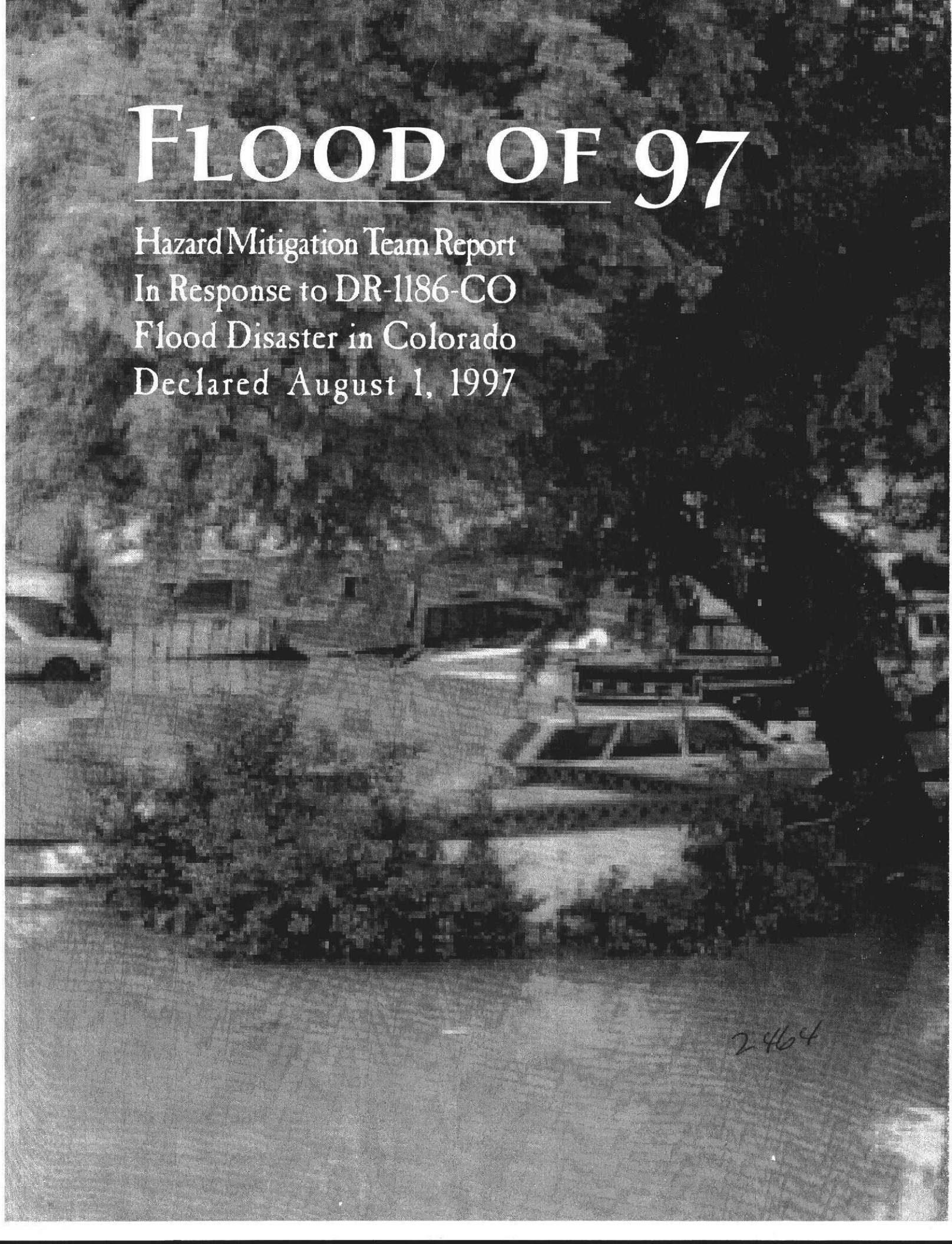

FLOOD OF 97

Hazard Mitigation Team Report
In Response to DR-1186-CO
Flood Disaster in Colorado
Declared August 1, 1997

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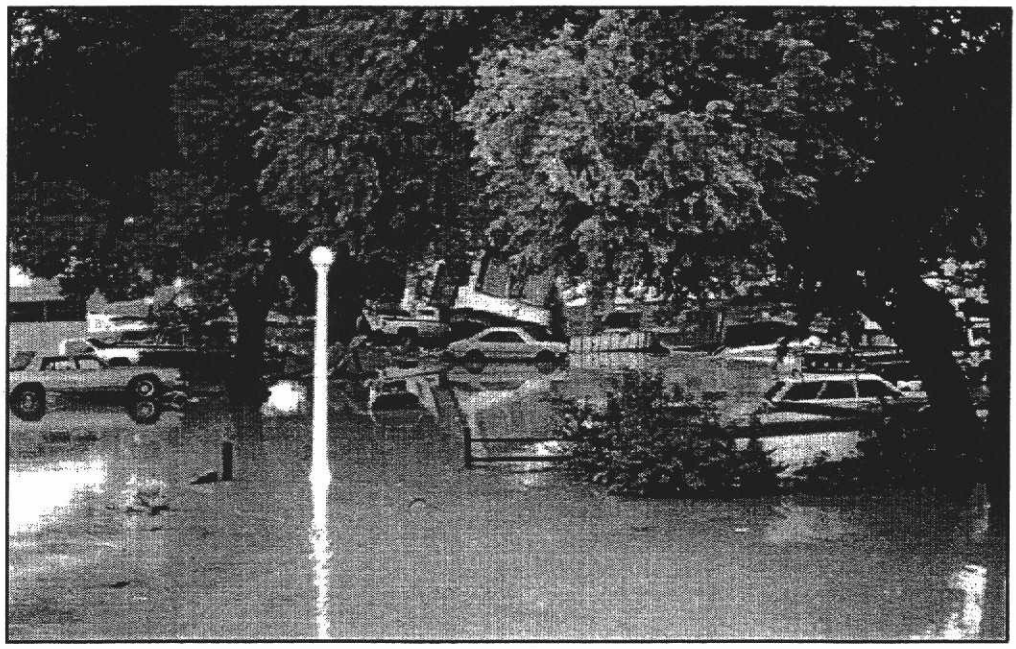
FLOOD OF 97



Hazard Mitigation Team Report
In Response to DR-1186-CO
Flood Disaster in Colorado
Declared August 1, 1997

Helping our communities be safer, stronger and smarter.

Acknowledgments
To the individuals and the governmental or private entities they represent for their invaluable assistance and contributions to this report.

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Published October 1997
Photos courtesy of John Weaver and Shawn Bailey, Poudre Fire Authority

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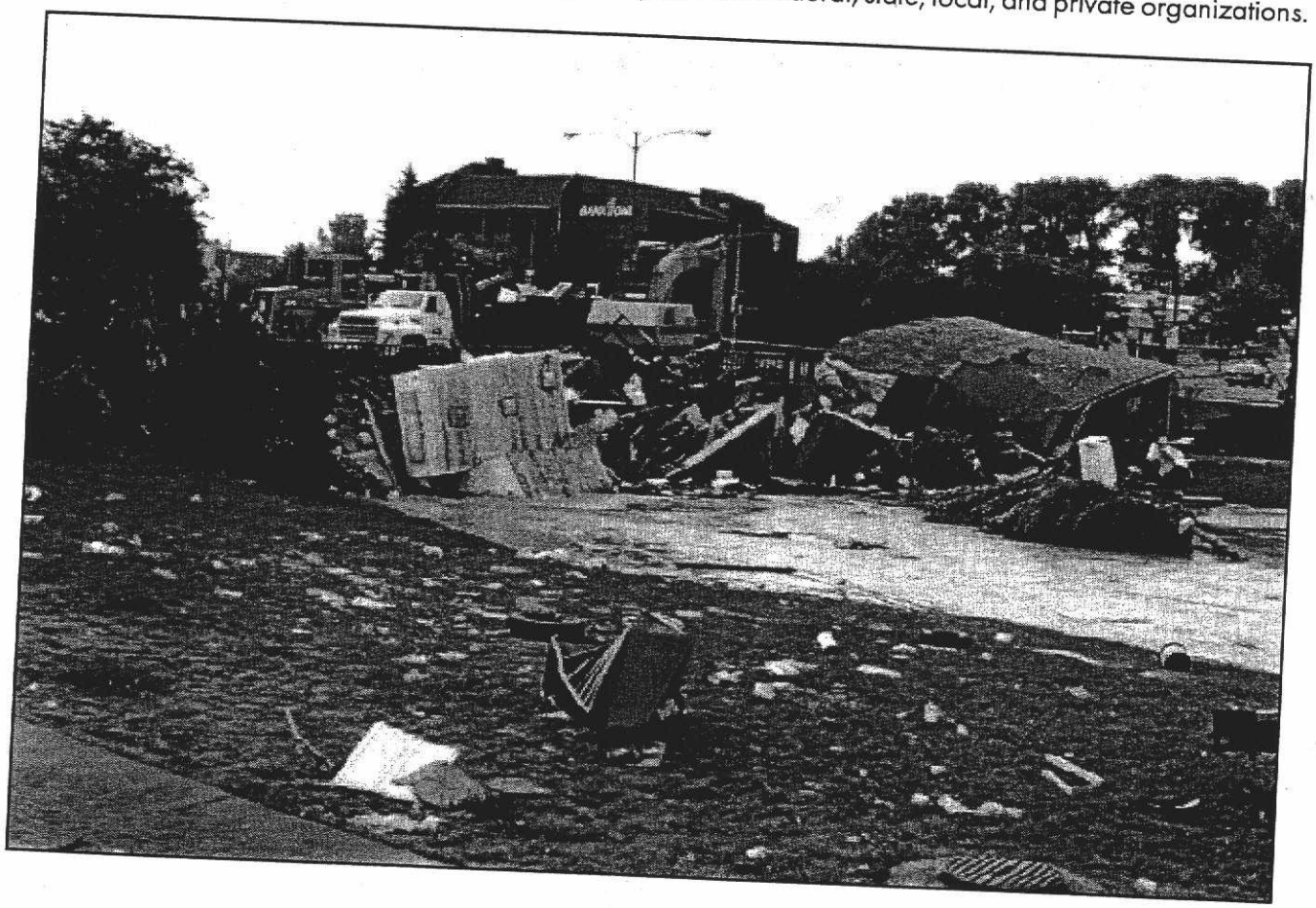
Executive Summary

In order to reduce damages associated with future floods or other natural hazards, the federal government has adopted a comprehensive, coordinated strategy to address these concerns. An Office of Management and Budget (OMB) directive, dated July 10, 1980 established the basis for Regional Interagency and Intergovernmental Hazard Mitigation Teams. These Teams are comprised of federal, state and local representatives in an effort to incorporate the background and expertise necessary to promote a comprehensive approach to hazard mitigation.

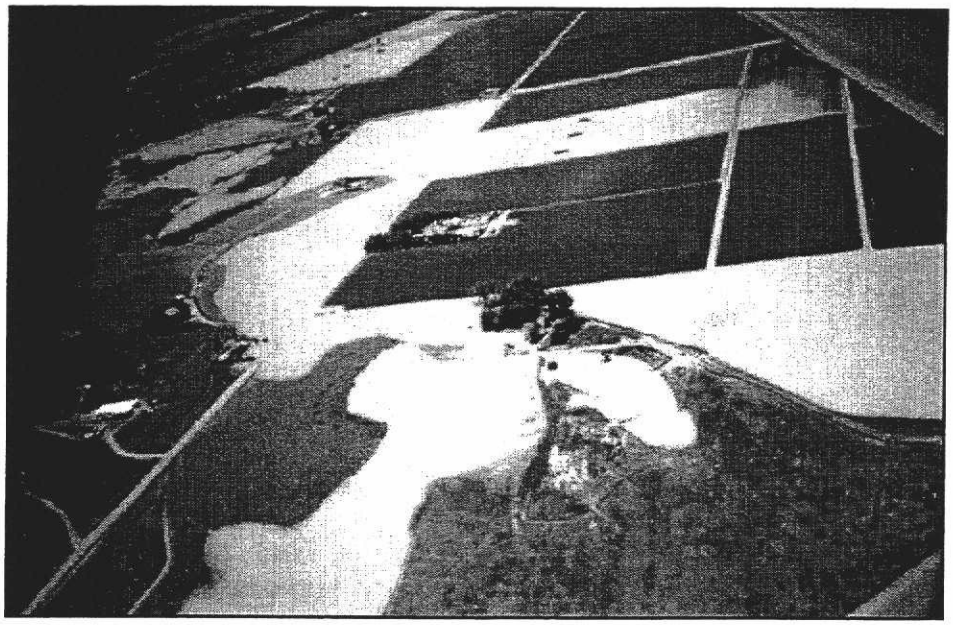
The Interagency Hazard Mitigation Team (IHMT) prepares mitigation recommendations for implementation during the post-disaster recovery phase, and presents those recommendations to the Governor in a report format. The authority for the IHMT derives from an interagency agreement entered into by twelve Federal agencies, coordinated by the Federal Emergency Management Agency (FEMA). The agreement established a common policy statement and implementing guidelines with respect to flood disaster planning and post disaster recovery practices. The IHMT meeting was held in Fort Collins on August 26, 1997, with participants from federal, state, local, and private organizations.



SPRING CREEK, FT. COLLINS

Introduction

On August 1, 1997, President Clinton declared three northeastern Colorado counties eligible to receive federal disaster assistance for damages due to severe storms, heavy rain, flash floods, flooding, mudslides, landslides, and severe ground saturation. Larimer, Logan, and Morgan Counties became eligible for disaster assistance due to damages incurred. An additional ten counties were added including, Lincoln, Prowers, Baca, Crowley, Kiowa, Weld, Otero, Clear Creek, Elbert and Phillips, bringing the total number of counties declared to thirteen. In addition to FEMA assistance, the U.S. Small Business Administration provided aid to affected areas in the form of low-interest loans and the city of Fort Collins and State of Colorado have applied for discretionary funding under HUD. Also, numerous voluntary agencies and organizations contributed support while the State of Colorado provided housing needs, Disaster Unemployment Assistance, Individual and Family Grants and other assistance.



NORTHEAST COLORADO

Purpose

This report provides hazard mitigation recommendations for the recent disaster event in the State of Colorado (DR-1186). Hazard mitigation is defined as any action taken to eliminate or reduce the risk to human life, property and the environment posed by a hazard. The recommendations presented in this report should be implemented by appropriate agencies and jurisdictions to prevent future disaster events from occurring. The information and recommendations will assist the State in updating its Hazard Mitigation Plan and in incorporating mitigation into the long-term recovery of Colorado.

Description of Event

During the summer months, all of Colorado is subject to convective thunderstorms. When sufficient humidity is present in the atmosphere, some of these storms produce large amounts of rainfall in short time periods. The source of the humidity is typically moisture from the Gulf of Mexico and the central plains states which, under certain weather patterns, can drift into eastern Colorado. Also, in mid and late summer, a monsoon wind circulation brings moisture, originating from either or both the Baja California area and/or the Gulf of Mexico, northward up across Mexico into the Southwest. The moisture source is responsible for many of the summer thunderstorms over Colorado's mountains and western valleys.

In late July 1997, tropical moisture was streaming northward across Mexico and the Southwest into Colorado. At the same time, a large high-pressure system stalled over the central high plains of the United States. The system's clockwise rotation pumped very humid air from the central plains and Gulf of Mexico into eastern Colorado. A cold front, associated with the high pressure area over the northern plains provided a trigger to set off thunderstorms as moist airmasses converged over Colorado.

In the 3-4 days preceding, July 28, 1997, the City of Fort Collins and most of eastern Colorado received soaking and/or drenching rains, adding to soil moisture in some locations. As the cold front arrived in the late afternoon of July 27th, strong thunderstorms developed just north and west of Fort Collins. Later that night, steady rains developed along the eastern base of the foothills in Larimer County and continued until about noon, July 28th. Several inches of new rain were reported just west and northwest of Fort Collins totally saturating the ground, producing major flooding in Laporte, and setting the stage for the evening flood event.

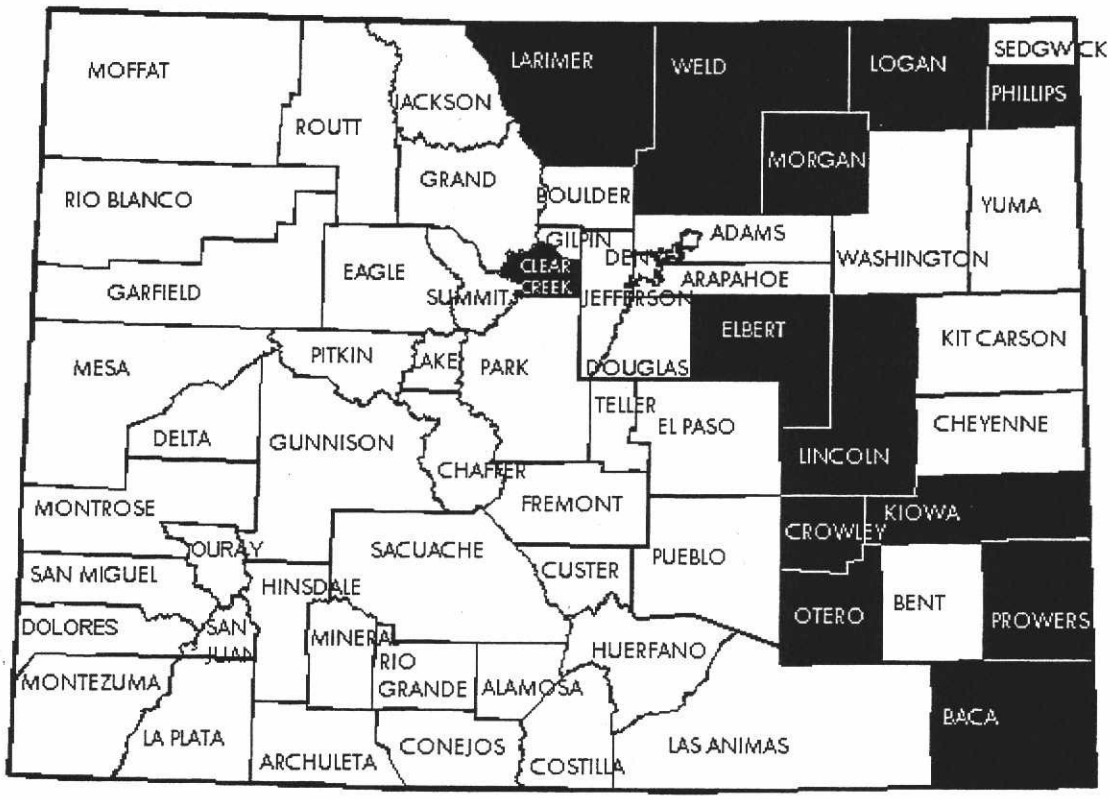
On the evening of July 28, 1997, intense rains began around 6:30 p.m. in the foothills west of Fort Collins. Winds from the east and southeast continued to pump moisture into the storm system throughout the evening. The core of the storm was very small but remained nearly stationary over the headwaters of Spring Creek, the Fairbrooke Channel, Clearview Channel, the CSU Drainage Basin and the West Vine Drainage Basin. Rainfall intensity increased and reached a maximum between 8:30 p.m. and 10:00 p.m. before ending abruptly. A subsequent analysis of rainfall conducted by CSU showed a maximum of 10.2 inches of rainfall in less than five hours near the intersection of Drake Rd. and Overland Trail.

On July 29, 1997, slow-moving thunderstorms dumped large amounts of rainfall over the Pawnee Creek Basin in Weld and Logan counties and over the Schaefer Draw Basin in Morgan County north of Weldona. Floodwaters from Schaefer Draw entered the unincorporated Town of Weldona on the evening of July 29 while similar damaging floodwaters from Pawnee Creek entered the unincorporated Town of Atwood early July 30th (west of Sterling and north of U.S. Hwy 6). Additionally, floodwaters flowing east from Atwood entered the City of Sterling.

During the Presidential Declaration Incident Period (July 28 - August 12, 1997), storm systems drenched other areas in northeastern Colorado as well as several counties in southeastern Colorado. In addition, the Denver Metro Area received flooding rains as did the Clear Creek County area to the west of Denver.

Disaster Declaration Status

DR-1186-CO



FEDERAL DISASTER DECLARATION COUNTIES

Surface and Hydrology

The greatest impacts from the 1997 flood event occurred in the following areas (Larimer, Logan and Morgan counties):

Larimer County

Spring Creek drainage in Fort Collins

Fairbrooke and Clearview Drainage Channels in western Fort Collins

West Vine Drainage area in Northwestern Ft. Collins

Colorado State University local drainage area

Morgan County

Shaefer Draw north and into the Town of Weldona

Logan County

Pawnee Creek northwest/west of Sterling in Atwood, and the City of Sterling

Numerous streams and watercourses contributed to flood damages in the following additionally declared counties: Lincoln, Prowers, Crowley, Kiowa, Weld, Baca, Otero, Clear Creek, Phillips and Elbert.

Larimer, Logan, Weld, Morgan and Clear Creek counties have drainage tributaries to the South Platte River. In addition, portions of Elbert and Lincoln counties have tributaries to the South Platte River. The river basin has a drainage area of about 24,300 square miles and is located in three states, Colorado (79 percent of the basin); Nebraska (15 percent of the basin); and Wyoming (6 percent of the basin).

The basin has a continental-type climate modified by topography, in which there are large temperature ranges and irregular seasonal and annual precipitation. Mean temperatures increase from west to east and on the plains from north to south. Areas along the Continental Divide average 30 inches or more of precipitation annually, which includes snowfall in excess of 300 inches. In contrast, annual precipitation on the plains east of Denver, Colorado, and in the South Park area in the southwest part of the basin, ranges from 7 to 15 inches. Most of the precipitation on the plains occurs as rain, which falls between April and September.

Rangeland is present across all areas of the basin except over the high mountain forests. Agricultural land is restricted mostly to the plains. Urban or built-up land is present primarily along the Front Range urban corridor in Colorado.

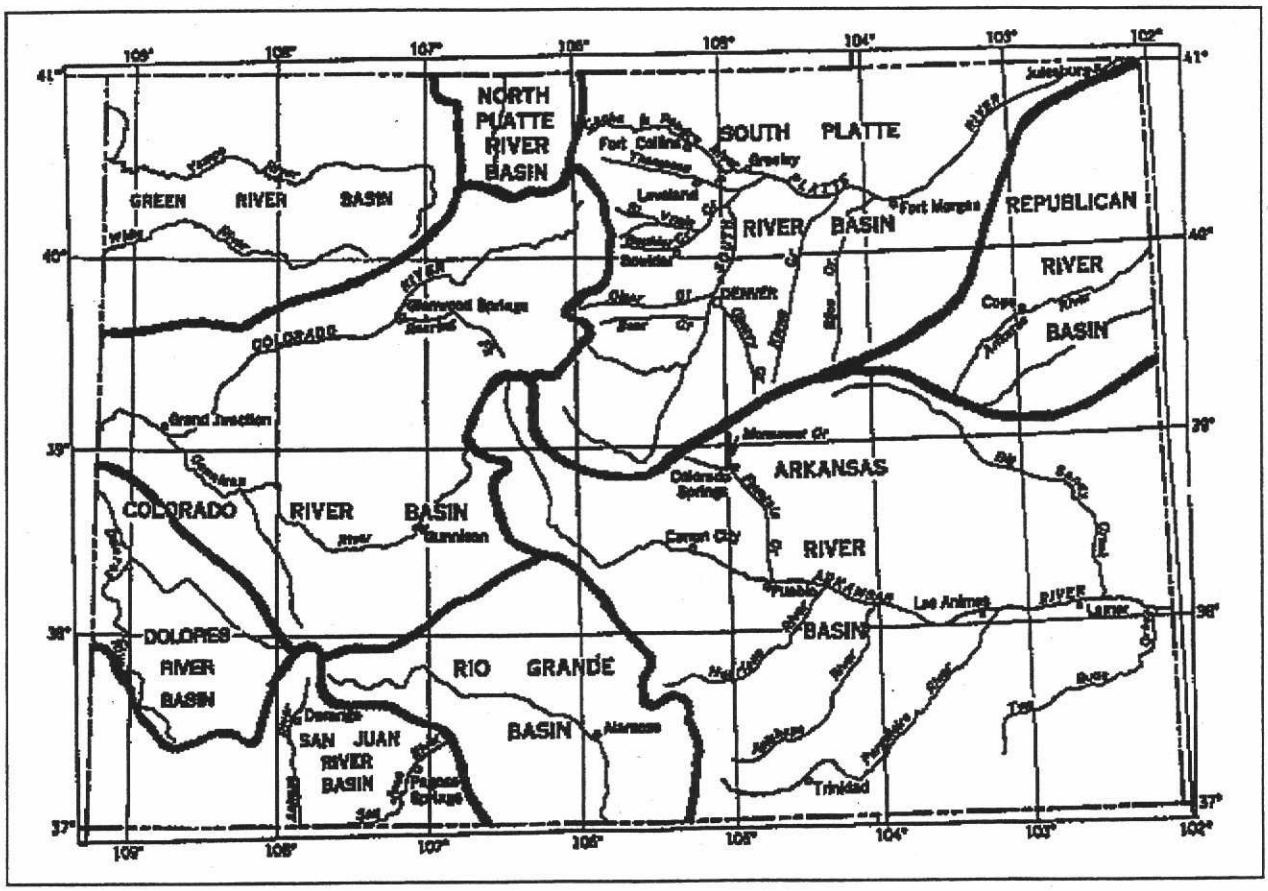
Phillips County and parts of Lincoln and Elbert Counties have drainage tributaries to the Republican River. The Republican River is, in turn, tributary to the Kansas River in Kansas. The Republican River Basin in Colorado consists primarily of rangeland with some farming and ranching communities scattered throughout the basin.

The Arkansas River Basin is very similar to the South Platte River Basin in topography, geology and hydrology. Annual mean temperatures are slightly higher than the Platte Basin. Annual rainfall amounts average between 7 and 15 inches, except in the mountainous areas of the Basin. Land use is similar as well and consists mainly of agriculture.

Crowley, Kiowa, Otero and Prowers Counties are drainage tributaries to the Arkansas River. In addition, portions of Elbert, Lincoln and Baca Counties are within the Arkansas River Basin.

A very small part of the incident area lies within the Cimmaron River Basin. The southern portion of Baca County has drainage tributaries to the Cimmaron River. The Cimmaron River flows from Colorado into Kansas and then into Oklahoma where it ultimately joins the Arkansas River in Tulsa. The Cimmaron River Basin is similar in topography and climate to the Arkansas River Basin.

Colorado River Basins



Damage Impacts

The heavy thunderstorm-generated rains along Colorado's Front Range and eastern high plains caused severe flash flooding in many communities. In Fort Collins, five women perished in the mobile home parks north of Spring Creek and west of College Avenue. Numerous homes beyond the 100-year floodplain were damaged in the city as well as in unincorporated Larimer County. City services were overwhelmed as streets flooded; power was lost in some locations and emergency services personnel worked to keep ahead of ravaging floodwaters.

In Morgan and Logan Counties, the communities of Weldona, Atwood and Sterling were all significantly impacted by floodwaters. Roads, bridges, culverts and other stream crossings were damaged or destroyed. Agricultural crops, irrigation facilities and land were destroyed in many areas. The same kinds of damages were experienced in the remaining ten counties, which were declared under FEMA Disaster 1186-CO.

As of October, 1997 the estimated FEMA reimburseble damage amounts were $16,955,750 under the Public Assistance Program and $7,925,000 under the Individual Assistance Program.

SPRING CREEK, FT. COLLINS

History of Flood Mitigation in Colorado

Flood Hazard mitigation has been occurring in Colorado for several decades. In the past, it was often implemented at the local level of government generally following flood disasters. In recent times, involvement from both the state and federal government has become more common as each entity has provided funding and technical assistance for flood hazard mitigation. In the future, the implementation of flood hazard mitigation strategies will still take place locally but it will be supplemented with new enthusiasm from the state and federal government as pre-disaster mitigation becomes the cornerstone of FEMA and state programs.

In the 1980's and the 1990's, Colorado state government's first formal experience with flood hazard mitigation followed the 1982 and 1984 Presidential Disaster Declarations, particularly in 1984. The 1982 declaration addressed the Lawn Lake Dam failure near Estes Park and was fairly localized in scope. On the other hand, 17 counties on Colorado's Western Slope were included under the 1984 declaration. Mitigation measures related to infrastructure and watershed management were implemented in Delta and Montrose Counties. These measures consisted primarily of replacing existing structures, such as bridges and culverts, that had washed out or been damaged with ones of larger capacity. An acquisition/buy-out also occurred in a subdivision in Paonia, Colorado. Bank stabilization efforts at several locations were undertaken.

In 1984, 100-year flooding occurred in the Delta County area upstream of the confluence of the Uncompahgre and Gunnison Rivers. These flood impacts set into a motion a series of actions by local governments which today has culminated in the development of a park at the rivers' confluence.

In 1993, the State's mountain snowpack was at an all-time high in several drainages. Pre-disaster mitigation activities such as sandbagging critical locations and placement of diversion structures occurred in western slope counties such as Gunnison County. Rock deflection jetties were placed to protect the county fairground facilities in Hotchkiss (Delta County). Bank stabilization was again commonplace. In addition, education efforts through the Colorado Water Conservation Board's *Spring Flood Awareness Campaign* prompted action from local governments.

The State's first Flood Task Force was formed in 1993 to disseminate real time data regarding streamflow, snowpack and potential for flooding and to provide coordination among federal, state, local and private entities involved in flood preparedness and response. Involvement by the Colorado Natural Hazards Mitigation Council (CNHMC) came to the forefront, as experts from across Colorado offered technical and engineering assistance to mitigate the impacts of flooding. Several mountain counties throughout the state were impacted to

one degree or another. Pre-disaster mitigation activities served to lessen impacts in those communities that had taken action.

In 1995, snowpack development came very late in the season (April through early June). However, in many locations it was equal to or exceeded the record snowpack of 1993. The State's Flood Task Force was convened again and provided valuable data for flood preparedness and mitigation. Many of the permanent mitigation measures which were enacted during the 1993 flood event prevented damages. Many other mitigation measures put into place just prior to the flood event worked admirably as well.

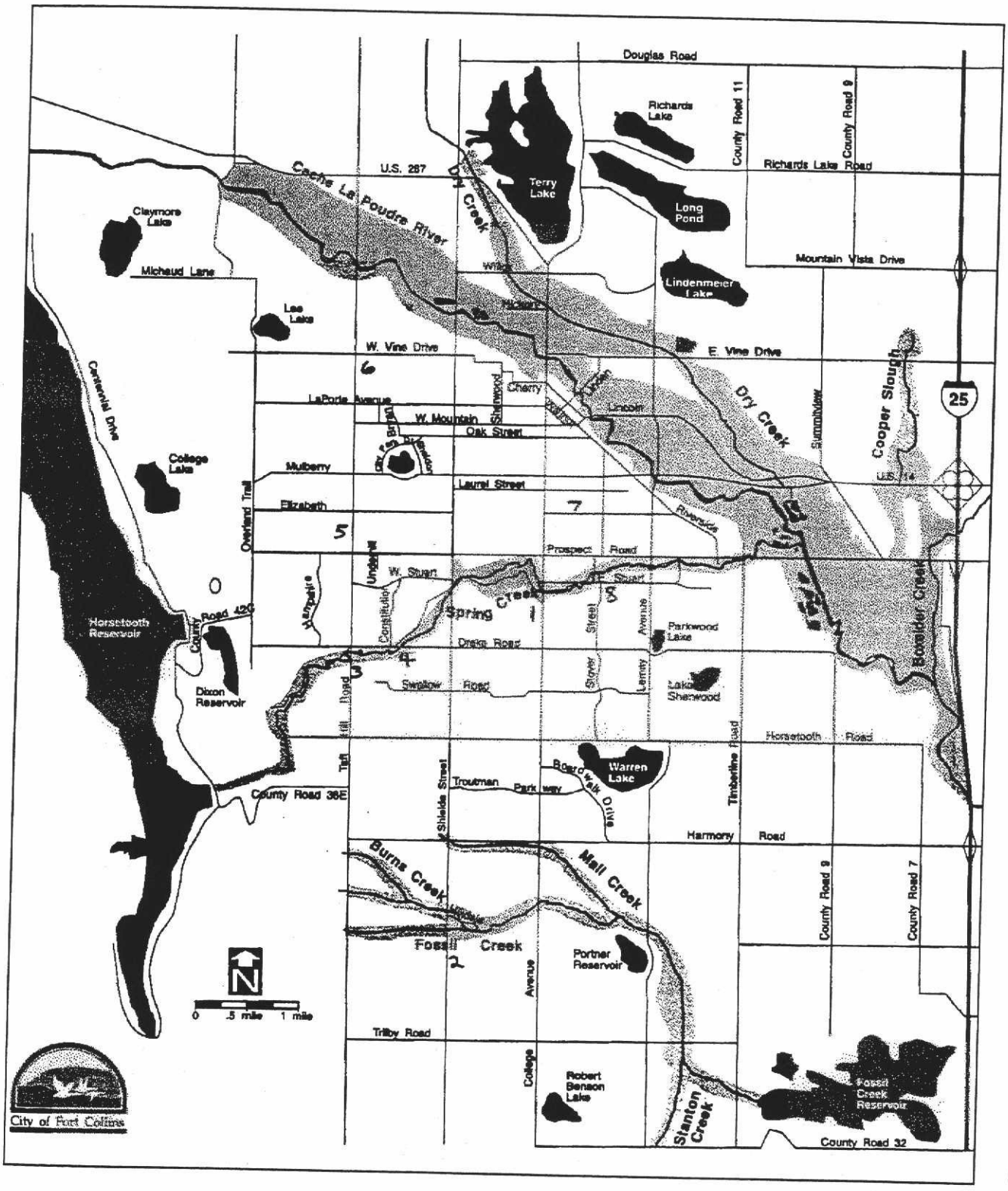
In 1996, the Flood Task Force was called into action again because of a high snowpack. In the end much of the snow melted without causing substantial problems, but the Task Force was able to provide assistance to local officials concerned about flooding in their jurisdictions.

Prior to the 1997 flooding, mitigation activities were undertaken by the City of Fort Collins, which reduced flood damages on Spring Creek. Some buildings in the 100-year floodplain had been previously acquired and the land converted to parks or open space. Several bridges and culverts had been enlarged to increase flow capacity. The result was that substantially fewer buildings remained in the 100-year floodplain of Spring Creek.

During these two decades state agencies have worked actively with local governments that have requested assistance with their specific problems. Mapping of floodplain areas has identified the mitigation needs of some communities. Planning and engineering assistance have been provided for developing and designing structural and non-structural projects to address flood problems. State funding has assisted many communities implement projects. Two slide shows documenting mitigation efforts statewide and encouraging more mitigation have been developed by the Colorado Water Conservation Board and shown to various audiences. In response to the 1997 floods, the Water Conservation Board, in cooperation with local agencies, is preparing Flood Documentation Reports for all the 13 counties included in the Presidential Declaration. Then the Water Conservation Board is preparing Flood Mitigation Feasibility Reports for selected communities to include with their Hazard Mitigation Grant applications, to provide technical support for those grant applications. The State is continuing to work cooperatively with as many entities as possible to reduce Colorado's flood hazard vulnerability.

Fort Collins Floodplains

Floodplain boundaries are approximate. Floodplains are the shaded areas.



Hazard Mitigation Objectives & Accomplishments

In keeping with the National Mitigation Strategy, this report identifies mitigation measures, successful mitigation activities and reinforces the traditional long-term goal to reduce loss of life and property damage, by eliminating or reducing the impacts of natural or man-made hazards. The objectives of hazard mitigation that were implemented during the response phase of the current disaster. They may also provide a framework for revisions to the Colorado Multi-Objective Mitigation Plan, as required by Section 409 of the Stafford Act.

The objectives are summarized under the following categories, which were developed and implemented during the response phase of this disaster:

- Mitigation Outreach
- National Flood Insurance Program (NFIP)
- Mitigation under the Public Assistance Program
- Mitigation under the Human Services Program

MITIGATION OUTREACH

Objective: Develop and distribute public education materials on mitigation to affected areas.

Dissemination of information is beneficial to the success of mitigation measures. Opportunities can be lost if information is not distributed to affected home/property owners and renters, particularly if repairs are already underway or completed. A public information campaign to publicize the benefits and techniques for mitigation is advantageous.

Mitigation outreach included:

- Mitigation counselors staffed the Disaster Recovery Centers (DRCs) distributing mitigation information and offering technical advice.
- A mitigation tour was conducted for members of the media showing examples of existing mitigation and mitigation success stories used in other cities and states.
- Mitigation staff made several media appearances including a mitigation spot on the FEMA radio network, newspaper interviews and radio broadcasts.

NATIONAL FLOOD INSURANCE PROGRAM (NFIP)

Objective: Increase the number of flood insurance policies by educating and promoting the benefits of flood insurance. Provide technical assistance to local floodplain officials on appropriate floodplain management practices through NFIP regulations.

The National Flood Insurance Program was created through enactment of the Flood Disaster Protection Act of 1968 and amended in 1973. The Act made flood insurance available to communities that adopted flood loss reduction measures in their jurisdictions. To participate, a community adopts a Resolution of Intent and a Flood Damage Prevention Ordinance that establishes sound floodplain management practices in areas subject to flooding. State and Federal NFIP staff conducted various outreach and technical assistance services including the following:

- NFIP staff provided information at the Disaster Recovery Centers, including handouts and technical advice.
- NFIP staff gave numerous radio and newspaper interviews relating information about the benefits of flood insurance, and worked with the Public Information Officer (PIO) in developing a flood insurance press release.
- NFIP staff attended local government and public community meetings, clarifying and explaining about the NFIP.
- Two NFIP insurance agent workshops were performed, discussing the NFIP regulations.

MITIGATION UNDER THE PUBLIC ASSISTANCE PROGRAM

Objective: Take advantage of mitigation opportunities allowable under FEMA's Public Assistance (PA) Program (Stafford Act Section 406). This type of mitigation is vital during the repair phase of a damaged site as identified by inspectors in Damage Survey Reports (DSRs).

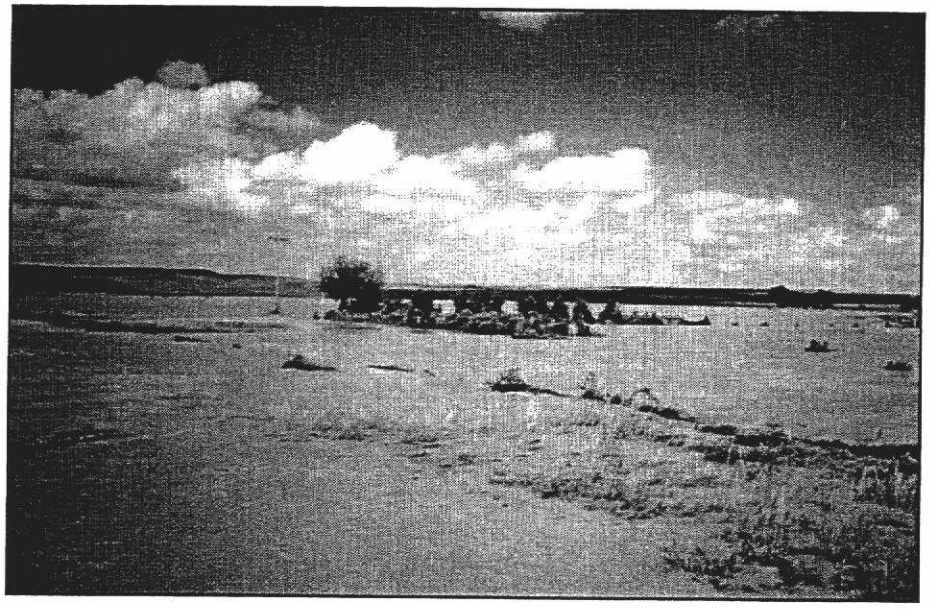
A component of hazard mitigation will be accomplished through PA administered by FEMA's Infrastructure Support Division. For the Colorado flooding disaster, most mitigation measures will consist of additional work, above and beyond normal eligible PA work, designed to reduce or eliminate future damages and associated costs.

During the survey inspector briefings, the inspectors were instructed to investigate possible mitigation opportunities at each damaged site. A benefit/cost analysis will be performed on all Damage Survey Reports (DSRs) with Hazard Mitigation Proposals during the normal review process.

Examples of Possible Public Assistance Hazard Mitigation Projects:

- Relocation of facilities in hazardous locations

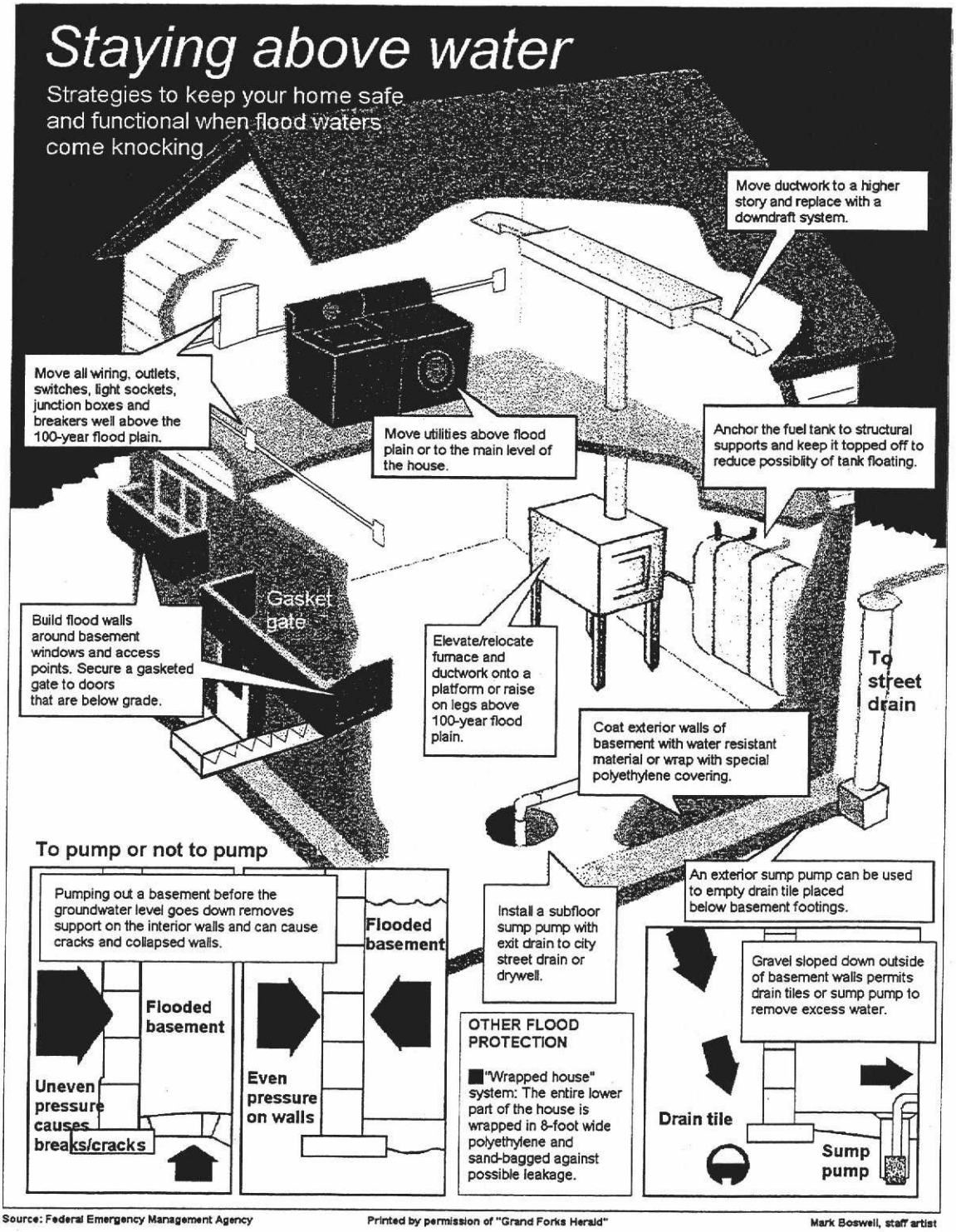
- Floodproofing bridges/culverts
  - Clear spans instead of multi-spans
  - Use disaster-resistant materials
  - Abandon/consolidate, where possible
  - Low water crossings instead of bridges
  - Install cut-off walls or headwalls on culverts
  - Increase hydraulic capacity
  - Flared end sections
  - Install jump spans instead of replacing embankments
  - Lower abutment footings
  - Flatten slopes on downstream culvert embankments
  - Tie down bridge decks
- Encourage construction standards which incorporate hazard mitigation measures
- Slope stabilization measures
  - Rip-rap
  - Crib/retaining walls
  - Soil retention blankets
  - Flatten slopes
- Floodproofing Buildings
  - Abandon/relocate
  - Floodproof doors/windows
  - Block basement windows
  - Elevate mechanical/electrical equipment
  - Install anti-backflow devices on floor drains
- Floodproofing Utilities
  - Place utilities on bridges instead of channel bottoms
  - Encase utilities or construct low head dams for protection
  - Install flapgates on storm sewer outfalls
  - Elevate controls and motors at sewage stations



MITIGATION UNDER THE HUMAN SERVICES PROGRAM

Objective: To provide education and funding for mitigation through the Disaster Housing Program, and State Housing Program.

Where appropriate, FEMA has provided Mitigation grants through the Disaster Housing Grant Program 800 Minimization Series. Information distributed at the DRCs and by FEMA Community Relations staff illustrates these measures.



Source: Federal Emergency Management Agency

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Mark Boswell, staff artist

Colorado Natural Hazards Mitigation Council

For the past two decades, Colorado has experienced rapid population and business growth. Pressures have increased to build structures in floodplains, on steep slopes, in wildfire areas, and other locations previously considered unsafe or too costly to develop. Recognizing these issues, Governor Roy Romer signed an executive order establishing the Colorado Natural Hazards Mitigation Council (CNHMC) in March of 1989. The Council was created as an interdisciplinary forum for exchanging information and promoting ways to reduce and manage impacts from natural hazards.

The Council is composed of almost three hundred volunteer committee members in the state of Colorado. The Council is organized into technical and hazard specific committees. The technical committees are Public Affairs and the Steering Committee. Hazard specific committees include Severe Weather, Dam Safety, Fire Management and Mitigation, Drought, Geologic Hazards, and Flood. A recently formed Policy Advisory Group will guide overall strategy.

The primary duties of the Council are to:

- Prioritize natural hazards in the State and review existing mitigation plans
- Develop a mitigation management strategy involving various levels of government
- Provide information and technical assistance to local governments and individuals

Through its volunteer committees, the Council has supported over one hundred mitigation projects since its inception. These include:

- Pre and post-disaster mitigation workshops for home owners and businesses in Canon City, Pueblo, Colorado Springs, Fort Collins, Rifle and Lyons
- Major flood mitigation activities in Lyons and the San Luis Valley
- Publication of The Mitigation Siren newsletter
- GIS familiarization workshops
- A hazard awareness contest for children
- Dam Safety and Emergency Planning brochures
- Publication of a Citizens Emergency Preparedness Guide

As an organization unique in this country, the Colorado Natural Hazards Mitigation Council is afforded a great opportunity to identify and mitigate hazards prior to major disasters. State, Federal and local governments, as well as the private and academic sectors, are working together as a dynamic coalition to address these significant issues in a systematic and timely fashion.

Smart Growth and Development Initiative

Governor Roy Romer's Smart Growth and Development Initiative began in the fall of 1994 as a response to uprecedented population growth and the challenge of preserving Colorado's unique natural beauty and quality of life. Much of the new development occurring in the state is located in the urban/wildland interface. This poses a serious threat since many new residents are unaware of potential hazards such as flooding, wildfire and geologic hazards. The Smart Growth process provides local governments with vital assistance to help address this growing concern effectively and thoughtfully.

This initiative provides a forum in which public discourse has progressed beyond the simplistic notions of "pro-growth" and "no growth" by developing partnerships among state and local governments, key stakeholder groups and citizens. Smart Growth is a bottom-up approach to local and regional visioning and strategy building process which relies on broad-based participation from all sectors of the community.

Two statewide summits, several regional summits, specific topic-based task forces and an Interregional Council developed an action agenda of 74 recommendations that deal directly with growth related problems, and an agency was designated responsible for implementation of each recommendation. Many of these recommendations have already been completed or are well underway.

Several of the recommendations deal directly with land use planning, and hazard mitigation planning is emphasized. Technical assistance is available directly to local governments, via planning commission workshops, land use planning workshops, publications and other means of information dissemination. Several projects that specifically involve hazard mitigation planning have been awarded the Governor's Smart Growth and Development Award.

For more information on Smart Growth in Colorado, you can contact the Smart Growth Action Center at (303) 866-2817.

Recommendations

The following issues and recommendations represent the collaborative efforts of Interagency Hazard Mitigation Team members that are intended to help achieve the goal of reducing future flood hazards. Many of the recommendations can be implemented immediately; others must be viewed as long-term measures.

Recommendations are summarized below:

HOUSING

H-1 Identify long term affordable housing

WATERSHED MANAGEMENT

WM-1 Improve current and develop accurate floodplain maps.

WM-2 Promote local support for effective land use planning and floodplain management.

WM-3 Encourage a comprehensive watershed management approach in floodprone communities.

WM-4 Promote an increased awareness of wetland and habitat resources and their benefits to floodplain management.

WM-5 Support the combination of structural and non-structural elements to reduce flood hazards in flood plains that have already been urbanized

INFRASTRUCTURE

I-1 Promote upgrading ditches and irrigation canals to safely convey flood flows.

I-2 Upgrade and maintain critical infrastructure.

I-3 Improve emergency warning systems.

EDUCATION/COORDINATION

EC-1 Provide disaster education to the general public

EC-2 Improve access for local government officials to information regarding floodplain management, flood hazard mitigation and flood insurance.

EC-3 Develop a disaster education program for public officials.

EC-4 Provide technical assistance to communities concerning floodplain management.

EC-5 Promote regional intergovernmental cooperation concerning floodplain management.

EC-6 Develop a natural hazard awareness and education program in K-12 Schools.

HEALTH AND ENVIRONMENT

HE-1 Encourage small communities to develop centralized sewer and water systems in areas that will not be impacted by flooding.

HE-2 Promote the development of contingency plans for household hazardous chemicals during flood events.

CODES AND STANDARDS

CS-1 Develop master drainage plans for state colleges, institutions, cultural facilities and other large public facilities.

CS-2 Strengthen design criteria for vulnerable infrastructure at the local level.

CS-3 Improve stream gage network.

CS-4 Increase rainfall-runoff modeling research

HOUSING

ISSUE:

H-1 Long term affordable housing following a disaster utilizing acquisition/ relocation

BACKGROUND:

Substantial damage to affordable housing stock following this disaster is a major concern. Permanent affordable housing that is safe from flooding needs to be made available to displaced individuals to insure a strong, growing community and economy.

RECOMMENDATIONS:

Local governments must take the lead to provide adequate permanent affordable housing to meet the needs of those affected by the disaster. Acquisition/ relocation of housing affected by the disaster, and other housing in areas of high future flood probabilities should be prioritized high on the list for mitigation opportunities in the recovery phase of this disaster. A combination of all disaster funding sources and a reprogramming of funds from housing related programs needs to be utilized to ensure a solid base of affordable housing in affected communities. Funding sources, which need to be combined, include:

- SBA
- HUD (HOME and CDBG)
- FEMA (HMGP)
- U.S. Department of Agriculture (Rural Development Administration)
- Cities, Counties and Regional Planning Councils
- State DOLA
- Colorado Housing and Finance Authority (CHFA)

An interagency approach to this problem must be used, with local clearinghouses of housing resources formed to counsel those in need of safe, affordable and permanent housing.

LEAD AGENCIES:

Local jurisdictions with support from Colorado DOLA, Division of Housing

FUNDING:

State, HUD, FEMA, SBA, U.S.D.A, CHFA, Colorado DOLA, Local jurisdictions

SCHEDULE:

One year

WATERSHED MANAGEMENT

ISSUE:

WM-1 Lack of current and accurate floodplain mapping in Colorado communities, especially rural unincorporated areas and in areas experiencing development.

BACKGROUND:

Much of the flood damage suffered in this disaster period occurred in areas not shown on FEMA maps as 100-year floodplain areas. Areas subject to "storm drainage" problems (as opposed to riverine flooding problems, if such a distinction can be drawn), areas downstream of irrigation ditches, areas subject to ponding without satisfactory outlet paths, areas beyond the limits of the 100-year (and even 500-year) flooding, and areas where debris accumulation and/or human emergency intervention altered flow patterns were all witnessed in 1997. Floodplain managers, emergency responders and citizens can all ask, "Can we rely on these floodplain maps during an actual flood emergency?"

RECOMMENDATIONS:

- Seek funding (local, State, Federal & private) to sponsor an all-day workshop on floodplain mapping issues
- In view of the 1997 experience, compare current FEMA and other floodplain maps to the outlines of the areas of inundation during flooding in 1997; identify specific technical issues of concern to hydraulic engineers who prepare floodplain maps
- Develop specific recommendations for each of the pertinent technical issues
- Implement recommendations on a pilot basis by conducting floodplain studies in Colorado communities where a particular floodplain-mapping problem was experienced
- Examine pilot studies with independent outside reviewers and make adjustments, as necessary
- Access information from EPA's Index of Watershed Integrity that uses 15 data layers to characterize individual watersheds

LEAD AGENCIES:

CWCB, Urban Drainage and Flood Control District, CU, CSU, Colo. School of Mines, irrigation companies, private consulting engineers, FEMA, COE (including HEC in Davis, CA), NRCS

FUNDING:

Agency and program funding

SCHEDULE:

One to five years

ISSUE:

WM-2 Local support for land use planning and floodplain management is lacking in many of Colorado's rural communities.

BACKGROUND:

The concept of land use planning is not universally accepted among Colorado's rural communities. The primary reason is that regulation of land use connotes restriction of property rights. Some rural residents do not want to be restricted from utilizing their land to its maximum potential even if it occurs in hazardous areas.

RECOMMENDATIONS:

Work with local governments to:

- Continue progress being made through the SMART Growth Process
- Develop a strategic planning process for local governments that develops and implements goals and objectives
- Use local area examples to build support
- Conduct public meetings and surveys to achieve implementation

LEAD AGENCIES:

Colorado DOLA, Colorado Natural Hazards Mitigation Council, CWCB

FUNDING:

DOLA, CWCB

SCHEDULE:

Immediate and on-going

ISSUE:

WM-3 Local planning efforts in Colorado are not usually watershed-based. There is a lack of adequate data, funding and coordination to develop multi-jurisdictional comprehensive planning initiatives in many of Colorado's floodprone communities.

BACKGROUND:

Historically, master/comprehensive planning initiatives in Colorado are locally initiated. However, floods cross jurisdictional boundaries. Typically, jurisdictions do not cooperate to solve drainage problems. Funding priorities in communities are often a reason for this problem. Plans to address local interests often do not have a basinwide perspective.

RECOMMENDATIONS:

- Promote long-range planning for future development in floodplain areas that will result in integrated flood control projects, which incorporate acquisition, open space, recreation, structural improve ments to address floodplains that have existing development
- Create a watershed-based Geographic Information System (GIS) in flood-affected areas of Colorado. The system should include: 1) geomorphic floodplain data (pre-development), 2) 1997 flood affected areas including limits of flooding, diversion points, problem areas, etc., 3) current land use, 4) currently designated floodplains including 100-year, 500-year, irrigation ditches, engineered structures, etc., 5) future mitigation opportunities, 6) location and amount of damages, 7) infrastructure including highway facilities, railroads, irrigation ditches, etc., and 8) storm data from the summer 1997 flooding
- Develop a cooperative work team to seek additional matching funds for the initiatives listed above including development of a GIS Decision Support System
- Access resources from EPA's Community Based Environmental Protection (CBEP) programs that can provide technical assistance and funding when available for scientific analysis, monitoring systems and environmental information

LEAD AGENCIES:

CWCB, CNHMC, DOLA, municipal and county planning departments

FUNDING:

USDA/NRCS, USACE, EPA, FEMA, WAPA, CWCB,CGS, CDPH&E

SCHEDULE:

Immediate and on-going

ISSUE:

WM-4 Floodplain, wetland and habitat resources have been degraded and destroyed in Colorado incrementally over decades.

BACKGROUND:

Colorado has experienced tremendous growth in the past ten years. It is estimated that 50 percent of the State's wetlands have been lost over the past 100 years. Population growth, increased urbanization and intensified agricultural use have put additional pressure on wetlands. Benefits that may be achieved by wetlands include flood control, groundwater recharge, improved water quality, wildlife habitat and open space. Beyond wetland initiatives, opportunities exist to develop water-

shed management planning and implementation strategies. The need for watershed planning has been typified by some of the problems experienced due to recent flooding. The problems include damaged irrigation facilities, loss of riparian areas, wetland loss and degradation, sedimentation of rivers, streams, ditches and other watercourses.

RECOMMENDATIONS:

- Promote watershed planning throughout Colorado
- Encourage increased federal, state and local government participation in the Colorado Wetlands Initiative
- Provide buffer areas adjacent to creeks and rivers to protect flow conveyance areas
- Clean debris from ditches and fields
- Make repairs to damaged irrigation facilities
- Improve vegetative growth in areas subject to frequent flood flows
- Coordinate watershed planning recommendations with proposed mitigation measures

LEAD AGENCIES:

Local jurisdictions, CWCB, CDOW, USDA/FSA, USDA/NRCS, USF&WS, EPA

FUNDING:

FEMA, USDA/NRCS, USDA/FSA, CDOW

SCHEDULE:

Immediate and on-going

ISSUE:

WM-5 Need for combining structural and non-structural elements to reduce flood hazards in floodplains that have already been urbanized.

BACKGROUND:

Much of the most severe flood damage experienced in this disaster occurred in watersheds where houses and other buildings cover much of the 100-year floodplain, including all or a significant part of the channel/flow path. If acquisition for demolition or relocation is feasible (economically, socially or politically) for only a small number of buildings and if floodproofing is similarly constrained, that does not mean other sound floodplain management alternatives don't exist. In such cases a combination of acquisition/relocation and floodproofing with structural drainage/flood control improvements can reduce flood hazards and provide open space, recreation, improve wildlife habitat and increase livability of neighborhoods.

RECOMMENDATIONS:

- Identify communities flooded in 1997 and other communities where urbanization appears to preclude fully non-structural approaches to flood hazard reduction;
- Identify non-structural measures that would contribute to flood hazard reduction in those communities and the constraints faced by the non-structural measures;
- Identify structural measures that would substantially enhance the effectiveness of non-structural measures in those communities;
- Seek multi-objective and multi-discipline design support for such combined structural non-structural projects; and
- Seek funding (federal, state, local and private for final design and construction of such projects)

LEAD AGENCIES:

CWCB, DOLA, local jurisdictions, private planning consultants, private landscape architects, private consulting engineers, FEMA, COE, NRCS

FUNDING:

FEMA, COE, NRCS, CWCB, DOLA, local jurisdictions, special districts

SCHEDULE:

One to ten years

INFRASTRUCTURE

ISSUE:

I-1 Lack of outlet facilities in ditches and canals

BACKGROUND:

Irrigation ditches and canals tend to intercept storm runoff and convey flows to adjacent basins. A breach in the ditch bank can result in flooding areas that normally would not be affected.

RECOMMENDATIONS:

- Equip ditches and canals with outlets to allow releases into drainage channels capable of safely conveying flows
- Establish overflow areas to accommodate the flood flows
- Consider upgrading structural improvements where creeks and drainages intersect irrigation ditches

LEAD AGENCIES:

Local jurisdiction, public works departments, ditch companies

FUNDING:

FEMA, local jurisdiction, storm water programs, ditch companies

SCHEDULE:

Six to twelve months

ISSUE:

I-2 Need to upgrade and maintain storm drainage infrastructure

BACKGROUND:

During high water flows, some storm drainage facilities failed. Plugged culverts, roadway elevations and railway embankments resulted in water being impounded and caused significant damage.

RECOMMENDATIONS:

- Improve drainage structures and roadway elevations
- Increase maintenance on culverts and other infrastructure areas
- Investigate legislative changes to address railroad exemptions in current statutes
- Develop model standards and guidelines where county roads cross drainage areas

LEAD AGENCIES:

CDOW, DLG, CDOT, Colorado General Assembly, local jurisdictions

FUNDING:

FEMA, State of Colorado General Funds, local jurisdictions, state agencies, railroads

SCHEDULE:

Immediate and on-going

ISSUE:

I-3 Improve emergency warning systems

BACKGROUND:

Accurate and real time data is lacking in order to warn citizens of hazards, to direct emergency response and to determine emergency measures, such as road closures. There was a substantial period of time between the initial development of the storms that lead to flooding in Fort Collins and Sterling in July 1997 and the actual flooding events. Nevertheless, lives were lost in Fort Collins

and property and infrastructure were damaged in these communities, and others. The question arises, "Was there a way to warn some people earlier in the sequence of events of the impending possibility of flooding?" It may have allowed emergency responders and citizens to remove more people, property and infrastructure from harm's way.

RECOMMENDATIONS:

- Review existing warning systems and procedures and implement changes that address adequate detection equipment, an understanding of authority, a mechanism to warn the public and monitoring procedures that result in improvements; public involvement is a key component to determine the appropriate system
- Seek funding (local, state, federal and private) to sponsor an all-day workshop on a single system (or multiple systems if more appropriate) for flood warning in Colorado; research existing systems in the Urban Drainage and Flood Control District and in the Pikes Peak area as well as programs of the National Weather Service and of private vendors in Colorado and other parts of the country; support funding and development of a comprehensive warning system with a local match (and other funding); implement initial phase of the system.

LEAD AGENCIES:

Local jurisdictions, CSU, CU, Colorado School of Mines, private meteorologists and other warning vendors, NWS, CWCB

FUNDING:

FEMA, NWS, USGS, local jurisdictions, agency and program funding

SCHEDULE:

One year

EDUCATION/COORDINATION

ISSUE:

EC-1 Lack of disaster education of the general public

BACKGROUND:

Education can mitigate loss of lives, property, jobs and other economic impacts by informing the public how to prepare for a disaster and steps to take in an emergency situation.

RECOMMENDATIONS:

Develop flood hazard awareness materials for the general public to include the following topics: 1) local emergency warning systems and procedures; 2) flood insurance (need and availability) and 3) instructions and safety information for individuals and families on disaster preparedness. Possible approaches include:

- Print/ broadcast public service announcements
- Information included in local phonebooks
- Brochures and information pamphlets for stores, libraries and other public places
- Information printed on grocery bags
- Construction of memorial/education parks with historical flood information and safety tips
- World Wide Web home pages for disaster awareness

LEAD AGENCIES:

Colorado OEM, CWCB, Colorado Natural Hazard Mitigation Council, American Red Cross

FUNDING:

FEMA, Colorado OEM, CWCB, Colorado Natural Hazards Mitigation Foundation, American Red Cross, private foundations

SCHEDULE:

Immediate and on-going

ISSUE:

EC-2 Lack of access for local government officials to information regarding floodplain management, flood hazard mitigation and flood insurance

BACKGROUND:

The issues surrounding flood hazard reduction are not always a priority in communities. This results from several factors. First, flooding does not occur frequently enough in most communities to be in the forethought of most local officials. Second, personnel turnover is a fundamental reason that local floodplain administrators are not always educated about the specifics of floodplain management. Therefore, there is a significant need to provide the means and institutional tools for improved access to floodplain management, flood hazard mitigation and flood insurance information.

RECOMMENDATIONS:

- Promote the increased use of the Internet and Geographic Information Systems (GIS) through workshops and training with assistance from existing programs and new funding opportunities
- Place an increased focus on the importance of hiring GIS technicians at the local level of government as well as adequate software for successful completion of this objective
- Focus on encouraging improved coordination within local government departments to encourage periodic information sharing
- Request that local governments appoint a lead department to accomplish the periodic updates and coordination initiatives
- Tabulate all floodplain management, flood hazard reduction, drainage and climate history information into a resource directory for local governments; include: 1) programs, 2) funding, 3) technical assistance, and 4) contacts in local, state and federal government that can be utilized by local governments in accomplishing hazard mitigation

LEAD AGENCIES:

CWCB, Colorado DOLA, Colorado Natural Hazards Mitigation Council

FUNDING:

FEMA, existing programs within CWCB and DOLA

SCHEDULE:

Three to six months

ISSUE:

EC-3 Lack of disaster education for public officials

BACKGROUND:

Education can prevent/lessen the loss of lives and prevents damage to property. The existing, limited, uncoordinated education of public officials concerning disaster management has resulted in a lack of knowledge on how communities can prevent, prepare and cope in time of disaster and following recovery operations.

RECOMMENDATIONS:

Develop and implement a disaster education program to be presented to local public officials. The presentations will include information on the following topics: standard terms/definitions, NFIP, disaster prevention, community homeowner floodproofing, warning systems and federal/state recovery and mitigation programs. Possible approaches include: 1) print/broadcast announcements; 2) presentations to local agencies and 3) distribution of already developed materials.

LEAD AGENCIES:

DOLA, Colorado OEM

FUNDING:

FEMA, Colorado OEM

SCHEDULE:

Immediate and on-going

ISSUE:

EC-4 Lack of technical capability in local government causes a shortfall in delivery of services related to floodplain management, flood hazard mitigation and flood insurance.

BACKGROUND:

The Colorado Water Conservation Board (CWCB) and the Colorado Department of Local Affairs (DOLA) provide training activities to improve local government capability in the areas of floodplain management and land use planning, respectively. Improved training and education is warranted.

RECOMMENDATIONS:

- Develop improved delivery of training and technical assistance with current state-of-the-art slide shows, workshops, manuals, etc. and assure that the correct audiences are targeted
- Utilize the Colorado Association of Stormwater and Floodplain Managers (CASFM); promote certification of local floodplain managers
- Encourage increased community participation in the NFIP's Community Rating System (CRS)
- Promote the concept of shared services among smaller local governments
- Promote the concept of basinwide planning among communities

LEAD AGENCIES:

CWCB, Colorado DOLA, Colorado OEM, Colorado Natural Hazards Mitigation Council, American Planning Association

FUNDING:

FEMA, CWCB, DOLA, Colorado OEM

SCHEDULE:

Six to twelve months

ISSUE:

EC-5 Difficulty in achieving intergovernmental cooperation when flooding crosses jurisdictional boundaries

BACKGROUND:

Floods cross jurisdictional boundaries. Typically, these jurisdictions do not cooperate to solve drainage problems. Funding priorities in communities are often a reason for this problem. Different communities in a similar geographic area often develop different master/comprehensive plans. These planning efforts often address local interests and do not have a basinwide perspective.

RECOMMENDATIONS:

- Expand and continue training for local government officials regarding comprehensive planning and take that opportunity to promote regional intergovernmental cooperation
- Educate the public and local officials about the advantages of intergovernmental cooperation
- Assemble peers from different jurisdictions to share experiences and provide assistance related to land use planning, floodplain management, flood hazard mitigation and intergovernmental cooperation

LEAD AGENCIES:

DOLA, Colorado Natural Hazards Mitigation Council, American Planning Association

FUNDING:

Agency and program funding

SCHEDULE:

Immediate and on-going

ISSUE:

EC-6 Lack of natural hazard awareness and education in K-12 Schools

BACKGROUND:

Education can mitigate loss of lives, and property. The existing in-school programs do not adequately address natural hazard awareness/preparedness which has resulted in a lack of knowledge on how to prepare for disaster events.

RECOMMENDATIONS:

Develop and implement a disaster education program, which expands on current fire safety programs in schools K-12. Program will include:

- Presentations by fire authority, meteorologists and media that informs school age children on the danger of natural hazards
- Distribution of brochures with hazard information, family disaster plans, and emergency phone numbers needed in the time of disasters

LEAD AGENCIES:

Colorado Association of School Boards, local school districts

FUNDING:

FEMA, American Red Cross, Colorado OEM

SCHEDULE:

1998-99 school year

HEALTH AND ENVIRONMENT

ISSUE:

HE-1 Flooding of sewers, septic systems, and private wells in northeastern and southeastern Colorado

BACKGROUND:

In northeastern and southeastern Colorado, during storm and runoff periods, many sewers, septic systems and private wells are flooded. Farms that rely completely on private wells may require outside water sources.

RECOMMENDATIONS:

- Encourage small communities, which depend upon individual sewers, septic systems and private water wells, to develop central ized systems in areas that will not be impacted by flooding

LEAD AGENCIES:

Local jurisdictions, DOLA, DLG, CDPHE, CWQCD, EPA

FUNDING:

EPA, Drinking Water and Sewer State Revolving Funds, WAPA and local jurisdictions

SCHEDULE:

Immediate

ISSUE:

HE-2 Collection and disposal of hazardous household chemicals impacted by flooding; chemicals impacting landfills, flooded areas and public water supplies

BACKGROUND:

Municipalities and counties often budget for periodic collection and disposal of household hazardous chemicals, but lack funding and procedures during an emergency. Flooding compounds problems for landfills that are experiencing difficulties with water issues, and creates the possibility of impacting down-stream water quality. Hazardous materials from various sites were released in the flooded areas and may have also moved downstream into public water supplies.

RECOMMENDATIONS:

- Develop a contingency plan that includes procedures for handling household chemicals during flooding periods and other emergencies
- Identify a funding source for emergencies
- Encourage increased mitigation measures such as elevation, diking or diversion around existing hazardous materials sites that might experience flooding
- Establish partnerships through the Local Emergency Planning Commissions to address issues at the local level

LEAD AGENCIES:

Local jurisdictions, fire departments and districts, emergency management offices, Local Emergency Planning Committees

FUNDING:

EPA, FEMA, USDA, Local jurisdictions, partnerships with the private sector

SCHEDULE:

Immediate and on-going

CODES AND STANDARDS

ISSUE:

CS-1 Lack of master drainage plans for state colleges and universities, institutions, cultural facilities, and other large local public facilities including hospitals, nursing homes, public safety facilities, etc.

BACKGROUND:

Universities, colleges, institutions, cultural facilities, and other large local public facilities including hospitals, nursing homes, public safety facilities, etc.in Colorado periodically experience (or face the threat of) flooding drainage problems. These entities may or may not know the level of threat at their location and the range of strategies that can be implemented to deal with it. Public officials and managers, as stewards of these facilities, must increase protective and risk management activities.

RECOMMENDATIONS:

Encourage preparation and implementation of a drainage floodplain master plan for every essential public facility. Master plans should include mitigation alternatives and recommendations for implementation. Encourage that all buildings within the 100 - 500- year floodplain be identified. Any building with a basement and/or a lowest floor lower than the 500-year flood elevation needs an inventory of everything (books, artwork, furniture, computers, etc.) that is kept below that flood level.

LEAD AGENCY:

All Colorado Executive Departments with the CWCB

FUNDING:

All Colorado Executive Departments with the CWCB

SCHEDULE:

One year

ISSUE:

CS-2 Inadequate infrastructure for storm water and surface drainage

BACKGROUND:

The existing storm sewer and surface drainage retention infrastructure was not adequate to contain severe storms and /or channel storm water into existing drainage in many rural communities and urban areas. Design criteria that are used for storm water control projects generally follow the 2 or 5 year. event criteria. This design standard may need to be more flexible to consider critical links and vulnerable sites.

RECOMMENDATIONS:

Local governments need to review and evaluate their existing storm water management plans and infrastructure to determine where improvements are necessary. The review criteria for critical and vulnerable areas may need a higher design criterion than the 2 or 5 year design to ensure total integrity of the entire plan.

LEAD AGENCIES:

Local jurisdictions

FUNDING:

FEMA, DOLA, USACE, FHWA

SCHEDULE:

Studies - six months

Implementation of new design criteria- one to five years

ISSUE:

CS-3 Review and improve stream gage network

BACKGROUND:

Flood hydrology is essential to preparing floodplain maps that appropriately guide local floodplain management efforts and properly warn people of the flood risk they may face. Two methods for performing flood hydrology are: 1) Statistical analyses of stream gage records on the stream(s) being studied, which assumes that we have good gages and that they have been in place for a good number of years (25 plus); 2) Rainfall-runoff modeling, which measures theoretical or actual rainfall data and translates that rainfall mathematically into flow on the stream system receiving the rainfall. The theoretical or actual rainfall data is dependent on one or more accurate rain gages, which are limited in many

portions of Colorado. This includes the zone between the Front Range foothills and the plains, where a large portion of Colorado's residents live and work. As a result, our hydrologic estimates for our floodplain studies are less accurate and reliable.

RECOMMENDATIONS:
Perform an inventory of existing network of stream and precipitation gages in Northeastern and Southeastern Colorado and determine the "holes" in that network; seek local, state and federal funding to install, operate and maintain gages to fill as many of those "holes" as possible; commit, to the extent possible, to a 25-year plan for each gage to assure an adequate period of record.

LEAD AGENCIES:
CWCB, Urban Drainage and Flood Control District, Colorado Division of Water Resources, USGS, NWS

FUNDING:
USGS, CWCB

SCHEDULE:
One year

ISSUE:
CS-4 Rainfall-runoff modeling research

BACKGROUND:
Many flood hydrology analyses in Colorado have been performed using rainfall-runoff modeling. That means the hydrologist used theoretical or actually measured rainfall data and translated that rainfall mathematically into flow on the stream system receiving the rainfall. Generally, stream gaging information was not available to verify that the flows computed through the mathematical model correspond to physical reality on that stream system.

RECOMMENDATIONS:
Seek funding (local, state, federal and private) to support rainfall-runoff modeling research at one or more universities and/or colleges in Northeastern Colorado; inventory the rainfall-runoff methodologies currently in use by hydrologists performing floodplain studies in Northeastern Colorado; conduct studies over a period of years to verify and/or modify the relationship between a given rainfall in a particular watershed and a specific flow at various locations on the stream system draining that watershed; develop one or more new rainfall-runoff models and calibrate the new model(s) to actual field data for the region of interest.

LEAD AGENCIES:
CWCB, C.U., C.S.U, Colorado School of Mines, COE, NRCS, USGS

FUNDING:
COE, NRCS, C.U., C.S.U, CWCB

SCHEDULE:
One year

Federal Agency Programs

PROGRAM	AGENCY	ELIGIBILITY	ASSISTANCE
Emergency Conservation Program for rehab of farmland, debris removal, water conservation. Releasing commodities for shelter residents' meals, initiating disaster food stamps and providing school lunches for displaced students	Consolidated Farm Services Agency (CFSA) under USDA United States Department of Agriculture (USDA)	Eligible agricultural producers Shelter residents and disaster victims	CFSA will provide up to 64% cost share of project, balance to be funded by farmers or ranchers
Repair and restore wildlife refuges. BIA welfare assistance to meet food and fuel needs of affected Tribes, and also snow removal, school repairs, and other assistance. Replacement and repair of USGS stream gauges and other damaged equipment	Department of Interior (DOI), including Bureau of Indian Affairs (BIA) and United States Geological Survey (USGS)	Local and State governments and Indian Tribes	Varies with type of services
Fund temporary jobs and provide cleanup assistance	Department of Labor (DOL)	Dislocated workers, homeowners under Federal Weatherization Program and public entities	Varies with type of services
Grants for preparing disaster mitigation plans, identifying potential projects, coordinating long term needs and projects	Economic Development Districts (EDDs) under Department of Commerce (DOC)	Local and State governments	75% federal/25% sponsor cost share
EPA State Revolving Fund/ CWA-low interest loans for restoring waste water facilities and for drinking water projects. CBEP-scientific analysis, monitoring systems, environmental information	Environmental Protection Agency (EPA)	Cities and towns	EPA also offers technical assistance on wetlands, household waste and removal of tanks and drums CBEP- Technical assistance an limited funding.
Reimbursement for repair of damaged federal - aid roads	Federal Highway Administration (FHWA)	Local and State governments	State match generally varies from 10% to 20%
Hazard Mitigation Assistance (HMGP or 404) - grants designed for long term mitigation projects	FEMA mitigation	Local and State governments, nonprofit organizations and Indian Tribes	Up to 75% federal/ 25% sponsor cost share
Public Assistance grants designed to restore public infrastructure. Also funds cost-effective mitigation measures	FEMA infrastructure support	Local and State governments, nonprofit organizations and Indian Tribes	Up to 75% federal/ 25% sponsor cost share
Flood Map Assistance Program (FMAP) grants	FEMA	NFIP jurisdictions in good standing	Limited to planning and technical assistance
Serve and enroll children affected by floods	Health and Human Services (HHS)	Head Start children	
Community Development Block Grant	Housing and Urban Development (HUD)	Cities and counties	Grants for a variety of projects
Emergency Watershed Protection - emergency repair of levees and structures, channel clearance and protection of eroding stream banks	Natural Resource Conservation Service (NRCS - formerly SCS) Under United States Department of Agriculture (USDA)	Public and private landowners represented by a project sponsor (public agency)	Up to 75% federal/ 25% sponsor cost share
PL 566 Small Watershed Protection Program - construct flood protection projects and land treatment	Natural Resource Conservation Service (NRCS)	Local, regional, and State governments	100% grants for structural projects, 75% for non-structural projects
Cooperative River Basin Program - appraises water sheds and land resources for conservation planning	Natural Resources Conservation Services (NRCS)	Local, regional, State and federal governments	Technical assistance

PROGRAM	AGENCY	ELIGIBILITY	ASSISTANCE
Soil and water loans to develop wells, terraces, waterways, control erosion and build dikes	Rural Economic and Community Development Services (formerly FmHA)	Owners and operators of farms and ranches	1% loans
HR 2667 Emergency Farm Loans to assist where physical damage affects farming, ranching or aquaculture	Rural Economic and Community Development Services	Farmers, ranchers, and aquaculture operators	4.5% loans
Floodplain management services for floodplain mapping, flood warning & preparedness planning and technical assistance (Sec 206)	U.S. Army Corps of Engineers	Local and State governments, Indian Tribes and water districts	Cost share varies with type of services
Planning assistance to support any water resource issue analysis related to state water plan (Sec 22)	U.S. Army Corps of Engineers	Local and State governments, Indian Tribes, water districts	50% federal/50% sponsor cost share
PL 84-99 Rehabilitation of flood control structures damaged by flooding	U.S. Army Corps of Engineers	State or political subdivisions	Repair to pre-flood condition; cost share may apply
Small flood control projects for flood prevention (Sec 205)	U.S. Army Corps of Engineers	Local and State governments, Indian Tribes and water districts	Projects up to $5 million per project; 65% federal/35% sponsor cost share
Emergency stream bank and shoreline protection to prevent erosion from damage to public and nonprofit facilities (Sec 14)	U.S. Army Corps of Engineers	Local and State governments, Indian Tribes and water districts	Projects up to $500,000; 65% federal /35% sponsor cost share
Partners for Wildlife - provides funds for improvement, protection of fish and wildlife habitat on private lands	U.S. Fish and Wildlife	Private citizens and corporations	Approximately 50% federal/50% sponsor cost share with USF&W providing supplies and landowner will to actual restoration
SBA disaster loans to help rebuild and recover after a disaster - assists in damaged real and personal property	U.S. Small Business Administration (SBA)	Homeowners, renters, businesses of all sizes and private nonprofit organizations	Low-interest, long-term loans (various terms) Up to 20% additional loan for mitigation measures

State Resources

PROGRAM	AGENCY/ORGANIZATION/ BOARD/GROUP	ELIGIBILITY
Offers financial and technical assistance as well as emergency training, planning and exercises services. Provides a coordinated state response and recovery program	Office of Emergency Management Department of Local Affairs	Local and regional jurisdictions, State agencies, organizations, boards and the private sector
Manages Community Development Block (non entitlement) Grants, Energy/Mineral Impact Assistance Program, Contiguous County Limited Gaming Impact funds	Field Services Department of Local Affairs	Local governments
Coordinates low to moderate housing grants	Division of Housing (DOH) Department of Local Affairs	Local governments and non-profits
Provides technical assistance for planning, land use, GIS service, resource coordination with universities and colleges, and packaging of grants for rural development	Division of Local Government	Local jurisdictions
Cooperative program for natural hazard mitigation planning - GIS resources	Geological Survey Colorado Department of Local Affairs	Local jurisdictions
Response and repairs to emergencies plus damage reimbursement to federal-aid road systems	Department of Transportation	Jurisdictions with federal-aid road systems
Manages State Revolving Fund for loans and grants to restore waste and wastewater facilities and drinking water projects. Provides damage and costs estimates for storm sewers, advise on household waste issues, testing of water quality in landfills, mosquito spraying if warranted, and activates the Crisis Management Center	Department of Public Health and Environment CDPH&E	Local jurisdictions
Grants and technical assistance for impacts on wildlife and wetlands	Division of Wildlife DNR	Local an regional jurisdictions, State agencies, individuals, private sector
Technical assistance for dams, flood control structures, water rights, and funding for emergency construction	Water Resources DNR	Local and regional jurisdictions, State agencies
Provides assessments for disaster locations, and advise, development and improvement for building codes	International Conference of Building Officials (ICBO)	Benefactors of building code information
Prepare flood documentation reports, mitigation recommendations. River rehabilitation and floodplain management unmet needs assessment for Colorado is under way.	Colorado Water Conservation Board DNR	Local jurisdictions, agencies, board, organizations and private sector
Technical assistance for evaluation of projects and information on reducing and managing impacts from natural hazards	Colorado Natural Hazards Mitigation Council	Local jurisdictions, agencies, boards, organizations and private sector
Construction Fund		5% of total revenue available as low interest loans for floodplain management activities
Provides consultation on historical structures and archeological sites, technical advice on preservation methods and resources, and administers the State Historical Fund Grants, including Emergency Grants.	State Historic Preservation Officer	Local jurisdictions and non-profits, federal and state agencies
Establishes procedures for declaration of a State emergency and an emergency reserve fund	Colorado State Statute (CRS) 24-77-104	Local jurisdictions

Acronyms

APA	American Planning Association
CASFM	Colorado Association of Stormwater and Floodplain Managers
CDBG	Community Development Block Grant
CDOW	Colorado Division of Wildlife
CDPHE	Colorado Department of Public Health and Environment
CGS	Colorado Geologic Survey
CHFA	Colorado Housing and Finance Authority
CNHMC	Colorado Natural Hazards Mitigation Council
CRS	Community Rating System
CWCB	Colorado Water Conservation Board
DLG	Colorado Division of Local Government
DOLA	Colorado Department of Local Affairs
DFO	Disaster Field Office
DSR	Disaster Survey Report
EDA	Economic Development Administration
EPA	Environmental Protection Agency
FCO	Federal Coordinating Officer
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FIRM	Flood Insurance Rate Map
FSA	Farm Service Agency
GAR	Governor's Authorized Representative
GIS	Geographic Information Systems
HEC	Hydrologic Engineering Center
HMGP	Hazard Mitigation Grant Program
HUD	Housing & Urban Development
IHMT	Interagency Hazard Mitigation Team
NFIP	National Flood Insurance Program
NRCS	Natural Resources Conservation Service
NWS	National Weather Service
OEM	Colorado Office of Emergency Management
SBA	Small Business Administration
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USF&WS	United States Fish & Wildlife Service
USGS	United States Geological Survey
WAPA	Western Area Power Authority

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