify criteria for using flood information and encourage State coordination of floodplain regulation -- has been met by adoption of the 100 year base flood standard and use of this standard by all states in the regulation and management of floodplains. The second recommendation -- assure that State and local planning take proper account of flood

Exhibit 1

House Document 465

I. Summary of Findings and Recommendations

The Nation needs a broader and more unified national program for managing flood losses. Flood protection has been immensely helpful in many parts of the country—and must be continued. Beyond this, additional tools and integrated policies are required to promote sound and economic development of the flood plains.

Despite substantial efforts, flood losses are mounting and uneconomic uses of the Nation's flood plains are inadvertently encouraged. The country is faced with a continuing sequence of losses, protection, and more losses. While flood protection of existing property should receive public support, supplemental measures should assure that future developments in the flood plains yield benefits in excess of their costs to the Nation. This would require a new set of initiatives by established Federal agencies with the aid of State agencies to stimulate and support sound planning at the local government and citizen level.

Statutory Federal policy dealing with cost sharing, land acquisition, and loan authority would need to be modified, but most of the measures would be taken by the Corps of Engineers, the Department of Agriculture, the Department of Housing and Urban Development, the Geological Survey, and the Environmental Science Services Administration under existing authority. Modest additional expenditures over the next 10 years and reorientation of Government effort would greatly reduce flood losses and demands for Federal relief.

The specific actions recommended by the task force may be summarized as follows:

	Category of Progress
To improve basic knowledge about flood hazard	
1. A three-stage program of delimiting hazards should be initiated by the Corps of Engineers, the Geological Survey, and other competent agencies.	A
2. A uniform technique of determining flood frequency should be developed by a panel of the Water Resources Council.	A
3. A new national program for collecting more useful flood damage data should be launched by the interested agencies, including a continuing record and special appraisals in census years.	C
4. Research on flood plain occupance and urban hydrology should be sponsored by the Department of Housing and Urban Development, the Department of Agriculture, and the Geological Survey.	B
To coordinate and plan new developments on the flood plain	
5. The Federal Water Resources Council should specify criteria for using flood information and should encourage State agencies to deal with coordination of flood plain planning, and with flood plain regulation.	B

	Category of Progress
6. Under the following Federal programs steps should be taken to assure that State and local planning takes proper and consistent account of flood hazard: Federal mortagage insurance Comprehensive local planning assistance Urban transport planning Recreational open space and development planning Urban open space acquisition Urban renewal Sewer and water facilities (Many of the necessary coordinating actions were accomplished during final preparation of this report.)	B
7. Action should be taken by the Office of Emergency Planning, the Small Business Administration, and the Treasury Department and other agencies to support consideration of relocation and flood-proofing as alternatives to repetitive reconstruction.	B
8. An Executive order should be issued directing Federal agencies to consider flood hazard in locating new Federal installations and in disposing of Federal land.	A
To provide technical services to managers of flood plain property	
9. Programs to collect, prepare, and disseminate information and to provide limited assistance and advice on alternate methods of reducing flood losses, including flood plain regulation and floodproofing, should be undertaken by the Corps of Engineers in close coordination with the Department of House and Urban Development, and the Department of Agriculture.	A
10. An improved national system for flood forecasting should be developed by the Environmental Science Services Administration as part of a disaster warning service.	B
To move toward a practical national program for flood insurance	
11. A five-stage study of the feasibility of insurance under various conditions should be carried forward by the Department of Housing and Urban Development.	A
To adjust Federal flood control policy to sound criteria and changing needs	
12. Survey authorization procedure and instructions should be broadened in concept.	A
13. Cost-sharing requirements for federally assisted projects should be modified to provide more suitable contributions by State and local groups.	B
14. Flood project benefits should be reported in the future so as to distinguish protection of existing improvements from development of new property.	A
15. Authority should be given by the Congress to include land acquisition as a part of flood control plans.	B
16. Loan authority for local contributions to flood control projects should be broadened by the Congress.	B

hazard -- has been met in large measure through the requirements of the National Flood Insurance Act and the Disaster Relief Act of 1974. The third recommendation -- support consideration of relocation and floodproofing as alternatives to repetitive construction -- has been met in part by the requirements of the National Flood Insurance Program, by the Federal postflood hazard mitigation team program, and by limitations placed on the amount of casualty losses that may be claimed under Federal income tax deductions. The fourth recommendation -- issue a Federal executive order directing Federal agencies to consider flood hazard -- has led directly to a 1966 order which was superceded and strengthened by a 1977 order.

Two recommendations address the goal of providing technical services to managers of floodplain property. The first recommendation -- establish programs to disseminate information, provide technical assistance and advice on alternative methods for reducing losses -- has been met through new and strengthened Federal and State programs to provide special studies and technical assistance and by publication of numerous handbooks and guidance documents (Appendix C). The second recommendation -- improvement of a national flood forecasting system -- has been met in part by improved data collection and communication systems and flood forecasting models.

A single recommendation addresses the goal of moving toward a practical national program for flood insurance by calling for an insurance feasibility study. This recommendation resulted in a feasibility study which in turn led to the passage of the National Flood Insurance Act resulting in the participation of 17,500 communities and almost 2 million insured properties.

Five recommendatons address the goal of adjusting Federal flood control policy to sound criteria and changing needs. The first recommendation -- broaden Federal flood control authority -- has been met in part by administrative procedures requiring evaluation of alternative plans including nonstructural measures. The second recommendation -- modify Federal cost sharing requirements -- is the subject of extensive studies, and although a trend toward increased non-Federal cost sharing has been established, basic differences remain to be resolved. The third recommendation -- report flood control benefits in the future distinct from benefits to existing property -- has been met in part by administrative procedures specifying benefit classes.

The fourth recommendation -- give authority to include land acquisition as part of Federal flood control plans -- has been met in part through individual project authorizations and through authority in the National Flood Insurance Act to permit purchase of insured, severely damaged properties. The fifth recommendation -- broaden the loan authority to allow local contributions to flood control projects -- has been partially addressed by existing legislation and by administrative initiatives taken to increase local contributions.

Viewed 20 years later, the Task Force report must be regarded as a powerful catalyst and benchmark for major advances in the Nation's efforts to reduce flood losses. Because of the Task Force Report and subsequent mitigating actions, the intensive development of the Nation's floodplains since 1965 has been accompanied by a growing number of flood loss mitigating actions.

3. The National Flood Insurance Program - A Management Approach Focused on Long-Term Flood Loss Reduction

A direct response to several Task Force recommendations is found in the National Flood Insurance Act of 1968 (Public Law 90-448), as amended, and the closely related Flood Disaster Protection Act of 1973 (Public Law 93-234), as amended.

The National Flood Insurance Program was designed to reduce future flood losses through State and local floodplain management efforts and to transfer the costs of residual flood losses from the general taxpayer to the floodplain occupant. This program represented a major shift in strategy from previous structural flood control and disaster relief efforts.

Even in the early stages of the National Flood Insurance Program, Congress had recognized the need for flood risk studies to provide data upon which local floodplain management and actuarial insurance rates would be based. The 1968 Act authorized a program of risk studies to be completed over a 15-year period following passage of the Act.

In 1983, when this 15-year period was to expire, many risk studies had yet to be conducted due to budget limitations during that period. As a result, the Federal Emergency Management Agency requested Congress to extend this period. In 1983, Congress passed Public Law 98-181 which

extended authorization for flood risk studies until September 30, 1985, and also required the Agency to submit to Congress, by September 30, 1984, a plan for bringing all remaining unstudied communities into full program status. The plan submitted incorporates a 1991 completion date.

The National Flood Insurance Program consists of two phases, emergency and regular programs. In the emergency program, insurance coverage may be provided at non-actuarial, federally subsidized rates in limited amounts during the period prior to completion of a community's flood risk study. To participate in the emergency program, communities are required to adopt and enforce only minimal floodplain management standards.

Although only minimal measures are required under the initial phase of the program -- i.e., the Emergency Program -- these measures are more than most communities have required. They are a start in the right direction. Once the definitive limits of the area that would be inundated by the flood with a one-percent chance of being exceeded during any given year and elevations for such a flood have been provided, the participating community must enact and enforce more specific measures to reduce the potential for flood losses. It is expected that the Emergency Program will be terminated in the next few years.

When local flood risk studies are completed, communities enter the regular program, at which time risk premium (actuarial) rates are charged for all new construction. In exchange for the increased amounts of insurance eligibility under the regular program, communities enact comprehensive floodplain management ordinances which are commensurate with the flood risk. Floodplain management and technical assistance services are provided to help program communities establish and implement floodplain management programs consistent with the conceptual framework presented in Chapter III.

Where high hazard areas have been delineated and risk zones have been identified, special criteria must be implemented. High hazard areas include riverine floodways and coastal high hazard areas. Where floodway data are provided, the community is required to (1) select and adopt floodway boundaries as encroachment limits and (2) prohibit future encroachments within the floodway that would result in any further increase in flood levels. In coastal high hazard areas, structures must be built to

withstand storm waves and currents and hurricane wave wash. These floodplain management requirements are primarily regulatory, as opposed to structural, dealing as they do with land use, public facilities, floodproofing, and construction measures.

Through financial and technical assistance the Federal Emergency Management Agency has enabled most States to enhance their capability to implement sound floodplain management programs; thus, local communities are able to receive guidance from the States on ways to adopt and enforce sound floodplain management programs including the insurance program's regulatory provisions.

In Section 2(a)(5) of the Flood Disaster Protection Act of 1973 (Public Law 93-234), the Congress found that "the Nation cannot afford the tragic losses of life caused annually by flood occurrences, not the increasing losses of property suffered by flood victims, most of whom are still inadequately compensated despite the provision of costly disaster relief benefits." Section 102(a) of the Act requires the purchase of flood insurance in communities where such insurance is available in connection with any form of Federal "financial assistance" for acquisition or construction located in identified special flood hazard areas. Section 102(b) of The Flood Disaster Protection Act of 1973 requires purchase of flood insurance when property located in the floodplain is to be secured by a conventional mortgage from a federally related lender. In effect, Federal financial assistance includes any FHA-insured or VA-guaranteed loan as well as loans secured by a federally insured bank, savings institution, or credit union for acquisition of improved land for a mobile home, for building construction, or for any improved real property in the floodplain -- further defined in Public Law 93-234, Section (3)(a)(4)1. Federal financial assistance is broadly defined as any form of loan, grant, guaranty, insurance, payment, rebate, subsidy, disaster assistance loan or grant, or any form of direct or indirect Federal assistance other than general or special revenue sharing or formula grants made to States. The construction referred to is essentially confined to walled and roofed buildings affixed to a permanent site, including mobile homes.

Communities identified by the Director of the Federal Emergency Management Agency as flood prone communities have a one-year period in which to enroll in the National Flood Insurance Program or thereafter be denied direct

Federal financial assistance for acquisition or construction purposes in identified flood hazard areas (Section 202 of Public Law 92-234).

The provisions of Section 102 mandating the purchase of insurance and Section 202 requiring the participation of floodprone communities apply only to the identified areas of special flood hazards in those communites. The same is true for the floodplain management measures required by Sectio 1305(c)(2) of Public Law 93-234. Insurance is available to all insurable structures within the entire community, and the floodplain management regulations apply only to the areas of special flood hazard but may be applied to all floodplains in the community.

In effect, therefore, except for a few communities which chose to risk the denial of certain Federal financial assistance in their flood hazard areas and those whose flood problems have not yet been called to the agency's attention, most of the Nation's floodprone communities have been notified and encouraged to enroll in the National Flood Insurance Program with its mandatory requirements for effective floodplain management. Of the approximately 20,000 identified flood-prone communities, over 17,500 are enrolled in the National Flood Insurance Program.

Finally, the insurance aspect of the program reinforces flood loss reduction in at least three ways:

(1) Once the flood insurance rate making study has been prepared, actuarial rates for new construction should indicate to prospective builders and buyers the extent of the hazard that they face, and the cost of insurance should discourage building in hazardous areas or at vulnerable elevations. Obviously, rate levels can influence building and buying decisions.

(2) The requirement that the structures which have been substantially damaged, if rebuilt, must be elevated or floodproofed and can be insured only at full actuarial rates may discourage both the nonconforming uses of floodplains not otherwise forbidden by ordinance and the repair and reconstruction of structures exposed to flood damage.

(3) The use of Section 1362 of the Act to acquire structures covered by flood insurance, if substantially or repetitively flood damaged, has become an important floodplain management tool.

4. Principles and Guidelines for Planning Water and Related Land Resources - A Planning Approach Focused on Federal Participation in Water Reslurces Programs.

The Economic and Environmental Principles and Guidelines for Water and Related Land Resources for Implementation Studies guide the principal Federal water resources agencies in the formulation and evaluation of Federal and federally assisted water resources projects. Issued by the Chairman of the U.S. Water Resources Council on March 10, 1983, these guidelines provide for standardization of planning methods and procedures while allowing considerable flexibility regarding the application of the procedures and the decision making processes. They provide for consideration of economic, environmental, regional, and social concerns and effects of proposed actions. The Federal objective for water resources projects as stated in the guidelines is to contribute to national economic development consistent with protecting the Nation's environment, pursuant to national environmental statutes, applicable executive orders, and other Federal planning requirements.

Application of the Principles and Guidelines provides for consistent and critical evaluation of floodplain management measures as well as other alternatives for reducing flood hazard and damages. Federal water resources planning is to be responsive to State, local, and national as well as international concerns. Accordingly, State and local participation is to be encouraged in all aspects of water resources planning. The plan that recommends Federal action is to be the plan that achieves the Federal objective unless the Secretary of a Department or head of an independent agency grants an exception. Exceptions may be granted when there are overriding reasons for recommending another plan, based on other Federal, State, local, or international concerns. In addition to evaluation of existing activities, available services, and other attributes of the floodplain, the Principles and Guidelines declare that the potential of the floodplain for natural and beneficial values, including open space, recreation, wildlife, natural flood storage, and wetlands should be recognized and displayed in the valuation of alternatives.

Nonstructural alternatives are encouraged where they tend to achieve most effectively the Federal objective for water resource projects stated above. Section 73 of the Water Resources Development Act of 1974 (Public Law 93-251) provides for cost sharing for nonstructural as well as structural flood damage reduction measures.

Similarly, the implementation of the authority to purchase high risk, substantially damaged properties after a flood, as provided under Section 1362 of the National Flood Insurance Act of 1968, as amended, can contribute to the appropriate consideration of nonstructural alternatives.

The U.S. Army Corps of Engineers, the Soil Conservation Service and other Federal agencies, through their various programs have awakened the public to the alternative of implementing nonstructural flood control measures. A few projects have been approved incorporating nonstructural measures such as floodproofing, relocating of damageable properties and flood warning systems. In other cases where communities discovered other options were available, they have sought and received block grants to permanently evacuate flood prone areas. Others have received grants and/or special financing to install flood warning systems and to assist home and business owners to floodproof their structures.

B. Natural Floodplain Values

Federal concern for natural floodplain values developed incrementally from a series of essential single-purpose public laws into a broad national policy objective of environmental quality set forth in the National Environmental Policy Act of 1969. This act is supported by a procedural requirement to assess the environmental impacts of all proposed Federal actions. The Council on Environmental Quality was established to set and monitor environmental policy. The Environmental Protection Agency was established to monitor and regulate individual components of environmental quality. More recently, Presidential messages in 1977 and 1978 focused attention on the need to protect the natural values of the Nation's floodplains and associated wetlands and coastal barrier islands.

1. Environmental Protection Prior to 1969

After a century of Federal policy directed almost exclusively at development of the Nation's natural resources, the late 19th century saw the first major pieces of Federal legislation designed to protect individual natural resources and resource areas. The period of 1870-1910 witnessed creation of individual national parks such as Yellowstone, the reservation of Federal forest reserves, and the first wildlife refuge. The interwar period of the 1920's and 1930's was marked by passage of the Fish

and Wildlife Coordination Act and other wildlife legislation. The 1960's were marked by emergence of a broader based concern for natural resources and passage of the Wilderness Act, the Wild and Scenic Rivers Act, the Land and Water Conservation Act, the Fish and Wildlife Service Organic Act, the Multiple Use-Sustained Yield (Forestry) Act, and the creation of the National Wildlife Refuge System. By the end of the 1960's a concern for the quality of individual natural resources gradually had given way to recognition of ecological systems and a concern for the quality of the environment as a whole.

2. The National Environmental Policy Act of 1969.

In enacting the National Environmental Policy Act, the Congress formalized recognition that the values of environmental resources are dependent upon the function of complex natural systems. This Act declared environmental quality to be a national goal and established a procedure for environmental impact assessment for proposed Federal projects and programs that may significantly affect the environment. Inherent in the environmental review process prior to a final decision to carry out a proposed action are: (1) public involvement and (2) notice that brings before the public an accounting for the various alternatives considered and their respective impacts. The goal of environmental quality and the accounting for planning alternatives and their various impacts is embodied in the aforementioned Principles and Guidelines of the Water Resources Council.

Federal agencies are required by the Act to develop procedures, and most have assigned supporting staff for this purpose. These procedures are monitored by the Council on Environmental Quality, also established by the Act to set and monitor environmental policy. Thus, the legislative and administrative foundation was formally set in place for an evaluation of the environmental values associated with water resources and floodplains.

C. Significant Related Legislation

Following passage of the Act in 1969, emphasis on protecting and enhancing environmental quality was embodied in important new legislation affecting water resources. These acts included the Endangered Species Act, the Forest and Rangeland Renewable Resources Act, and the Soil and Water Resources Conservation Act. Of special importance are the Coastal Zone Management Act (Public Law 92-583 as amended), the Dam Safety Act (Public Law

Public Law 95-217), and the Disaster Relief Act of 1974 (Public Law 93-288) which offer significant potential to minimize adverse impacts on lives, property, and natural floodplain values. Implementation of this legislation helped set the stage for the 1977 Executive Order 11988, Floodplain Management.

The Coastal Zone Management Act of 1972 (Public Law 92-583) authorized the first national program to promote the wise use and protection of coastal land and water resources. The Act provides funds, policy guidance, and technical assistance to coastal State and territorial governments to help them establish and maintain coastal management programs that meet Federal requirements. In 1980 amendments, Congress further clarified the goals of the Act by identifying nine national interest areas which the States are required to address as part of their approved programs. Included among these is the requirement to provide for "the management of coastal development to minimize the loss of life and property caused by improper development in flood-prone, storm surge, geological hazard, and erosion-prone areas and in areas of subsidence and saltwater intrusion, and by the destruction of natural protective features such as beaches, dunes, wetlands, and barrier islands." (Section 303(b)(B)). Twenty-eight of the 35 eligible coastal States and territories are currently participating in the Federal program.

The Federal Dam Safety Act (Public Law 92-367) authorized the Secretary of Army to undertake a national program of inspection of dams to identify those dams which constitute a danger to human life or property. Under the direction of the Corps of Engineers, 68,000 dams were inventoried and about 10,000 were inspected to identify those with deficiencies which might lead to structural failure or floods exceeding spillway design. 5/ Reports furnished to the Governor of each State identified a total of about 3,000 unsafe dams. Less than one-half of the States have taken steps to adequately ensure the regulation and inspection of dams. The Federal Emergency Management Agency has worked closely with the Association of State Dam Safety Officials to develop and encourage States to adopt a model State dam safety program. The Interagency Committee on Dam Safety has prepared and issued emergency action planning guidelines and other technical assistance materials for the use of federal and nonfederal dam owners and operators. 6/

5/ U.S. Army Corps of Engineers, National Program for Inspection of Non Federal Dams - Final Report to Congress, 1982.

6/ Federal Emergency Management Agency, Emergency Action Planning Guidelines for Dams, 1985.

The Clean Water Acts of 1972 and 1977 (Public Law 92-500 and Public Law 95-217) assign important responsibilities affecting floodplains to the Corps of Engineers and the Environmental Protection Agency. Section 404 authorizes the Corps of Engineers to issue permits for the discharge of dredged or fill material into waters of the United States, in place of or in addition to any permits that may be issued under Section 10 of the Rivers and Harbors Act of 1899. It also expands jurisdiction for issuing such permits from navigable waters-in-fact to all waters of the United States, including adjacent wetlands or isolated wetlands which affect or could affect interstate commerce, such as prarie potholes used by migrating water fowl.

Dredged or fill material may be produced for discharge as a part of maintaining navigation or for such things as docks, piers, bridges, sewer outfalls, water intakes, fills to create fastland and discharge associated with agricultural conversions.

Before issuing a Section 404 permit, the Corps of Engineers consults with the appropriate State governments, and Federal resource agencies, including the Environmental Protection Agency, Fish and Wildlife Service, and the National Marine Fisheries Service. Under certain conditions the Environmental Protection Agency may allow individual States to issue these permits for all waters except those that are traditionally navigable in fact. In addition, Section 404(b)(1) requires that the Environmental Protection Agency issue guidelines for protecting the aquatic environment, including wetlands, which are used in determining the acceptability of proposed discharges of dredged or fill material. Section 404(c) authorizes the Environmental Protection Agency to prohibit or restrict discharges with unacceptable adverse environmental impacts on fish, shellfish, wildlife, water supply or recreation.

In addition, the water quality management program under Section 208 of the Clean Water Act requires an areawide system for planning waste treatement facilities. Section 209 calls for accelerating preparation of Level B basin plans under the Water Resources Planning Act (Public Law 89-80). Each of these programs along with other programs of the Clean Water Act mandate planning coordination within and between levels of government on matters of vital concern to floodplain management.

The Disaster Relief Act of 1974 (Public Law 93-288), as amended, deals with floods as well as other natural disasters or emergencies. Federal funding is provided

for planning by State and local governments and for other disaster preparedness program or activities. After a declaration by the President of a major disaster, flood insurance to cover insurable facilities against future losses is a condition for approval of grant assistance and payments. Each federally funded nonemergency project is reviewed prior to approval for environmental clearance, floodplain management, control of wetlands, and appropriate hazard mitigation measures. The concerns of the Act for disaster preparedness and prevention relate the planning emphasis directly to disaster response and to the regulatory requirements in the insurance program and in various hazard mitigation programs.

The new land and water planning tools afforded by the Clean Water, Dam Safety, Coastal Zone Management, and Disaster Relief Acts (Public Laws 92-500, 95-217, 92-367, 93-288) offer an opportunity to use Federal assistance to strengthen the role of the States. These Acts challenge the Federal and State governments to coordinate floodplain management activities. The National Environmental Policy Act, as one of the legislative items mandating consideration of alternative actions associated with flood risk, has already contributed to improvement of the floodplain management decisionmaking process.

D. Executive Order 11988, Floodplain Management

Attention of the Executive Branch was sharply focused on environmental values and floodplain management by the President's May 23, 1977 Message on the Environment and accompanying Executive Order 11988, Floodplain Management. 7/

The Message to Congress stressed the scope of environmental issues and pledged firm support to environmental protection. In a section on water policy, the President directed that there be an overall review of water policy and that Federal agencies take leadership in emphasizing protection of the environment in the management of floodplains, wetlands, coastal barrier islands, and marine sanctuaries. Concurrent with the Message, the President issued Executive Orders 11988 and 11990 (see Appendices A and B), directing Federal agencies to seek alternatives

7/ "The Environment - Message to the Congress, May 23, 1977." Weekly Compilation of Presidential Documents, Monday, May 30, 1977; Vol. 13, No. 22, pp. 782-808. (This includes Executive Order 11988, Floodplain Management and Executive Order 11990, Protection of Wetlands).

to avoid locating or supporting activity in floodplains or wetlands. While not stated in the Message, it is important to note that most of the Nation's wetlands, coastal barrier islands, and marine sanctuaries are located within riverine and coastal floodplains. Thus, the Floodplain Management Order is central to these other areas of environmental values.

Executive Order 11988, Floodplain Mangement, replaces a 1966 Order that encouraged Federal agencies to avoid uneconomic, unnecessary, and hazardous uses of floodplains. The new Order establishes a general policy bringing together concerns for human safety, health and welfare, and property with concerns for restoring and preserving natural and beneficial floodplain values and drawing its authority from the National Flood Insurance Act, the Flood Disaster Protection Act, and the National Environmental Policy Act. The policy directive of the Order is to (1) avoid directly or indirectly supporting floodplain development, (2) avoid actions located in or affecting the floodplain, unless the floodplain location is the only practicable alternative, and (3) in the absence of a practicable alternative, require that actions must be designed or modified in order to minimize potential harm to or within the floodplain. The Order applies to all proposed actions of all Federal agencies and requires agencies to issue implementing procedures. An interpretation of the Order has been issued by the Water Resources Council. 8/

The Order's requirements, as interpreted by the Water Resources Council, constitute a decisionmaking process having the following sequential elements:

(1) the determination of whether a proposed action is within the one-percent chance floodplain or has the potential to affect or be affected by the floodplain;

(2) the informing and involvement of the public in the floodplain management decisionmaking process at the earliest possible time;

(3) the identification of practicable alternatives to carrying out an action in the floodplain;

8/ U.S. Water Resources Council "Floodplain Management Guidelines for Implementing Executive Order 11988," Federal Register, February 10, 1978 (44FR6030).

(4) where there is no practicable alternative to proposed actions affecting the floodplain, the identification of the potential adverse impacts of and support for additional development resulting from the proposed action;

(5) the identification of the steps necessary to minimize potential adverse impacts of and support for additional development, and of the steps necessary to restore and preserve natural floodplain values;

(6) the reevaluation of the proposed action, in light of the potential adverse impacts of and support for additional development, the steps necessary to minimize such development and the steps necessary to restore and preserve natural floodplain values;

(7) the notification to the public of any final decision to locate in the floodplain and the explanation of the basis for this decision; and

(8) the review of actions which affect or are affected by the floodplain to assure that they are implemented in a manner which is consistent with the requirements of Executive Order 11988.

These are the key substantive and procedural requirements that make up the foundation of the Federal policy on floodplain management. Federal government agencies must comply with these requirements and must maintain a leadership posture in all of their actions affecting floodplains. The Order also provides that opportunity for public participation in Federal decisions affecting floodplains be extended by early public notice, impact evaluation, and statement-of-findings requirements. Public scrutiny of agency decisions, the primary enforcement mechanism, is supported by a budget certification requirement and periodic evaluation of agency procedures. Finally, agency procedures implementing the Order are to incorporate the concepts of "A Unified National Program for Floodplain Management."

In 1982 the Office of Management and Budget directed the Federal Emergency Management Agency to carry out a review of the implementation of Executive Order 11988 and the appropriateness of its associated 100-year base flood standard. The review found the Order to be reducing exposure to potential flood losses and that retention of the Order was supported by nearly all agencies. The review found a need for improved implementation of the Order by Federal agencies. The review also found the 100-year base flood

standard to be strongly supported and being implemented at all levels of government. The Office of Management and Budget reaffirmed its commitment to the Order and directed that the Federal Interagency Task Force on Floodplain Management and the Federal Emergency Management Agency carry out several follow-up activities. 9/ These activities include development of training material for agency field personnel and in specified instances, the improvement or adoption of final agency implementing procedures.

Agency efforts to develop implementing procedures and to comply with the Order have heightened the awareness of the need for floodplain management. This is true of Federal agency personnel and also State and private individuals concerned with decisions affecting the floodplain. Consequently, floodplain management is regarded as a process by which decisions are made rather than simply a set of floodplain regulations or flood control structures. Implementation of the Order would be greatly supported by the operation of a strong floodplain management programs in all States.

Agency efforts to implement the Floodplain Management Order also highlight its close relationship to Executive Order 11990, Protection of Wetlands. Both orders are similar in structure; although one major difference is that the wetlands Order does not apply to Federal permits or licenses involving wetlands on non-Federal property. However, most wetlands are located within coastal and riverine floodplains and are thus covered by the Floodplain Management Order. Field level experience with both Orders strongly suggests the need for integrated management of wetlands and floodplains and other closely related natural features, such as barrier islands.

E. Subsequent Administrative and Legislative Actions

1. The 1978 Water Policy Message sets forth many water policy initiatives affecting floodplain management. 10/ Among these initiatives, the two areas of greatest impact

9/ "The 100-year Base Flood Standard and the Floodplain Management Executive Order: A Review Prepared for the Office of Management and Budget by the Federal Emergency Management Agency." September, 1983.

10/ "Federal Water Policy - Message to the Congress, June 6, 1978." Weekly Compilation of Presidential Documents, Monday, June 12, 1978, Vol. 14, No. 23, pp. 1044-1051.

deal with Executive Order 11988, nonstructural measures, and water conservation. First, the need for full and rapid implementation of Executive Order 11988 is reemphasized. Second, greater utilization of nonstructural floodplain measures is encouraged by specific directives to: (1) modify Federal water resource planning procedures to require formulation of at least one primarily nonstructural alternative plan where a structural project is being considered; (2) restructure Federal cost sharing to remove biases against nonstructural floodplain management measures; and (3) utilize Federal programs to help reduce future flood losses by acquisition of flood prone land and property.

Follow-up on these initiatives resulted in important progress toward coordinating and advancing a unified approach to floodplain management and the enhanced awareness of the need for floodplain management. As indicated above, the Executive Order 1988, Floodplain Management fostered acceptance of a uniform flood hazard standard and a procedure for evaluating proposed actions affecting floodplains. Water resource planning procedures have been modified to assure that consideration will be given to nonstructural loss reduction measures. The decision to provide funds to implement the National Flood Insurance Program authority to purchase severely damaged insured property was prompted by these initiatives.

2. Federal Flood Hazard Mitigation Teams were established pursuant to a July 1980 memorandum from the Office of Management and Budget and the ensuing interagency implementing agreement executed by 13 department level agencies. 11/ The memorandum directed "...that all Federal programs that provide construction funds and long term recovery assistance must use common flood disaster planning post flood recovery practices." Interagency hazard mitigation teams are activitated following Presidential declaration of flood disaster. The teams, which include State and local representatives, conduct a field level assessment

11/ "Interagency Agreement for Nonstructural Damage Reduction Measures as Applied to Common Flood Disaster Planning and PostFlood Recovery Practices"; December 15, 1980 (signed by the Federal Emergency Management Agency; the Departments of Agriculture, Army, Commerce, Health and Human Services, Housing and Urban Development, Interior and Transportation; Environmental Protection Agency; Small Business Administration; and the Tennessee Valley Authority).

of damage and develop a long term recovery concept plan which provides the basis for specific mitigation recommendations to be achieved through the use of Federal recovery assistance funding. Examples of recommendations successfully implemented include: purchase or relocation of severely damaged properties; relocation of washed out highways; construction of flood control structures; and floodproofing of structures. The first five years of experience with the hazard mitigation teams has shown the team mechanism to be an effective coordination and loss reduction device.

3. The Coastal Barrier Resources Act (Public Law 97-348) was passed in 1982 for the purpose of minimizing the loss of human life and natural resources by restricting those Federal expenditures that would have the effect of encouraging the development of coastal barriers along Atlantic and Gulf coasts. Undeveloped coastal barriers were identified on maps and designated as part of the Coastal Barrier Resources System. Locations within the system generally are not eligible for Federal expenditures for constructing or purchasing any structures, infrastructure or accessway; to carry out any erosion control or shoreline stabilization projects; or to provide financial assistance including insurance under the National Flood Insurance Program. The impact of this legislation is to unify Federal Programs in an effort to eliminate Federal subsidies for development in high risk coastal areas, and the destruction of natural coastal barrier resources.

F. Summary

The Federal concern for floodplain management has been shaped since 1966, largely by House Document 465 and the National Environmental Policy Act. The growing acceptance of a holistic conceptual framework for floodplain management and the strong Executive Order 1988, Floodplain Management are important strides toward establishing a solid Federal component for a unified program. The hazard mitigation team mechanism, implementation of the Coastal Barrier Resources Act, and administrative emphasis on nonstructural measures have each served to draw Federal programs toward a unified program. However, as Chapter VII demonstrates, improvement is needed in many program areas at the Federal level as well as at other levels of government.

CHAPTER VII

IMPLEMENTATION OF A UNIFIED NATIONAL PROGRAM FOR FLOODPLAIN MANAGEMENT

The chapter explains how floodplain management can be unified through coordination and utilization of existing institutional and legislative arrangements. Existing institutions and the relevant characteristics of organizational and operational considerations are described. These include information, research, consistent evaluation concepts, and financial assistance.

This chapter concludes that the role of the Federal government in floodplain management is decreasing relative to that of the States, which in most instances have established programs, gained experience and become increasingly effective. At the same time, almost all communities have established rudimentary floodplain management programs and are beginning to develop expertise. As this evolution toward a national program progresses, there continues to be a need for coordination of policy and programs and a sharing of information and experience within the agencies at each level of government and among the levels of government.

A. Coordination of Existing Programs

A basic condition necessitating coordination of floodplain management activity is the diversity of flood situations across the Nation. These situations are derived from four broad classes of flooding, each with its own distinguishable characteristics and requiring a somewhat different mix of loss reduction strategies, tools, and government actions. The most common source of flooding is over-the-bank flooding of streams which ranges from the flash floods of small streams in hilly terrain to the relatively slow rising, extensive floods of large rivers. This riverine flooding is a concern for almost all the 20,000 flood prone communities in the Nation. The second source is coastal flooding associated with hurricane or other storm driven waters reaching over-the-shore inland and affecting approximately 600 communities, most of which are also subject to riverine flooding. The third source is rising groundwater levels often associated with land subsidence and this source affects possibly 100 communities which may also be subject to riverine and coastal flooding. The last source, local storm drainage, results from failure to plan and provide adequate storm water drainage and is most frequently

associated with the 3,000 most rapidly growing urban communities in the Nation. Efforts to implement a unified program must address these sources individually or in combination as the local situation dictates.

Because of the complexity of the Nation's flood problems, the diffusion of responsibility under constitutional and legislative frameworks between levels of government and among agencies results in an approach that lends itself to being uncoordinated, fragmented, and inconsistent. This major problem should be met through continuing efforts towards improved coordination and cooperative development of information and other related technical planning and implementation assistance among all concerned interests at the local, State and Federal levels.

1. Federal Role

Although the major responsibility for regulating floodplain use is non-Federal, the programs of the Federal government frequently influence floodplain management decisions either directly or indirectly. Specific Federal interests include (a) transferring the burden of flood losses from the general public back to the floodplain occupants; (b) reducing flood losses and losses of natural floodplain values while pursuing goals of wise use and conservation; (c) maintaining agricultural, mineral, and biological resources; (d) using waterways as arteries of commerce; (e) providing water supply and waste treatment; (f) recognizing recreational and esthetic opportunities of open space; and (g) providing disaster relief. Among the loss reduction programs, most were established to deal with riverine and coastal flooding because flooding caused by inadequate stormwater drainage or rising groundwater /subsidence is, for the most part, considered local responsibility.

Fragmentation exists throughout Federal and non-Federal relationships. It may lead to indecision and inaction or to "shopping" among Federal agencies for the "best" programs as judged by favorable local cost sharing, rather than a full consideration of local needs. Although Exhibit 2 is not complete it indicates the current Federal effort is diffused through 27 agencies and nine program purposes.

Because of inadequate coordination, or focusing on narrow agency missions, the numerous Federal programs

sometimes have worked at cross purposes. One example is postflood emergency rehabiltation of structures in high flood hazard areas where alternative locations had been identified in planning programs. Another significant problem has been that the policy and corresponding rules for action are so varied that the non-Federal sector has been unsure about how the Federal government is going to respond to a given flood related situation. These problems and issues have been addressed in part by agency implementation of Executive Order 11988, Floodplain Management and the interagency hazard mitigation teams. However, continued progress requires further reflection of basic floodplain management principles in agency policies and procedures.

One area of concern is the need for consistent policies for the protection of natural floodplain values. Floodplains include most of the Nation's wetlands, and coastal barrier islands. Wetlands and barrier islands are undergoing rapid development and are the object of various policies including Executive Order 11990, Protection of Wetlands and the Coastal Barrier Resources Act. Integration of floodplain, wetlands, and barrier island policies is essential if field level implementation of these policies is to be expedited.

Another area of concern is the continuing need for more consistent policies regarding housing and related construction grants and loans, and support for public facilities such as roads and waste treatment systems. Executive Order 11988, Floodplain Management, is providing a successful basis for decisionmaking in (1) acquiring, managing and disposing of Federal lands and facilities; (2) providing federally undertaken, financed, or assisted construction and improvements; and (3) conducting Federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulating, and licensing activities. The Executive Order and Federal agency procedures for implementing the Order can serve as models from which States can strengthen their own management programs.

To attain a unified national program, the Federal agencies must continue to develop consistent policies and activities, including those which would encourage and support the States and local goverments in developing effective programs of their own. This is especially important as Federal budget and program levels are

Exhibit 2

Federal Floodplain Management and Related Programs by Agency

	Department of Agriculture									Department of the Army		Department of Commerce			Department of Energy		Department of Health, and Human Services	Department of Housing and Urban Development		Department of the Interior			Department of Transportation			Federal Emergency Management Agency		Small Business Administration		Tennessee Valley Authority	
	Agriculture Research Service	Agriculture Stabilization and Conservation Service	Economic Research Service	Farmers Home Administration	Forest Service	Soil Conservation Service	Corps of Engineers	National Oceanic and Atmospheric Administration	Economic Development Administration	Bureau of Economic Analysis	Federal Energy Regulatory Commission	Public Health Service	Community Planning and Development	Federal Housing Administration	Bureau of Land Management	Bureau of Reclamation	Geological Survey	Fish and Wildlife Service	Coast Guard	Federal Aviation Administration	Federal Highway Administration	Federal Railway Administration	Federal Insurance Administration	State and Local Programs and Support Directorate						
Flood Insurance Studies*	–	–	–	–	*	–	*	–	–	–	–	–	–	–	–	*	–	–	–	–	–	–	S	–						
Flood Plain Management Services	–	–	–	–	S	–	S	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	S	–		S				
Flood Plain Information Studies and Reports																														
Riverine	–	–	–	–	S	–	S	–	–	–	–	–	–	–	–	–	S	S	–	–	–	–	F	–			S			
Coastal	–	–	–	–	I	–	S	G	–	–	–	–	–	–	–	–	I	S	–	–	–	–	F	–						
Technical and Planning Services**																														
Full Program	–	–	–	–	S	–	S	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	F	–			S			
Program Elements	–	–	I	G	I	S	S	I	S	S	I	–	–	–	I	I	S	–	–	I	I	I	I	–			S			
Flood Modifying Construction	–	–	–	G	I	S	S	–	F	–	–	–	–	–	–	–	–	–	–	I	–	–	F	–						
Flood Preparedness, Emergency, and Recovery	–	F	–	G	S	S	S	G	–	–	–	S	G	–	–	–	S	–	S	–	–	–	G	SG						
Warning and Forecasting	–	–	–	–	–	–	–	S	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	I						
Research	S	–	S	–	I	I	S	S	S	–	–	–	–	–	–	S	S	S	–	–	–	–	–	–						
Open Space	–	–	–	–	I	S	–	G	–	–	–	–	G	–	–	–	–	S	–	–	–	–	I	–						

*Administered by the Federal Insurance Administration through reimbursable technical studies by agency shown.
**Land and Water Resources.

S. Staff and Funds
F. Funds
G. Grants and Loans
I. Incidental

reduced. In a practical sense, the Federal role should continue to be strong in information gathering, developing floodplain management criteria, floodplain mapping and in technical planning and implementation services. The Federal role should continue to become more supportive of ongoing State floodplain management activities and encourage adoption of similar programs in States where these are absent. In brief, Federal encouragement and support can be carried out by actions that:

- provide overall objectives and principles as guidelines for consistent State program development, recognizing that, until and unless the States have acquired the capabilities, direct and widespread Federal assistance may be necessary, although not necessarily desirable;

- provide basic information and interpretative analysis for use by State agencies in administering floodplain management programs;

- provide consistent program action, evaluation, and development criteria;

- provide consistent technical, planning, program criteria, and implementation assistance responses through agency actions;

- provide continued, coordinated efforts to develop and implement hazard mitigation strategies and policies;

- provide financial support to the States for establishing or improving floodplain management capabilities as authorized by statue;

- provide for well-defined and active State roles in Federal program activities;

- provide for working directly with the States in dealing with local entities to insure consistent administration of floodplain management programs.

a. Federal Coordination

The primary mechanism for coordination of Federal programs is the Interagency Floodplain Management Task Force which has operated under the auspices of the Federal Emergency Management Agency since 1982 and prior to that date under the Water Resources Council.

The Task Force is responsible for maintaining and encouraging the implementation of "A Unified National Program for Floodplain Management." It has facilitated communications among agencies and assisted in the development of consistency among Federal programs. This coordination has been effective where technical issues were involved and has been enhanced through workshops and seminars, multiagency projects, and particularly through more than 20 publications such as the Floodplain Management Executive Order Guidelines, the Handbook for Flood Plain Management, and the Regulation of Flood Hazard Areas. 12/ The success of the Task Force in fostering progress toward achievement of a Unified National Program argues for the continuation of the Task Force effort.

As Exhibit 2 suggests, however, there continues to be a great need for coordination among Federal agencies for all types of programs. Effective coordination of Federal assistance programs encourages State efforts to develop and maintain their own floodplain management capability. It also encourages local efforts to implement sound and effective floodplain management programs.

b. Regional Coordination

At the regional level, the Delaware and the Susquehanna River Basin Commissions and the Tennessee Valley Authority encourage both statewide and interstate planning of flood-related matters. Established as permanent regional institutions, and in the case of the commissions composed of Federal and State members, these institutions are in a strategic position to guide, coordinate, and unify both Federal and State programs for managing floodplains. Because they are continuing institutions with full-time professional staff, much can be expected of them in coordinating the schedules, priorities, and resources necessary to implement floodplain management programs in their regions. For example, the Delaware and Susquehanna Federal-interstate compact commissions carry out floodplain information and hazard studies. The Tennessee Valley Authority provides a unique high degree of coordination of flood-related activities in its region of the country. In addition, programs such as the areawide and statewide water quality management programs under the Clean Water Act, and the coastal planning programs under the Coastal Zone Management Act, further promote the regional coordination of floodplain management.

12/ See list of publications in Appendix C.

2. State Role

State programs dealing with floodplain management, like those of the Federal government, are the responsibility of a multiplicty of agencies and may be housed in departments such as natural resources, planning, human resources, public works and urban affairs. Also, like the Federal government, States are mostly concerned with riverine and coastal sources of flooding, currently tending to regard stormwater drainage as a local responsibility.

States have the responsibility for coordination within their jurisdiction. The States are vested with the police power, which, by specific delegations to local government, provides the framework within which much of the decisionmaking takes place. State government is close enough to the problems to deal with specifics and yet can handle intrastate floodplain problems that transcend community lines. Likewise, multijurisdictional problems not manageable at the local level can usually be resolved at the State level.

The States are in a position to set strategy for coordination of management programs by establishing statewide standards and procedures for aggregating local programs into subbasin and basin management programs. For the National Flood Insurance Program, the Governors have appointed State coordinators who often serve as coordinators in other water resources programs. They have demonstrated how water resources planning can benefit from State guidance even as the block grant approach has reduced Federal direction. There is a continuing need for a single statewide coordinating office in each State to foster vigorous management programs that will encourage floodplain management in local and regional comprehensive planning; that will monitor and encourage effective coordination among the various offices in the State responsible for other floodplain impacting programs such as coastal zone and wetlands management and pre-and post-flood planning; and that will maintain liaison with Federal agencies, including the Interagency Floodplain Management Task Force.

Especially since the mid 1970s, State capability to carry out floodplain management activity has expanded and now many states have vigorous and comprehensive Floodplain management programs that recognize the full range of alternatives discussed in the conceptual framework. These States have (1) established minimum

standards for local programs; (2) provided floodplain information and training programs; (3) coordinated floodplain management activities at all governmental levels; (4) assisted localities in evaluating various flood damage reduction alternatives, in drafting local floodplain regulations and in solving administrative problems encountered in regulating floodplain development; and (5) established programs for the monitoring and evaluation of the effectiveness of local administration (Exhibit 3).

EXHIBIT 3

STATE FLOODPLAIN MANAGEMENT 13/

Activities	Number of States
Information Distribution	47
Hydrologic and Hydraulic Studies	22
Assistance with Local Ordinances	39
Training Local Officials	34
Monitoring Local Program Administration	27
Enforcement of Violations	16
Insurance Activities	22
Training Insurance Agents and Lenders	10
Regulatory Statutes Adopted	31

A survey of specific State activities indicates the relative importance of eight types of floodplain management activities (Exhibit 3). Almost all (47) States carry out the basic activity of floodplain management information distribution. Almost half of the States (22) conduct hydraulic and hydrologic studies associated with flood hazard identification. Most States (39) assist with the establishment of local ordinances and the training of local officials having responsibility for ordinance implementation (34). About half of the States (27) monitor local program implementation while

13/ Adapted from Chapter V "State Programs," Regulation of Flood Hazard Areas to Reduce Flood Losses, Vol. 3. U. S. Water Resources Council, 1982.

only 16 States actually enforce ordinances. Almost half of the States (22) provide assistance with flood insurance activities and only 10 assist by training insurance agents and lenders.

Some States have enacted legislation that directs the State to step in, solve problems, and regulate areas if communities are not performing their statutory responsibilities. In many States, the functions of floodplain management and related land and water resources concerns have been consolidated under one department. Among the rest of the States, some have merely enabled communities to adopt floodplain regulations, and others have taken no specific actions. In a few of those States that have taken no specific action, the general enabling legislation is often broad enough that zoning and subdivision regulations render specific legislation enabling floodplain regulation unnecessary.

In some States, the legislative basis for floodplain regulation has been present for many years and has stimulated significant action. However, it has only been during the past decade that major State regulatory and zoning programs have emerged, some prompted and fostered by Federal programs.

A total of 31 States have adopted legislation establishing direct State regulation of flood hazard areas or State standard setting for local regulations, including eight which have adopted regulatory or mapping standards surpassing the minimum National Flood Insurance Program's standards. Ten additional States provide technical assistance to local governments on loss reduction techniques such as floodproofing, flood warning, and stormwater management.

Enactment of enabling legislation explicitly addressing floodplain regulations in all States, where such legislation does not exist, should be a primary element in State strategy for coordinating floodplain management programs. This legislation should be buttressed by establishment of a single statewide coordinating office and assignment of staff to carry out floodplain management activities together with application of the concepts found in Executive Order 11988, Floodplain Management, and Executive Order 11990, Protection of Wetlands.

Thus, the importance of the State role in floodplain management is well recognized. However, some States have not taken the active role expected of them. One contributing factor has been that in the administration of some programs Federal agencies essentially bypass State governments and deal directly with local governments. As a result, some States have seen little need to become involved. Federal agencies should continue to seek ways to develop well-defined States roles in their program activities and to work directly with the States in dealing with local governments.

Another contributing factor has been the increased fiscal burden that would have to be assumed by the States under the floodplain management approach. It is apparent that thin or nonexistant funding of this activity at the State level will have to be bolstered and that the States will have to establish budgetary priorities supportive of floodplain management.

Realistically, State legislatures will find it necessary to accept more responsibility to provide levels of funding needed to carry out a comprehensive State floodplain management program, especially as Federal financial assistance is limited in accord with current Federal deficit reduction policies. Floodplain management assistance to States should be supported by provision of floodplain data and information in order to: (1) accelerate the adoption of regulatory controls and other management measures, and provide for their administration, and (2) more effectively utilize ongoing programs as well as the particular expertise possessed by the various Federal agencies. This assistance should be both technical and financial.

To evaluate these efforts, information on the progress of State efforts to increase their floodplain management activities should be periodically assessed and reported to the Congress. This activity should be undertaken jointly by the Interagency Floodplain Management Task Force and the Association of State Floodplain Managers. The Association was established in 1978 to provide a forum for each of the States to share experience and to assist one another to improve the effectiveness of their floodplain management programs.

3. Local Role

Like other levels of government, local responsibility for programs dealing with floodplain management tend to

be fragmented. Unlike other levels of government, local government must deal directly with all sources of flooding and especially stormwater drainage which nationally has become a major source of flood losses.

Because flood-related problems cross local community boundaries, local management efforts need to be guided by State, and Federal standards. Nearly all localities can carry on basic floodplain management efforts. Some have a separate office to administer this type of effort; others rely on traditional offices such as those of the city engineer, director of public works; zoning administrator, or building inspector. However, many small communities have only part-time officials and employees. It is in this latter situation where local floodplain management capabilities are most severely limited, that continuing efforts toward coordinated State-Federal support are critically required.

In spite of many limiting factors, thousands of communities have adopted regulations in conjunction with mapping and floodplain information programs of Federal agencies (Exhibit 2) and a significant number have responded to State programs. By January 1986, over 17,500 communities were enrolled in the National Flood Insurance Program and therefore were committed to adopting and enforcing floodplain management measures that at a minimum were consistent with National Flood Insurance Program criteria. Of that number, over 8,500 in the Regular Program had been furnished detailed flood hazard maps, and therefore are responsible for application of more stringent regulatory measures. These same locally enacted regulations are an essential complement to measures taken to modify flooding and the impacts of flooding if floodplain management is to be effective in mitigation flood losses. The existence of local regulatory programs should be used by Federal and State agencies as a condition of providing financial assistance to locally initiated management programs and projects. This is particularly important where local governments have not adequately addressed stormwater drainage management because of limited resources, resistance to land use planning, and a tendency to deal with urban growth incrementally, rather than through long term master planning. The phasing of such requirements into ongoing programs and currently authorized projects will have to be dealt with by each agency.

Local adoption of land use and construction controls is but the start of the regulatory process in floodplain management. To assure that these regulatory measures and objectives are readily understood and accepted by governmental officials and the public, and thereby effectively carried out, there should be a continual assessment of local capabilities and need for assistance. Some of the States have gained considerable expertise and insight through their work with various Federal agencies and localities in developing comprehensive flood damage reduction programs. Because of their experience and relationship to localities, the States are the logical governmental unit to provide the above assessments and assistance. Existing State capabilities should continue to be utilized in this effort. Federal incentives should be provided to encourage other States to provide local assessments and assistance.

For most floodplain management activities, the local government has the responsibility to initiate application to State and Federal agencies for participation in and assistance from the various programs. The local government must also enact and enforce land and water use regulations and in some cases maintain and operate structures on the floodplain. Thus, to achieve effective floodplain management decisions by obtaining needed levels of technological planning, and financial assistance, local governments must be provided with complete and current information about State and Federal programs.. Conversely, State and Federal agencies must continue to be knowledgeable about the goals and decisions of local governments to exercise effective subbasin and basin wide management activites. Furthermore, to respond adequately to program needs, the Congress and the State legislatures must continue to be provided with information about progress in achieving more effective floodplain management.

For their part, a number of local governments have developed innovative programs to mitigate recurrent and serious flooding in both coastal and inland situations. This innovation has "...involved not only adoption of particularly stringent or unique floodplain regulations but also ancillary ones such as wetland regulations, dune protection ordinances and shoreland zoning restrictions that establish lot sizes, regulate tree cutting, and control other aspects of land use. These collectively reduce losses and serve broader community objectives. Innovative local programs are also characterized by particularly effective administra-

tion and enforcement. Regulations are often combined with nonregulatory approaches such as acquisiton." 14/ Experience with these innovations needs to be shared among local floodplain managers through newsletters and professional meetings with the encouragement and support of State and Federal agencies.

B. Operational Considerations

Those performing the technical and administrative functions of a floodplain management program must give adequate attention to organizational and operational considerations if the program is to be effective. Although these needs are somewhat similar at all levels of government, the existence of differences among the levels must be acknowledged and resolved by making adequate provision for the requirements of each. For example, at the Federal level, agency policy and legislative support are required; they are also needed at the State level in addition to a stregthening of capabilities in resource planning areas; and at the local level, participation in the planning process is required of public officials and local citizens.

1. Information

Effective planning is the key to "A Unified National Program for Floodplain Management," and planning is based on information. Therefore, one of the most important organizational and operational needs is adequate and reliable data in a relevant and usable form.

During the past decade, flood data and floodplain information have been gathered and analyzed at an increased rate, especially through ongoing Federal programs. However, of the estimated 20,000 communities with flood hazards, fewer than 50 percent, to date, have been furnished detailed flood and flood related information by various Federal and State agencies in order to provide a basis for implementing a floodplain management program. Even where data related to flooding exist, potential users are not always aware of all the

14/ Innovation in Local Floodplain Management, Appendix B, Regulation of Flood Hazard Areas to Reduce Flood Losses, Volume 3. Special Publication 4. Natural Hazards Research and Applications Center, University of Colorado, Boulder, 1982, p. 16.

information that is available or where to find it (and often how to use it). For example, the Soil Conservation Service has prepared detailed soil maps and interpretations for more than 72 percent of the Nation, and this information could be used to determine appropriate uses of floodplains and to assist in tentative or preliminary delineation of flood hazard areas in the absence of engineering evaluations, especially in rural areas. Similar soil surveys are carried out by public land management agencies including the Bureau of Indian Affairs, Bureau of Land Management, and the Forest Service. In another example, the Fish and Wildlife Service has carried out a National Wetlands Inventory providing descriptions and maps of the Nation's wetlands, areas generally found within floodplains.

The Geological Survey also assists in defining flood hazards by analysis of flood records collected for many years, especially for small streams during the last 20 or 30 years. Thus, there is a critical need to develop information dissemination programs to make potential floodplain users aware of data sources and the means of accessing data.

A full range of flood-related technical services and planning guidance is provided by the Corps of Engineers though its Floodplain Management Services Program. Similar services are provided by the Soil Conservation Service and for a limited geographical area by the Tennessee Valley Authority. The Federal Emergency Management Agency has established a technical assistance program for communities participating in the National Flood Insurance Program and through its interagency hazard mitigation team responsibilities is encouraging post-flood disaster mitigation activity. Flood forecasting and warning services provided by the National Oceanic and Atmospheric Administration depend upon public awareness and response to have meaning. The latter illustrates that improved information dissemination and utilization are as important as improved data, and both are needed. The need for including the costs of installing and maintaining a flood alarm system and/or data collection network and disseminating a flood or flash flood warning should be evaluated as part of any floodplain management plan.

As recognized in the review of House Document 465, there has been a major deficiency in research and information on floodplain occupancy. While this deficiency has been partially addressed, a National Science Foundation

sponsored study shows that among Federally supported research projects on floods and their mitigation, only 15 per cent deal with floodplain occupancy. 15/ Information is needed about the perception of and response to flood risk and about the social effectiveness of floodplain land use and other management tools. Interpretation of the information on floodplain occupancy is closely associated with cultural, biological, and physical data relevant to the interrelationships of land, water resources, and environmental values; the types and specificity of data remain to be determined.

House Document 465 notes further that consistent procedures are needed for reporting both experienced and projected flood losses. Consistent data on experienced flood losses compiled on a yearly basis, by State,and for specific events, such as individual hurricanes or large regional floods would permit more effective evaluation of current programs to reduce flood losses. The latter requires a national compilation of the amount, location, physical type, and nature of the human occupancy of floodplains and would provide information basic to development of sound policies for future floodplain management. National and regional policy objectives could be established to guide decisions about floodplain development, preservation, and restoration. Better choices could be made among alternative actions and priorities for resource allocation. Compilation of a national assessment of programs could be coordinated with the National Water Assessment Program of the U.S. Geological Survey and the Community Assistance Program of the Federal Insurance Administration.

Since the late 1970s, a wealth of information about how to assess floodplain resources and potential uses has been published by Federal and State agencies. A floodplain management handbook describing in detail floodplain management objectives, tools, strategies, and the available Federal programs was prepared by the Water Resources Council for use by State and local officials in implementing the conceptual framework of Chapter III. Supporting documents describing individual State programs have been prepared by some States and by the Water Resources Council to facilitate further information flow

15/ S.A. Changnon, Jr., et al. A Plan for Research on Floods and their Mitigation in the United States. Illinois State Water Survey: Champaign, IL, 1983. pp 12-13.

to the local level. Within each State there should be a centralized source of floodplain data accessible to local planners and floodplain decisionmakers. Annual conferences of the Association of State Floodplain Managers and the National Flood Insurance Program now provide vehicles for exchange of knowledge, training and coordination among the States and between the States and Federal agencies. However, a periodic national conference also involving local and private floodplain managers should be convened to further evaluate and foster coordination of floodplain management activities.

More information is needed on the hydrologic and hydraulic conditions associated with the major sources of flooding (riverine, coastal, rising groundwater/subsidence, and local stormwater drainage), on the impact of development on flooding levels, and more effective, simpler methodologies for delineating flood hazard area. However, another problem arises as data are analyzed. Although a uniform approach has been devised for presenting hydrologic and hydraulic data for gauged reaches, streamflow records are available for relatively few locations, and different techniques must be employed to develop synthetic flood information at ungauged locations. (Similar problems occur with tidal flood data.) Hydrology, however, is not an exact science, and qualified studies for the same site occasionally result in inconsistencies that are difficult to resolve.

In spite of recent progress, all these difficulties interact to compound the information related problems, which in turn frustrate local planning and delay needed programs. These difficulties must be overcome to ensure that required planning information for riverine and coastal areas is obtained and made readily accessible.

Previous chapters have suggested a management approach that emphasizes comprehensive planning. To be effective, however, this approach requires continuing reinforcement by ongoing programs of training and information flows to planners at all levels, and planners in turn must convey information to their constituencies of decisionmakers and citizens. For their part, planners need to continue to emphasize overall management of floodplains in the context of community and regional planning and the conceptual framework described herein.

2. Research Coordination

A single program of floodplain management research employing modern scientific techniques does not exist,

although a great deal of related research has been done and progress has been made in identifying research needs. Coordination of research is needed. At the direction of Congress, the National Science Foundation prepared a 1980 report setting forth the problems of flood hazard mitigation. 16/ A follow-up study in 1982 set forth a flood hazard mitigation research agenda by discipline. 17/ Thus, there has been recognition of both the need to coordinate research and to translate research into operatonal guidelines. To be effective, a research program requires the full cooperation and support, including funds, of concerned Federal, State, and local interests. In such a program an annual assessment of research needs and priorities would be identified by chief administrators of a coordinating body in conjunction with officials of State water resource and planning agencies. Research projects to satisfy these needs would be defined by the chief administrators of the coordinating body, and when funded, qualified research agencies and individuals would be selected by appropriate agencies to carry on such research. Surveillance of research programs would be the responsibilities of the coordinating body.

Although major Federal water research programs include those operated by the departments of Agriculture, Army, Commerce, and Interior; the Environmental Protection Agency; and the Federal Emergency Management Agency; there is room for improved coordination. To a limited degree the Interagency Floodplain Management Task Force responsible for implementing the Unified National Program for Floodplain Management has provided a research coordination function by encouraging multiagency support of selected research activities. In keeping with its objective of fostering implementation of a unified program, the Task Force should encourage establishment of a research coordination mechanism which would involve all levels of government as advocated above.

3. Evaluation Guidelines and Analysis of Alternatives

Achievement of the goals of floodplain management requires analysis of all alternative plans prior to selecting a course of action. For many major Federal actions the timely analysis of alternative plans is also a requirement of the National Environmental Policy Act. There is a need to

16/ National Science Foundation. A Report on Flood Hazard Mitigation; Washington, D.C.; September 1980.

17/ Changnon, op. cit.

apply accepted techniques of analysis and evaluation consistently, regardless of the applicable legislation or level of jurisdiction involved, in order to encourage the development of objective, well-coordinated comprehensive plans. These techniques should provide comparability for investment decisions and a full display of all alternative strategies and tools within the conceptual framework of floodplain management. Uniform implementation of such standard techniques would be instrumental in reducing inconsistencies in existing public programs and fragmented responsibilities in floodplain management. Use of the Economic and Environmental Principles and Guidelines for Implementation Studies published by the Water Resources Council for planning water and related land resources is facilitating realization of many of the objectives expressed in this section.

4. Federal Financial Programs

The terms of Federal loans and grants (including those which may be used for community development assistance, cost sharing, and investment programs) should act as incentives for sound floodplain management. A consistent national policy for providing Federal financial assistance is needed to assist State and local government units in fulfilling responsibilities for present and future use of floodplain and related resources. It must be emphasized that cost sharing can have wide-ranging implications for floodplain related investments. Involved are not only the relative proportions of cost sharing and their impact on the number and size of projects and programs permitted under limited budgets, but also the question of which tools of floodplain management are to be cost shared. Current emphasis upon the use of nonstructural tools must be accompanied by careful analysis of when, how much, and what form of Federal cost sharing is appropriate. Currently, the Federal Government bears a large share of the cost for programs that modify floodwaters and for programs that modify the impact of flooding on communities and individuals.

Given consistent Federal policy as a guide, State governments can develop their own policies for floodplain management that in time would provide guidance to local governments in implementing their programs. Plans and actions for floodplain management would then reflect environmental, esthetic, economic, and social considerations in an integrated approach, less biased by inconsistent funding and cost-sharing opportunities. It

would encourage all applicants for grant, loan, and investment programs to give appropriate consideration to all alternatives, provide adequate information regarding each, and specify measures to be taken to ensure that each option will receive a fair and impartial evaluation. Before any proposal could be approved, each project application would be accompanied by plans, specifications and estimates, or description of the proposed work prepared in sufficient detail to indicate the approach that is to be taken. Institutional arrangements among Federal, State, and local governments must be coordinated so that respective program standards and criteria may be satisfied and individual programs can be administered with speed and flexibility. Development and management of programs at State and local levels usually require additional funding. If the Federal Government is to share in this funding, consistent cost sharing practices are also needed.

5. Substate Institutional Arrangements

Many conflicts in floodplain management arise between local communities or between adjoining incorporated and unincorporated areas, between which or through which a common stream flows. Diking or filling of floodplains in one jurisdiction may cause increased flood levels downstream or across the stream. Constriction of the channel may cause increased flood levels in upstream communities. On the other hand, communities which share a common floodplain may realize unexpected benefits in pooling their management efforts, as in joint acquisitions or regulatory programs. With increasing reliance placed on nonstructural floodplain management, the importance of coordination within individual watersheds and floodplains is of critical importance. Counties, special districts, and interlocal agreements can be utilized to overcome conflicts and achieve necessary coordination.

County governments in many States are potentially useful in the implementation of floodplain management plans in small watersheds, especially around metropolitan areas where inadequate stormwater drainage is a major cause of flooding. The powers of counties may be augmented by State legislation as necessary to expand their functions, for instance, to acquire land as floodways. Together with regional planning agencies and councils of governments, county planning offices may provide technical assistance to local governments. Finally, counties normally exercise zoning and planning jurisdiction over unincorporated areas within their borders. Where adopted, strong county floodplain regulations may serve to inspire local municipalities to do the same.

Special districts perform many floodplain management functions throughout the United States. Traditionally, local drainage, flood control, and levee districts have enabled the costs of such improvements to be charged to the owners of benefitted land. Special districts at the county level in many States provide flood mitigation benefits through the acquisition and management of regional parks and forest preserves. Sewage treatment districts, water districts, and other metropolitan service districts may exert important influence for better or worse on regional floodplain management efforts through their corporate policies and decisions. Certain districts have been formed under special acts of State legislatures for the purpose of managing a particular watershed or stream valley for a variety of objectives, including flood control. The potential utility of special districts for resolving interlocal floodplain problems has scarcely begun to be explored.

Where the communities which share a floodplain agree as to the need for a coordinating mechanism, they may enter into some form of interlocal agreement or contract according to the applicable State law. Municipalities have entered into formal intergovermental contracts to establish flood control commissions or drainage districts with a variety of delegated powers relating to flood control and floodplain management. Intergovernmental agreements are being much more widely accepted for diverse public functions ranging from libraries to medical care to waste disposal. The use of such agreements for floodplain management is long overdue.

C. The Current Situation and the Conceptual Framework

The foregoing discussion indicates that the relative role of the Federal government in national floodplain management is declining as local, but especially State, governments have begun to develop experience and effective programs. Viewed in the context of the major sources of flooding and the statements on sound floodplain mangement found in the conceptual framework, attention is focused squarely upon ineffective coordination as a major weakness in the use of the limited resources presently devoted to floodplain management. Each of the interdependent components of sound floodplain management -- goals, future needs, alternative strategies, accounting, motivation, and evaluation -- depends upon effective coordination. Institutional arrangements organized to satisfy the objectives and principles of

floodplain management are necessary to coordinate policies and programs within and among each level of government. The problem is to provide institutional arrangements that can effectively exercise authority, articulate policies and programs, and provide the resources needed to carry out the respective responsibilities.

A system that can build on and incorporate the elements of existing institutions is more likely to be successful than an entirely new set of institutional arrangements. For the most part, the tools of a floodplain management system exist, but the authority to utilize them is dispersed among different levels of government and among various agencies.

1. Intragovernmental Coordination

At each level of government, statutory responsibility for programs integral to floodplain management is often spread across several agencies. Because Federal programs are a common source of funds for State and local programs, and because States are the primary source of necessary management powers, leadership in coordinating programs at the Federal and State levels is prerequisite to effective coordination among all levels of government.

There are many ways of achieving coordination among agencies at a given level of government. At the Federal level the current Task Force under the auspices of Federal Emergency Management Agency should be retained to carry out a continuing evaluation of Federal programs for their consistency and to facilitate communication and encourage coordination of floodplain management activities. General functions of this Task Force should include (1) preparing reports for the Congress and the public on progress toward achieving "A Unified National Program for Floodplain Management;" (2) developing and recommending a national plan of priorities for Federal assistance to State and local governments to assure wise management of the Nation's floodplains; and (3) providing leadership in solving broad problems such as standardization of techniques for data collection, analysis, and dissemination. The housekeeping function for the Task Force, including maintaining necessary files and records, providing clerical assistance and meeting space, operating a clearinghouse for floodplain management and related information, and providing other services, should be provided by the Federal Emergency Management Agency. A similar coordinating body, possibly the Association of State Floodplain Managers could provide an appropriate mechanism at the State level.

2. Intergovernmental Coordination

Given effective coordination of agency programs at the Federal and State levels, the task of coordination between levels of government becomes easier. Functions of the Task Force described above should include continuous liaison, overall assistance and guidance for program development, and a forum for the participation of multi-State regional organizations, the individual States, and local governments.

With active and coordinated Federal participation and support, State planning agencies could provide the necessary means to develop a set of institutional arrangements that can be focused through substate regional organizations and local governments on the floodplains of the Nation. The State, with the legislative authority necessary to initiate the programs, with firsthand knowledge of conditions, and with proximity to the problems, is best situated to assume the lead role of managing and directing a unified floodplain management program. Institutional arrangements that the States would have to develop are not set forth here. However, to be consistent with floodplain management, Federal support would have to be predicated upon institutional arrangements within the State providing for:

- legislative direction to develop a statewide floodplain management program and to assemble and maintain a floodplain management staff; and

- legislation providing authority for the State to specify a floodplain amangement program for communities that do not respond in a reasonable time.

Intergovernmental and intragovernmental coordination, accompanied by adoption and utilization of the precepts found in the conceptual framework, are essential to achieving in practice the national goal of unified floodplain management.

APPENDIX A

Floodplain Management

Statement by the President Accompanying Executive Order 11988. May 24, 1977

The floodplains which adjoin the Nation's inland and coastal waters have long been recognized as having special values to our citizens. They have provided us with wildlife habitat, agricultural and forest products, stable ecosystems, and park and recreation areas. However, unwise use and development of our riverine, coastal, and other floodplains not only destroy many of the special qualities of these areas but pose a severe threat to human life, health, and property.

Since the adoption of a national flood control policy in 1936, the Federal Government has invested about $10 billion in flood protection works. Despite substantial efforts by the Federal Government to reduce flood hazards and protect floodplains, annual losses from floods and adverse alteration of floodplains continue to increase.

The problem arises mainly from unwise land use practices. The Federal Government can be responsible for or can influence these practices in the construction of projects, in the management of its own properties, in the provision of financial or technical assistance including support of financial institutions, and in the uses for which its agencies issue licenses or permits. In addition to minimizing the danger to human and nonhuman communities living in floodplains, active floodplain management represents sound business practice by reducing the risk of flood damage to properties benefiting from Federal assistance.

Because unwise floodplain development can lead to the loss of human and other natural resources, it is simply a bad Federal investment and should be avoided. In order to avoid to the extent possible the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative, I have issued an Executive order on floodplain management.

Floodplain Management

Executive Order 11988. May 24, 1977

By virtue of the authority vested in me by the Constitution and statutes of the United States of America, and as President of the United States of America, in furtherance of the National Environmental Policy Act of 1969, as amended (42 U.S.C. 4321 *et seq.*), the National Flood Insurance Act of 1968, as amended (42 U.S.C. 4001 *et seq.*), and the Flood Disaster Protection Act of 1973 (Public Law 93–234, 87 Stat. 975), in order to avoid to the extent possible the long and short term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative, it is hereby ordered as follows:

SECTION 1. Each agency shall provide leadership and shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains in carrying out its responsibilities for (1) acquiring, managing, and disposing of Federal lands and facilities; (2) providing Federally undertaken, financed, or assisted construction and improvements; and (3) conducting Federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulating, and licensing activities.

SEC. 2. In carrying out the activities described in Section 1 of this Order, each agency has a responsibility to evaluate the potential effects of any actions it may take in a floodplain; to ensure that its planning programs and budget requests reflect consideration of flood hazards and

floodplain management; and to prescribe procedures to implement the policies and requirements of this Order, as follows:

(a)(1) Before taking an action, each agency shall determine whether the proposed action will occur in a floodplain—for major Federal actions significantly affecting the quality of the human environment, the evaluation required below will be included in any statement prepared under Section 102(2)(C) of the National Environmental Policy Act. This determination shall be made according to a Department of Housing and Urban Development (HUD) floodplain map or a more detailed map of an area, if available. If such maps are not available, the agency shall make a determination of the location of the floodplain based on the best available information. The Water Resources Council shall issue guidance on this information not later than October 1, 1977.

(2) If an agency has determined to, or proposes to, conduct, support, or allow an action to be located in a floodplain, the agency shall consider alternatives to avoid adverse effects and incompatible development in the floodplains. If the head of the agency finds that the only practicable alternative consistent with the law and with the policy set forth in this Order requires siting in a floodplain, the agency shall, prior to taking action, (i) design or modify its action in order to minimize potential harm to or within the floodplain, consistent with regulations issued in accord with Section 2(d) of this Order, and (ii) prepare and circulate a notice containing an explanation of why the action is proposed to be located in the floodplain.

(3) For programs subject to the Office of Management and Budget Circular A-95, the agency shall send the notice, not to exceed three pages in length including a location map, to the state and areawide A-95 clearinghouses for the geographic areas affected. The notice shall include: (i) the reasons why the action is proposed to be located in a floodplain; (ii) a statement indicating whether the action conforms to applicable state or local floodplain protection standards and (iii) a list of the alternatives considered. Agencies shall endeavor to allow a brief comment period prior to taking any action.

(4) Each agency shall also provide opportunity for early public review of any plans or proposals for actions in floodplains, in accordance with Section 2(b) of Executive Order No. 11514, as amended, including the development of procedures to accomplish this objective for Federal actions whose impact is not significant enough to require the preparation of an environmental impact statement under Section 102(2)(C) of the National Environmental Policy Act of 1969, as amended.

(b) Any requests for new authorizations or appropriations transmitted to the Office of Management and Budget shall indicate, if an action to be proposed will be located in a floodplain, whether the proposed action is in accord with this Order.

(c) Each agency shall take floodplain management into account when formulating or evaluating any water and land use plans and shall require land and water resources use appropriate to the degree of hazard involved. Agencies shall include adequate provision for the evaluation and consideration of flood hazards in the regulations and operating procedures for the licenses, permits, loan or grants-in-aid programs that they administer. Agencies shall also encourage and provide appropriate guidance to applicants to evaluate the effects of their proposals in floodplains prior to submitting applications for Federal licenses, permits, loans or grants.

(d) As allowed by law, each agency shall issue or amend existing regulations and procedures within one year to comply with this Order. These procedures shall incorporate the Unified National Program for Floodplain Management of the Water Resources Council, and shall explain the means that the agency will employ to pursue the nonhazardous use of riverine, coastal and other floodplains in connection with the activities under its authority. To the extent possible, existing processes, such as those of the Council on Environmental Quality and the Water Resources Council, shall be utilized to fulfill the requirements of this Order. Agencies shall prepare their procedures in consultation with the Water Resources Council, the Federal Insurance Administration, and the Council on Environmental Quality, and shall update such procedures as necessary.

Sec. 3. In addition to the requirements of Section 2, agencies with responsibilities for Federal real property and facilities shall take the following measures:

(a) The regulations and procedures established under Section 2(d) of this Order shall, at a minimum, require the construction of Federal structures and facilities to be in accordance with the standards and criteria and to be consistent with the intent of those promulgated under the National Flood Insurance Program. They shall deviate only to the extent that the standards of the Flood Insurance Program are demonstrably inappropriate for a given type of structure or facility.

(b) If, after compliance with the requirements of this Order, new construction of structures or facilities are to be located in a floodplain, accepted floodproofing and other flood protection measures shall be applied to new construction or rehabilitation. To achieve flood protection, agencies shall, wherever practicable, elevate structures above the base flood level rather than filling in land.

(c) If property used by the general public has suffered flood damage or is located in an identified flood hazard area, the responsible agency shall provide on structures, and other places where appropriate, conspicuous delineation of past and probable flood height in order to enhance public awareness of and knowledge about flood hazards.

(d) When property in floodplains is proposed for lease, easement, right-of-way, or disposal to non-Federal public or private parties, the Federal agency shall (1) reference in the conveyance those uses that are restricted under

identified Federal, State, or local floodplain regulations; and (2) attach other appropriate restrictions to the uses of properties by the grantee or purchaser and any successors, except where prohibited by law; or (3) withhold such properties from conveyance.

SEC. 4. In addition to any responsibilities under this Order and Sections 202 and 205 of the Flood Disaster Protection Act of 1973, as amended (42 U.S.C. 4106 and 4128), agencies which guarantee, approve, regulate, or insure any financial transaction which is related to an area located in a floodplain shall, prior to completing action on such transaction, inform any private parties participating in the transaction of the hazards of locating structures in the floodplain.

SEC. 5. The head of each agency shall submit a report to the Council on Environmental Quality and to the Water Resources Council on June 30, 1978, regarding the status of their procedures and the impact of this Order on the agency's operations. Thereafter, the Water Resources Council shall periodically evaluate agency procedures and their effectiveness.

SEC. 6. As used in this Order:

(a) The term "agency" shall have the same meaning as the term "Executive agency" in Section 105 of Title 5 of the United States Code and shall include the military departments; the directives contained in this Order, however, are meant to apply only to those agencies which perform the activities described in Section 1 which are located in or affecting floodplains.

(b) The term "base flood" shall mean that flood which has a one percent or greater chance of occurrence in any given year.

(c) The term "floodplain" shall mean the lowland and relatively flat areas adjoining inland and coastal waters including floodprone areas of offshore islands, including at a minimum, that area subject to a one percent or greater chance of flooding in any given year.

SEC. 7. Executive Order No. 11296 of August 10, 1966, is hereby revoked. All actions, procedures, and issuances taken under that Order and still in effect shall remain in effect until modified by appropriate authority under the terms of this Order.

SEC. 8. Nothing in this Order shall apply to assistance provided for emergency work essential to save lives and protect property and public health and safety, performed pursuant to Sections 305 and 306 of the Disaster Relief Act of 1974 (88 Stat. 148, 42 U.S.C. 5145 and 5146).

SEC. 9. To the extent the provisions of Section 2(a) of this Order are applicable to projects covered by Section 104(h) of the Housing and Community Development Act of 1974, as amended (88 Stat. 640, 42 U.S.C. 5304(h)), the responsibilities under those provisions may be assumed by the appropriate applicant, if the applicant has also assumed, with respect to such projects, all of the responsibilities for environmental review, decisionmaking, and action pursuant to the National Environmental Policy Act of 1969, as amended.

JIMMY CARTER

The White House,
May 24, 1977.

APPENDIX B

Protection of Wetlands

Statement by the President Accompanying Executive Order 11990. May 24, 1977

The Nation's coastal and inland wetlands are vital natural resources of critical importance to the people of this country. Wetlands are areas of great natural productivity, hydrological utility, and environmental diversity, providing natural flood control, improved water quality, recharge of aquifers, flow stabilization of streams and rivers, and habitat for fish and wildlife resources. Wetlands contribute to the production of agricultural products and timber, and provide recreational, scientific, and aesthetic resources of national interest.

The unwise use and development of wetlands will destroy many of their special qualities and important natural functions. Recent estimates indicate that the United States has already lost over 40 percent of our 120 million acres of wetlands inventoried in the 1950's. This piecemeal alteration and destruction of wetlands through draining, dredging, filling, and other means has had an adverse cumulative impact on our natural resources and on the quality of human life.

The problem of loss of wetlands arises mainly from unwise land use practices. The Federal Government can be responsible for or can influence these practices in the construction of projects, in the management of its own properties, and in the provisions of financial or technical assistance.

In order to avoid to the extent possible the long and short term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative, I have issued an Executive order on the protection of wetlands.

Protection of Wetlands

Executive Order 11990. May 24, 1977

By virtue of the authority vested in me by the Constitution and statutes of the United States of America, and as President of the United States of America, in furtherance of the National Environmental Policy Act of 1969, as amended (42 U.S.C. 4321 *et seq.*), in order to avoid to the extent possible the long and short term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative, it is hereby ordered as follows:

SECTION 1. (a) Each agency shall provide leadership and shall take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities for (1) acquiring, managing, and disposing of Federal lands and facilities; and (2) providing Federally undertaken, financed, or assisted construction and improvements; and (3) conducting Federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulating, and licensing activities.

(b) This Order does not apply to the issuance by Federal agencies of permits, licenses, or allocations to private parties for activities involving wetlands on non-Federal property.

SEC. 2.(a) In furtherance of Section 101(b)(3) of the National Environmental Policy Act of 1969 (42 U.S.C. 4331(b)(3)) to improve and coordinate Federal plans, functions, programs and resources to the end that the Nation may attain the widest range of beneficial uses of the environment without degradation and risk to health or safety, each agency, to the extent permitted by law, shall avoid undertaking or providing assistance for new construction located in wetlands unless the head of the agency finds (1) that there is no practicable alternative to such construction, and (2) that the proposed action includes all practicable measures to minimize harm to wetlands which may result from such use. In making this finding the head of the agency may take into account economic, environmental and other pertinent factors.

(b) Each agency shall also provide opportunity for early public review of any plans or proposals for new construction in wetlands, in accordance with Section 2(b) of Executive Order No. 11514, as amended, including the development of procedures to accomplish this objective for Federal actions whose impact is not significant enough

to require the preparation of an environmental impact statement under Section 102(2)(C) of the National Environmental Policy Act of 1969, as amended.

SEC. 3. Any requests for new authorizations or appropriations transmitted to the Office of Management and Budget shall indicate, if an action to be proposed will be located in wetlands, whether the proposed action is in accord with this Order.

SEC. 4. When Federally-owned wetlands or portions of wetlands are proposed for lease, easement, right-of-way or disposal to non-Federal public or private parties, the Federal agency shall (a) reference in the conveyance those uses that are restricted under identified Federal, State or local wetlands regulations; and (b) attach other appropriate restrictions to the uses of properties by the grantee or purchaser and any successor, except where prohibited by law; or (c) withhold such properties from disposal.

SEC. 5. In carrying out the activities described in Section 1 of this Order, each agency shall consider factors relevant to a proposal's effect on the survival and quality of the wetlands. Among these factors are:

(a) public health, safety, and welfare, including water supply, quality, recharge and discharge; pollution; flood and storm hazards; and sediment and erosion;

(b) maintenance of natural systems, including conservation and long term productivity of existing flora and fauna, species and habitat diversity and stability, hydrologic utility, fish, wildlife, timber, and food and fiber resources; and

(c) other uses of wetlands in the public interest, including recreational, scientific, and cultural uses.

SEC. 6. As allowed by law, agencies shall issue or amend their existing procedures in order to comply with this Order. To the extent possible, existing processes, such as those of the Council on Environmental Quality and the Water Resources Council, shall be utilized to fulfill the requirements of this Order.

SEC. 7. As used in this Order:

(a) The term "agency" shall have the same meaning as the term "Executive agency" in Section 105 of Title 5 of the United States Code and shall include the military departments; the directives contained in this Order, however, are meant to apply only to those agencies which perform the activities described in Section 1 which are located in or affecting wetlands.

(b) The term "new construction" shall include draining, dredging, channelizing, filling, diking, impounding, and related activities and any structures or facilities begun or authorized after the effective date of this Order.

(c) The term "wetlands" means those areas that are inundated by surface or ground water with a frequency sufficient to support and under normal circumstances does or would support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, and similar areas such as sloughs, potholes, wet meadows, river overflows, mud flats, and natural ponds.

SEC. 8. This Order does not apply to projects presently under construction, or to projects for which all of the funds have been appropriated through Fiscal Year 1977, or to projects and programs for which a draft or final environmental impact statement will be filed prior to October 1, 1977. The provisions of Section 2 of this Order shall be implemented by each agency not later than October 1, 1977.

SEC. 9. Nothing in this Order shall apply to assistance provided for emergency work, essential to save lives and protect property and public health and safety, performed pursuant to Section 305 and 306 of the Disaster Relief Act of 1974 (88 Stat. 148, 42 U.S.C. 5145 and 5146).

SEC. 10. To the extent the provisions of Sections 2 and 5 of this Order are applicable to projects covered by Section 104(h) of the Housing and Community Development Act of 1974, as amended (88 Stat. 640, 42 U.S.C. 5304(h)), the responsibilities under those provisions may be assumed by the appropriae applicant, if the applicant has also assumed, with respect to such projects, all of the responsibilities for environmental review, decisionmaking, and action pursuant to the National Environmental Policy Act of 1969, as amended.

JIMMY CARTER

The White House,
May 24, 1977.

APPENDIX C

FLOODPLAIN MANAGEMENT PUBLICATIONS

In 1968 the Congress directed the President to prepare "A Unified National Program for Floodplain Management" (Public Law 90-448, §1302 (c)). Subsequently Federal agencies working together through the interagency Floodplain Management Task Force (under the auspices of the Water Resources Council until 1982 and thereafter under the auspices of the Federal Emergency Management Agency) have issued a series of publications in support of the Unified National Program. A list of these publications, their source and cost are provided hereafter. Those publications most frequently requested by local local, State and Federal agencies are marked by an asterisk (*) and an abstract has been provided herein courtesy of the Natural Hazards Research and Applications Information Center, University of Colorado.

The following abbreviations have been used:

PC.....Paper Copy

MF.....Microfiche

GPO.....U.S. Government Printing Office
Superintendent of Documents
Washington, D.C. 20402

NTIS.....National Technical Information Service
5285 Port Royal Road
Springfield, VA 22151

FR.....Federal Register

UC.....University of Colorado
Natural Hazards Research and Applications
Information Center, Campus Box 482, Boulder,
CO 80309

FLOODPLAIN MANAGEMENT PUBLICATIONS

1. General

A Unified National Program for Flood Plain Management*
(September 1979) (May 1976 - out of print)
GPO 052-045-00058-4 $5.50

Floodplain Management Guidelines for Implementing E.O. 11988*
(February 10, 1978)
43 FR 6030 Federal Register

Floodplain Management Handbook,* H. James Owen and Glen R. Wall (September 1981)
GPO 008-022-00167-1 $4.75

Evaluating the Effectiveness of Floodplain Management Techniques and Community Programs,*
Tennessee Valley Authoriy, (1984)
UC Special Publication No. 10 P.C. $8.00

2. Regulation of Flood Hazard Areas

Regulation of Flood Hazard Areas to Reduce Flood Losses, Vol. III*; Jon A. Kusler (1982)
UC $8.00

Strengthening State Floodplain Management*,
Patricia A. Bloomgren
UC $8.00

Local Innovations in Floodplain Regulation*, Jon A. Kusler (1982)
UC $8.00

Floodplain Regulations and the Courts*, Jon A. Kusler (1984)
UC $5.00

Regulation of Flood Hazard Areas, Vols. 1, and 2 (1971, 1972)
U.S. Water Resources Council
GPO Out of Print

3. Nonstructural Flood Loss Reduction

Nonstructural Floodplain Management Study: Overview
Gilbert F. White (October 1978)
NTIS PB 80 158538 PC $ 6.00 MF $4.00

Floodplain Acquisition: Issues and Options in Strengthening Federal Policy, Jon A. Kusler (October 1978)
NTIS PB 80 158090 PC $10.50 MF $4.00

Improved Formulation and Evaluation of Nonstructural Elements for Water Resources Plans in Flood Hazard Areas
Leonard A. Shabman (October 1979)
NTIS PB 80 160120 PC $ 7.50 MF $4.00

Options to Improve Federal Nonstructural Responses to Flood
Rutherford H. Platt (December 1979)
NTIS PB 80 160146 PC $13.50 MF $4.00

Nonstructural Measures in Flood Damage Reduction Activities
Gerald E. Galloway, Jr. (July 1980)
NTIS PB 81 180424 PC $ 9.00 MF $4.00

The Influence of Regulations and Practices on the Implementation of Nonstructural Flood Plain Plans
CME Associates, Inc. (November 1980)
NTIS PB 81 231763 PC $ 9.00 MF $4.00

4. Integrated Floodplain/Wetlands Management

State and Local Acquisition of Floodplains and Wetlands*
Ralph M. Field Associates (September 1981)
NTIS PB 82 184805 PC $10,50 MF $4.00

Analysis of Methodologies Used for the Assessment of Wetland Values, (includes Appendices A-B) Environmental Laboratory, U.S. Army Waterways Experiment Station (September 1981)
NTIS PB 81 245664 PC $10.50 MF $4.00

Analysis of Methodologies used for the Assessment of Wetland Values
Appendices C-E (September 1981)
NTIS PB 82 110362 PC $31.50 MF $4.00

Sources of Wetlands/Floodplain Research Information (October 1980)
NTIS PB 81 112476 PC $ 6.00 MF $4.00

Workshop Report on Bottomland Hardwood Wetlands
National Wetlands Technical Council (June 1-5, 1980)
NTIS PB 81 224974 PC $16.50 MF $4.00

Economic Aspects of Wildlife Habitat and Wetlands
Midwest Research Institute (February 1979)
NTIS PB 81 190654 PC $12.00 MF $4.00

Emerging Issues in Wetland/Floodplain Management -- Summary Report of a Technical Seminar Series
Jon A. Kusler (September 1979)
NTIS PB 80 129802 PC $ 7.50 MF $4.00

Emerging Issues in Wetland/Floodplain Management -- Supporting Materials for a Report of a Technical Seminar
Jon A. Kusler (September 1979)
NTIS PB 80 130404 PC $15.00 MF $4.00

5. Technical Studies

Cooperative Flood Loss Reduction: A Technical Manual for Communities and Industry*, H. James Owen (September 1981)
GPO 003-017-00501-1 $ 5.50

Guidelines for Determining Flood Flow Frequency
Bulletin 17B (revised) Hydrology Committee (September 1981)
GPO 051-045-00084-3 $ 6.75

An Assessment of Storm Surge Modeling
Hydrology Committee (1980)
NTIS PB 81 233785 PC $ 7.50 MF $4.00

Estimating Peak Flow Frequencies for Natural Ungaged Watersheds
(A Proposed Nationwide Test) Hydrology Committee (1981)
NTIS PB 81 239329 PC $27.00 MF $4.00

6. Abstracts of Frequently Requested Publications

U.S. Water Resources Council. 2120 L Street, NW. Washington, D.C. 20037 A Unified National Program for Floodplain Management (Revised), 1979.

Available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Stock Number is 052045-0058-4.

Since it was first issued in 1976, a number of factors have prompted a revision of the report. These factors include: the President's 1977 Environmental Message; Executive Order 11988 on Floodplain Management; Executive Order 11990 on the Protection of Wetlands; and the President's Water Policy Reform Message of 1978. The report describes a unified, cooperative effort by all levels of government and the private sector to minimize loss of life, property and environmental values within floodplains. A conceptual framework is set out to guide local, State and Federal decision makers toward balanced consideration of alternative goals, strategies, and tools. Improved comprehensive local floodplain management efforts under the National Flood Insurance Program, the Coastal Zone Management Program, the Clean Water Act, and other programs are also described. At all governmental levels, innovative floodplain management efforts encompassing a wide range of tools and stressing nonstructural mitigative approaches are being increasingly emphasized.

Executive Order 11988 - Guidelines for Federal Agencies. Federal Register 43, no. 29, February 10, 1978.

A set of guidelines for Federal agencies to use in implementing Executive Order 11988--Floodplain Management--has been issued by the Water Resources Council. The objectives of the Executive Order are "to avoid to the extent possible the long- and shortterm adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development whereever there is a practicable alternative..." Through their regulations and procedures, the Federal agencies are required to take a leadership role in:

- avoiding the base (one per chance) floodplain if at all possible;
- acting to adjust to the base floodplain; and
- keeping the public informed of proposed actions in the base floodplain and encouraging public participation in floodplain decision making.

The Guidelines, the result of a 12-month effort of an interagency task force, spell out the responsibilities of the agencies to recognize that floodplains have unique and significant public values, and to evaluate the potential effects of any action which they may take in a floodplain. The agencies must take floodplain management into account both in formulating their own water and land use plans, and in evaluating the water and land use plans of others. Procedures for doing this are to be prepared in consultation with the Water Resources Council, the Federal Insurance Administration, and the Council on Environmental Quality.

Floodplain Management Handbook. Flood Loss Reduction Associates. Prepared for the U.S. Water Resources Council. 1981. 69 pp. plus appendices. Available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Stock # 008-022-00167-1.

This handbook summarizes flood problems, their causes and what can be done to reduce losses. It is intended to help local officials, public interest groups, and concerned citizens to assess the problems in their areas and initiate effective management of the floodplain. Guidelines for developing a floodplain management program are included and sources of technical and financial assistance are identified.

Special Publication #10, Evaluating the Effectiveness of Floodplain Techniques and Community Programs. 133 pp. $8.00

This report grew out of a seminar sponsored in 1984 by the Tennessee Valley Authority with the cooperation of the Interagency Floodplain Management Task Force. The volume has five parts: an overview of the issues; two issue papers summarizing the state of knowledge on evaluating the effectiveness of nonstructural floodplain management programs and community programs; the papers presented by

speakers and panelists at the seminar; and conclusions and recommendations. The papers were given by university researchers, Federal agency staff, State and local government representatives, and private consultants.

Special Publication #2, Regulation of Flood Hazard Areas to Reduce Flood Losses, Volume 3. Jon A. Kusler. 1982. 300 pp. $8.00

This volume was contracted for by the U.S. Water Resources Council to update and supplement Volumes 1 and 2 which were published by the Council between 1968 and 1971. Volume 3 reviews accomplishments and problems of the 1970s in the use of floodplain regulations as one element of floodplain management. Strategies are suggested for improving the quality of regulations and for combining regulations with other management tools to achieve multiple State and local goals during the 1980's.

Special Publication #3, Strengthening State Floodplain Management, Appendix A to Volume 3 (SP#2). Patricia A. Bloomgren.
1982. 123 pp. $8.00

SP #3 reviews existing State floodplain management, makes suggestions for strengthening existing programs, and provides a framework for developing new ones. State statutes, their enforcement, and litigation based on them are analyzed. Profiles of State floodplain management programs provide specific information.

Special Publication #4. Innovation in Local Floodplain Management, Appendix B to Volume 3 (SP#2). Jon A. Kusler. 262 pp. $8.00

SP #4 examines innovative community floodplain management regulalations with nonregulatory techniques. The volume is supplemented by 75 case studies of communities with creative floodplain management programs.

Special Publication #5. Floodplain Regulations and the Courts, 1970-1981. Jon A. Kusler. 51 pp. $5.00

SP #5 is a separate volume for attorneys, government officials, researchers, and others with an interest in the legal ramifications of floodplain management. The publication reviews conclusions from the 1970 and 1971 reports on judicial response to floodplain regulations, examines the types of cases litigated during the 1970s, and analyzes judicial treatment given to specific claims and issues. Additionally, the report provides descriptions of the rulings handed down during the decade by both Federal and State courts in over 50 cases on floodplain and wetland regulations, flood insurance and Section 404 permits. Complete with a bibliography.

State and Local Acquisition of Flood Plains and Wetlands: A Handbook on the Use of Acquisition in Flood Plain Management, U.S. Water Resources Council, 1981. 137 pp. Out of Print.

Land acquisition is a nonstructural flood management alternative which offers a number of distinct economic and social advantages. Directed at State and local planning officials familiar with flood management problems but without experience in floodplain acquisition, this handbook addresses economic, organizational, and managerial difficulties associated with the acquisition process. Elements of an acquisition program discussed include funding, the condemnation procedure, relocation assistance, and legal authority. Ten case studies of successful relocation projects disclose the features of each acquisition program which contributed to its ultimate success. The handbook stresses that land acquisition is not an end in itself, and that the process usually needs to be used in conjunction with other flood management tools to achieve best results.

Cooperative Flood Loss Reduction: A Technical Manual for Community and Industry, Flood Loss Reduction Associates. Prepared for the SEDA Council of Governments, U.S. Water Resources Council, U.S. Army Corps of Engineers, Federal Emergency Management Agency, and National Weather Service. 1981. 105 pp. plus appendices. $5.50. Available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402; Stock #003-01700501-1.

This manual describes two categories of measures for loss reduction: those with community-wide effects, generally requiring the participation of local governments; and site-specific measures that can be implemented by individual property managers. The mutual benefits to communities and industry of cooperative efforts to implement complementary measures are stressed. The manual describes the procedure for developing such cooperative programs and includes a case study which has produced multi-million dollar benefits.

APPENDIX D

TRENDS FOR FLOODPLAIN MANAGEMENT

July 1984

Prepared by the Federal Interagency Floodplain Management Task Force

INTRODUCTION

Beginning in 1980, the Water Resources Council started to examine the future direction for floodplain management. The Water Resources Council's effort coincided with a similar undertaking by the National Science Foundation. That endeavor was continued by the Interagency Floodplain Management Task Force after its reassignment to the Federal Emergency Management Agency because it was timely to definitively examine the appropriate direction for floodplain management.

That effort required an exhausting review of the numerous floodplain management documents which have been published over the past two decades and which set forth recommendations for floodplain management programs and activities. The following documents were examined in the context of future direction for floodplain management activities, with overall query of how they would tie into A "Unified National Program for Floodplain Management."

House Document 465 (U.S. House of Representatives, 1966)
New Directions in U.S. Water Policy (The National Water Commission, 1973)
Flood Hazard in the United States: A Research Assessment (University of Colorado, 1975)
The Water's Edge (Bureau of Outdoor Recreation, League of Women Voters, National Association of Counties, 1975)
Natural Hazard Management in Coastal Areas (National Oceanic and Atmospheric Administration (NOAA), 1976)
A Unified National Program for Floodplain Management (Water Resources Council, 1979)
A Report on Flood Hazard Mitigation (National Science Foundation, 1980)
Issues and Options in Flood Loss Reduction (Office of Technology Assessment, 1980)
The Federal Coastal Programs Review (National Oceanic and Atmospheric Administration, 1981)
Strengthening State Floodplain Management (Water Resources Council, 1981)
Developing Flood Hazard Mitigation Priorities (National Science Foundation, 1982)
Volume III, Regulation of Flood Hazard Areas to Reduce Flood Losses (Water Resources Council, 1983)
Local Innovations in Floodplain Management (Water Resources Council, 1982)
A Plan for Research on Floods and their Mitigation in the United States (Illinois State Water Survey, 1983)

The Task Force focused on the National Science Foundation report entitled "Flood Hazard Mitigation." That report, published in 1980, contained 34 conclusions and 67 recommendations. These recommendations encompassed recommendations proposed in various earlier documents, and were considered adequate as a guide for assessing floodplain management needs for the future.

A second National Science Foundation report entitled "Developing Flood Hazard Mitigation the planning and implementation recommendations. These recommendations were further divided into three strategies: (1) modifying the susceptibility to flood damage and disruption; (2) modifying the floods themselves; and, (3) modifying (reducing) the adverse impacts on the individual and the community - discussed in "A Unified National Program for Floodplain Management." In addition, the recommendations in the second classification were reviewed and several have been included in this document.

TRENDS OF FLOODPLAIN MANAGEMENT

Since 1965, when the Federal government recognized a holistic approach to contending with flooding, there has been a significant set of developments. Floodplain management is recognized as wise use of the nation's floodplains. An increased emphasis has been placed upon nonstructural approaches. Thousands of communities have adopted floodplain management ordinances in order to participate in the National Flood Insurance Program. Federal agencies have expanded their efforts in providing financial and technical assistance. Acquisition of flood prone properties has begun. Executive Order 11988, Floodplain Management has been implemented by Federal agencies. Many warning and response systems have been developed. In post-flood disaster situations, interagency hazard mitigation teams have been established and activated.

The recent recommendations for improving floodplain management must be examined in the context of these developments. As we proceed through the 1980's we must determine whether these recommendations will further the advances of the past 15 years and whether the end result will be a significant reduction in the future loss of life and property from flooding as well as the retention of natural floodplain values. In examining this report's recommendations, several trends are evident. The remainder of this brief overview will address these trends in the context of the overall recommendations for future action by Federal, State and local governments, as well as by the private sector.

The advent of the National Flood Insurance Program in 1968 has resulted in over 17,000 communities participating in the program with approximately 1.9 million insured properties. The direct impact of the program has been hazard identification and initiation of mitigation measures in each participating jurisdiction. With floodplain identification nearly completed, there is now a widespread availability of risk data. Utilizing this information, many communities have undertaken innovative and effective approaches to managing their flood hazard areas. The States, themselves, have increased their resource commitment and unified support of floodplain management. Their commitment is evidenced by the formation of and initiatives taken by the Association of State Floodplain Managers. Growth and commitment by the States and local communities are critical for the long term development and future of an overall program of floodplain management, a fact recognized in 1976 when "A Unified National Program for Floodplain Management" concluded that the Federal government alone had progressed about as far as it could.

However, without increased public awareness and acceptance, the regulations cannot be implemented successfully. Therefore, it is necessary to provide greater information to the local officials, private citizens, and the media on non-structural and structural approaches for achieving sound floodplain management. Without that increased knowledge and endorsement, the local decisionmaker and implementing official will be unable to enact and enforce those measures and techniques designed to reduce the loss of life and property.

In order to enhance those floodplain management initiatives, financial and technical assistance by the Federal agencies has been increased. This has particularly been demonstrated by the United States Army Corps of Engineers, the Soil Conservation Service, Tennessee Valley Authority, Federal Emergency Management Agency and other agencies.

Some form of floodplain management regulations has been adopted by all of the communities participating in the National Flood Insurance Program, although the impacts of these regulations are not well documented. These floodplain management regulation actions taken by local governments demonstrate that awareness of and the ability to deal with these flood problems has been increased. It cannot be emphasized enough that it is the adoption and enforcement of various floodplain measures by local governments that will ultimately lead to the reduction of flood losses.

Acquisition of flood-prone property has been recommended as an alternative to be considered along with other flood hazard mitigation strategies. Over time, the purchase of improved and unimproved flood-prone properties and their subsequent dedication to open space or other less damageable uses should result in substantial cost savings to the taxpayer. Within the past several years, the Federal Emergency Management Agency implemented Section 1362 of the National Flood Insurance Act, thereby commencing its flooded property acquisition program. That program, in conjunction with other Federal land acquisition programs, will provide the basis for carrying out this recommendation. However, acquisition programs presently have limited applicability.

Continued compliance and implementation of Executive Order 11988, Floodplain Management by all affected Federal agencies with endorsement by State and local governments are necessary if substantial savings from flood damages are to be achieved. In 1982, the President's Task Force on Regulatory Relief requested that the Federal Emergency

Management Agency review the regulatory burdens imposed by Federal floodplain management policy as established by Executive Order 11988. That Task force concurred with the 1983 Federal Emergency Management Agency report which concluded that Federal floodplain management policy has successfully guided unwise actions away from floodplains and minimized the impact of those actions taken in floodplains. Parallel efforts are now needed at the State and local level.

That same Task Force also concluded that the 100-year base flood standard appeared to be working well, it has widespread use, and it would not be in the public interest to adopt another methodology. Nevertheless, with the rapidly developing urban areas, the broader floodplain management issues within the entire watershed must be addressed. Urban runoff must be examined and stormwater management implemented.

Traditionally, the emphasis of floodplain management actions has been directed towards riverine flooding with special action given to coastal hazard areas. The Coastal Barriers Resources Act precludes the availability of most Federal financial assistance, including flood insurance, on the Department of Interior's designated undeveloped coastal barriers. More than anything else, passage of that Act signifies that there has been a reaffirmation of the basic Federal policy that floodplain occupants should bear the full cost of their occupancy. In recent years, the attention has begun to focus on other types of flooding situations. Often characterized as "unique" hazard areas, it may be appropriate to refer to mudflood, mudflow, alluvial fan, erodable stream bed, flash flood, ice jam, etc., as "regional" high hazard areas.

Long term mitigation measures have been the basis for the floodplain management provisions advocated by Federal agencies and adopted by State and levels of government. However, in order to more completely implement strategies to reduce losses of life and property, greater attention must be given to flood warning and response systems. While warning and response systems are being incorporated into comprehensive planning for earthquakes, hurricanes, and other natural hazards, insufficient attention has been placed on mechanisms for flooding events.

In December, 1980, 12 Federal agencies executed an interagency agreement for nonstructural damage reduction measures applied to common flood disaster planning and post-recovery practices. Through the use of hazard

mitigation teams, flood disaster recovery efforts have been coordinated and those efforts have given full consideration to nonstructural as well as structural measures to minimize future flood losses. With the experience of the past several years, there is the demonstrated utility for continuing the hazard mitigation teams. However, insufficient attention has been given to developing procedures with State and local representatives for pre-disaster planning to avoid future losses.

It is highly noticeable that the following recommendations stress, almost in their entirety, nonstructural strategies and solutions. In examining means for reducing flood losses, all alternatives for totally integrated floodplain management approach must be explored. In addition to floodplain management regulations, insurance and flood preparedness measures, due consideration must be given to the full range of flood hazard reduction measures including the structural solutions such as levees and channel modifications and protection of natural floodplain values.

Notwithstanding the progress made in the past 15 years, problems still persist. Regulation of Flood Hazard Areas to Reduce Flood Losses, Volume III, concluded "few measures initiated in the 1970's were used to their full potential." Major problems included:

- Regulations were only partially effective in many of the 12,000 emergency program communities that adopted or stated the intent to adopt regulations to qualify for the National Flood Insurance Program.

- The National Flood Insurance Program studies and map scales, levels of accuracy, and types of data were often partially inadequate for regulation, acquisition, and other site-specific floodplain management because they were developed to meet insurance rather than land use management needs.

- Local governments and some State agencies lacked staff experience to evaluate how individual permits would affect flood flows. Neither were agency personnel able to monitor or enforce State and local floodplain regulations.

- State and local regulations were relatively ineffective in reducing losses to existing uses except immediately after flood disasters.

- Floodplain regulations were often poorly coordinated with other resource protection regulations and comprehensive zoning and planning.

- Federal subsidies for flood control works, disaster assistance, flood insurance, and public works sometimes encouraged continued floodplain development or discouraged local government control of floodplain development and private damage reduction measures such as floodproofing.

- Court challenges to regulations were continued, although very few were successful.

In evaluating the recommendations, it must be remembered that each level of government (Federal, State and local) has separate authorities and responsibilities in addressing the potential loss to life and property from flooding and the protection of natural floodplain values. Experience has shown that sound floodplain management cannot be implemented in a vacuum; the various participants must be brought together in order to collectively implement the total and integrated program.

Through the following recommendations, the Task Force seeks to further the goal of a cooperative floodplain management program with its partnership of State responsibility, local management, and Federal assistance.

RECOMMENDATIONS

STRATEGY A: MODIFY THE SUSCEPTIBILITY TO FLOOD DAMAGE AND DISRUPTION

1. Floodplain management regulations should be developed in consonance with Federal and State law, and adopted and enforced by local communities.

2. All levels of government and private entitites should make increased use of alternatives of identifying and acquiring those 100-year floodplain areas for which inundation would be particularly costly or which have particular value for other purposes. Generally, these lands should be dedicated to open space use.

3. There should be complete implementation of Executive Order 11988 by all affected Federal agencies. In complying with the Executive Order, Federal agencies must insure consistency within each agency, A new and effective approach, such as appropriate multiagency review for proposed projects and forseeable activities on an area-wide basis, is strongly encouraged.

4. States should be encouraged to adopt Executive orders, similar to the Federal Executive Order, which will properly guide investment of State monies away from high hazard areas.

5. Planning, including standards, guidelines and procedures for dealing with urban storm runoffs, should include consideration of future changes in land use and density when estimating discharges and predicting future probabilities of flooding.

6. Storm water detention regulations are relatively recent and related planning, design, and legal issues should be explored through a number of demonstrated projects.

7. Use of the 100-year flood standard as a minimum for regulation of flood hazard areas should be continued. In addition, critical facilities should be at a minimum protected to the 500-year flood elevation. These include but are not limited to fire, disaster and police centers, hospitals, prisons, and facilities for the elderly and handicapped. Both standards should be checked periodically to determine the need for boundary adjustment.

8. The States should be encouraged to provide increased funding and staff for flood hazard mitigation in floodplain management, response planning, and stormwater management. The Federal government should support the States in developing well defined legislative and administrative provisions and staff to carry out flood hazard mitigation.

9. Complete and comprehensive flood hazard mitigation plans for coastal areas, including barrier islands, should be developed and implemented.

10. Greater emphasis should be placed on the consequences of potential dam failures.

11. Flood warning and response systems should be expanded to the maximum extent practicable to cover occupied flood-prone areas. The response plans must be developed locally, and where practicable, linked to the regional and national warning systems. Each system should be tested at least annually, and where practicable, semi-annually, and be conducted under the ageis of an independent organization.

12. Policies should be developed to help prevent bias in the benefit/cost analysis of alternative measures for flood loss reduction. Such bias may relate to non-structural/structural, governmental/private, and developmental/environmental measures.

13. Federal, State and local authorities should study the potentials for major coastal erosion, landslides, and mudslides, and should develop land-use plans and implement appropriate land-use regulations.

14. Liaison and coordination between government agencies responsible for flood hazard mitigation and other aspects of water resources planning and management should be improved, or whenever appropriate be established, developed and used.

15. Further methodology to improve integration of planning different aspects of flood hazard mitigation should be developed. Such strategies may be effective if they reflect mixes of structural and nonstructural approaches appropriate to the circumstances.

16. Federal agencies, State offices and local communities should improve the development, and updated maintenance of pre- and post-disaster flood hazard mitigation plans

to facilitate timely local response, relief, rehabilitation and long term recovery.

17. Federal and State agencies and local communities should make a determined effort to strengthen the existing flood forecasting, warning and evacuation systems.

18. Federal, State and local program standards, guidelines and regulations should be changed to prohibit any new development in floodway areas which will increase flood elevations. In circumstances requiring exceptions to this prohibition, a promising solution may be for the developer to purchase all necessary property rights from all adversely affected property owners to compensate for increased flood damage, increased building costs, increased flood insurance and other costs.

19. Research should be undertaken to identify means available to local governments to strengthen their responsibilities for flood mitigation. Also, research should be undertaken to identify ways in which State and Federal agencies can carry out their respective programs in order to strengthen the role of local governments and avoid pre-empting that local responsibility.

20. Research should be supported to determine the general beneficial aspects of flooding to groundwater resources, recreation, water quality, commercial and sport fisheries, general wildlife resources, and other components of riverine and coastal floodplain and wetland environments. Information from this research should be incorporated within the various flood hazard mitigation strategies.

STRATEGY B: MODIFY FLOODING

1. No funding for any Federal, State or local structural flood control measures should be made available unless accompanied by appropriate floodplain regulations and flood preparedness plans.

2. The various Federal, State and local policies covering the design, construction, and use of levees and channel modifications for flood control should be reviewed. Any problems associated with the policies should be identified and solutions should be recommended.

STRATEGY C: MODIFY THE IMPACT OF FLOODING ON INDIVIDUALS AND THE COMMUNITY

1. The availability of Federal flood insurance in an area should continue to be contingent upon appropriate local land use planning and implementation. Also, Federal flood control measures, financial assistance in floodplain land acquisition, and financial aid in relocating floodplain occupants out of the floodplain should be contingent upon effective local land-use planning and implementation.

2. Policies and procedures should be developed to decrease or eliminate the subsidy for flood insurance from the Federal government in high hazard areas after repetitive losses.

3. To assure public awareness of flood potential, past and potential flood heights should be prominently displayed in developed and developing floodplains.

4. Information presented to residents in hazard-prone areas should stress the potential losses from future floods.

5. Research should be undertaken to better analyze the nature, size and trend of the Federal subsidy to the National Flood Insurance Program.

6. The information on the probability of future floods should also be presented on the basis of the risk of its occurrence over a time period such as 20 or 30 years rather than a one year or 100-year time period; people are likely to pay more attention to, and take protective action for, an event which they see as somewhat likely to occur in their lifetime such as their mortgage period.

7. The impact and effectiveness of different programs and procedures for disseminating information on flood hazards relative to individual and community adoption of mitigation measures should be evaluated.

8. A national effort should be undertaken to disseminate both structural and non-structural design information to State and local governments and to the design professions. Much of this information is available, but it is not reaching the proper users.

9. Educational information and guidance manuals need to be supplied to local officials and lenders in all flood-prone communities. They must be made aware of the opportunities to incorporate such information into local planning and development efforts.

10. An information packet should be developed for the media which explains the nature of floods, the relationship between unwise development and damage, hazard mitigation methods, and available programs.

11. The important role that tax adjustments at the Federal, State and local level can play, both in influencing decisions about floodplain occupancy and in providing relief to individuals should be examined.

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