Topography has a direct impact on water movement and soil formation. The upper Mississippi River Basin is characterized by two distinct kinds of landscape: open systems which drain externally, and closed systems where drainage is trapped within a common depository. Due to the extended period of rain preceding the 1993 flood, the impacted area became completely saturated and surface depressions filled; therefore, storage available for additional runoff could only be found in the deep depressional areas located in the prairie pothole region of the Dakotas, Minnesota and Iowa. Hydrologic model studies of four watersheds that are representative of distinctly different upper Mississippi River Basin areas or terrain units were completed in 1994 by the SAST. The modeled watersheds represented only 5 of the 70 terrain types in the basin and therefore information derived from these models has limited applicability to assessing flood flow reductions basin-wide. In the watersheds modeled the maximum reduction for floodplain wetlands was 6 percent of the peak discharge for the 1-year event and 3 percent of a 25- and 100-year storm event. Wetlands are more effective in upland areas with more deeply incised potholes, where reductions were 23 percent of the 1-year event, 11 percent of the 25-year event, and 10 percent of the 100-year event. In areas of shallow depressions, restored wetlands reduced peak discharge by 9 percent of the 1-year event, 7 percent of the 25-year event, and 5 percent of the 100-year event. With the installation of a combination of land treatment measures and restored wetlands in the watershed, the models indicated runoff reductions of 12 to 18 percent are possible for the 25-year or less event. This indicates these practices could be effective for the smaller storm events. Wetland restorations in the uplands could function much the same as small upland reservoirs. It was shown more than three decades ago that small flood damage reduction dams are effective in the reach of stream immediately downstream but their effect diminishes rapidly with distance. Another report concluded that for certain watersheds, peak flow decreases as wetland areas increase. In very small watersheds (less than 100 sq. mi.), peak flowrates decreased by an average of 3.7 percent for each increase in wetland area equivalent to one percent of the area of the watershed. Applicability of this report may be limited only to the study areas. While wetlands may have some impact on peak flow in the smaller watersheds during smaller storms, their effects in larger watersheds during larger events has not been sufficiently documented and needs further study. Alternative watershed practices clearly produce varying degrees of success in reducing flood runoff rates depending (in addition to the magnitude and intensity of the rainfall and antecedent moisture conditions) on the percentage of the basin treated and basin topography. Generally, as drainage areas increase, upland treatment measures, wetlands, and small detention structures have had less effect in decreasing peak flowrates.

Upland wetlands restoration and upland land treatment practices can be effective for smaller floods but diminished in value as storage capacity is exceeded in larger floods such as the Flood of 1993. Present evaluations of the effect that wetland restoration would have on peak flows for large floods on main rivers and tributaries are inconclusive. For large events like the 1993 flood, upland treatments had little effect. Land treatment and detention storage (upland wetlands) can play a role in reducing peak runoff in some watersheds but are not a panacea for solving flood problems. The Review Committee concluded that only a combination of upland and floodplain management practices can reduce floodplain damages.**Federal Insurance Programs**

At the time of the 1993 flood, the federal government operated two insurance programs that provided claims payments to those impacted by the Midwest flood; the National Flood Insurance Program (NFIP) and the Federal Crop Insurance Program. Table 1 summarizes claims

payments from these programs by state. Under both programs, individuals paid an annual insurance premium to the government and the government provided insurance coverage.

Table 1
Summary of Federal Insurance Claims Payments by State for the 1993 Midwest Floods in Millions of Dollars.

Program	Total	IL	IA	KS	MN	MO	NE	ND	SD	WI
Federal Crop Insurance Program Claims Payments	1,017.0	25.4	281.2	40 4	353 9	27.7	49 0	139 3	54 1	46 0
National Flood Insurance Program Claims Payments	297.3	61.4	23 4	10.7	1.7	192.3	4.8	0.3	0.8	2 0
Total Claims Payments	1,314.3	86.8	304 6	51.1	355.6	220.0	53.8	139 6	54.9	48.0

Sources: US Department of Agriculture, Flood Information Center, "USDA Emergency Assistance Paid to Flood States," April 4, 1994; Federal Emergency Management Agency, Federal Insurance Administration, computer print-out, March 16, 1994.

Flood insurance coverage on buildings and their contents is available through the NFIP in participating communities. Under the NFIP insurance premiums for buildings that pre-date the identification of the flood hazard in a particular community are subsidized, but for buildings built after that date, premiums are based on full actuarial rates. All costs of administering the program, including the costs of floodplain mapping and salaries of federal employees are charged to policyholders. The Midwest flood was the third most costly in terms of NFIP payments, exceeded only by Hurricane Hugo and the December 1992 coastal storm that struck New York, New Jersey, Massachusetts, Delaware, and Connecticut. In 1993, over half of the losses and two thirds of the payments were in Missouri. States in the upper basin had lower average payments since buildings were generally subject to shallow flooding along tributaries which flooded basements and some first floors. States in the lower basin had much higher average losses reflecting the deep flooding in the bottoms along the main stems of the Mississippi and Missouri rivers). High average payments in Missouri also reflect large payments to small businesses and other non-residential buildings. Even in the counties with disaster status, in excess of 80,000 insured properties did not sustain flood losses. Some of these were behind levees that did not overtop or fail, but most were on tributaries that did not flood or where flooding was of less than 100-year frequency. At the time of the 1993 flood farmers could have protected themselves from actual crop losses or prevented planting caused by uncontrollable natural events through purchase of crop insurance from the FCIC. This government corporation within the US Department of Agriculture (USDA) provided coverage for 51 crops in the event of loss from drought, excess soil moisture, flood, frost, hail, wind, insects, and other natural perils. Historically drought has been the major cause of crop loss (55 percent) while floods represent only two percent of claims. Excess soil moisture, however, represents 16 percent of losses. Farmers must purchase the

insurance early in the crop year. For example, a policy to cover a corn crop planted in 1993 in the Midwest would have to be purchased by April 15. Farmers could have chosen the level of insurance coverage that they wished to purchase, but they were not able to insure their crop for the full value. Maximum coverage was 75 percent of expected crop yield. To encourage participation, the federal government subsidized crop insurance premiums up to 30 percent and paid administrative, actuarial, underwriting, and selling expenses.

The NFIP was created by Congress in 1968 in response to mounting flood losses and escalating costs to the general taxpayer for disaster relief in the belief that flood insurance is preferable to disaster assistance. To encourage participation in the NFIP by communities and purchase of flood insurance by individuals, the federal government subsidizes the premiums for buildings constructed prior to the issuance of a FEMA Flood Insurance Rate Map (FIRM). This subsidy also recognizes that many floodplain buildings were built or purchased without knowledge of the flood risk. New construction (post-FIRM) is charged an actuarial premium that reflects the property's risk of flooding. Approximately 60 percent of NFIP policyholders pay a full actuarial rate and 40 percent are subsidized. For the NFIP to be successful in indemnifying property owners from flood losses and reducing federal expenditures for disaster assistance, a high percentage of property owners must purchase and maintain flood insurance coverage. The program depends on the mandatory flood insurance purchase requirement contained in the Flood Disaster Protection Act of 1973 and voluntary purchase by other property owners at risk. The 1973 Act requires the purchase of flood insurance by property owners who receive federal grants or loans or loans from a federally supervised, regulated, or insured lender for the acquisition, construction, or improvement of structures located in identified special flood hazard areas (the 100-year floodplain). In the 9-state region affected by the 1993 flood, only about 20 percent of structures in the floodplain carried flood insurance, a rate well below optimal levels.

The NFIP has not achieved the public participation needed to reach its objectives. Estimates of those covered by flood insurance nationwide range from 20 to 30 percent of the insurable buildings in identified flood hazard areas. Estimates in the Midwest flood area ranged from below 10 percent up to 20 percent. None of the estimates are authoritative, since no nationwide inventory of floodprone structures exists. The Review Committee obtained reliable structure counts for a number of Midwest communities. Market penetration in these communities ranged from less than 5 percent to more than 50 percent. The Review Committee believed that market penetration in small rural communities was probably less than 10 percent. For most medium to large communities, market penetration appeared to be in the 20 to 30 percent range. For a few large communities with middle-income floodplain populations and a high degree of flood hazard awareness among community officials, lenders, and property owners, market penetration exceeded 30 percent and, in one instance, 50 percent.

A perception persists that disaster assistance compensates homeowners as fully as flood insurance coverage. A particular concern expressed by communities and others after the Midwest flood was that disaster victims, particularly those with lower incomes, who obtained disaster assistance from the Individual and Family Grant Program, the Disaster Housing Program, the Red Cross, and other programs ended up as well off as those who purchased flood insurance and received payment for claims. Generous disaster assistance creates negative incentives for the purchase of flood insurance.

The Review Committee recommended that the Administration take a number of actions to improve both the NFIP and the Crop Insurance Program. Many of these recommendations were incorporated in a Flood Insurance Reform Act signed by the President in late 1994. Several changes in the Crop Insurance Program have also been made by the Congress and the President, although , in both cases there still remains much room for improvement.

3.4 Relocations and Buyouts Following Floods

Throughout history, well-designed and well-sited structural measures have demonstrated their effectiveness in protecting property and saving lives. While structural measures have been the primary approach to flood damage reduction, another approach to minimizing vulnerability, not widely used in the past, is the removal of vulnerable populations from the floodplain. Because of the severity and duration of the 1993 flood, the general public took a new interest in this strategy. Building on its experience with the NFIP, the FEMA capitalized on this interest in removals. The Administration responded by targeting federal recovery that support buyouts and relocation of floodplain populations. The fundamental value of buyouts over structural approaches is that they completely eliminate flood risk for affected individuals and, at the same time, may have environmental and hydrologic benefits. Relocation associated with buyouts can, however, involve social, environmental, or hydrological impacts. The Administration established buyouts of flood-damaged properties as the first priority for mitigation funds available for the Midwest flood and, by October 1995, had approved over 8200 homes for voluntary relocation or buyout.

This approach represented a clear turning point in federal flood recovery policy, since it is the first time that buyouts have been attempted on such a large scale. Buyouts were an appropriate federal response for the Midwest flood and for floods like it. Many of the buyout neighborhoods had been damaged repetitively by flooding. Subject to deep and long duration flooding, they were isolated by floodwaters for extended periods of time. In addition a significant percentage contained older, lower value housing, much of it of poor quality and in need of rehabilitation. Under the right circumstances, buyouts will not only reduce flood damages and protect people and property but also achieve other objectives such as improving the quality of affordable housing, increasing recreational opportunities and wildlife values, and general betterment of the community.

During the 1993 flood, acquisition by federal and state governments of environmental easements or title to agricultural lands subject to frequent flooding also became tools in assisting recovery and in removing people from long-term flood vulnerability. In addition to meeting the needs of disaster relief victims, these programs were effective in achieving the nation's environmental goals. Since the 1993 flood, federal and state governments have obtained interest from willing sellers in over 100,000 acres of marginal bottomlands , and were additional funds available, would have obtained interest in over 60,000 more acres.

4. Environmental Implications of Human Intervention

Fish and wildlife resources in the upper Mississippi River Basin have been significantly affected by the loss of wetlands and other terrestrial and aquatic habitats due to construction for navigation and flood damage reduction structures.

The upper Mississippi River was originally a free-flowing, alluvial riverine environment with associated riparian habitats. Construction of navigation control structures (rock dikes) and installation of the slackwater navigation dams have created habitat types substantially different from those found in a free-flowing alluvial river.Habitat types within the upper Mississippi River slackwater navigation pools are created by coincident physical, water quality, and botanical characteristics. River position, depth, water-surface area, stage and discharge, vegetation, river-bottom types, water quality, and the superimposed structural elements within the river define the various habitats. Three distinct habitat zones occur in the slackwater navigation pools. The upper end of each pool is like the original river although subject to exaggerated water level fluctuations from the upstream dam releases. Marsh development is limited. In the middle portion of the pools, downstream impoundment backs water up and over the islands and old hay meadows, creating large areas of shallow water. This section has the best marsh development, and some deep sloughs and wooded islands can be found. In the lower end, immediately above each dam, wide open water lake-like areas occur. While impoundment of the upper Mississippi River for slackwater navigation created a variety of backwater and side-channel habitats, these dams also slowed river currents, starting the irreversible process of sedimentation. Many backwater habitats are filling with sediments from the erosion of upland agricultural and developed lands. Rock dikes and channel maintenance dredging also contribute to the problem. Mississippi River backwaters still provide critical fish production and nursery habitats, but may be lost to sedimentation and eutrophication within 50 years. Downstream from its confluence with the Missouri River, the upper Mississippi River takes on a very different character, similar to that of the Missouri River. Forty-six species of Mississippi River fish, virtually all of which have been affected by flood damage reduction measures and navigation, are listed by basin states as rare, threatened, endangered, or a species of special concern.

Parts of the Missouri River were well known as a braided river with swift, muddy flows. The historic floodplain was a ribbon of islands, chutes, oxbow lakes, backwaters, marshes, grasslands, and forests. Sandbars and wooded islands dotted the channel. Between 1879 and 1954, human actions and natural changes shortened the river by 45.6 miles, reduced river surface area by over 50,000 acres, reduced the number of islands from 161 (24,419 acres) to 18 (419 acres), and converted nearly 67,000 acres of river habitat from public to private ownership, most to agriculture. Nearly one-third of the Missouri River has been impounded, another one-third channelized, and the hydrologic cycle, including temporal flow volume and sediment transport, has been altered on the remainder. The Missouri River formerly had peak run-off during two periods, March-April and June. Prior to 1954 flushing flows, known as dominant discharge, occurred every 1.5 years. The river was in a state of equilibrium; net sediment entering a reach replaced an equal amount leaving allowing for ample habitat development, and aquatic nutrition. Loss of sediment load led to channel degradation which contributed to the loss of off-channel habitat and further severed the river from its floodplain. Since the early 1950s the Missouri River

has thus been deprived of a floodplain in most reaches. Water temperature, photoperiod, and run-off cues have been altered by reservoir releases for navigation and other purposes are rare.

Aquatic and terrestrial habitats of the Illinois River Valley have suffered a series of cataclysmic events since 1900: (1) permanent rise in water level from water diverted from Lake Michigan, (2) the draining of more than half of the 400,000 acre floodplain through the construction of levees and pumping stations, (3) an upsurge in untreated urban and industrial pollution during the 1920s, (4) the creation of a 9 ft. channel and its attendant navigation dams in the 1930s, and (5) an acceleration in sedimentation rates following World War II, apparently resulting from an increase in the amount of open row crops grown within the basin. As an example, in 1908, a 200-mile reach of the Illinois River produced 10% of the total US catch of freshwater fish (employing 2,000 commercial fishermen and yielding 24 million lbs. of fish annually). Commercial fish yield totaled about 178 lbs/ac of permanent water, but by the 1950s yield had dropped to 38 lbs/ac and by the 1970's to 4 lbs/ac, totaling 0.32% of the total US freshwater harvest.

Alteration of Mississippi, Illinois and Missouri Rivers and floodplains has resulted in significant changes or losses of habitat. The disruption of natural ecosystems has caused the destruction of many native species populations and has caused an increasing number to be listed as threatened or endangered.

5. Management Aspects of Floodplain Management

5.1 General

Since passage of the Flood Control Act of 1936, the federal government has dominated the nation's flood damage reduction efforts and, as a result, the nation's floodplain management activity. Structural programs were deemed important and were also the principal sources of funds for any efforts to stem the rising tide of flood losses. In recent years, the federal government has begun to support nonstructural approaches. Many states, tribes, and local governments developed and carried out floodplain management efforts that both reduced flood damages and enhanced the natural functions of floodplains. There are more than 8,000 miles of levees in the Upper Mississippi Basin. Approximately half were constructed by the federal government or were locally constructed using federal standards. The levee system in the Upper Mississippi Basin is a loose amalgam of federal store and locally constructed levees. In carrying out these programs, however, they were hampered by uncoordinated and conflicting federal programs, policies, regulations and guidelines that have hindered efficient floodplain management. Some state and local governments have not been as active in floodplain management. With the federal government assuming the dominant role and funding most ecosystem restoration, flood damage reduction, and flood recovery activities, the incentive has been limited for many state, tribal and local governments, businesses, and private citizens to share responsibility for making wise decisions concerning floodplain activity.

5.2 Management Responsibilities

The division of responsibilities for floodplain management activities among and between federal, state, tribal, and local governments is not clearly defined. Within the federal system, water resources activities in general and floodplain management in particular lacks coordination. Management of the nation's water resources is provided by several federal agencies. Yet water resource issues are inextricably linked and accomplishment of agency mandates requires coordination and collaboration among agencies. The National Flood Insurance Act of 1968 required reports to Congress analyzing the implementation of current programs and recommending 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. Despite these Unified National Program for Floodplain Management reports, the United States, in practice, has no unified national program for floodplain management.

State and local governments have little fiscal stake in floodplain management; without this stake, few incentives exist for them to be fully involved in floodplain management. State governments must assist local governments in dealing with federal programs but, in may cases, do not become involved in federal-local activities.

In 1977 with issuance of Executive Order (EO) 11988, Floodplain Management, President Carter raised federal agency attention to issues of floodplain use. It was apparent following the 1993 flood that some federal agencies either were unaware of or misunderstood the requirements of the EO and either built or supported building in floodplains. Under the EO, federal agencies must demonstrate that no practicable alternative site exists outside of the floodplain, and if no alternative exists, take steps to minimize direct and indirect impacts of the proposed action and to restore and preserve the floodplain. Discussions with the FEMA, USACE, and state floodplain managers revealed several examples of apparent non-compliance by federal agencies with the EO. While the responsible agencies no doubt believed they had complied with the EO, these developments point out some of the deficiencies with the EO. Among the most notable examples were a low-income housing project funded by HUD and a federally funded state prison within floodplains, and a proposed construction of a federal weather station behind an uncertified levee.

Federal and state oversight over non-federally constructed levees was and remains diffuse. Several states regulated construction in floodplains, but many did not. The situation was further exacerbated by the potential for future flow increases that could occur if development continued upstream and by the uncertainty about changes that may occur in long term weather patterns. Few states controlled either the decision about where levees are placed relative to the river channel or whether a particular levee should be protected from overtopping (floodfought) during a flood, although such actions can have hydraulic and environmental consequence elsewhere. Some states had little or no involvement in the processes associated with federal levee programs since federal agencies generally dealt directly with local levee districts. The Review Committee recommended that the President should propose enactment of a Floodplain Management Act to establish a national model for floodplain management, clearly delineate federal, state, tribal, and local responsibilities, provide for fiscal support for state and local floodplain management activities, and recognize states as the nation's principal floodplain manager. He should also issue a revised Executive Order clearly defining the responsibility of federal agencies to exercise sound judgment

in floodplain activities. In late 1994, a committee of the US Senate proposed a Floodplain Management Act, However, as a result of the change of control of the Congress in November, 1994, the action was tabled. Several states, on their own, have substantially revised their floodplain management programs.

5.3 Planning

The Review Committee concluded that the principal federal water resources planning document, Principles and Guidelines, was outdated and did not reflect a balance among the economic, social, and environmental goals of the nation. This lack of balance was exacerbated by a present inability to quantify, in monetary terms, some environmental and social impacts. As a result, these impacts are frequently understated or omitted. Many critics of Principles and Guidelines saw it as biased against nonstructural approaches and the that the federal government supports more structural than non-structural projects. The Review Committee recommended that the President should immediately establish environmental quality and national economic development as co-equal objectives of planning conducted under the Principles and Guidelines. Principles and Guidelines should be revised to accommodate the new objectives and to ensure full consideration of nonstructural alternatives. He should also direct that federal agencies give full consideration in planning to all possible alternatives for vulnerability reduction, including permanent evacuation of floodprone areas, flood warning, floodproofing of structures remaining in the floodplain, creation of additional natural and artificial storage, and adequately sized and maintained levees and other structures.

5.4 Management of the Upper Mississippi Basin System

At the time of the 1993 flood there was no coordinated strategy for effective management of the water resources of the upper Mississippi River Basin. Such a strategy still does not exist. Responsibility for integrated navigation, flood damage reduction and ecosystem management has been and remains divided among several federal programs. This is in sharp contrast to the lower Mississippi River Basin where one activity, the Mississippi River Commission provides for a comprehensive approach to water resources development within the alluvial valley of the Mississippi. The current flood damage reduction system in the upper Mississippi River Basin represents a loose aggregation of federal, local, and individual levees and reservoirs. This aggregation does not ensure the desired reduction in the vulnerability of floodplain activities to damages. Many levees are poorly sited and will fail again in the future. Without change in current federal programs, some of these levees will remain eligible for post-disaster support and will be repaired again after the next flood. Current federal rules essentially require, the federal government to repair these levees each time they fail.

The Review Committee recommended that the President assign responsibility, in consultation with the Congress, to the Mississippi River Commission , for integrated management of flood damage reduction, ecosystem management, and navigation on the upper Mississippi River and tributaries and assign the Commission responsibility for development of a plan to provide

long-term control and maintenance of sound federally built and federally supported levees along the main stems of the Mississippi and Missouri Rivers.

5.5 Use of Science and Technology

At the time of the 1993 flood, the nation was not using science and technology to full advantage in gathering and disseminating critical water resources management information. Opportunities existed to provide information needed to better plan the use of the floodplain and to operate during crisis conditions. The Review Committee recommended that the Administration should establish a federal information clearing house to provide federal agencies and state and local activities the information already gathered by the federal government during and following the 1993 flood and to build on the pioneering nature of this effort, and exploit science and technology to support monitoring, analysis, modeling, and the development of decision support, data acquisition, and geographic information systems for floodplain activities.

6. In Sum

The Mississippi River Flood of 1993 was a significant hydrometeorological event that produced widespread impacts across the Midwest of the United States. Study of the events surrounding the flood as well as the flood itself, have produced a significant amount of information concerning the use and management of lands subject to flooding. The recommendations of the Interagency Floodplain Management Review Committee provide a focus for actions that should be considered as the United States grapples with the problems of reducing the vulnerability of floodplain activities and those who inhabit the floodplain.

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ENDNOTES

1. This paper is based on and in part extracted verbatim from the report of the Interagency Floodplain Management Review Committee, which, under charter from the Executive Office of the President of the United States., conducted a six month review of the 1993 flood event. The report, *Sharing the Challenge: Floodplain Management into the 21st Century*, was submitted to the White House in July 1993. The Review Committee consisted of federal engineers and physical, social, and biological scientists who contributed technical and institutional knowledge in the fields of flood damage-reduction and river basin ecosystem management. Of the 31-member Review Committee, 15 members were located in Washington, DC, and 16 formed the Scientific Assessment and Strategy Team (SAST), which operated from the Earth Resources Observation System (EROS) center at Sioux Falls, South Dakota The SAST was chartered by the White House in November 1993 "to provide scientific advice and assistance to officials responsible for making decisions with respect to flood recovery in the upper Mississippi River Basin." It was incorporated into the Review Committee in January 1994 to serve as its research arm for scientific analysis Other members of the committee were Dr Margriet Caswell, Thomas Wheri, Department of Agriculture, Richard DiBuono, Arnold Robbins, Harry Shoudy, Department of the Army (Corps of Engineers) Robert Clevenstine, Jerry Rassmussen, Department of the Interior, Shannon Cunniff, Joseph Ferrante, Lewis Rosenbluth, Environmental Protection Agency, and Mary Jean Pajak, Michael Robinson, Federal Emergency Management Agency and their work is reflected in this paper.

2. The accuracy of the assigned flood recurrence interval remains in question. St Louis has experienced floods similar to the 1993 event in 1900, 1909, 1927 and 1973.

Anexo 4.4/Appendix 4.4

PROGRAMA DE MITIGACIÓN DE INUNDACIONES DE LA CUENCA DEL RÍO MAGDALENA-COLOMBIA

por
David Humberto Ojeda Awad y Héctor Guzmán Alvarez

INTRODUCCION

MOTIVACIONES Y PROBLEMÁTICA

Colombia ha venido buscando desde hace mas de seis décadas un marco físico de trabajo en donde se articulen orgánicamente las actividades económicas con la protección de las infraestructuras sociales y la conservación del sistema natural.

Desde los años cincuenta se ha probado la administración de los recursos naturales y el ambiente a través de entidades del orden publico basada en el aérea geográfica de la cuenca Hidrográfica. Estos entes, sin cumplir su objetivo de administrar los recursos naturales como bienes públicos en beneficio de la ciudadanía, asumieron paralelamente la responsabilidad de la gestión ambiental, incluyendo actividades de planificación, ordenamiento, y manejo y por ende acciones de preservación, conservación y protección. Para tal fin se comprometieron componentes de investigación, transferencia y ajuste de tecnología y fomento de los recursos naturales renovables. Todo lo anterior llevó a un incumplimiento en cada uno de los anteriores componentes y por ende a un desgaste en la acción Estatal.

Dentro de este esquema, la problemática de las inundaciones del rio Magdalena, las medidas de control se vieron expresadas solo en medidas estructurales, localizadas puntualmente; descuidando la visión integral que debe primar en cualquier actividad que busque resolver problemas ambientales.

La multiplicidad de funciones, componentes y elementos, al igual que la falta de claridad conceptual en el manejo ambiental, hicieron fracasar este modelo de abocar la problemática ambiental al igual que lo sucedido en el manejo político administrativo del país.

La promulgación de la nueva Constitución Nacional en el año de 1991, puso en marcha un nuevo esquema de relación Estado ciudadanía basado en el proceso de la participación comunitaria expresado en su forma política como Descentralización Político Administrativa y otorgamiento de autonomía local para el manejo de sus propios asuntos en concordancia con las políticas nacionales.

METODOLOGIA Y ACTIVIDADES

Colombia frente a la problemática de las inundaciones del Rio Magdalena y sus afluentes ha venido, a través de un proceso de gestión directa de Estado, ejecutando acciones a través de diferentes instituciones (Ministerio de Obras Publicas, Ministerio de Agricultura, Corporaciones Autónomas Regionales - CVC, Empresas de Energía y Acueducto de Bogotá). Estas realizaciones han sido puntuales, aisladas y sin una estructuración integral y sistémica, basadas solo en obras estructurales sin participación de la comunidad.

La conceptualización de cuenca y el manejo integral de los recursos naturales, a pesar de verse reflejada en la legislación desde 1974 (Código Nacional de los Recursos Naturales), no ha

acompañado este proceso, perdiéndose de esta manera la visión integral y orgánica propia de un enfoque sistémico que aporta la conceptualización de cuenca hidrográficas para afrontar situaciones ambientales.

Con el proyecto Colombo Holandés se introduce el elemento de predicción a partir de sistemas de alarma instalados en redes especiales.

Otras medidas ejecutadas por el Estado han sido la realización de estudios de producción de sedimentos, comportamiento hidrológico de la cuenca e hidráulico del cauce principal del río, Diagnósticos Socio Económico del Alto Magdalena, al igual que investigaciones en el manejo de los recursos naturales (aguas, suelos, Bosques), transferencia de tecnología y fomento de los recursos naturales a través del proyecto Cuenca Alto Magdalena ejecutado por el Instituto de Desarrollo de Recursos Naturales (INDERENA), con recursos de crédito del Banco Mundial.

Logros y Lecciones

El país para la cuenca del Magdalena dispones de una Red de Básica Hidrometeorológica, y de una Red de Alertas conformada por cincuenta y nueve estaciones automáticas, las cuales son el elemento básico de prevención y mitigaciones de los efectos de las periódicas inundaciones que afectan las zonas bajas de las cuencas aportantes y de la planicie inundable del río Magdalena.

Resultado primario de la información producida son los mapas de amenazas por inundaciones que se vienen elaborando conjuntamente con la Dirección Nacional de Prevención y Atención de Desastres, al igual que una cartografía temática a escala 1:500.000 sobre la caracterización de sus recursos naturales.

De igual manera, para su administración integral y por mandato Constitucional se creo la Corporación del Río Grande de la Magdalena y por Ley 99/93 la constitución de trece corporaciones autónomas regionales (espacialmente cubren departamentos), encargadas además de la administración de los recursos naturales de la gestión ambiental y del acompañamiento del desarrollo sostenible de los trece departamentos que la componen, conforme a la nueva Ley de Plan de Desarrollo Nacional.

Finalmente, a partir de 1993 se creó el Ministerio del Medio Ambiente y el Instituto de Hidrología, Meteorología y Estudios Ambientales (IDEAM), encargados de aportar elementos del conocimiento ambiental hacia el logro de un ordenamiento ambiental territorial de la cuenca y orientar el manejo de los recursos naturales a fin de obtener el *desarrollo sostenible*, paradigma constitucional y marco de referencia del actual Plan de Desarrollo gubernamental EL SALTO SOCIAL.