City of Colorado Springs
Flood Hazard
Mitigation Plan

The Flood of June 17th, 1993

By
George Wehner
Carol Foster
Office of Emergency Management
University of Colorado at Colorado Springs

City of Colorado Springs
Colorado Department of Local Affairs
Division of Local Government
Office of Emergency Management

September 1993

Acknowledgements

Mayor
Robert Isaac

Vice Mayor
Leon Young

Assistant to Mayor
Nancy Bramwell

City Council

Mary Lou Makepeace	**Jack Forest**
Lisa Are'	**John Hazzelhurst**
William Guman	**Leon Young**
Cheryl Gillaspie	**Randall Purvis**

Recognition is Given to the Following Individuals for their Assistance and Energy in the Response to the June 17, 1993 Storm.

Donna Fair
City of Colorado Springs

Dan Bunting
Pikes Peak Regional Building Department

Jim Maxwell
National Weather Service - Colorado Springs

Bill Leon
University of Colorado at Colorado Springs

Bob Kistner - Fred Sibley
Scott Roscoe - Bill Rakocy
Rita Cairns - Jeff Herd
Office of Emergency Management - Golden

Mike Schoback
Colorado Springs School District 11

Paul Sunberg
Cheyenne Mountain Zoo

Jim Neal
Memorial Hospital - Colorado Springs

Dee Jones - Marisa Neuzil

Special Recognition and Thanks Goes to the Field Personnel of these Colorado Springs Departments that Responded to the June 17, 1993 Storm.

Police - City Fire Department - Streets - Power And Light
Storm Water - Waste Water - Parks And Recreation
Engineering

Table of Contents

Introduction

Pikes Peak Area - From Pine Creek

Purpose of Study

Colorado Springs, a city of 410,000 people, has suffered many floods in its history. June 17, 1993, the city faced a storm that left three inches of rain in 3.5 hours and up to six inches of hail in some parts of the city. The purpose of this Flood Hazard Mitigation Plan is to identify critical flood hazard issues faced by the community. The plan seeks to accomplish an indepth look at this incident and to identify actions that could be taken in the future to mitigate against some of the problems which were incurred during this flood. The Colorado Springs Flood Hazard Mitigation Plan has been prepared by the Office of Emergency Management with support from local city, county, and state personnel.

Scope of Study

The Flood Hazard Mitigation Plan is focused primarily on the city of Colorado Springs, emphasizing the hard hit areas of low elevation within city limits. The hazard analysis is not only limited to the flood on June 17, but also takes a look at future potential floods.

Colorado Springs Vulnerability

Nestled in the foothills of Pikes Peak, Colorado Springs is a city extremely vulnerable to flash flooding. Severe weather, caused by summer heat, generates thunderstorms that can occur with little warning. Like many pioneer settlements, the city is located along waterways which can flood during storms that produce one or more inches of rain per hour.

Many historic floods have occurred in the Pikes Peak area. Weather conditions, topography, hydrology, and geography have combined to create both hazardous and costly situations for the city. It is crucial for the city of Colorado Springs to take steps to minimize risks to the citizens and damage to property during future flooding. This can best be accomplished through community awareness, flood preparedness, and mitigation planning.

Community Descriptions

The City of Colorado Springs is a front range community located in the south central portion of the state. It is the county seat for El Paso county. Colorado Springs was a planned community for wealthy people suffering from tuberculosis. The discovery of gold and later the establishment of many military installations directly affected the development of the city.

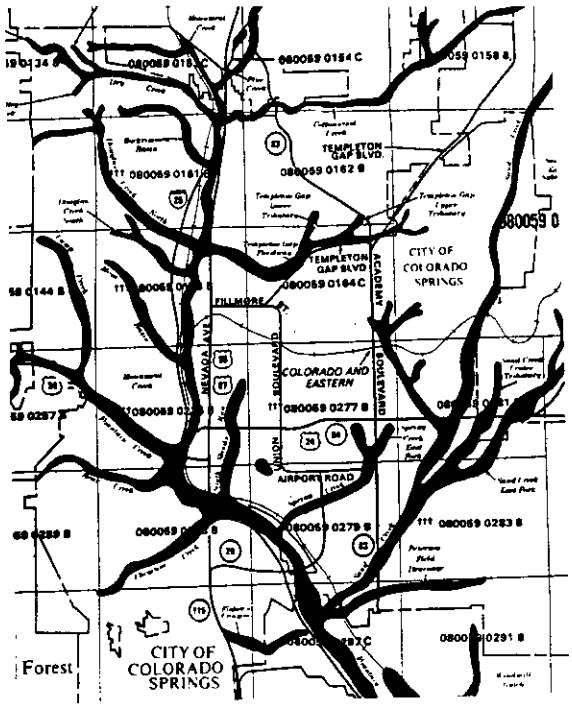
The present economy is based on the presence of military installations, tourism, and the electronics industry. Major tourist attractions of the area include Garden of the Gods, Pikes Peak, Manitou Springs, the Olympic Training Center, the Air Force Academy, and the five star Broadmoor Hotel.

Colorado Springs had one of the highest growth rates in the nation between 1970 and 1980 and continues to grow today. Housing developments in Colorado Springs are for the most part contained along the Pine, Kettle, Cottonwood, and Sand Creek basins.

Streams Affecting Colorado Springs

The following information regarding streams and drainage areas is provided by the September 1992 flood insurance study of Colorado Springs by the Federal Emergency Management Agency:

Colorado Springs is subject to flooding from the Fountain and Monument Creeks and twelve of their tributaries. Fountain Creek originates approximately five miles northwest of Green Mountain Falls in Teller County. The headwaters are fed from glacial snowpacks and springs of the alpine canyons of Pikes Peak. Glacial deposits remain in many of the valleys above the 9,500-foot elevation. The aspen, spruce, and pine covered narrow canyons are straight, steep-walled, and well-drained. The bedrock creek channels are boulder-strewn and average five feet in width above the foothills.



Streams in the Colorado Springs Area

The foothills are a narrow transition from the mountains to the high plains. The transitional area varies from rough parallel ridges to narrow, gently sloping mesas with pine, pinion, cedar, and oak cover. The stream emerges on the high plains in Colorado Springs. South of the city, the watershed to the west of Fountain Creek is in the foothills while the eastern watershed is on the high plains. The rolling high plains terrain is rough, broken, and sparsely vegetated. The sparse vegetation is typical of the semi-arid region and consists of brush, cactus and native grasses. The flood plain is comprised of narrow-strip irrigated farms, cottonwood trees, salt cedar, and other thick undergrowth.

Camp Creek originates in the Pike National Forest northwest of Colorado Springs and

joins Fountain Creek near 30th Street. The creek flows in a concrete-lined channel through residential areas.

Cottonwood Creek, an east-bank tributary of Monument Creek, originates near the Black Forest north of Colorado Springs. It flows south-westwardly through northern Colorado Springs and passes under the Atchison, Topeka, and Santa Fe Railway as well as Interstate 25 where it joins Monument Creek. The stream along most of the course is deeply eroded into rock outcroppings and in the lower reach is lined with willows. Within Colorado Springs, Cottonwood Creek flows in a sand-bottom, riprap-sided channel.

Douglas Creek (North and South) drains an area in and adjacent to northwestern Colorado Springs. The stream flows southeasterly for approximately 8 miles to join Monument Creek near the Templeton Gap Floodway outlet. Lower portions of Douglas Creeks north and south have been channelized into concrete-lined drainage structures.

Dry Creek, North Channel Dry Creek, North Fork Dry Creek, South Valley Dry Creek, and Big Valley, collectively drain into the Dry Creek Basin. The Dry Creek Basin is bounded on the west by the Front Range of the Rocky Mountains, on the south and north by ridges, and on the east by Monument Creek. It slopes from the west to the east toward Monument Creek, rising from an elevation of 6,250 feet to an elevation of 9,250 feet. The western portion of the basin is heavily forested, mountainous terrain drained by three major tributaries of Dry Creek. These tributaries are steep, well-defined ravines which come to a confluence west of the Sisters of Mount Saint Francis Convent. The central portion of the basin is characterized by gently rolling wide valleys, separated by foothill ridges and mesas. Through the central part of the basin Dry Creek is poorly defined and flows through broad, gently sloping meadows. The Eastern portion of the basin is fully developed and Dry Creek flows through eroded channels as well as greenbelt areas. Dry Creek has been channelized from approximately 1,500 feet downstream of Dairy Ranch Road to a point 500 feet upstream of Dancing Horse Road. For the most part, flow in Dry Creek and its tributaries is intermittent.

Kettle Creek, a left-bank tributary to Monument Creek, originates on the western slope of the Black Forest. A two mile segment of the lower reach is within U.S. Air Force Academy boundaries. The basin is subject to urban development. Typically, the creek cuts a narrow, deep canyon. Its drainage area encompasses approximately 17 square miles.

Mesa Basin is located in western Colorado Springs. It is bounded on the north by the Garden of the Gods, on the west by Mesa Road, on the south by Uintah Street, and on the east by Monument Creek.

The main channel in this basin drains the western portion of the basin. It flows southeasterly through the basin, passes under Interstate 25 between Caramillo and Buena Venture Streets, and joins Monument Creek.

Monument Creek originates northwest of Colorado Springs and travels 35.7 miles to join Fountain Creek in southwestern Colorado Springs. From its source, the perennial stream flows easterly for approximately 8 miles, descending from a 9,350 foot elevation through precipitous canyons and transitional foothills to emerge near Palmer Lake at the 7,100 foot elevation. The creek then turns south and parallels the mountains for the remaining distance to its confluence with Fountain Creek. Monument Creek is generally entrenched, with an average slope of 30 feet per mile. It has been channelized between

Pine Creek - Note - Stream Erosion Near Home-site

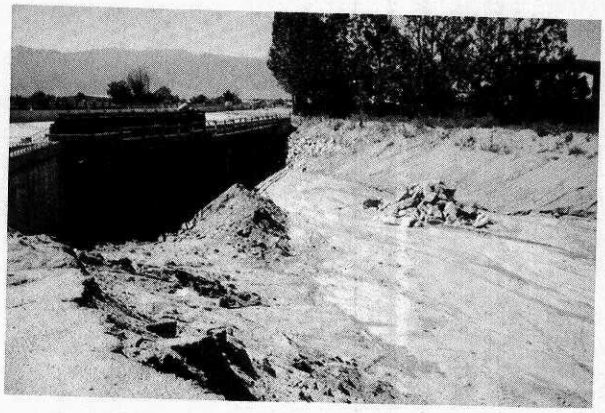
Woodman Road to approximately 7,000 feet downstream. West of the main stem of the creek lies rough and broken mountain terrain. The vegetation ranges from mixed coniferous trees to hardy shrubs and mountain grasses. East of the main stem lies the high plateau that descends gradually to gently rolling land covered by grass, shrubs, and bushes. Both coniferous and deciduous trees grow along the creek banks.

The Peterson Field Drainage is a left bank tributary of Sand Creek, entering at 0.25 mile from Sand Creek's confluence with Fountain Creek. The upper one-third of the basin is characterized by shallow swales that convey overland flow across Peterson Airfield. Detention ponds under development within the airfield boundaries substantially limit peak flows from this area. The lower portions of the drainage are characterized by light industrial and residential development; the channel is concrete lined from Monica Drive to its confluence with Sand Creek.

Pine Creek, a narrow, deep stream, joins Monument Creek in northern Colorado Springs and is 7 miles long. It has a drainage area of approximately 10 square miles. The upper reach of Pine Creek is an area of recent annexation and potential development. The lower reach borders U.S. Air Force Academy land. Heavy commercial development has taken place in the lower portions of the Pine Creek basin. North Pine Creek is a right bank tributary of Pine Creek entering in the upper reaches of Pine Creek.

The Rockrimmon Basin lies in northwestern Colorado Springs. The basin is oriented in a southeasterly direction to the outfall points along Monument Creek near the Woodman Road Interchange on Interstate Highway 25. The basin is drained by one major defined channel with many minor contributing branches and, except after a storm, all channels are dry. Lower portions of the drainage way flow are confined to a concrete channel.

Sand Creek originates northeast of the city and flows southwesterly through eastern Colorado Springs and joins Fountain Creek 0.5 miles south of the southern corporate limits. Sand Creek is typical of many ephemeral streams in that there is a tendency for the channel to meander over a period of years. Historical evidence of meandering is predominant in the lower reaches where there is relatively less topographic relief and the channel broadens into and becomes a part of the flood



Sand Creek - One of Two New Bridges

plain. Two tributaries to Sand Creek are Sand Creek East Fork and Sand Creek Center Tributary.

Shooks Run is divided into two separate and distinct reaches. There are North Shooks Run (Templeton Gap Drainage Basin) and South Shooks Run.

The Templeton Gap Drainage Basin (North Shooks Run) originates in northeastern Colorado Springs in a cup-like depression, surrounded by hills. It flows southwesterly along and parallel to Templeton Gap Road, until it is intercepted by the Templeton Gap Floodway and is diverted northwesterly to Monument Creek. South Shooks Run begins at the Templeton Gap Floodway and runs parallel to Templeton Gap Road for five miles to join Fountain Creek near the southern corporate limits, approximately 0.25 mile east of U.S. Highway 85-87. The stream originates in a residential area and throughout its course flows through residential or business areas.

Spring Creek originates in east-southeastern Colorado Springs, flows southwesterly, and joins Fountain Creek near Janitell Road Crossing. The creek divides into two definite streams near Airport Road (Spring Creek and Spring Creek East Fork). The Spring Creek valley is relatively wide in the northern two-thirds of the basin, becoming deep and narrow in the lower one-third. Long reaches of Spring Creek are concrete lined in industrial and commercial areas. Spring Creek also flows through a lake on Valley Hi Golf Course.

The Templeton Gap Floodway originates near Acacia Drive and Templeton Gap Road and diverts North Shooks Run into Monument Creek.

Physiographically, the area of Monument and Fountain Creeks is characterized by gently sloping plains, mountain ranges and basins. There are some horizontal sedimentary outcrops in the Black Forest which represent rock formations from the Rocky Mountain uplift over 60 million years ago. Exposed sedimentary rocks along the edge of the mountain front are tilted. Above the sedimentary foothills the pre-Cambrian mountain core is largely of Pikes Peak granite.

What is a 100 Year Flood?

The science of predicting the effects of floods on lives and property falls largely upon hydrologists. They estimate future floods by studying the past behavior of a stream. Floods are often categorized according to their return interval e.g. 10-50-100-year flood. Each flood interval is related to a percent chance that a flood may actually occur within a given year.

This has caused considerable confusion at times: - A 100-year flood does not happen with absolute regularity every 100 years. Rather, a 100-year flood may occur at any time within any given year. Colorado state law, however, requires that the 100-year floodplain be used for land use regulation, as the floodplain concept provides a national standard for the National Flood Insurance Program. It is critical, however, for floodplain residents to remember that floods greater than the standard 100-year flood event may occur at any time and may also exceed projected estimates designated by the 100-year floodplain boundary.

Types of Floods:

Floods may occur on riverine systems. Commonly, a river basin is fed by a hierarchical

Sand Creek - Note - Drainage Crosses Roadway

order of stream channels that convey the normal flow of water from smaller watersheds contained within the basin. Flooding results when the flow of water becomes greater than the carrying capacity of the individual stream channel. Rate of rise, peak discharge (magnitude), duration, and frequency of floods, are all a function of physical features and weather conditions which contribute to the volume of water in the river system.

Snowmelt flood: Snowmelt flooding typically occur May through June. Generally this occurs when there are warm Spring temperatures creating a fast snowmelt and/or a combination of spring run off and rain fall over the affected watershed. Serious flooding can result when a heavy spring rain accompanies a snowmelt in May and June.

Flash flood: Flash floods result from intense summer thunderstorms. This flood event is characterized by an intense cloudburst, a sudden rise in stream level, short duration, and little or no warning. Typically the flash flood season in Colorado stretches from June to September.

General rain floods: General rain floods are caused by general rainfall events that occur over a wide geographic area for several days, totally saturating the shallow soils. These floods are characterized by a slow, steady rise in the stream level and a peak discharge of long duration. Because of the slow rate of stream rising and the time available for warning, few lives are usually lost in this type of flood event.

Dam Failure: Severe sudden flooding can also occur in the Colorado Springs area from a dam failure. There are 18 dams in the surrounding vicinity. Dam failure is generally related to extreme snowmelt or rainfall.

Early Flood Warning System

Work toward an early flood warning system started in 1986 and was a positive step toward flood preparedness. It is used and supported by Colorado Springs, El Paso county, and the surrounding towns of Manitou Springs, Green Mountain Falls, Fountain, and Palmer Lake. The base station is located in Colorado Springs. Designed to cover 580 square miles in western El Paso county, the system contained 26 remote sensing stations, 20 precipitation gauges and 6 stream level gauges. Data is relayed by radio from the remote sensors to the main base station at the Regional Building in Colorado Springs. Dan Bunting, the flood plain manager, maintains and operates the Early Flood Warning System. Data collected is forwarded to the National Weather Service at the city airport. The system continues to be updated and now includes two counties and in excess of fifty sensing stations and gauges.

Flood History of Colorado Springs

The founders of Colorado Springs were educated by their first flood five years after the incorporation of their young, fledgling town. Listed are the most severe floods that have inundated Colorado Springs:

The flood on June 16, 1864, was described in an article from The Colorado Springs Gazette as follows: - a heavy cloud came up over Cheyenne Mountain and the sky gathered darkness until nearly sundown, when rain and hail began to fall in tremendous torrents. ..The rain came down, not in drops but in floods, the hail consisted of huge ice, some of them over 3 inches in diameter; the whole surface of the country was flooded as though it were a vast lake and in some ravines the water rushed along in torrents 20 to 30 feet deep... The area of the storm was confined within a radius of 3 or 4 miles.

Thirteen deaths were caused by the flood. The estimated peak discharge of Monument Creek for the 1864 flood was 40,000 cubic feet per second, well above the normal summertime flow of 2500 cfs.

On July 26, 1885, homes and businesses along the Templeton Gap Basin, Monument, and Shooks Run Creeks suffered thousands of dollars in property damage. Bridges were destroyed over Cheyenne, Cottonwood, Squirrel, and Sand Creeks. Two people were reported killed during this flood.

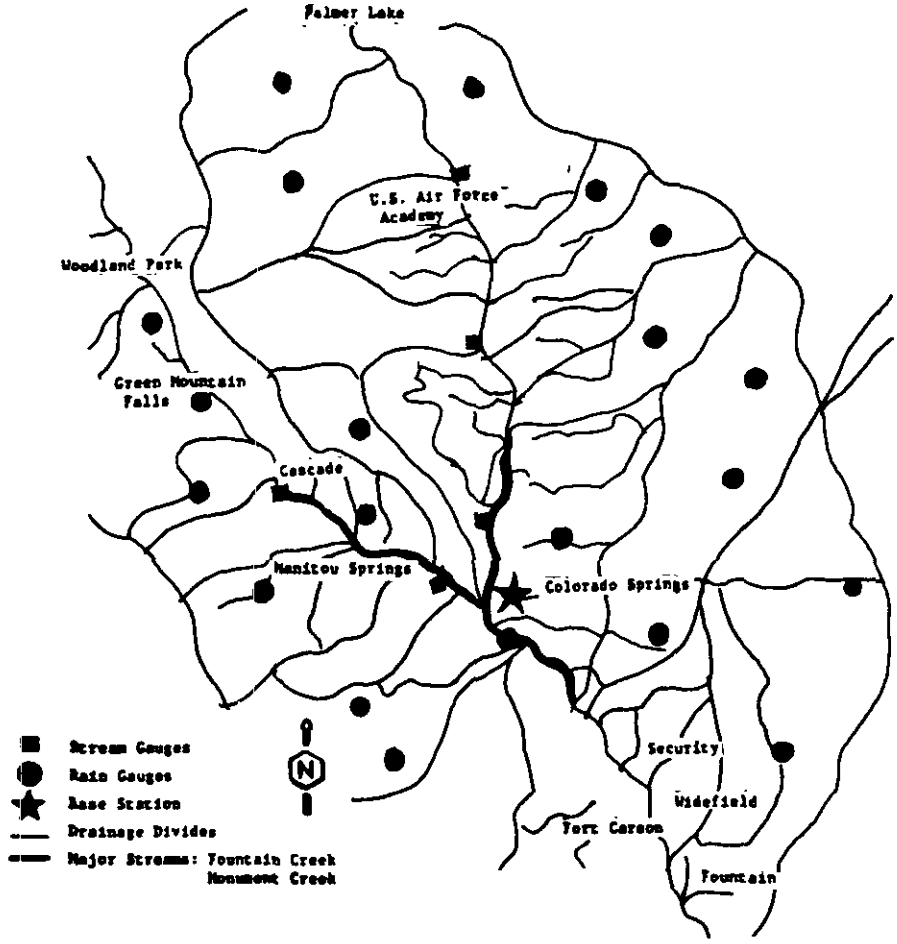
The July 33, 1921 issue of The Colorado Springs Gazette described this flooding as follows: Shooks Run had before 9 PM (June 3) become a river. It had spread its waters over the northwestern part of the city, covering several blocks... Sand Creek and Fountain Creek were roaring, (filling) the banks to overflowing, flooding gardens, farms, ranch houses.

May 31, 1935, saw the most severe flooding on Fountain Creek from a storm concentrated in the Kettle and Fountain Creek basins. The Bijou Street bridge was the only bridge left crossing Monument and Fountain Creeks.

The newspaper account stated: - ...flood waters from half dozen cloud burst swept through Monument Valley...shortly after noon...four lives were lost and property damage, exclusive of that suffered by the railroads, was estimated by the city engineers as $1,215,000.00.

Four people died in this flood. The water reached flood stage in less than an hour.

It should be noted from the map depicting residential and commercial damage during the recent flood that the newer urban areas suffered many problems and are increasing flows on the existing creeks. Because it is an expanding city, Colorado Springs must deal with the risk of urban flooding. Flash flooding is extremely dangerous because of the intensity and the tremendous amounts of water and debris carried by it. The land is no longer able to absorb the rainfall, causing two to six



Early Flood Warning System

times as much runoff as from the natural terrain. Streets become rivers as the rainfall follows its course. The June 17, 1993, event was certainly not a record storm; however, a study of this incident and the experience gained in handling it reveals ways to prepare for future flooding.

The June 17,1993 Flooding

June 17, 1993 - Rescue on I-25 - Gazette Telegraph

Like many days in June, an afternoon heat generated thunderstorm formed above. This storm did not pass through, but instead circled over the city. The relentless downpour started at 4:15 p.m., causing numerous alarms on two creeks, thus a flood warning was issued at 4:55 p.m.

Homeward bound workers found traffic problems in low lying areas prone to urban flooding. Portions of the city were hit by heavy hail and drainage became impeded. The intersection at Lexington and Rickshaw had an estimated three feet of water. Interstate 25 was closed at Bijou Street exit while civil engineers examined the structure of the overpass which had been under water. Occupants of vehicles at Siferd Boulevard and Austin Bluffs Parkway were rescued from flood waters during the storm.

A weather spotter reported 3.5 inches of rainfall between the hours of 5:00 p.m. and 7:20 p.m. in the Village Seven area of Colorado Springs. Hail up to six inches deep was reported in the Vista Grande and Village Seven areas. Shooks Run Creek overflowed its banks and a subsequent evacuation of Campers Village Mobile Home Park ensued. 135 people were evacuated and sheltered over night through arrangements made by the local chapter of the American Red Cross.

Extensive efforts on the part of the police and fire personnel was caused by the report of two boys being swept away in the Templeton Gap Floodway. Six fire vehicles, Flight for Life Helicopter, and police personnel searched along the Templeton Gap waterway trying to spot the two children. The search continued for approximately two and a half hours until

August 9, 1988 - Sierra Madre Street Flooding - Gazette

it was cancelled due to lack of information to verify the report.

The volume of water caused flooding in basements, damage to yards, roads, and roofs. The swift short-lived storm had a significant impact on the area.

Meteorology

The June 17, 1993 storm developed quickly. At 4:00 p.m. a lightning strike hospitalized Anthony Grantz who was golfing on the sixteenth hole at Patty Jewett Golf Course. No lightning preceded this strike. Moderate showers developed over Colorado Springs and became more severe as people ended their work day. The storm cell stalled over the city, dumping heavy rain from the far north reaches of Briargate and south to the downtown area. The three and a half hour storm was created by an upper level disturbance that mushroomed due to warm afternoon ground temperatures in the vicinity. Moist air from the edge of Hurricane Adrianna in the Gulf Coast of Mexico also increased the size of the storm.

Response

Response was immediate but hectic during the June 17 event. The new Colorado Springs Police Operations Center (POC) served well as the Emergency Operations Center; both the police and fire dispatches are located in this building. The City Emergency Manager, Donna Fair, coordinated efforts for notification, evacuation, and sheltering from this facility which served as the EOC.

The flood warning system sensor alarms located in Cottonwood Creek and Shooks Run drainage basin, initiated the issuing of a Flash Flood Warning by the National Weather Service. The warning went through the Emergency Broadcast System process to local 5:00 PM news on radio and television. Police and fire personnel were busy throughout the evening with stalled cars, accidents, lightning strikes, flooded basements, and automatic alarms ringing. There were water rescues on city streets due to urban flooding.

The fire department responded to over 90 calls during the flood, double what they receive on a normal day. At one point, all fire department vehicles were in service.

Official response followed in the days after the deluge on June 17th. A meeting of public officials was held for discussion and input exchange pertaining to the incident. A damage assessment team from the State Office of Emergency Management helped with estimates during the subsequent weeks.

The City Office of Emergency Management chose to use the flood as a learning tool for the community. After the storm, the dissemination of information included newspaper articles, TV interviews, and a mailing of brochures regarding flood awareness included an emergency preparedness for severe weather, national flood insurance program,

June 17th - Evacuation of Camper Village - Gazette T.

and Homeowners Guide to Flood Mitigation. A flood damage survey form published in the Gazette Telegraph, allowed citizens and businesses to report damages. The information collected will be used to mitigate flood-damaged property. Problem areas will be reexamined.

The state and city, through combined efforts, sponsored two flood fairs, one on June 22, the other on August 3. Professionals were available to answer specific questions asked by homeowners. Flood proofing methods such as sandbagging were demonstrated. (see Appendices for additional information).

Damages

The City Office of Emergency Management damage survey revealed the following:

The Cheyenne Mountain Zoo and Will Rogers Shrine suffered damages from the wash out of roads and fences. The estimated cost of repair was $38,300.

Eleven schools in the area had damages to roofs and ceilings estimated at $500,000.

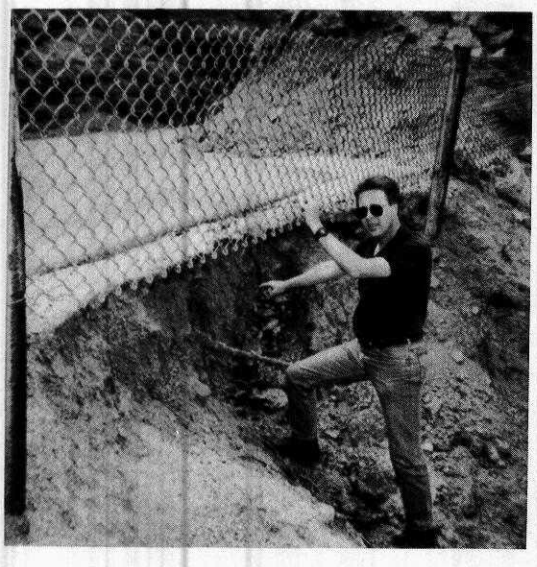
Memorial Hospital had minor flooding in the new emergency room. Patients were treated in the hallways for a short time.

Eighty home owners used the report form. Most damage was from flooded basements. Soaked carpets, walls, furniture, water heaters, and furnaces were the major concerns. Residents were warned about pumping water from the basements too quickly as pressure from water in the ground outside could cause walls to buckle. The damage to private property was estimated at $76,000.

Flood Mitigation Activities

Opportunities

There are many alternatives available to help reduce future impacts of flooding in Colorado Springs. These include improved land use planning, structural improvements, emergency preparedness and flood warning, and increased public awareness.

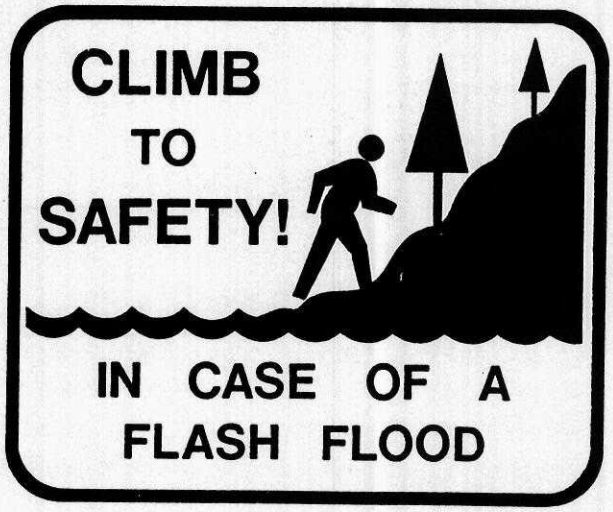


Wash Out Damage - Will Rogers Shrine Road above Cheyenne Mtn

The Colorado Office of Emergency Management has prepared this Flood Hazard Mitigation Plan with the intention of offering concrete, realistic suggestions that the City of Colorado Springs can initiate to help minimize the flood hazard. Community educational activities will continue through the City Office of Emergency Management under the direction of Donna Fair. Request for presentation and lectures are welcomed by this office. Organizations and schools present prime opportunities to teach mitigation. To lessen the severity of an event is everyone's goal. This storm should serve as a glimpse of what a major event would cost homeowners and government. The cost of damages on June 17 is estimated at $1,000,000.00. Of the estimated eighty reports returned, one person had flood insurance.

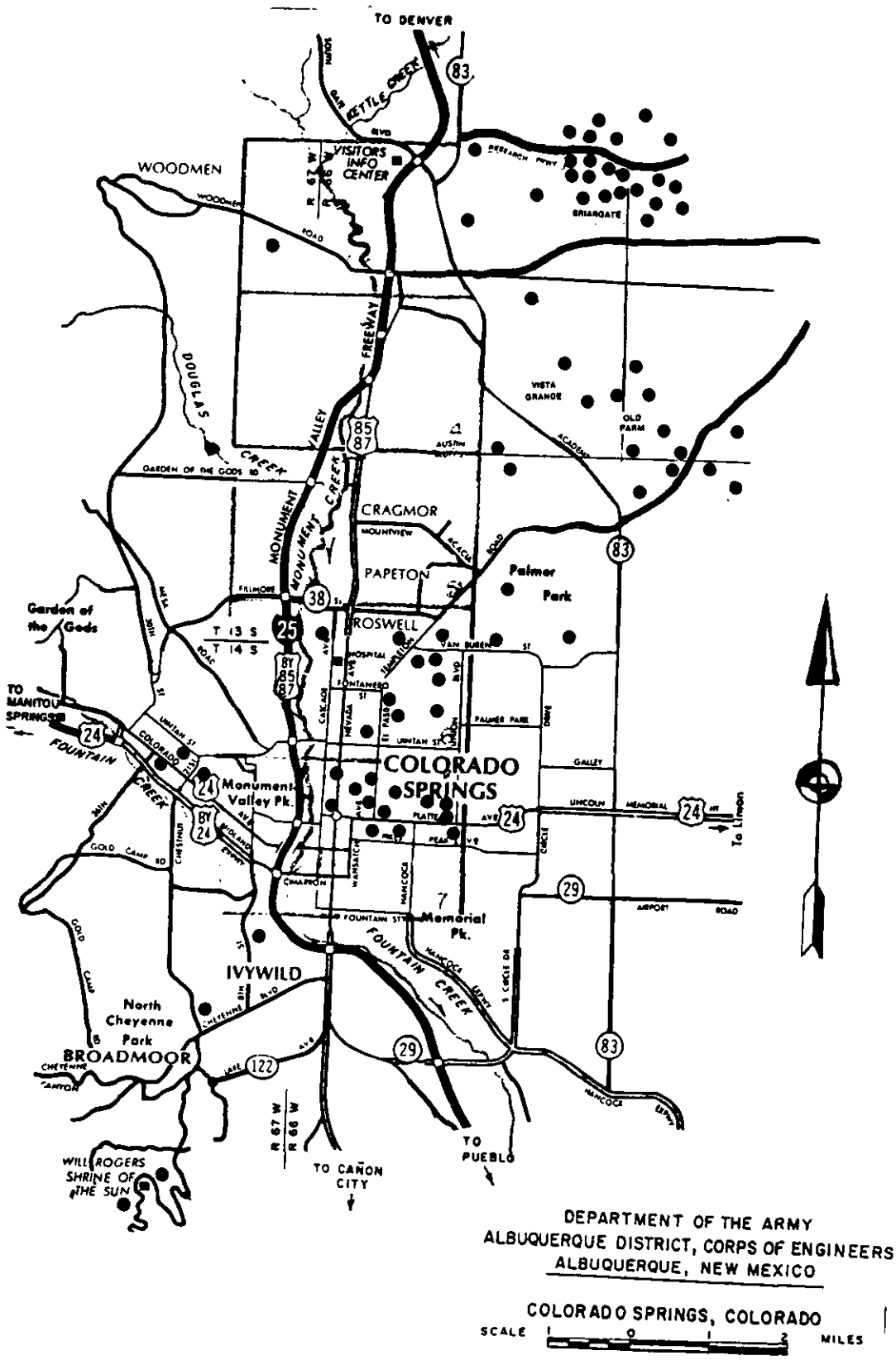
Flood Insurance

The El Paso County Regional Building Department estimates over 14,000 people live in flood plain areas. These areas contains about 4,300 buildings concentrated along Shooks Run, Sand, Monument, Fountain, and Cottonwood creeks.

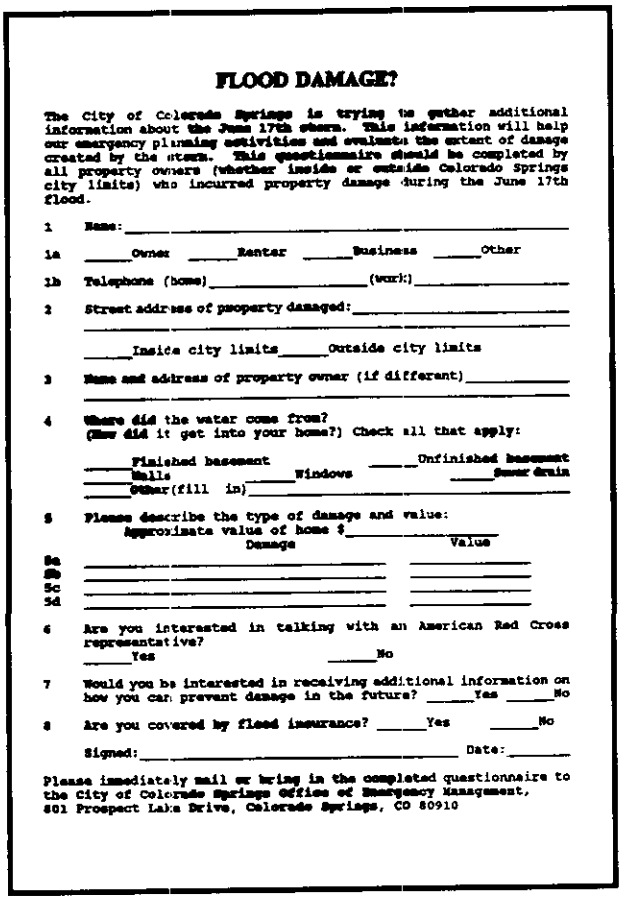


Flood insurance policies are not offered by all insurance companies. Only designated National Flood Insurance Policy companies write flood policies.

In 1968, the U.S. Congress established the National Flood Insurance Program (NFIP). The NFIP is designed to benefit both individuals and the communities in which they live. It enables all individual property owners to pur-



June 17, 1993 - Damage Location Map



FLOOD DAMAGE?

The City of Colorado Springs is trying to gather additional information about the June 17th storm. This information will help our emergency planning activities and evaluate the extent of damage created by the storm. This questionnaire should be completed by all property owners (whether inside or outside Colorado Springs city limits) who incurred property damage during the June 17th flood.

1 Name:_____

1a _____Owner _____Renter _____Business _____Other

1b Telephone (home)_____(work:)_____

2 Street address of property damaged:_____

_____Inside city limits_____Outside city limits

3 Name and address of property owner (if different)_____

4 Where did the water come from?
(How did it get into your home?) Check all that apply:

_____Finished basement _____Unfinished basement
_____Walls _____Windows _____Sewer drain
_____Other(fill in)_____

5 Please describe the type of damage and value:
Approximate value of home $_____

	Damage	Value
5a		
5b		
5c		
5d		

6 Are you interested in talking with an American Red Cross representative?
_____Yes _____No

7 Would you be interested in receiving additional information on how you can prevent damage in the future? _____Yes _____No

8 Are you covered by flood insurance? _____Yes _____No

Signed:_____ Date:_____

Please immediately mail or bring in the completed questionnaire to the City of Colorado Springs Office of Emergency Management, 801 Prospect Lake Drive, Colorado Springs, CO 80910

Flood Damage Questionnaire

chase flood insurance at reasonable rates, while it requires communities to adopt and administer local flood plain management measures aimed at protecting lives and new construction from future flooding. Through this criteria, the Federal Emergency Management Agency (FEMA) and participating communities are able to reduce future flood losses. The adoption and enforcement of flood plain regulations is a condition for staying in the NFIP. Communities have been suspended from the regular program in the state of Colorado for not enforcing adopted flood plain ordinances.

Summary

A analysis of this storm reveals that the time of day, rapid development, volume of water, and areas involved made this short storm a chaotic one. Educating the public should remain a priority. The storm served as an opportunity to practice under pressure for all those involved: the officials, the media, and the weather service.

The Colorado Springs Office of Emergency Management has written a local emergency operations plan which has a flood annex and is consistently revised and updated to reflect current threats to the community. It also identifies the functions and responsibilities that will be taken by city departments and agencies in the event of a flood.

Floodproofing for Business and Homeowners

FLOOD FAIR

801 PROSPECT LAKE DRIVE

JUNE 29, 1993 7:00-8:30 P.M.

AGENDA

I Introductions — *Donna Fair, Bob Kistner, Dan Bunting*

II How to Protect Your Home and Business

III Flood Plain Management in Colorado Springs/El Paso County Area

IV Flood Insurance Questions and Answers

Engineers and Hydrologists will be available to assist in mitigation efforts to help flood-proof your property.

Sandbagging demonstration.

Presentations by the local Emergency Manager

Department of Local Affairs (DOLA)

Flood Plain Administrator

For further information, contact
The City of Colorado Springs Office of Emergency Management
578-7057

Flood Fair

Many of the floodproofing techniques that keep water away from a residence, such as flood walls, levees, and structural sealing, may require special treatment for openings such as doors, windows, driveways, etc. These closures act as shields to cover the gap and prevent water from entering, and can be of a variety of shapes, sizes, and materials.

In some cases closures are permanently attached using hinges so that they can remain open when there is no flood threat. They may be portable, normally stored in a convenient location and slipped into place when a flood threatens. In certain situations, when flooding is of very low level, usually less than one foot, some method of enclosing low entrances such as basement doors or window wells might be a satisfactory option. In any case, there are a number of elements involved in designing and using a closure system.

In areas of shallow, low velocity flooding, closures can be used on doors, windows, vents,

PUBLIC OFFICIALS CONFERENCE

JUNE 29, 1993 3:00 - 5:00 P.M.
CITY COUNCIL CHAMBERS
30 S. NEVADA AVENUE

AGENDA

I Introductions

Colorado Springs Office of Emergency Management
Department of Local Affairs (DOLA)
Others

II Hazards in Colorado - Slide Show
Case Study - Homes & Business' in Jeopardy

III How to Protect Your Home and Business

IV How to Read A Flood Insurance Map
Flood Plain Management in Colorado Springs and the El Paso County Area

V Flood Insurance Questions and Answers

VI Disaster Programs - How to Declare a Disaster

Federal	*FEMA*
State	*Bob Kistner*
Local	*Donna Fair*
Private (COVOAD) Red Cross	*Joyce Gordy*

for further information, call 578-7057

The City of Colorado Springs Office of Emergency Management

Public Officials Conference

and other building openings. However, the first step with the use of closures placed directly on buildings is to be certain that both the closure and the wall systems are strong enough and sufficiently watertight to withstand flood pressures. The use of closures

Prairie Hills Elementary School

directly on a structure is considered to be part of the sealing process.

Closures can be considered as an option only if a flooding situation provides sufficient time to install the closures. The need for both warning time and "human intervention" is critical, since all closure system require personnel to install them and make certain they are properly sealed.

Closures that are stored between floods must be readily accessible. The effectiveness of an entire closure system will be compromised if the closures are stored such that flooding renders them inaccessible, or if even one closure is improperly installed.

For most flooding situations, a homeowner should consult with a professional engineer to be certain that the closure system being planned can withstand the hydrostatic and hydrodynamic pressures that will be involved.

Low Profile Permanent Closures

For cases involving flood levels of up to two feet, a type of "mini-flood wall can be used to permanently protect various types of openings. Possible materials for this use include brick, concrete block and poured concrete. Figure 16 shows a wall around a window well. For flooding around a basement door, a low wall around the entrance may be the solution, as shown in figure 16. Though the "mini"-walls may not require the degree of reinforcing of larger flood walls, they should be supported by and securely tied onto a footing so that they will not be undercut by scouring.

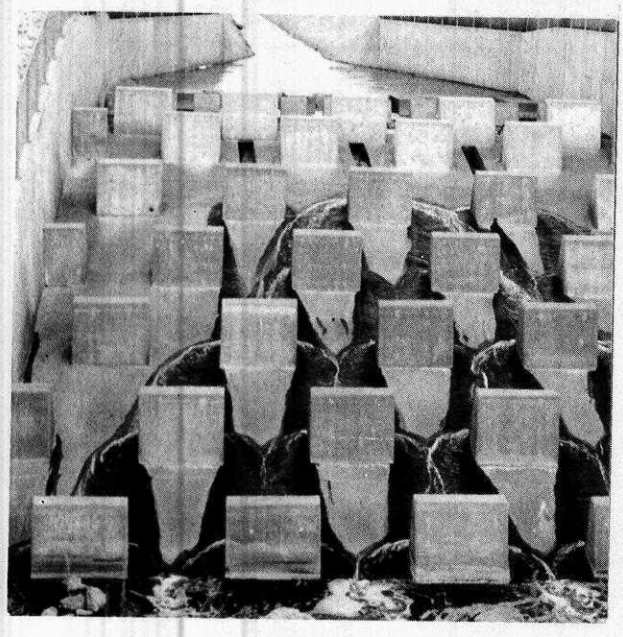
Sandbagging

As a last resort or during emergencies, sandbags can keep water away from vulnerable property. However, flood proofing measures

Sandbagged House on Custer Avenue

and moving contents out of the way are much more secure methods to accomplish the same thing. Additionally, sandbagging can be very expensive.

A community plan for sandbagging requires buying sandbags before a flood. Get burlap or plastic sandbags. Other kinds of bags simply won't hold up. Burlap or plastic bags cost 25



Pine Creek Flood Energy Dissipater

to 50 cents each. Sand and plastic sheeting must also be stockpiled.

Sandbagging can also be very time consuming. It takes two people approximately one hour to fill and place 100 sandbags, giving you a wall one foot high and 20 feet long. If you skimp on the bags, you risk putting up a wall that will be knocked over.

When a flood is imminent, everyone wants to sandbag, usually because they don't know what else to do. While it does have a therapeutic effect, sandbagging should be considered only as part of an overall flood response plan, or as a last resort for individuals.

A good plan will help use your limited time and resources most efficiently. An overall flood response plan might call for sandbags to fill in any gaps in a flood wall.

State Assistance

OEM will improve the state's capability to respond to disaster response and recovery efforts by the incorporation of mitigation into disaster preparedness and recovery programs and activities. The Disaster Preparedness Improvement Grant (DPI) and Emergency Management Training (EMT) will work in unison to establish and complete training activities for emergency managers, state and local government officials, business and industry, and private citizens of Colorado.

Appendix A - In The Event of a Flood: Tips to minimize loss of life and property

The following tips are from the Federal Emergency Management Agency Federal Insurance Administration National Flood Insurance Program and should be used as suggested guidelines for action before, during, and after a flood.

STEPS TO TAKE TODAY

- ☐ Make an itemized list of personal property, including furnishings, clothing, and valuables. Photographs of your home - inside and out - are helpful. These will assist an adjuster in settling claims and will help prove uninsured losses, which are tax deductible.
- ☐ ***Learn*** the safest route from your home or place of business to high, safe ground if you should have to evacuate in a hurry.
- ☐ ***Keep*** a portable radio, emergency cooking equipment, and flashlights in working order.
- ☐ ***Persons who live in frequently flooded areas should keep on hand materials such as*** sandbags, plywood, plastic sheeting, and lumber which can be used to protect private property. (Remember, sandbags should not be stacked directly against the outer walls of a building, since, when wet, the bags may create added pressure on the foundation.)
- ☐ ***Buy flood insurance***. You should contact your property/casualty agent or broker about eligibility for flood insurance, which is offered through the National Flood Insurance Program. Generally, there is a five-day waiting period for this policy to become effective, so don't wait until the last minute to apply.
- ☐ ***Keep*** your insurance policies and a list of personal property in a safe place, such as a safety-deposit box.
- ☐ ***Know*** the name and location of the agent(s) who issued the policies.

WHEN THE FLOOD COMES

The safety of your family is the most important consideration. Since floodwaters can rise very rapidly, you should be prepared to evacuate before the water level reaches your property.

- ☐ Keep a battery-powered radio tuned to a local station, and follow all emergency instructions.
- ☐ **If you're caught in the house** by suddenly rising waters, move to the second floor and, if necessary, to the roof. Take warm clothing, a flashlight, and portable radio with you. Then wait for help...don't try to swim to safety. Rescue teams will be looking for you.
- ☐ ***When outside the house,*** **remember.... FLOODS ARE DECEPTIVE.** Try to avoid flooded areas, and don't attempt to walk through floodwaters that are more than knee deep.
- ☐ **If, and only if, time permits...**there are several precautionary steps that can be taken.
- ☐ **Turn off all utilities** at the main power switch and close the main gas valve if evacuation appears necessary. Do not touch any electrical equipment unless it is in a dry area

and you are standing on a piece of dry wood while wearing rubber gloves and rubber soled boots or shoes.

- ☐ **Move valuable papers,** furs, jewelry, clothing, and other contents to upper floors or higher elevations.
- ☐ **Fill bathtubs, sinks and jugs with clean water** in case regular supplies are contaminated. You can sanitize these items by first rinsing with bleach.
- ☐ **Board up windows** or protect them with storm shutters or tape to prevent flying glass.
- ☐ **Bring outdoor possessions inside the house** or tie them down securely. This includes lawn furniture, garbage cans, tools, signs, and other movable objects that might be swept away or hurled about.
- ☐ **If it is safe to evacuate by car,** you should consider doing the following:
- ☐ **Stock the car with non perishable foods** (like canned goods), a plastic container of water, blankets, first aid kit, flashlights, dry clothing, and any special medication needed by your family.
- ☐ **Keep the gas tank at least half full** since gasoline pumps will not be working if the electricity has been cut off.
- ☐ **Do not drive where water is over the roads.** Parts of the roads may already be washed out.
- ☐ **If your call stalls out in a flooded area,** abandon it as soon as possible. Floodwaters can rise rapidly and sweep a car (and its occupants) away. Many deaths have resulted from attempts to move stalled vehicles.

AFTER THE FLOOD

If your home, apartment or business has suffered flood damage, immediately call the agent or broker who handles your flood insurance policy. The agent will then submit a loss form to the National Flood Insurance Program. An adjuster will be assigned to inspect your property as soon as possible.

- ☐ *Prior to entering a building,* check for structural damage. Make sure it is not in danger of collapsing. Turn off any outside gas lines at the meter or tank, and let the house air for several minutes to remove foul odors or escaping gas.
- ☐ *Upon entering the building,* do not use open flame as a source or light since gas may still be trapped inside; a battery-operated flashlight is ideal.
- ☐ Watch for electrical shorts or live wires before making certain that the main power switch is turned off. Do not turn on any lights or appliances until an electrician has checked the system for short circuits.
- ☐ **Cover broken windows** and holes in the roof or walls to prevent further weather damage.
- ☐ **Proceed with immediate cleanup measures** to prevent any heath hazards. Perishable items which pose a health problem should be listed and photographed before discarding. Throw out fresh food and previously opened medicines that have come in contact with flood waters.
- ☐ ***Water for drinking and food preparation*** should be boiled vigorously for ten minutes (until the public water system has been declared safe). Another method of disinfecting is to mix 1/2 teaspoon of liquid commercial bleach with 2-1/2 gallons of water...let stand for five minutes before using. The flat taste can be removed by pouring the water from one container to another or adding a pinch of salt. In an emergency, water may be obtained by draining a hot water tank or melting ice cubes.

- ☐ ***Refrigerators, sofas, and other hard goods*** should be hosed off and kept for the adjuster's inspection. A good deodorizer when cleaning major kitchen appliances is to add one teaspoon of baking soda to a quart of water. Any partially damaged items should be dried and aired; the adjuster will make recommendations as to their repair or disposal. Take pictures of the damage done to your building and contents.
- ☐ **Take all wooden furniture outdoors,** but keep it out of direct sunlight to prevent warping. A garage or carport is a good place for drying. Remove drawers and other moving parts as soon as possible, but do not pry open swollen drawers from the front. Instead, remove the backing and push the drawers out.
- ☐ **Shovel out mud while it is still moist** to give walls and floors a chance to dry. Once plastered walls have dried, brush off loose dirt. Wash with a mild soap solution and rinse with clean water; always start at the bottom and work up. Ceilings are done last. Special attention at this early stage should also be paid to cleaning out heating and plumbing systems.
- ☐ **Mildew can be removed from dry wood** with a solution of 4 to 6 tablespoons of tri-sodium phosphate (TSP), 1 cup liquid chlorine bleach, and 1 gallon water.
- ☐ **Clean metal at once** then wipe with a kerosene-soaked cloth. A light coat of oil will prevent iron from rusting. Scour all utensils, and, if necessary, use fine steel wool on unpolished surfaces. Aluminum may be brightened by scrubbing with a solution of vinegar, cream of tartar, and hot water.
- ☐ **Quickly separate all laundry items** to avoid running colors. Clothing or household fabrics should be allowed to dry (slowly, away from direct heat) before brushing off loose dirt. If you cannot get to a professional cleaner, rinse the items in lukewarm water to remove lodged soil. Then wash with mild detergent; rinse and dry in sunlight.
- ☐ ***Flooded basements should be drained*** and cleaned as soon as possible. However, structural damage can occur by pumping out the water too quickly. After the flood waters around your property have subsided, begin draining the basement in stages, about 1/3 of the water volume each day.

Appendix B - Sources of Assistance

The following agencies can provide advice or assistance before, during, or after a flood.

Emergency Management

City of Colorado Springs Emergency Managemant
Fire Training Center
801 Prospect Lake Drive
Colorado Springs, CO 80901
(719) 578-7057

El Paso County Emergency Management
1824 S. Wahsatch Ave.
Colorado Springs, CO 80906
(719) 632-1180

Colorado Office of Emergency Management
Camp George West, Bldg 120
Golden, CO 80401
(303) 273-1622

Flood Mitigation/Control Information

Colorado Water Conservation Board
1313 Sherman St, Rm 720
Denver, CO 80203
(303) 866-3441

Flood Insurance

Local Insurance Agents - Your City or County
Federal Emergency Management Agency (FEMA)
Federal Insurance Administration
Washington, D.C. 20472
(202) 646-2780
(800) 638-6620

Victim Assistance

American Red Cross
Pikes Peak Chapter

Appendix C - References

Emery, E., Montoya., Wilson, D. Series of potential storms triggers flooding. (1993, June 8). Gazette Telegraph

Fessel, C. (1993). Flood risk exist here, too. Gazette Telegraph.

Leon, B., La Riva, Marina, Woldruff, Deborah. (1986). Pikes Peak Area Flash Flood Warning System. Community Development Monograph Series #18, Colorado Springs, CO.

Luciani, F., (1993). Report: Exercise. El Paso County Office of Emergency Program Manager.