
Colorado Natural Hazards Mitigation Council



1997-1999 Report

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Overview

Colorado Natural Hazard Mitigation Council

The Colorado Natural Hazard Mitigation Council was originally established in 1989. This organization has evolved and matured over the past decade in significant ways. Through the dedication and collaboration of the many professionals who participate as members of the Council and its committees, it has facilitated the development of successful strategies to manage mitigation of natural hazards of Colorado.

Although the committee structure has evolved over the past several years, the role of the Council has remained the same:

- to respond to hazard mitigation opportunities in a systematic manner that maximizes efficient use of resources;
- to coordinate the efforts of policy makers and practitioners from different jurisdictions and disciplines; and
- to integrate the various complementary strategies into a unified approach.

Over the past three years, a successful new mitigation strategy has taken hold nationally. Project Impact has quickly proven its value as a mitigation strategy, emphasizing sustainability, capacity building, and peer mentoring as the foundation on which to build disaster resistant communities. The State Hazard Mitigation Team, one of the Council's working groups, has supported Colorado communities interested in Project Impact by providing technical expertise and guidance to local governments and assisting in the state nomination process.

An important ongoing challenge for the emergency management community, and in particular for mitigation efforts, is to prove and document the cost effectiveness of these efforts in reducing losses suffered due to natural disasters.

The structure of the Council and committees is included in Appendix A.

State Hazard Mitigation Team

The State Hazard Mitigation Team (SHMT) is a working group of the Colorado Natural Hazards Mitigation Council (CNHMC) that is convened on an as-needed basis. The team brings together experts working in fields relevant to the particular disaster or event of interest.

The SHMT was convened twice in three years to assist with duties related to the two presidential disaster declarations. Members of the SHMT:

- updated the State of Colorado Flood Hazard Mitigation Plan;
- developed an implementation strategy for the plan;
- reviewed and selected criteria for prioritizing projects;
- conducted HMGP applicant briefings for eligible communities; and
- prioritized projects submitted by local entities.

Committees

Members of the committees of the Colorado Natural Hazards Mitigation Council are composed of professionals in both the public and private sector who work on a regular basis in the field or subject matter. These subject experts have come together over the years to work on various mitigation activities.

The following are hazard committees of the Council:

- Dam Safety & Warning Committee
- Drought Mitigation Committee
- Flood Mitigation Committee
- Wildfire Mitigation Committee
- Severe Weather Committee
- Geologic Hazards Committee

The Geologic Hazards Committee has two subcommittees: Landslide and Earthquake.

There are also designated liaisons representing the Council to two important technical communities:

- GIS and Mapping and
- Building Codes.

Beyond the normal activities of the members, many of the committees were officially represented when the State Hazard Mitigation Teams were convened for the 1997 and 1999 presidential disaster declarations.

Committees are also called upon to assist with content and review of large projects, such as with the development of a comprehensive strategy for hazard mitigation for the State of Colorado.

**1997, 1998, and 1999
in Review:
Natural Hazard Events and
Subsequent Mitigation Efforts**

1997

In 1996, Coloradans learned unforgettable lessons about the relationship between wildfires and flash flooding from Buffalo Creek. Throughout 1997, Coloradans were about to witness one of the most destructive hailstorms, flooding events, and blizzards of the decade.

Hailstorm and Rain Event

On July 19, 1997, a destructive hailstorm, accompanied by torrential rain, thrashed eastern sections of the Denver metropolitan area. For approximately fifteen minutes, hail up to 1.25 inches in diameter fell, causing cars to stall, damaging many cars and home roofs, and flooding some homes in the area. Two to three inches of accumulation on the ground were reported. Rainfall recorded at a National Weather Service forecast office showed that rainfall peaked at 3.83 inches in about an hour.

(www.crh.noaa.gov/den/event.html)
(www.crh.noaa.gov/den/hailstorm.html)

Flood Disaster in Colorado: Presidential Disaster Declaration 1186-DR-CO Declared: August 1, 1997

Presidential Declaration Incident Period: July 28-August 12, 1997

Intense thunderstorm-generated rains along the Front Range and eastern high plains descending on soils already saturated from prior rainy days brought onerous flash flooding to many locations. The most substantial losses were incurred by communities in Larimer, Morgan, and Logan Counties, including the loss of five lives in the City of Fort Collins.

Other counties also declared due to substantial losses incurred include Crowley, Weld, Lincoln, Prowers, Kiowa, Baca, Elbert, Otero, Phillips, and Clear Creek.

As a result of the presidential disaster declaration, the State of Colorado received federal funds for disaster assistance and hazard mitigation. Under the Hazard Mitigation Grant Program (HMGP), these projects are underway or completed

- Fort Collins: Completed a stream gauge/warning system and a project on floodproofing.
- Larimer County: Close to completing a drainage/detention system in the West Vine area.
- Wiley/Prowers County: Is replacing a bridge.
- Canon City: Is constructing a debris detention basin.
- Sterling/Logan County: Is working on a flood control project.

The 1997 State Hazard Mitigation Team (a working group representing the Council and committees, composed of persons with expertise in analyzing flood events and mitigation) was instrumental in setting criteria, prioritizing, and selecting projects. The team also conducted HMGP applicant briefings for eligible communities/entities.

Blizzard

On October 24th and 25th, one of the deadliest blizzards of the 1990s hit eastern Colorado with a vengeance. The storm developed "as deep east to northeast flow associated with a vigorous upper level low pressure system over the Four Corners, combined with a strong Arctic airmass over the Central Great Plains."

(www.crh.noaa.gov/cgi-bin-den/his.pl)
(www.crh.noaa.gov/pub/blizzard97/blizzard97.html)

Snowfall accumulation over the area ranged from over a foot to nearly four feet along the foothills. Strong winds created drifts up to ten feet tall, reduced visibility, and created wind chills to forty below zero. Emergency service personnel and the Colorado National Guard worked diligently to rescue stranded motorists and other victims of the storm. Stranded motorists were taken to Red Cross shelters as traffic halted to a standstill. As conditions worsened, air flights were canceled and travelers were stranded at the Denver International Airport. Four people and thousands of cattle died in Northeast Colorado as a result of this blizzard.

1998

In 1998, another unforgettable event occurred in the western part of the state as a dam failed, threatening lives and property.

Dam Failure

The Carl Smith Dam is a Class I dam situated in the Leroux Creek Basin. The original earthen dam was completed in 1950 and provides both regulation of flow and 800 acre-feet of water storage. On May 2, 1998, the dam suddenly breached, sending a wall of water flowing over the section of the embankment that had slid down about thirteen feet. Approximately 500 acre-feet of stored water was released, eroding the breach forty feet down to the foundation and 250 feet across at the top. Peak flows at the dam approached 4000 cubic feet per second. Several residents were evacuated and no human lives were lost, however, the floodwaters did take a costly toll. In the aftermath it was discovered that there was a loss of livestock, and several bridges and diversion structures were swept away.

Since the original construction, major technological advances have occurred in dam design, forcing not only the breached area to be redesigned, but the remaining portion of the dam had to be overhauled, as well. With a design approved by the State Engineer and a strong commitment to safety and mitigation, in July 1999, reconstruction began. According to the Division of Water Resources, upon completion of some small remaining items, the structure should be approved for storage during the 2000 irrigation season.

(www.dnr.state.co.us/water/streamlines/win00/article9.htm)

1999

In 1999, more severe weather induced flooding, landslides, and mudslides and a small community fought a tragic fire.

Severe Storms, Flooding, Landslides, and Mudslides: Disaster Declaration 1276-DR-CO Declared: May 17, 1999

Two areas along the Front Range were heavily impacted by a widespread three-day rainfall event occurring from April 29th through May 1st: Northeast Colorado along the South Platte River and tributaries and Southeast Colorado along the Arkansas River and tributaries. Counties declared for the disaster include Bent, Crowley, Custer, Elbert, El Paso, Fremont, Kiowa, Larimer, Las Animas, Otero, Pueblo, and Weld.

As a result of the 1999 presidential disaster declaration, the State of Colorado received federal funds for disaster assistance and hazard mitigation. Under the Hazard Mitigation Grant Program and the Unmet Needs program, the following projects are underway or proposed:

- Otero County: Buyout of homes in the floodplain.
- Manitou Springs: Acquiring homes damaged by a landslide.
- La Junta: Lift station project.
- Fort Collins: Early warning system.
- Fort Collins: Floodproofing project.
- Pueblo: Early warning system.
- Colorado Springs: Acquisition of homes damaged or under imminent threat by a landslide.
- Otero County: Channel improvement project.
- Colorado Water Conservation Board: Floodplain designation and flood hazard mitigation planning project.
- Otero County: Early warning system.
- Crowley: Drainage improvement project.

Monument Gulch Fire at Battlement Mesa

On June 27th, a teenager from out of town set fire to parched grass in an arroyo near Battlement Mesa. The fire, edged on by the wind, blackened 156 acres, took nine homes, and damaged dozens of others. Damage is estimated at well over \$2.33 million. Fortunately no lives were lost.



Home lost in Battlement Mesa fire.

Strong mitigation measures have been taken to make this community more disaster resistant. Three days after the fire, a public meeting was held in Battlement Mesa by the Colorado State Forest Service (CSFS) and the local fire department. Over 200 homeowners attended the meeting where they were instructed in various ways they could reduce the risk of wildfire in their area.

Also, an effort was undertaken by Battlement Mesa Corporation to thin some of the brush and timber in the more hazardous areas around Battlement Mesa.

The CSFS marked approximately 35 acres of thinning in brush and pinyon-juniper vegetation surrounding development in the area. Thinning in these areas was completed last July and August using several contractors. The fire-scarred area was reseeded with grass and forbs in late fall of 1999. This was a joint effort by the Bureau of Land Management, Natural Resource Conservation Service, CSFS, and Battlement Mesa Corporation, utilizing Emergency Watershed grant funds. The area was reseeded aurally using a private fixed wing aircraft.

Committee Reports: 1997 - 1999

Each year, the committee Chair, or another qualified representative, is asked to review their group's accomplishments of the past year for the members of the Council.

Flood Committee

Report by Larry Lang, Chair and Mark Matulik, Vice-Chair, Colorado Water Conservation Board

Overview

The Flood Committee continues to employ its talents and program resources through Colorado State government and private groups. The committee has enjoyed much support from the private sector in the form of professional services and technical data on critical and complex issues.

The report period includes two major flood years – 1997 and 1999. Due to these flood events, Colorado received presidential disaster declarations in both years. These declarations made financial and technical assistance programs available to affected local communities. However, these programs placed an increased workload on existing state agency staff whose statutory duties require participation in declared disasters. The increased workloads in most cases take time away from programmatic areas and often have adverse impacts on agency responsibilities.

What is the answer to the question, "How do we staff for flood disaster declarations?" Please review the *Vision Statement* section at the end of this report for the committee's thoughts and ideas. Your input is welcomed, as well.



Fort Collins flood - 1997 (photo courtesy of John Weaver)

This report covers four (4) major areas of activities:

- Planning
- Documentation
- Response
- Mitigation

Planning Activities:

1. Colorado Flood Task Force
 - a. Chaired Colorado Flood Task Force to convene state and federal partners for preparedness activities and prepared assessments for Flood Outlooks related to spring and summer flood events in 1997, 1998, and 1999.
 - b. Created and updated Department of Natural Resources flood Web page to include information on flood potential and compilation of current data.
2. Prepared and distributed annual flood insurance news release in 1997, 1998, and 1999 to encourage the purchase of flood insurance in March/April of each year.
3. Developed and conducted workshop training for local officials on flood mitigation activities on the following topics:

• Flood Fight 101	Spring 1997
• Floodplain Management 101	Summer 1998
• Floodproofing	Fall 1999
• CLOMR/LOMR	Spring 1997

4. CWCB Flood Hydrology Committee
The committee conducts quarterly meetings to review hydrologic standards and criteria.
 - a. The committee also supports the development and implementation of technical advancements in natural hazard identification and management including:
 - Engineering models including HEC-RAS, FLO-2D and GIS Applications
 - Statewide Floodplain Management Needs Assessment
5. Hazard Mitigation Planning
 - a. Support the development and adoption of local flood hazard mitigation plans
 - b. Preparation of 1998 Colorado Flood Hazard Mitigation Plan
 - c. Co-Chaired State Flood Hazard Mitigation Team including 1) revision of 1998 Colorado Flood Hazard Mitigation Plan, 2) development of implementation procedure for 409 Plan recommendations, 3) review and approval of HMGP applications, and 4) review and approval of Project Impact applications.

Documentation Activities:

1. Coordinate actions of flood data collection agencies
2. Post-Flood Documentation Activities
 - a. Established preliminary flood-stage and damage levels in 1997 and 1999
 - b. Collected run-off data and radar imagery
 - c. Reconstituted rainfall isoheytals of the 1997 and 1999 flood events
 - d. Prepared statewide flood damage estimates in 1997, 1998 and 1999
 - e. Prepared State of Colorado flood documentation reports:
 - *Colorado's 1997 Flood Season in Review*
 - *1998 Colorado Flood Report*
 - *Colorado's 1999 Flood season in Review*

Response Activities:

The committee worked in harmony with the Disaster Field Office(s), federal and state agency officials, local government officials, and flood victims on post-flood issues and tasks. The committee provided leadership for:

1. Sterling Flood Fight Operation 1997
2. Weldona Flood Fight Operation 1997
3. Routt County Flood Fight Operation 1997
4. Co-Disaster Mitigation Officer 1997
5. Disaster Mitigation Officer 1999
6. Disaster Field Office technical support in 1997 and 1999
7. Damage assessment for federal/state declaration in 1997 and 1999

Mitigation Activities:

The committee membership worked on the following tasks and projects:

1. Preparation of the 1997 Hazard Mitigation Grant Program applications
 - a. Fort Collins Floodproofing
 - b. Fort Collins Early Warning
 - c. Sterling Flood Control Project
 - d. Weldona Flood Control Project
 - e. Larimer County Drainage Improvement Project
 - f. Wiley Channel Improvement Project
 - g. Canon City Flood Detention Project
2. Preparation of the 1999 Hazard Mitigation Grant Program applications
 - a. Otero County Acquisition Program
 - b. Manitou Springs Acquisition Program
3. Implementation of HMGP and Flood Control Projects
 - a. Fort Collins Floodproofing
 - b. Fort Collins Early Warning
 - c. Sterling Flood Control Project
 - d. Weldona Flood Control Project
 - e. Wiley Channel Improvement Project
 - f. Canon City Flood Detention Project
 - g. Ouray Deflection Flume Project
 - h. Alamosa Levee Project
 - i. Grand Junction Levee Project
 - j. Fort Collins Channel Improvement Project

4. Participated with the Colorado Water Conservation Board in the following program activities:
 - a. Creation of the *Multi-Objective River Basin Planning Program*
 - b. Increased funding for flood projects through the *CWCB Construction Fund Program*
 - c. Procured funding for a *Statewide Stormwater and Drainage Criteria Manual*

Vision Statements

The committee has witnessed a number of agency issues that should be addressed in the near future including:

- continuing to institutionalize flood hazard mitigation in state government through implementation of the 1999 Colorado Flood Hazard Mitigation Plan;
- improving and co-sponsoring flood hazard mitigation education and training opportunities for local officials and the public-at-large;
- formalizing and permanently establishing the Colorado Flood Reservist System and continuing to respond to flood emergencies in a timely, professional manner;
- supporting structural and non-structural flood control projects statewide;
- providing a means to employ additional staff in post-flood response and recovery operations; and
- establishing a means to develop and implement a *rapid response community recovery plan* following a disaster.

Dam Safety and Warning Committee

*Report by Jack Byers, Chair
Office of the State Engineer*

The Dam Safety and Warning Committee (DS&WC) met on February 22, 1999 to discuss:

- the history of the committee,
- overview of past activities,
- the mission and goals,

- public awareness,
- emergency preparedness,
- technical assistance and
- miscellaneous issues.



Blue Mesa Dam

The Chair of the DS&WC developed and presented two workshop sessions on Dam Safety at the 1999 Governor’s Conference on Emergency Management.

The Chair represented the DS&WC and his agency through attendance and participation on the:

- 1999 Interagency Hazard Mitigation Team, contributing to the State of Colorado Interagency Hazard Mitigation Team Report: Long Term Recovery Strategy In Response To 1276-DR-CO,
- 1999 State Hazard Mitigation Team, contributing to the update of the 1999 Colorado Flood Hazard Mitigation Plan,
- Governor’s Flood and Drought Preparedness Conference team, and
- FEMA State hazard mitigation planning meeting.

As for the future, some additional meetings will be called this spring (Spring 2000) for collaboration on some of the Division of Water Resources activities. Activities may be associated with dam owner training and dam safety rule revisions.

Geologic Hazards Committee

*Report by David C. Noe, Chair
Colorado Geological Survey*

The Geologic Hazards Committee’s (GHC) mission is to monitor, encourage, and support the recognition and mitigation of geologic hazards in Colorado.

The Committee is chaired by the Chief of the Engineering Geology Section of the Colorado Geological Survey. Until 1999, William Pat Rogers was the Committee Chair. David C. Noe assumed the Chair after Pat's retirement.

Private Sector:

Geologic and engineering consultants

There are two subcommittees that focus on specific geologic hazards. The nineteen member Earthquake Subcommittee is co-chaired by Robert Kirkham

(Colorado Geological Survey) and John Nicholl (URS Greiner Woodward-Clyde).

The ten member Landslide Subcommittee is chaired by Jerry Higgins (Colorado School of Mines).

The Committee and its subcommittees were reorganized in late 1997, with a goal of becoming more proactive. The main accomplishments of these groups are listed in the following paragraphs.

In late 1998, the Landslide Subcommittee responded to a destructive reactivation of the Debeque Canyon landslide in Mesa County which damaged Interstate 70 near the town of Cameo. A series of fact-finding meetings and field trips led to the

funding (by the Federal Highways Administration) of an emergency landslide investigation. The investigation is being done by a public-private partnership (Colorado Geological Survey, Colorado School of Mines, Colorado Department of Transportation, U.S. Geological Survey, and Golder Associates) and should be completed by mid-2000.

In mid-1999, members of the Committee provided assistance, as members of the Colorado Interagency Hazard Mitigation Team convened in June 1999, in response to the presidentially-declared flooding and landslide disasters in El Paso, Pueblo, Otero, Bent, and several other counties.

In late 1999, the Earthquake Subcommittee concluded a two-year effort to produce a consensus fact sheet on earthquakes and seismicity in Colorado. The fact sheet, titled "Colorado Earthquake Information," was released as a long (3-page) version and a short (1-page) version.

The two versions are to be used to provide information for emergency management, media, and educational purposes. The long version was incorporated into "Colorado Earthquake Hazards," a map of earthquakes and related hazards published for free distribution by the Colorado Office of Emergency Management.



*Debris flow on Storm King Mountain
(photo by J. Scheidt, Bureau of Land Management)*

The main purpose of the Committee is to maintain a liaison with national (FEMA), state (COEM), and local emergency management offices during times of geology related incidents and disasters. A second purpose is to consider the status of geologic hazards recognition and mitigation in Colorado and to encourage and support activities that reduce the impacts of geologic hazards. The Committee considers a wide range of geologic hazards including landslides, debris flows, swelling soils, hydrocompactive soils, heaving bedrock, rockfalls, snow avalanches, radioactive soils, and earthquakes and seismicity. The Committee has fourteen members who represent the following constituencies:

Federal Government:

U.S. Geological Survey

State Government:

CO Office of Emergency Management
CO Geological Survey
CO Division of Minerals & Geology
CO Department of Transportation

Local Government:

Denver Water
Jefferson County Planning and Zoning

Higher Education:

Colorado School of Mines

Drought Mitigation Committee

*Report by Jeffrey Brislawn, Chair
Office of Emergency Management*

Since the development of the Colorado Drought Response Plan in 1981, Colorado has had a drought monitoring and assessment organization known as the Water Availability Task Force (WATF). The task force is comprised of Colorado's water supply specialists from state, local, and federal government, as well as public and private sector experts in climatology and weather forecasting. When the WATF becomes concerned during times of drought risk, task forces are convened to determine impacts. The Drought Mitigation Committee is composed of the Water Availability Task Force and the Chairpersons of the Drought Impact Task Forces.



As with other committees, this committee has seen leadership changes in the past three years. Long time committee chair and state drought expert Len Boulas retired from the Office of Emergency Management

(COEM) in December of 1997. Len continues to be active with the WATF as a citizen member. Fred Sibley, also of COEM, assumed the chair position from January 1998 to April 1999. Jeff Brislawn, mitigation planner and GIS analyst at COEM, is the current Chair.

The following is a summary of activities and accomplishments of the committee for 1997 through 1999:

Colorado Weather and Climate Monitoring

The WATF holds meetings at least quarterly to discuss water availability and related issues. The group acts as an early warning system whose recommendations, under certain circumstances, might trigger activation of the Colorado Drought Response Plan. This group also facilitates the development of monitoring and assessment system improvements.

Climate and weather phenomenon gained national attention beginning in 1997, as advances in remote sensing technology helped track the onset of the global climatic-oceanographic events El Nino and La Nina.

El Nino was associated with rapid and expansive warming of the tropical Pacific Ocean during the summer of 1997, followed by dramatic cooling in 1998, which remained into 1999.

El Nino and La Nina allowed for the prediction of temperature and precipitation anomalies many months in advance. The WATF, as well as the media, closely monitored the situation to see if the predicted impacts would occur. With the exception of an October blizzard in 1997, and some heavy snows in southern Colorado, the El Nino winter resulted in near to below average precipitation over western, central and northeast Colorado.

La Nina had the WATF worried in April 1999, as the state climatologist assessed that conditions were the most ripe for drought than ever before seen in the 17-year history of the WATF. Fortunately, these concerns were mitigated by the abundant late April precipitation that lasted into the summer. The WATF held more frequent meetings during emerging dry periods, but the last few years of the 1990s remained wet overall. The past three winters have had above average temperatures.

Years of effort and research at the Colorado Climate Center resulted in the production of two valuable documents that describe Colorado's drought history. Published in 1999, "Historical Dry and Wet Periods in Colorado" is a technical and highly detailed document. A summary of the document geared towards mass consumption was published in the "Water in the Balance" newsletter of the Colorado Water Resources Research Institute titled "A History of Drought in Colorado: Lessons Learned and What Lies Ahead." This research is being adapted for use in water planning by the Colorado Water Conservation Board. In 1999, the Center also began publishing its quarterly newsletter, "Colorado Climate," after a three-year hiatus.

The Office of the State Climatologist also developed a new drought index, the SPI. This index has been adopted nationally.

Western Drought Coordination Council

Members of the WATF were instrumental in the development and implementation of the Western Drought Coordination Council, (WDCC) which was established in 1997 to help the federal government respond to future droughts without diminishing the rights of states to control water through their laws. Colorado participation with this council resulted in the completion of a document titled "Recently Impacted States Historical Drought Information."

The document is a comprehensive listing of recent drought impacts by economic sector and the actions taken to reduce those impacts. Completed in 1999, the document will be a valuable reference to Colorado and other states vulnerable to serious droughts.

National Drought Policy Commission

The WDCC activities were suspended in June of 1999 after the creation of the National Drought Policy Commission (NDPC), which overlapped some of the WDCC activities. Members of the WATF continue to provide input and recommendations to the NDPC as the commission formulates policy on drought response at the national level.

Colorado Drought Response Plan Update

The Colorado Office of Emergency Management (COEM) is taking the lead on updating the Colorado Drought Response Plan with input and assistance from the Drought Mitigation Committee. Last updated in 1990, the plan is currently being revised for the year 2000, with completion anticipated in the first quarter of 2000. The new version of the plan will be titled *The Colorado Drought Mitigation and Response Plan*. Long term drought mitigation issues are addressed through an organizational approach and a list of state drought mitigation tools. The new version includes an executive summary with the intention of making the document more accessible to a mass audience. The plan will be available in electronic format from the COEM Web page.

Drought Planning Survey

The Colorado Water Conservation Board undertook a drought planning survey of local water conservancy districts and sixty-seven municipalities in late 1999. Results will be used to encourage the development of local water and drought plans.

Governor's Conference on Flood and Drought Preparedness

On December 2nd and 3rd, 1999, the Department of Natural Resources hosted a Governor's Conference on Flood and Drought Preparedness to address what Colorado can do to reduce its vulnerability to flood and drought disasters. Drought Mitigation Committee members assisted with the preparation for this conference and member Jack Truby presented Colorado's Drought Response Plan. Over two hundred concerned Coloradans attended the event, which was seen as a proactive step by Governor Owen's administration to address mitigation issues prior to a disaster event. Conference proceedings are due out on CD-ROM in Spring 2000.

Other activities of the members included:

- Assisting other states with development of their drought plans (most recently New Mexico and Arizona).
- Assisting the Denver Water Board in running a drought exercise.
- Recommending funding for and providing technical assistance to Colorado State University to do a study of historical drought impacts in Colorado from a societal perspective.
- Coordinating with the Colorado Water Resources and Research Institute in pursuing drought-related research.
- Recommending funding assistance for the development of the SPI.

GIS / Mapping

*Report by Marv Koleis, Liaison
Colorado Office of Emergency Management*

Mapping Projects

The projects described below demonstrate a very significant and positive collaborative working relationship between the various state and federal agencies who contributed effort and data.

Wildfire Mapping

The Colorado State Forest Service, in collaboration with the Colorado Office of Emergency Management, has developed a series of regional *Wildfire Hazard Assessment Maps*. Fuels and disturbance regimes were derived from a statewide vegetation GIS layer, which was generalized from Thematic Mapper satellite imagery developed as part of the National Gap Analysis Program (scale 1:100,000). The source of this information was the Colorado Division of Wildlife. Terrain data from U.S. Geological Survey Digital Elevation Models (DEM), at a scale of 1:250,000, was also used. This data was formatted into a GIS layer by the Colorado Department of Public Health and Environment and then used to derive slope and aspect information. Other layers included in this assessment were housing unit density from the US Bureau of the Census, population growth, fire protection district boundaries from the Colorado Department of Local Affairs, highways and local roads from the Colorado Department of Transportation, and hydrography from the Colorado Division of Water Resources.

Colorado Earthquake Hazards Map Revision

The 1993 *Colorado Earthquake Hazards Map* underwent a revision over the last two years. The purpose of the map is to provide a tool to further general education about earthquake hazards across Colorado. Distribution of this map was initially targeted toward county emergency managers and the K-12 school system. Significant additional research efforts were completed by the Colorado Geological Survey with regard to historical earthquakes, as well as faults and folds in Colorado. The results of this research are portrayed on this map. Some other changes include the representation of Colorado landforms through a newly developed shaded relief image. This map is being distributed by the Colorado Earthquake Information Center, the Colorado Office of Emergency Management, and the Colorado Geological Survey.

Regional GIS Initiatives

There have been three significant regional GIS development initiatives undertaken over the last three years. The San Luis Valley, the Upper Arkansas Council of Governments, and the Northwest Council of Governments have all undertaken the development of regional GIS. GIS has been identified as a tool which can aid the analysis and decision making associated with many local and regional issues, most notably planning and infrastructure issues associated with Smart Growth.

Evolution of Mapping/GIS Coordination Activities

Recent changes in the coordination of GIS activities in Colorado over the past two years have been the creation of a statewide GIS coordinating group called GISCO and the disbanding (or sunset) of the Colorado Geographic Information Coordinating Committee (GICC). The GICC sunset with the end of the Romer administration. GISCO represents the merging of the GICC and the Colorado Counties GIS/LIS Committee (COCO). The goal is to re-create these organizations into one which can incorporate the best features and work accomplished by both.

Information and data from Colorado state agencies relative to GIS and mapping can be found at the following internet sites:

CDOT www.dot.state.co.us/business/index.htm
 DoLA www.dlg.oem2.state.co.us/cartog/cartog.htm
 DNR www.elbert.state.co.us
 CDPHE www.cdphe.state.co.us

Severe Weather Committee

*Report by Robert Glancy, Chair
National Weather Service*

The most notable accomplishment of the Severe Weather Committee (SWC) for the period 1997-1999, was the final development of the Family Emergency Preparedness Guide. This publication contains safety and response information on major natural disasters, floods, tornadoes, lightning, winter storms, earthquakes, fires and wildfires. There is also information on warning methods, National Weather Service watches and warnings, and emergency first aid. The Guide has been widely distributed to libraries and schools, and has been reprinted several times by state and local emergency managers.

The Weather Safety Board, produced jointly by the committee and State Farm Insurance in 1995, has since been loaned dozens of times to a variety of events and conferences. The board contains display panels on general weather information, thunderstorms, tornadoes and tornado safety, flooding, and flood safety, hail and roofing materials and winter storms. The board is housed at State Farm when it is not being loaned, and is currently being updated with more recent statistics and information on additional hazards.

In the past year, most members of the committee were heavily involved with Y2K preparations, so other activities of the committee were suspended.

Building Codes

Report by Steve Thomas

The primary focus is to provide technical assistance to Council committees or communities upon request. For example, after the floods in Fort Collins in 1997, assistance was requested and provided in the form of performing inspections and posting placards designating properties safe or unsafe.

Wildfire Mitigation Committee

Report by Rich Homann, CSFS

Wildfire Hazard Mitigation is an on-going process that requires flexibility in its delivery and application to be efficient and effective.

Wildfire Hazard Mitigation needs in Colorado are identified in the Wildfire Hazard Mitigation Plan prepared by the Colorado State Forest Service in August 1995.

Since its publication, mitigation activities have taken place at the local, county, and state level. This report highlights some of the activities that have taken place throughout Colorado during the past year and also lists some of the planned activities for next year.

Summary of Mitigation Grants funded by the Colorado State Forest Service on a 50/50 cost share match.

Huerfano County

Print and provide each rural landowner with the guide "Living with Wildland Fire." Participating fire departments and landowner associations will visit rural landowners and provide this publication to increase awareness and education in preparation, prevention, and living with wildland fire. Whenever personal contact is not possible, the publication will be mailed to the landowner.

Las Animas County

Print and provide each rural landowner with the guide "Living with Wildland Fire." Participating fire departments and landowner associations will visit rural landowners and provide this publication to increase awareness and education in preparation, prevention, and living with wildland fire. Whenever personal contact is not possible, the publication will be mailed to the landowner.

Ouray County

The county will begin a 3-5 year effort to develop comprehensive GIS map showing response times and routes for fire departments; developing the base information for coordination of emergency response areas within various fire districts; provide county homeowners information necessary to assist them in identifying fuel risks on their property; identifying to homeowners areas not within effective response times and how to take additional mitigation actions needed.

San Miguel County

Develop comprehensive GeoHazard maps for inclusion into the county GIS data base. This multi-year effort will begin by obtaining a recent state wildfire hazard map, and through ground verification, update this data base locally. The second stage would involve converting the GIS maps into images suitable for posting on the county web site for public access.

Conejos County

Establish and implement an effective emergency plan for affected areas of the county, including coordination with emergency preparedness agencies, personnel; delineating ownership boundaries; and identifying agencies, manpower, and facilities and equipment available.

Gunnison County

In coordination with the county land use department and County Commissioners, develop language for the county land use resolution requiring subdividers to submit mitigation plans with their application to subdivide. Threats, forest health, access routes, water sources and available resources must be addressed. The county will also develop wildfire hazard mitigation plans on two additional subdivisions.

Larimer County

Disposal of material generated from wildfire hazard mitigation efforts is an increasing problem in rural areas. The county will coordinate a mobile chipping program with 10 fire departments and homeowner associations to make the chipper available at each site. The intent is to provide an economical and feasible option to and feasible option to hauling materials to the county landfill, while reducing burning permits, and reduce impact on the county landfill facility.

Jefferson County

Funded efforts are to provide mitigation training for county fire personnel enabling them to conduct town meetings or homeowner talks. Videotapes and brochures will also be provided to the homeowners.

Pitkin County

In order to prepare and support local officials in development and implementation of an urban wildland interface code, the county will provide a seminar on code development conducted by the International Fire Code Institute. Target participants are: Community Development Division, Building Department, Road and Bridge, Board of County Commissioners, and fire departments including Fire Marshals, Chiefs and members of the Aspen, Basalt, Carbondale, and Snowmass departments.

Baca Grande Volunteer Fire Department

Public education will be the focus of mitigation efforts in 2000. The department will perform public presentations focusing on basic wildfire mitigation and wildfire hazards; fire resistance of green belts in developed areas; and mitigation around homes.

Parker Fire Protection District

The FireWise Program will be established, through obtaining and distribution of homeowner manuals and video, local educational efforts with elected officials, and improve public awareness through newsletters, brochures, town meetings, and web access.

Upper Arkansas Valley Wildfire Foundation

Efforts will concentrate on education awareness: distribution of information packets detailing prevention/mitigation measures to county building departments; provide wildfire reviews; make presentations to Lake County officials regarding adoption of subdivision regulations; host homeowner association meetings; bulletin board presentations at public events; send "Wildfire Prevention/Mitigation Notice" cards to landowners.

Cherryvale Fire Protection District

Slash generated from mitigation efforts may be disposed of through chipping or burning. Larger bole wood can only be either burned, or used as firewood. Increasing air quality restrictions prohibit the disposal of bole wood by burning in the field. Pallet producers have indicated an interest in purchase of material cut to specific dimensions such as that produced by a portable mill. The department has purchased a trailer mounted Wood-Mizer mill (not using mitigation grant funds) to produce dimensional material for sale to local markets. The trailer mounted mill will be transported to locations around Boulder County where bole material has been felled, eliminating the need to transport the material to a central location. Operators from various agencies will be trained in use of the mill.

Other Mitigation Activities

- Production of State Wide Red Zone map.
- Passage of HB 1283 with attached legislative declaration acknowledging mitigating hazards and promoting fire management planning on a county wide basis.
- Implementation of South Platt and Upper Elk Creek projects focusing on landscape scale management across jurisdictional boundaries.

Planned Mitigation Activities in 2000-2001

- Continue with the Mitigation Grants Program
- Produce and distribute FireWise Notebooks to every Fire Department in the State
- Review and update the State Wildfire Hazard Mitigation Plan to reflect changes and progress since 1995.
- Wildfire Mitigation Conference

The calendar year 2000 wildfire season is setting records across the west. Colorado is no exception. The intensity, complexity, and size of wildfires has drawn national and statewide attention that will bring about change. The challenge in the Wildfire Hazard Mitigation arena will be to guide the tools made available by that change toward productive meaningful results.

1997, 1998 and 1999 Annual Conferences

In 1997 and 1998, the Natural Hazards Mitigation Conferences were held during the annual Conferences on Emergency Management. In 1999, the CNHMC annual conference was held in conjunction with the Local Emergency Planning Committee Conference and the Governor's Conference on Emergency Management. Members of the Council and committees were invited to participate in the conferences and attend sessions. The conference format provides an excellent opportunity to combine resources and share ideas and success stories.

Throughout the three-year period, conference attendance remained very high with over one hundred participants each year. Those attending the conferences came from a variety of different backgrounds and experiences. Conference attendees included representatives from federal, state, and local governments, and nonprofit and private sectors. Local government representatives account for over one-third of the conference attendees.

A comprehensive list of participants is included in Appendix B.

Highlights of the conferences included sessions on local and state mitigation efforts, grant programs, emergency preparedness, legislative issues, and committee reports.

1997 Conference

The conference took place from October 1st through October 3rd in Breckenridge.

Topics and speakers on the Council agenda included:

- Welcome, Opening Remarks – Ronald W. Cattany, Chair of the Council and Deputy Director of the Department of Natural Resources
- Pre-Disaster Mitigation Funding - Mark Matulik, Colorado Water Conservation Board; Sherryl Zahn, Federal Emergency Management Agency; Fred Sibley, Colorado Office of Emergency Management
- Pre-Event Assessment of Post Wildfire Flood Debris Volumes: How Much Water And Mud is Coming Down That Hill When It Rains After The Fire??? - Robert Rasely, US Department of Agriculture, Natural Resources Conservation Service

- Wildfire Mitigation: Fire Behavior In The Interface - Mike Tombolato, Cherryvale Fire Protection District
- Historic Preservation Issues in Mitigation: The SHPO Role - Kaaren Hardy, Colorado Historical Society
- WGA Western Drought Coordination Council - Len Boulas and Jack Truby, Colorado Office of Emergency Management
- National Weather Service Warning, Training, Communications - Larry Mooney, National Weather Service
- Building Codes: New Wildfire Code: Will It Fly In Colorado? - Jerry Wooldridge, Summit County Building Department
- Using GIS For Mitigation - Jeff Brislaw, Colorado Office of Emergency Management
- El Nino, Fact or Fiction - Nolan Doeskin, Colorado Climate Center

1998 Conference

The 1998 conference occurred from September 28th through September 30th in Breckenridge, Colorado.

Topics and speakers on the Council agenda included:

- Welcome, Opening Remarks - Ronald W. Cattany, Chair of the Council and Deputy Director of the Department of Natural Resources
- Public and Private Sector Insurance Issues Risk Management - Panel 1 – CO State University's 1997 Flood Experience – Richard Kimball, J&H Marsh & McLennan, Inc.; John Cook, State of Colorado Risk Management; Al Bosch, Alliance Insurance Company
- Public and Private Sector Insurance Issues – Marketing Mitigation – Jim Russell, Institute for Business and Home Safety
- Project Impact – Richard Weiland, FEMA
- Building Safe For Wildfire Interface Zones – Peter Slack, Architect & Firefighter

- ❑ Colorado Seismic Projects: Recent and Future – Frank Patete and Tom Boyd, Colorado School of Mines; Bob Kirkham, Colorado Geological Survey
- ❑ Water and Sewer System Mitigation Grants and Loans – Barry Cress, Division of Local Government
- ❑ Severe Weather Updates/Issues – Bob Glancy, National Weather Service; Donna Fair, Colorado Springs Office of Emergency Management
- ❑ National Drought Policy Act of 1997, Implications for Colorado – Roseann Gonzales, Western Drought Coordination Council
- ❑ Post Disaster Hazard Mitigation Grants, Lessons Learned From 1997-1998 – Mark Matulik, Colorado Water Conservation Board; Fred Sibley, Colorado Office of Emergency Management

1999 Conference

The conference was held from August 30th through September 2nd in Breckenridge, Colorado.

Topics and speakers on the Council agenda included:

- ❑ Welcome, Natural Hazards Council Status – Ron Cattany, Chair of the CNHMC and Deputy Director of the Colorado Department of Natural Resources, a chairperson or a member of each committee
- ❑ GIS: Planning or Response Tool? GIS in Flood Response and Preparation (HAZUS Software) – Marv Koleis and Jeff Brislawn, Colorado Office of Emergency Management; Claudia Haack-Benedict, City of Fort Collins
- ❑ Colorado Wildfire Hazard GIS Mapping Project: Where is the Red Zone? Marv Koleis and Jeff Brislawn, Colorado Office of Emergency Management; Chuck Dennis, Colorado State Forest Service
- ❑ Local Land Use Planning and Mitigation – Local Success Stories – Charles Unseld, Department of Local Affairs; Dave Michaelson, OTAK Rock Creek Studies; Steve Westbay, Mount Crested Butte Planning Director
- ❑ Prescribed Fire Liability and Legislative Issues in Colorado – Rich Homann, Colorado State Forest Service

- ❑ Luncheon Speaker – Bob Gore, FEMA Regional Deputy Director

Other noteworthy mitigation sessions at the conference included:

- ❑ Dam Safety in Colorado - Jack Byers Chairperson of the Dam Safety and Warning Committee, Colorado Office of the State Engineer; Pat Hagan, U.S. Bureau of Reclamation; Duane Freeman, Delta County Emergency Management
- ❑ Drought Issues – Nolan Doesken, member of the Drought Committee, State Climatologist with the Colorado Climate Center
- ❑ EMWIN / NOAA / NWS Warning Systems - Bob Glancy, Chairperson of the Severe Weather Committee, National Weather Service, Warning Coordination Meteorologist
- ❑ Flood Mitigation Assistance Program - Mark Matulik, Vice-Chair of the Flood Mitigation Committee, Colorado Water Conservation Board
- ❑ Project Impact: Lessons Learned – Laura Oman, Clear Creek County Emergency Management; Kevin Kuretich, Morgan County Emergency Management; Glenn Levy, City of Fort Collins Emergency Management
- ❑ Hazard Mitigation Grant Program: Post Disaster Mitigation – Fort Collins Update

Natural Hazard Mitigation in Colorado

Hazard Mitigation Grant Program

The Federal Emergency Management Agency administers the Hazard Mitigation Grant Program. States become eligible to apply to this grant program after a presidential disaster declaration. As a result of the 1997 and 1999 declarations, Colorado became eligible for this grant program.

As a result, the State of Colorado has received approximately nine million dollars in federal funds for hazard mitigation efforts. Projects selected have been within the declared counties.

State Hazard Mitigation Program: Local Mitigation Projects

In 1997, 1998, and 1999, funds were available for local mitigation efforts through the State Hazard Mitigation Program (SHMP). Small-scale projects were solicited through local emergency managers and awards were granted to many communities. Local communities were required to provide local match and complete the projects in a short time span. Some communities or organizations were able to put together multiple funding sources to complete larger projects.

Many different types of projects were partially funded through the SHMP program. Types of projects encouraged include:

- training in mitigation activities,
- mitigation-based planning,
- mitigation studies, and
- printing mitigation information.

The following sections illustrate some local projects successfully completed through this program.

Data and Mapping Projects

Yampa River Flood Inundation GIS Data and Mapping Project

In 1997, the City of Steamboat Springs, concerned with flooding in densely populated areas along the Yampa River, requested funding assistance to take aerial photos of the Yampa River at high water and use them to construct a GIS database and maps. The desired result was a tool used for (1) updating emergency management plans and (2) better managing development in the floodplain.

GIS Wildfire Hazard Mapping in Garfield County, CO
Garfield County planning staff, already working with hazard maps describing slope and soil hazards, septic system constraints, surficial geology, and floodplains were interested in developing wildfire hazard maps for conducting reviews of proposed subdivisions within the county.

Studies

Needs Assessment For Floodplain Map Revision for Delta County

The purpose of the needs assessment was to identify areas of map deficiencies and prioritize these deficiencies. This then allowed the County to move forward with revised studies and mapping.

Slope Stability (Landslide) in SW Colorado Springs

This project supported efforts to document conditions, partially fund an engineering analysis and identify mitigation alternatives.

Hail Study

Due to the frequency, occurrence, and high dollar losses associated with hailstorms in Colorado, and to better understand the nature of this natural hazard, the Colorado Climate Center at the Colorado State University is conducting a hail study. The study involves measuring the number and size of hail stones, collecting radar data, and comparing the data with ground reports. The study is sponsored by many agencies and many volunteers are trained in data collection to support the effort.

San Miguel River Ice-Flow Surge Study

In recent years, ice runs in the Upper San Miguel Basin have damaged minor structures near the river and threatened human safety. This study involved the collection of flow and temperature measurements and observations of ice-flow phenomena and impacts, leading to possible predictive models and channel modifications.

Events and Trainings

Gunnison County Household Chemical Collection Day

This project was cosponsored with the Colorado Emergency Planning Council. Several jurisdictions were able to benefit from this project. The focus of the project was to collect and, properly and safely, dispose of household hazardous materials. This served to (1) assist the residents with the safe disposal of hazardous materials and (2) protect the communities from unsafe disposal such as dumping.

Safety Fairs

Washington County held a three and one-half hour safety education fair for hazardous materials handlers. The program was designed to raise awareness of possible problems and liabilities involved with handling hazardous materials and discuss good prevention and mitigation practices.

Denver held a safety fair in conjunction with their annual CPR event. The event focused on individual and family preparedness skills appropriate to multiple hazards, including CPR training and the dissemination of many types of safety information.

Denver Weather Spotter Trainings

These severe weather workshops targeted members of public, nonprofit and private organizations concerned with interpreting weather patterns. Topics of the program include: Watches and Warnings Defined (including winter watches and warnings); Severe Weather Statistics; Severe Weather Development (typical Colorado storms, winter storms activity, thunderstorm development); and Safety Issues. Over eighty-five people attended the two workshops.

Douglas County Slash/Mulch Program

Downed and dead slash on the forest floor presents a wildland fire hazard. This project provided a site for collection and the woody material was chipped into mulch for residents and the county to use for gardening and landscaping.

Colorado Fire Mitigation & Wildfire Conference

This is the only wildfire conference in the country focused on mitigation. The event is sponsored by several local and state agencies including West Metro and Boulder Fire Districts, the Colorado State Forest Service, Jefferson County, and the Colorado Office of Emergency Management. More than 550 people participated in three years.

Information and Public Awareness Campaigns

Clear Creek County Resource Manual

This resource manual provides contacts for critical incidents in Clear Creek County. The manual was designed with an easy to follow format. Sections are organized by type of incident or need.

Jefferson County Wildfire Outreach Program

As part of an ongoing effort to raise awareness and mitigate the fire hazard in Jefferson County, door knob bags containing wildfire information and safety tips were distributed to homeowners and others.

Northeast Colorado Emergency Managers' Public Awareness Campaign

This information effort is directed at the ten northeastern Colorado counties. Brochures and news articles on hazards and safety tips are developed and printed in both English and Spanish for distribution throughout the region.

Newsprint Guides

"Living with Wildland Fire: A Guide For Homeowners" was a collaborative effort between Mesa County agencies and state agencies. The intent was to inform residents in rural areas of Mesa County on how to create effective defensible spaces, how to get involved with the FireWise program, and what to do if wildfire approaches your home.

The "San Luis Valley Emergency Preparedness Guide" contains articles and safety information on wildfires, hazardous material spills, severe winter storms, floods and flash floods, Y2K, supply and essential services shortages, accidents, tornadoes, livestock and pet issues. The publication also includes information on how to prevent or mitigate losses by creating a plan and preparing in advance.

La Plata County Alternate Emergency 911 Program

Identifying flags were provided to those persons and vehicles with radio communications equipment who will be able to access 911 if the phone systems go down. Information brochures were developed and provided to residents explaining the plan.

Yuma Weather Radio

Currently, NOAA weather radio does not cover Eastern Yuma County. This project provided the radio transmitter by which people living and working in this mainly rural area are able to receive timely information from the National Weather Service regarding severe weather warnings for tornadoes, high winds, damaging hail, and severe winter storms.

Project Impact Communities

The focus of Project Impact is to create disaster-resistant communities through public/private partnerships. Committee members have been assisting the Project Impact communities, as well as other communities, with technical assistance. Project Impact communities in Colorado include:

- Fort Collins,
- Morgan County,
- Clear Creek County,
- San Luis Valley, and
- The City and County of Delta.

APPENDIX A

Colorado NATURAL HAZARDS MITIGATION



Policy Advisory Board

- FEMA Regional Director
- OEM Director
- State Forester
- Colorado Municipal League (2)
- Colorado Counties, Inc. (2)
- Private Industry
- Academia
- Colorado General Assembly
- Governor's Office
- Volunteer Group
- Media Representative
- Private Citizen (2)
- Natural Hazards Center, Boulder
- State Geologist
- Association of Contingency Planners
- American Planning Association
- Urban Drainage and Flood Control

CHAIR

ADMINISTRATOR

STEERING COMMITTEE

- Severe Weather
- Drought
- Geologic Hazards
- Dam Safety and Warning
- Fire Management & Mitigation
- Flood
- GIS and Mapping
- Building Codes
- Public Affairs

AUGUST 2000

APPENDIX B - Conference Attendees

Abbey, Ben	-----	Consultant
Abe, Gary	-----	National Transportation Safety Board
Adams, Christopher R.	-----	Colorado State University
Airy, Joe	-----	Federal Bureau of Investigation
Anderson, Bev	-----	Boulder County Emergency Management
Anderson, Clyde	-----	Moffat County Office of Emergency Management
Anderson, Kimberly F.	-----	Denver Office of Emergency Preparedness
Andrews, Thomas	-----	Consultant
Archambault, William Jr.	-----	Colorado Office of Emergency Management
Arkland, Carol	-----	Boulder Office of Emergency Management
Ashby, Joseph R.	-----	Federal Emergency Management Agency
Ashcraft, Karen K.	-----	Pueblo County Office of Emergency Management
Avery, Michael J.	-----	Colorado Department of Agriculture
Axtell, Kris	-----	City of Rio Rancho, New Mexico
Bailey, John M.	-----	Adams County Sheriff's Office
Bailey, Michael	-----	Las Animas Emergency Management
Baltazar, Joe	-----	Morgan County Public Works
Bardsley, Richard	-----	Colorado Office of Emergency Management
Bassi, Richard A.	-----	City of Rio Rancho, New Mexico
Baun, Bob	-----	The Fort Collins Coloradoan
Beck, Arthur C.	-----	Federal Emergency Management Agency
Bell, Jerry	-----	KOA Radio
Benoy, Barbara H.	-----	Environmental Protection Agency
Bergethon, Karen	-----	U.S. Forest Service
Bergman, Bob	-----	Public Utilities Commission
Bishop, Tillman (Tilly)	-----	Former Colorado State Senator
Bissonnette, Alana	-----	Kaiser
Bjorland, Larry	-----	Colorado Springs School District
Blackburn, Sgt. William	-----	Lakewood Police Dept & Adams/JeffCo HAZMAT Team
Blaha, Frank J.	-----	AWWA
Blair, Jane	-----	Bureau of Reclamation
Bobicki, Charolette	-----	Alamosa County Board of County Commissioners
Borland, Larry	-----	Consultant
Bosch, Al	-----	Allianz Insurance Company
Boulas, Leonard	-----	Consultant
Boyd, Tom	-----	Colorado School of Mines
Braaf, Bob	-----	Federal Emergency Management Agency
Brackney, John	-----	Arapahoe County Board of County Commissioners
Brislawn, Jeffrey	-----	Colorado Office of Emergency Management
Broady, Chris	-----	Grand County Sheriff's Department
Brooks, Bob	-----	Department of Local Affairs
Brooks, Hope	-----	Colorado State Patrol
Broom, Stan	-----	Governor's Office of Business Development
Brown, Gregory R.	-----	Colorado Office of Emergency Management
Bruce, Joseph A.	-----	Hazmat Team
Burkhart, Carol	-----	State Farm Insurance
Bush, Stanley G.	-----	Littleton Emergency Planning Department
Byers, Jack	-----	Colorado Division of Water Resources
Byron, Joe	-----	Environmental Protection Agency
Carney, Thomas J.	-----	University of Colorado at Boulder
Carroll, James C.	-----	U.S. West
Cattany, Ronald W.	-----	Colorado Department of Natural Resources
Champlin, Greg	-----	Denver Fire Department
Charles, Ken	-----	Department of Local Affairs
Chestnutt, Jim	-----	Federal Emergency Management Agency
Christoffersen, Robert A.	-----	City of Glendale Fire Department/Office of Emergency Mngt
Clagett, Charles D.	-----	Lincoln County LEPC
Clagett, Laura M.	-----	Emergency Management (Hugo)

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Clark, Sue	Colorado Office of Emergency Management
Clark, Col. Tom	Federal Emergency Management Agency
Clymer, Cheri Zane	Consultant
Cobb, Abbie	Summit County Public Safety
Conner, Shauna S.	Aurora Fire Department
Conner, Lt. Frank	Denver Police Department
Cook, John	State of Colorado Risk Management
Cook, Paul	Division of Fire Safety
Cordova, William R.	Colorado Office of Emergency Management
Craft, Ronald	City of Aurora
Creamer, Dennis	Conoco, Inc.
Cress, Barry	Colorado Department of Local Affairs
Crowley, Russell L.	Archuleta County Office of Emergency Mngt
Cuthriell, Tim	Denver Office of Emergency Management
Daniels, Phillip	Pueblo County Emergency Management
Darr, Douglas N.	Adams County Office of Emergency Preparedness
Davis, Stacy R.	Federal Heights Police Department
Demetry, Cynthia Jill	Colorado Springs Utilities
Denney, Steve	Colorado Office of Emergency Management
Dennis, F. Chuck	Colorado State Forest Service
Dodson, Dave	Loveland Fire Department
Doeskin, Nolan	Colorado State University Colorado Climate Center
Douglas, Steven G.	Pueblo County Department of Public Safety
Downs-Keim, Debra	Colorado Division of Local Government Field Services
Dukart, Rosalie	Adams County Office of Emergency Preparedness
Dunbar, George W.	Buena Vista Correctional Facility
Dunkak, Kevin	San Miguel County Emergency Medical Services
Ebert, Vernon E.	San Miguel County Office of Emergency Preparedness
Edfast, Curtis A. Sr.	Great West Life
Edlund, Jeri	JAE Consultant, Inc.
Eldridge, Elma	Colorado Office of Emergency Management
Ellis, James	Jefferson County Emergency Management
Elsner, Adene	Colorado Office of Emergency Management
Enfante, Steven	Fort Morgan Emergency Management
Erker, Cynthia L.	Morgan County Board of County Commissioners
Fair, Donna	City of Colorado Springs Office of Emergency Management
Finan, Bill	Environmental Protection Agency CEPPO
Fink, Ed	Colorado Department of Transportation
Finley-Rarey, Gail	State Trauma Council
Folz, Ceil	Vail Valley Foundation
Ford, Glenn	Environmental Protection Agency
Frazier, Deborah	Rocky Mountain News
Freeman, Duane	Delta County Emergency Management
Fuqua, Charisse R.	Federal Emergency Management Agency
Gablehouse, Timothy R.	Consultant
Gaines, Herman	U.S. West
Galloway, Jean	KUSA Channel 9
Gally, Marilyn S.	Colorado Office of Emergency Management
Gavelda, Patricia Lynn	Colorado Office of Emergency Management
Gerzina, Lori	Colorado Dept. of Public Health and Environment
Girvan, Richard	Bureau of Reclamation
Glancy, Robert	National Weather Service
Gomez, Paul L.	Huerfano County Emergency Management
Gonzales, Roseann	Western Drought Coordination Council
Gore, Bob	Federal Emergency Management Agency
Gorman, Thomas D.	New Mexico Dept of Public Safety/Emergency Management
Graepler, Bill	Colorado State Forest Service
Graham, Gary L.	Denver Office of Emergency Preparedness
Granberg, Melanie	Gablehouse & Epel
Gray, Jerry G.	Hinsdale County Emergency Medical Service
Grecco, Alfredo R. Jr.	Colorado Springs Utilities
Grice, Rick	Governor's Office of Energy Management

Grier, David P. III	Federal Emergency Management Agency
Grier, Tommy F. Jr.	Colorado Office of Emergency Management
Gudahl, Wesley B.	Alamosa County Sheriff's Department
Gumina, Kent	Division of Local Government Field Services
Haack-Benedict, Claudia	City of Fort Collins
Hagan, Pat	U. S. Bureau of Reclamation
Haggerty, Al	Red Cross
Hahl, Sherryl	Federal Emergency Management Agency
Hardy, Kaaren	Colorado Historical Society
Harpstrite, Debra L.F.	Safety Coordination, Safety Coordination
Hasselbrink, Carl L.	Chaffee County Office of Emergency Preparedness
Heffernan, Tess	Fort Collins City Manager's Office
Heister, Charles G.	Environmental Protection Agency
Herring, Ed	Weld County Office of Emergency Management
Hoffner, Roger	Arapahoe County Office of Emergency Mngt
Holderman, Gale Dean	Pueblo County Sheriff's Department
Holt, Gregory A.	DIA Operations Manager
Holm, David W.	Colorado Office of Emergency Management
Homann, Richard	Colorado State Forest Service
Hoon, Frederick L.	Colorado National Guard
Hopkins, Joan	Red Cross
Howard, Charlie	Consultant
Hutchins, John	Rio Blanco Sheriff's Department
Jacoby, Dawn	Federal Emergency Management Agency
Jackson, Janet	Department of Agriculture
Jacobsen, Chris J.	Lakewood Maintenance Operations
Jancouskas, William F.	Defense Finance and Accounting Services
Johnson, Jack	Consultant
Jones, Janet M.	Colorado Dept. of Public Health and Environment
Jones-Hard, Susan	Colorado Dept. of Public Health and Environment
Kammerzell, John	Larimer County Sheriff's Office
Kanenaga, Jerry	City of Sacramento
Kelley, Chrystine	Colorado Department of Public Health and Environment
Kennedy, Les	Public Health and Env't/Buckley Air National Guard Base
Kimball, Richard	J&H Marsh & McLennan, Inc.
Kirkham, Robert	Colorado Geological Survey
Kirtland, Jack	Colorado Division of Local Government Field Services
Kissell, Robin	Colorado Department of Transportation
Kissner, Cathy	Seventh Day Adventist
Knoy, Jim	Environmental Protection Agency
Koleis, Marvin	Colorado Office of Emergency Management
Krol, Stan	USPHS
Kuretich, Kevin F.	Morgan County Office of Emergency Management
Lancy, James A.	City of Aurora Office of Emergency Management
Landin, Doug	Colorado State Patrol
Lang, Larry	Colorado Water Conservation Board
Lavelett, Arnold. D.	El Paso County Emergency Services Department
Lee, Doug	Rocky Mountain Catastrophe
Leideritz, James D.	Teller County Emergency Management
Levy, Glenn M.	Poudre Fire Authority
Lewis, Rae	Buena Vista Correctional Facility
Lightbody, Valerie J.	Elbert County Emergency Management
Lindstrom, Gary	Summit County Board of County Commissioners
Loughner, Virginia S.	City of Aurora Risk Management
Lowrey, Mark	Colorado Division of Local Government Field Services
Lowry, Tanky	Huerfano County Civil Defense
Manka, Thomas J.	Thornton Police Department
Martinez, Gil	Colorado Contractors Association
Martinez, Katrina	Adams County Emergency Preparedness
Martinez, Margie	Weld County Sheriff's Office
Matthews, Douglas F.	Jefferson County Sheriff's Department

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Matulik, Mark D.	Colorado Water Conservation Board
McCoy, Michael G.	Federal Emergency Management Agency
McDonough, Tracy	Belfor USA
McGrane, Michael G.	Department of Local Affairs
McMorran, Richard J.	El Paso Sheriff's Office
Medley, Ted	Colorado Office of Emergency Management
Meek, Michael	Rio Rancho Department of Public Safety, New Mexico
Mesite, James Frank Jr.	El Paso County Office of Emergency Management
Meyer, Guy J.	Garfield County Emergency Management
Michaelson, Dave	OTAK Rock Creek Studios
Michalek, Michael J.	Denver Office of Emergency Preparedness
Mileti, Dennis	University of Colorado
Miller, Aubrey	USPHS
Miller, Alex	Consultant
Miller, Bradley	Environmental Protection Agency
Monroe, Dennis	Washington County
Montoya, Fidel (Butch)	City/County of Denver
Moody, John S.	Dept. of Health & Environment, Golden
Mooney, Larry	National Weather Service
Moran, Mike	KKCD TV
Moreland, Michael	Adams County
Morosco, Wes	National Park Service
Murphy, Lynn	California Office of Emergency Services
Neb, Kevin L.	Grand County Emergency Medical Service
Neese, William G.	Federal Emergency Management Agency
Nelms, Mike	Red Rocks Community College
Nelsen, Rich	Denver Police Department
Neuwirt, Anne Marie	Colorado Office of Emergency Management
Niehoff, Bob	Association of Contingency Planners
Nilsson, Erik D.	Larimer County Emergency Management
Nofziger, Wade	Federal Emergency Management Agency
Norway, Chad	Mesa County
Nozum, Greg	Drug Enforcement Agency
Nun-Marin, Rafael	Colorado National Guard
Nunn, Tom	Northwest Airlines
Olsen, Steve	Federal Emergency Management Agency
Olson, Marian L.	Sardus
Oman, Laura J.	Clear Creek County Emergency Management
O'Rourke, Robert V.	City of Aurora Risk Management
Pacheco, Frances Elizabeth	County Administration San Luis, CO
Packer, Michelle	Federal Reserve Bank
Parker, Kimberly K.	Mesa County Emergency Management
Patete, Frank	Colorado School of Mines
Patron, Mandy	Colorado Office of Emergency Management
Pearson, Alan	Colorado Division of Water Resources
Peratt, Judy	Jefferson County Department of Emergency Preparedness
Philipsborn, Clancy	Consultant
Phillips, Donald K.	Bureau of Reclamation
Pine, Julia	Colorado State Patrol
Pittman, Andrew	Colorado Springs – LEPC
Plakorus, John G.	Colorado Department of Local Affairs
Quick, Mark C.	Division of Fire Safety, Lakewood
Rajca, Andrew	Summit Fire Authority
Rakocy, Bill	Colorado Office of Emergency Management
Ragsdale, William G.	Colorado Springs Fire Department
Rasely, Robert	USDA National Resource Conservation Service
Ray, Kristy	American Red Cross – Fort Collins
Ray, Bob	Public Service Company
Raymond, James C.	Douglas County Sheriff's Office/Office of Emergency Mngt
Reddy, Michael G.	Colorado Office of Emergency Management
Reitan, Harold T.	Consultant

Rhodes, Jerry	Cunningham Fire Chief
Rodosevich, Robert M.	Health and Environmental Technologies
Roospold, Ivo	Colorado Office of Emergency Management
Rossbach, Everette	Gilpin County Office of Emergency Preparedness
Rowe, John A.	Region 10, Ouray County
Roy, Robert A.	Environmental Protection Agency
Russell, Jim	Institute For Business and Home Safety
Ryan, Tim	Channel 9 News
Sage, Bryan	Colorado Office of Emergency Management
Sandoval, Don	Colorado Division of Local Government
Sanelli, Diane	Federal Emergency Management Agency
Santarelli, Rikki	Gunnison County Board of County Commissioners
Sarmo, Tim	Colorado Division of Local Government Field Services
Sawyer, Thomas L.	Aurora Fire Department
Scandale, Frank	The Denver Post
Scheffert, Linda	El Paso County Emergency Management
Schwarz, Sara	Colorado State Patrol
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Schoenbein, Donald J.	Englewood Fire Department
Schuman, Mark D.	N. Washington Fire Protection District
Schwarz, Sara	Colorado State Patrol
Schwarz, Joe	Skyview Weather
Severin, George	Washington County Emergency Management
Shiple, Cathy	Colorado Division of Local Government Field Services
Shoemaker, Floyd	Federal Emergency Management Agency
Sibley, Fred	Colorado Office of Emergency Management
Skahill, John S.	Delta Rocky Mountain Petrol
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Slaight, Vicky	Red Cross – Northwest Colorado
Slaughter, Ronny	Diamond Shamrock
Smith, Bob	Fort Collins Utility Department
Smith, Jeffy	Consultant
Smith, Jim	Boulder County Sheriff's Office
Smith, Marian	Garfield County Board of County Commissioners
Steinhaus, Eric	Environmental Protection Agency
Stern, Lawrence	Boulder Office of Emergency Management
Stewart, David W.	City of Denver Attorney's Office
Stewart, Kevin	Urban Drainage
Stewart, Phil	City of Federal Heights
Stewart, Tommy Carl	Department of Public Health and Environment
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Stoddard, Scott	Corps of Engineers-Sacramento
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Stone, Jo Ann	Gunnison County Office of Emergency Services
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Sullivan, David	Denver Office of Emergency Preparedness
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Timmermeyer, Bill	Department of Local Affairs
Tobinson, Janie A.	Federal Emergency Management Agency
Tombolato, Michael	Cherryvale Fire Protection District
Truby, Jack	Consultant
Trump, Lorie	American Red Cross – Grand Junction
Turner-Naranjo, Tracy S.	LEPC Member Colorado Springs
Unsel, Charles	Colorado Department of Local Affairs
Unterzuber, Bob	Colorado Department of Labor and Employment
Valdez, Mathew L.	Costilla County Planning and Zoning
Vale, Chuck	Routt County Emergency Management
Varnes, Richard	Consultant
Venard, Diane	American Red Cross – Mile High
Von Lindern, Paula	State Farm Insurance

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Wallace, John ----- Federal Emergency Management Agency
Wam, Staffon ----- Lamar/Prowers County
Warren, Jim ----- Environmental Protection Agency
Weaver, D. A. ----- LEPC Member, Pueblo
Weber, Andrew ----- Morgan County Office of Emergency Management
Weiland, Richard P. ----- Federal Emergency Management Agency
Werner, Keri M. ----- Arapahoe County Sheriff's Department
Westbay, Steve ----- Mount Crested Butte Planning Department
Westerdahl, General ----- Colorado Army National Guard
Westkott, Jim ----- Colorado Department of Local Affairs
White, Polly ----- Colorado Office of Emergency Management
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Willman, Rebecca ----- FCC
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APPENDIX C

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