

Predisaster Mitigation Plan For:

Dolores County, Colorado

Town of Dove Creek, Colorado

Town of Rico, Colorado

10-31-03

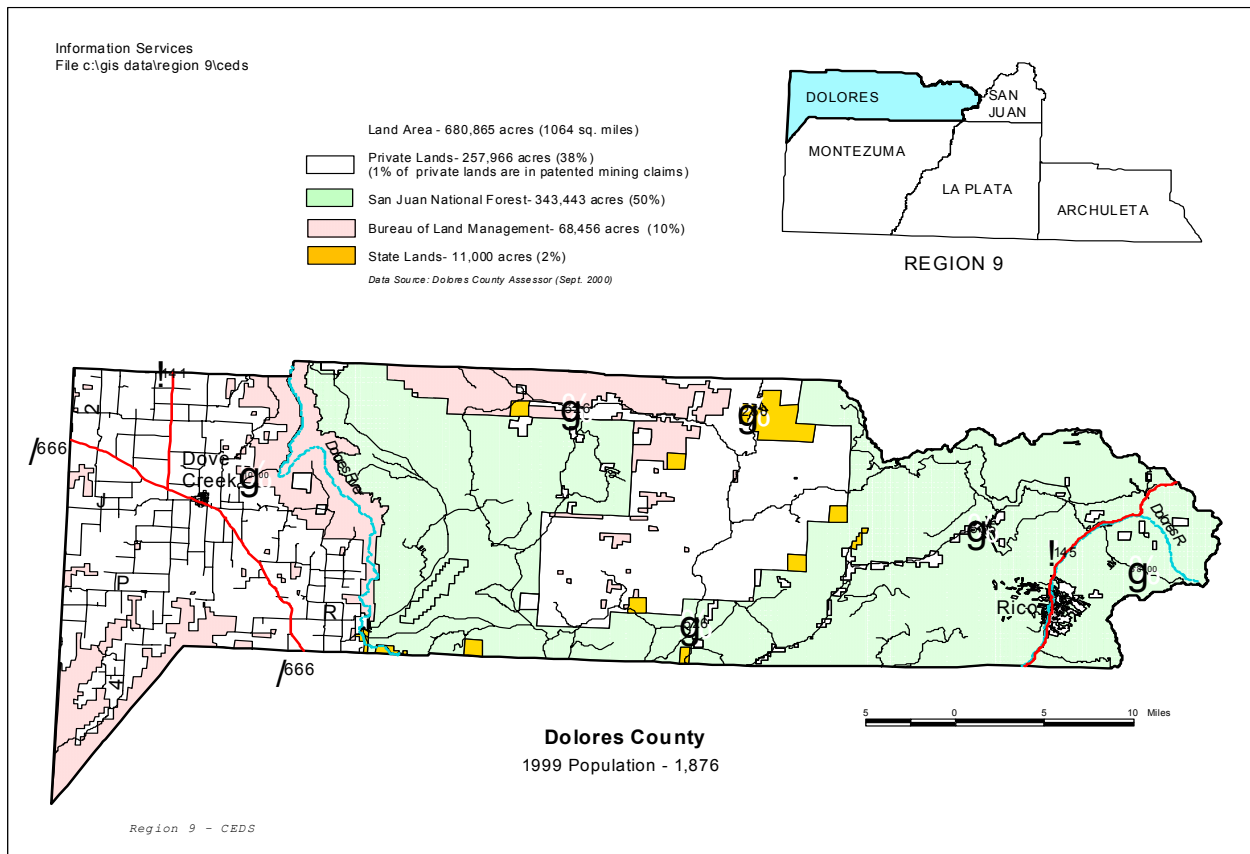
Prepared By Dolores County Predisaster Planning Committee:

I. Introduction

The Dolores County All Hazard Mitigation Plan was developed in accordance with the requirements of the Federal Emergency Management Agency (FEMA) Section 322 local hazard mitigation planning regulations as well as additional guidance documents provided by FEMA and the Colorado Office of Emergency Management. The goal of this plan is to assist Dolores County in reducing the human and economic costs of natural disasters. This plan provides a comprehensive risk assessment, vulnerability analysis, mitigation strategies, and implementation schedule for the county and each of the municipalities. At the request of the Dolores County Commission, this plan analyzes both natural and man-made hazards.

II. Description of Planning Area

Dolores County Colorado



◆ Dolores County is located in Southwest Colorado on the Utah border in the transition from high desert mesas to the high mountains of the Rockies. The economy is dominated by agriculture. The agricultural sector in Dolores County was built upon the production of dry land crops. Dove Creek is known as the "Pinto Bean Capitol of the World" for its long - standing production of high quality pinto beans. Historically, the mountainous (eastern) part of Dolores

County supplied timber to a number of small saw mills, and was the site of gold, silver, copper, lead, zinc and molybdenum mining in the Rico area.

Dolores County is comprised of 673,897 acres (1,052 sq. miles). Of these 58% are state and federal lands, and 42% are in private ownership. There are new regulations to establish a permitting process, and performance standards, for public review and approval of certain new development activities and land use changes within the unincorporated area of Dolores County. The performance standards are intended to ensure that new developments do not interfere with existing land uses, especially agricultural operations; and that they comply with a variety of existing county, state and federal regulations. Land use policies will need to be amended to include the PDM recommendations included in this plan

Dolores County has a very low population density and low per-capata income. Studies indicate (Operation Healthy Communities, OHC) has determined that in 1999 a minimum of \$7.84/hr provides a livable wage in Dove Creek, and about 81% of families would be able to qualify for a median priced home of \$37,000. A minimum of \$8.24/hr provides a livable wage in Rico, although only about 55% of families would qualify for a median priced home of \$102,400. About 56% of families could qualify for a median priced (\$92,250) home in rural Dolores County

III. Community Background

Dove Creek - Situated on the high intermountain plateau and valleys, western Dolores County was originally lush native grass that attracted settlers beginning in the 1870s. By 1910 open range and overgrazing had caused sagebrush to overtake native grasses in most of the area. In 1914 the Federal Government opened the area to homesteaders and dry land bean and wheat farming began in earnest. The lack of grass cover has made drought more severe and dry land farming more difficult. Exposed ground between sage brush has increased the potential for erosion and flash flood when the rains return to the inter mountain region. The region has been declared a drought disaster area 4 of the past 7 years.

Rico - Historically, the mountainous (eastern) parts of Dolores County supplied a number of small saw mills with timber, and was the site of gold, silver, copper, lead, zinc and molybdenum mining in the Rico area, beginning around 1869. In 1879 the discovery of rich, oxidized silver ore was discovered on Niggerbaby Hill, Blackhawk Mountain, and the west slope of Telescope Mountain. This led to the incorporation of the Town of Rico and a 320 - acre town site was platted out into streets and alleys.

The mining district had its ups and downs until 1926 when the Rico Company started to rebuild the mining industry. In 1937 the Rico Argentine Mining Company constructed a mill and eventually became the only surviving mining company of size. A sulphuric acid plant was constructed in 1953 and operated until 1965. At this time there were only about 300 people left in the town. From 1965 to 1971 the industry concentrated on lead and zinc mining and the population dropped to approximately 45.

At present the mining industry is non-existent and Rico is in the process of redefining its economy and future development plans. Anecdotal evidence is that Rico, with a current population of about 230 people, is beginning to grow again based largely on people who commute to Telluride or, which is undergoing rapid expansion as a Ski Town. Retirees and persons with discretionary income are becoming a more significant portion of the economy. Rico is also attracting crafts persons to the community including two black smiths, candle company, Mercantile store and others.

Rico has many multiple hazards from avalanche, landslides, floods, and land subsidence caused by mine shafts under the entire town. The Planning Commission and the Town Council has been aggressive researching hazards to the community and implementing appropriate ordinances to prevent new construction in flood zones, and avalanche chutes and out run areas. The there is no data or maps of the mineshafts under the town to allow the Rico Planning Commission and Town Council to develop zoning ordinances that respond to the subsidence problem. As soon as the information is available the town will enact appropriate policies.

Growth of Rico over the next 20 years is anticipated as land values go up

IV. Adoption Process and Documentation

The Dolores County All Hazards Mitigation Plan was developed as a multi-jurisdictional plan; therefore, to meet the requirements of Section 322 the final plan was be adopted by each of the municipalities as well as the county. This section documents the adoption process of each local government in order to demonstrate compliance with this requirement. The plan was adopted prior to being submitted to FEMA.

All Hazards Mitigation Plan Adoption Resolution

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Resolution # _____

Adopting the Dolores County, Rico and Dove Creek All Hazards Mitigation Plan

Whereas, County of Dolores, recognizes the threat that natural hazards pose to people and property; and

Whereas, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

Whereas, an adopted all hazards mitigation plan is required as a condition of future grant funding for mitigation projects; and

Whereas, Dolores County, Towns of Rico and Dove Creek participated jointly in the planning process with the other local units of government within the County to prepare an All Hazards Mitigation Plan;

Table 1. Dolores County PDM Steering Committee Membership

Name	Organization
Clyde Church	Facilitator, Dolores County Economic Development Specialist
Leroy Gore	Chairman Dolores County Commissioner
Dave Allen	Dolores County Land Use Commission
Ashton Harrison	Rico Town Manager
Irvin Frazier	Dove Creek Town Manager
Mike Bauer	Montezuma Water Co.
Mary Randolph	County Nurse Dolores Medical Clinic
Tim Rowell	County Sheriff
Jerry Sam	Deputy Sheriff
Tim Lestina	US Forest Service NRCS
Rod Holdon	Empire Electric
Bob Clayton	Kinder Morgan - Gas pipe line company
Doug Sparks	Empire Electric
Dan Ochaci	Colorado State Forest Service
Gary Jennings	NRCS –National Resource Conservation Service
Jim Saunders	Colorado Department of Transportation
Julie Stowe	Commissioners Secretary
Chuch Lurvey	Dolores County Water Co.
Pat Huskey	Dolores County Assessor

Table 2 Town of Rico Planning Commission

Tom Bennett	Chairman
Ashton Harrison	Rico Town Manager
Eric Heil	Rico legal council
Linda Yellowman	Member
Genevive Yellowman	Member
Dean Belch	Member
Jerrie Akey	Member
Kjersten Turner-Spitzman	Member

B. Risk Assessment and Mitigation Planning

One of the early acts of the Dolores County Project planning process was to begin a Risk Assessment conducted by the planning team as a whole to examine the community's risks and vulnerabilities to natural and man-made hazards. This committee, formed in June 2003, comprises representatives from federal, county, municipal, and private entities.

Most information has been collected from historical records and engineering studies commissioned by various organizations in the past. Dolores County flood maps are very old and little data exists on the detail nature of the steep mountain streams and rivers in the Eastern end of the county.

Due to recent federal regulations requiring local hazard mitigation plans, Dolores County decided to allocate the bulk of its funding and resources to hazard identification, risk assessment, and hazard mitigation planning activities. The Hazard Assessment and Mitigation Steering Committee was tasked with most of the activities related to the development of this plan and was

considered the Core Planning Team. Committee members have worked throughout the process from the initial kick off meeting to the final selection and development of the plan (see table below). Some organizations have dropped out because they felt that their infrastructure was not threatened, did not pose a safety or economic impact to county or town residents. Attendance at the meetings was low and prompted many one on one and small group meetings to meet the grant planning requirements and insure participation of the team members.

Table 3. Dolores County All Hazard Mitigation Planning Process Timeline

Date	Activity	Purpose
June 16, 2003	Kick off meeting with County Commissioners	For public officials and general public
June 26 2003	Partnerships formed with community Kick off meeting in Dove Creek, attendance 2 people	Establish Project partnership
July 9 2003	Risk Assessment/Mitigation Planning Committee formed Mitigation 101 Educational Workshop Attendance 8 people	Begin risk assessment and mitigation planning process Conducted for Risk Assessment/Mitigation Planning Committee
Jul 10, 2003	Contacted Rico Town Manager for information	For examples of hazard mitigation plans
July 14 & 15, 2003	Risk Assessment/Mitigation Planning Phone calls, collecting historical data	Data collection
July 16 to 22, 2003	Gather existing information from agencies	Data collection
July 23, 2003	Contacted USFS asking for participation in the planning process	Include County Fire plan and forest roads in the plan
August 4, 2003	<ul style="list-style-type: none"> Discussed PDM planning process with County Commissioners Presented PDM planning process to Dolores County Development Corporation 	<ul style="list-style-type: none"> Awareness of the planning progress and to increase participation Awareness of the planning process and to increase participation
August 5, 2003	Begin writing plan	
August 25, 2003	GIS software training	Attempt to use GIS map overlays and County Assessor property maps
September 3	PDM Steering Committee	Review GIS Capabilitiy
September 4, 2003	Added significant number of GIS layers funded by the Town of Rico	Review new overlays created discussion of the overlay in accuracy
September 5, 2003	Develop Historical disaster time line attempted, inadequate data and resources to build an accurate history back to the 1870's forward	Partial time lines documented, more accurate from 1950's to present
September 8, 2003	Status report to Dolores County Commissioners	Status report
	Risk Assessment/Mitigation Planning Committee (Core Planning Team) meeting	Focus on risk assessment – data collection, hazard identification
September 22, 2003	Meeting with Gary Jennings NRCS	Attempt to resolve GIS Issues
September 23, 2003	Risk assessment evaluation complete	
Sept 23 to 27, 2003	Plan development	
October 7, 2003	Rico meeting with town manager	Collect input and review plan draft
October 14, 2003	Rico Meeting with town manager	To review plan edits

Date	Activity	Purpose
October 15/16, 2003	Legal Notice in Rico Sun Times and Dove Creek Herald	Notification of public meeting
October 15, 2003	Risk Assessment/Mitigation Planning Committee (Core Planning Team) meeting	To present plan draft and obtain comments
October 15, 2003	Public Meeting Dove Creek	To present draft risk assessment and obtain comments
October 28, 2003	Rico Planning Commission and public meeting	To present draft risk assessment and obtain comments
October 29, 2003	Risk Assessment/Mitigation Steering Committee (Core Planning Team) meeting, by email and phone	Final plan Review
October 30, 2003	Draft Plan submitted to state	For review by core planning team
October 31, 2003	Final plan submitted to Dolores County	Final version with revisions incorporated
November 3, 2003	Dolores County Commission meeting	Presentation of draft plan and public meeting
November 13, 2003	Dove Creek Town Council meeting	Presentation of plan for adoption
May 2004	Rico Town Council meeting	Presentation of plan for adoption
December 1, 2003	Dolores County Commission meeting	Presentation of plan for adoption

C. Public Involvement

Throughout the process there were several opportunities for public input. All meetings were public and postings were made either at the Dolores County Court House or at the Rico Town Hall for Rico meetings or in the respective town newspapers. Meetings were held at different stages in the process: the first to announce the kick-off of the project during a regularly scheduled meeting of the County Commissioners to describe the planning process; the second to present the draft plan. Each of the meetings was advertised through legal notices in the local newspaper, or legal postings. Copies of the risk assessment and draft plan were made available for the public at various viewing locations in the county and the municipalities. Information about the planning process and copies of planning documents were also made available on the Dolores County Court House and at the Rico Town Hall. Comments were solicited at each meeting and contact phone numbers were posted with the document to contact the committee. All comments that have been received to date from the public have been reviewed and incorporated into the final version of the plan as appropriate.

When committee members could not make the meetings and input from that member was critical they were copied on the output of the meeting and / or personally visited at their office.

VI. Risk Assessment

Risk assessment is the process of identifying the hazards and measuring the potential loss of life, personal injury, economic injury, and property damage resulting from natural or man-made hazards. The results of this risk assessment assist Dolores County and towns in identifying and understanding their risks from natural and man-made hazards. This information also serves as the foundation for the development of the mitigation plan and strategies to help reduce risks from future hazard events.

This risk assessment followed the methodology described in the FEMA publication 386-2 “Understanding Your Risks – Identifying Hazards and Estimating Losses” and was based on a four-step process: 1) Identify Hazards, 2) Profile Hazard Events, 3) Inventory Assets, and 4) Estimate Losses. Using FEMA guidance, as well as the Section 322 regulations for developing local hazard mitigation plans The steering Committee has developed a risk assessment that identifies:

- ◆ ◆ The hazards to which the county and its communities are susceptible.
- ◆ ◆ The impact of these hazards on physical, social, and economic assets.
- ◆ ◆ The areas within the county most vulnerable to these hazards.
- ◆ ◆ The potential costs of damages or costs avoided through future mitigation projects.

A. Hazard Identification

The first step in the risk assessment process was to identify each of the hazards that can occur within Dolores County and its towns. This hazard identification process began with a review of previous hazard events based on historical data provided by the Dolores agencies from town records, engineering studies and reference photography books. The goal was to understand the nature and extent of natural and man-made hazards in the county (see history below). In addition to these resources the planning team also conducted hazard identification and prioritization exercises (see table 4 below). The findings from these steps were utilized to determine the priority hazards for Dolores County and its municipalities, which will become the focus of the mitigation strategies developed in the remainder of this plan.

Hazard History

Past occurrences of hazard events are likely predictors of future events. A review of the hazard history of Dolores County, therefore, helps to provide a better understanding of what hazards the county is susceptible to. Detailed descriptions of the historic hazard events, including information on losses of life and property, as well as estimated damages are historical and antidotal. Below are summaries of the major events by hazard type based on information that was available during the development of this plan.

The worst hazard events experienced in Dolores County were incidences of flooding resulting from heavy rains, snow melt, avalanches and land slides.

Rico Disaster Time Line

1911 – Dolores River Floods washing out Rio Grand and Southern rails and rail yard

1912 - Snow plow derailed by avalanche, RG& Southern in Burns Canyon

1912 - Avalanche destroys rail trestle at Nigger Baby Hill (bridge 66A that was 18' High)

1915 - Winter avalanche derails snow blower locomotive and coal car

1932 – Snow slide north of Rico closes rail service and knocks down telegraph pole

1936 – Snow plow derailed and buried on Nigger Baby hill

1991 - Silver Creek flooding reaches mineshaft and fills the mine with water causing mine subsidence in Rico, some home damage.

2003 – August, Corps of Engineers estimate 6” rain in 90 minutes fills Dead Wood Creek with boulders and debris 25’ wide X 8’ deep and 700’ long causing flooding in Sundial subdivision. The debris came within 30 feet of the highway culvert down stream.

Dove Creek Disaster History

1972- Heavy rains washed out 800 feet of 8” inch water main and feeder lines along Dove Creek.

August 21, 1984 - Heavy rain washed out and plugged water culverts in Dove creek in an unnamed wash that runs through town. Some roads were breached during the storm and others following to remove debris from the area. Property damage was avoided by rapid response from the town road crew clearing the watercourse.

Context of the Hazards

Winter Storm - Rico

Severe winter storms are more common in the eastern end of the county due to the high elevation, which significantly increases snowfall and the colder temperatures, reduces snow melt. Elevations in Eastern Dolores County range from approximately 7000 feet to 13,000 feet at the mountain summits.

Avalanche – Rico

Significant avalanche history, photographs and GIS slope and engineering studies indicate that portions of Rico are at risk, Debate continues as to the specific lots affected due to questions about the overlay accuracy of the GIS layers. An estimated 25 properties, homes and businesses lie in the identified avalanche chute and out run areas.

The road along the west fork of the Dolores River has many avalanche chutes and steep slopes. There is a high risk of the community of Dunton being isolated for several days without services or emergency evacuation routes. See attached Avalanche map of the Rico area.

Land Slides

Rico has slopes of 30 to 40% and rock land slides. The entire town is built on an alluvial fan formed by Silver Creek and Dead Wood Creek. No formal assessment has been conducted beyond the work conducted by Wilbur Engineering. See the attached geologic hazard map of Rico.

Earth Quake

USGS and local experience indicates that while earthquakes occasionally occur the magnitude is very small and not a concern to county residents unless they coincide with heavy snowfall and rains which could trigger avalanches or rock slides.

Tornado

Dolores County has experienced two recorded incidences of tornado touchdowns. The most recent tornado occurred in 1989 and neither event resulted in any major damage or deaths.

Wind Storm

Dolores County has also experienced high windstorms not associated with tornado events. According to the materials provided by the Dolores County Coordinator, the county has experienced two high wind events within the last five years.

Severe Thunderstorm and Hail

According to the records provided by the Dolores County Emergency Manager for this risk assessment, Dolores County has experienced at least one severe thunderstorm event. Summer thunderstorms annually damage. One thunderstorm washed out 800 feet of city water line.

Technological Hazards

Dolores County has experienced one recent technological hazard event involving the transportation of hazardous materials (ammonium Nitrate Fertilizer), which resulted in no injuries or deaths and only minor property damage. Western Dolores County has straight wide highways but the state highway in the Rico area is narrow and is very winding as it climbs through the Dolores River Valley rising from approximately 7500 feet to over 10,000 at the Lizard Head Pass summit. The terrain and the confinement of the narrow valley present a confinement hazard for volatile materials in transit through the region.

The proximity of the highway to the Dolores River also presents containment issues for liquids spilled into the river. The river in this region has a steep grade and is confined by a narrow canyon.

VII. Priority Hazards

The historical hazard information provided insight into some of the high priority hazards that should be included in the plan. The rationale for selecting these hazards is described in greater detail below. Additional hazards were also identified and prioritized through an exercise that was conducted with the Core Planning Team and the Dolores County Hazard Steering Committee. In both exercises the participants were asked to identify natural and man-made hazards that occur in Dolores County and rank the selected hazards from highest to lowest priority. The results of those exercises are included in Appendix A of this document. The table below provides a summary of how the priority hazards were determined using a combination of historical occurrences, public perception of hazard risk, and the probability of future occurrence based on other technical resources.

Table 4. Prioritization of Hazards for Dolores County

Hazard	Probability of Occurrence	Public Perception of	Historic Occurrence	Sources
Thunderstorms and lightning	M	M	Yes	NWS / AES / ES
Floods	H	H	Yes	NRCS/ AES /ES
Severe Winter Storms	H	H	Yes	NOAA AES /ES
Windstorms	L	M	Yes	ED and DDR / AES
Hurricanes	N/A	N/A	No	N/A
Drought	H	H	Yes	USDA/ NRCS/ AES
Tornados	L	L	Yes	NWS and county records
Hail Storms	H	H	Yes	NWS /AES and county history
Extreme Summer heat	M	M	Yes	AES /Dove Creek weather station
Wild Fire	H	H	Yes	USFS/ CSFS/ ES
Land Subsidence	H	H	Yes	Rico News Paper/ town records
Land slides	H	H	Yes	USGS/ ES/ NRCS and Churis Wilbur Engineering Study
Earth Quakes	L	L	Yes	USGS
Avalanche	H	H	Yes	USGS / NRCS and Churis Wilbur Engineering

				Study
Fire	H	H	Yes	DCV Fire Department and Rico Fire Department
Hazardous material spills	L	H	Yes	Colorado State Patrol/ CDOT/ ES
Terrorism	N/A	N/A	N/A	N/A
Dam Failures	L	L	No	ES / Water Board
Nuclear accidents	N/A	N/A	N/A	N/A

Key: H=High, M=Medium, L=Low, N/A=Not applicable or no historical records available, ES= Emergency services, DCRD=Dolores County Road Department, NWS=National Weather Service, CDOT=Colorado Department of Transportation, USGS= United States Geological Survey, AES= Agricultural Extension Service of Colorado State University Service, USFS= United States Forest Service, NRCS= National Resource Conservation Service,

Based on these findings and the results of technical research the following hazards were selected as priority hazards for Dolores County: Floods; Landslides; Wildfires; Land Subsidence; Severe Winter Storms; Windstorms; Drought and Avalanche.

A. Profile of Hazard Events

The second step in the risk assessment process was to create a profile of each of the priority hazards in Dolores County. This analysis assisted in determining the potential damages in the county from natural and man-made hazards. This portion of the risk assessment was attempted through the use of Geographic Information Systems (GIS) software to develop maps that show the geographic locations for some of the priority hazards. Maps were developed for flooding, landslide, and avalanche using existing data and maps provided by NRCS, County Auditor and engineers under contract to the Town of Rico. The remaining priority hazards are described in narrative form due to data limitations or an inability to map the geographic extent of the hazards.

1. Mapped Hazards

a. Floods

Flooding is defined as a general and temporary condition of partial or complete inundation of normally dry land areas from: the unusual and rapid accumulation or runoff of surface waters from any source; or mudflows or the sudden collapse of river banks. Flooding is arguably the highest priority natural hazard in Dolores County. This is largely due to the physical geography of the county, which includes the Dolores River and creeks as well as a varied topography.

Located in a transition zone between the high southwestern desert on the west side of the county to the mountains of the eastern portion the county sometimes reaching 13,000 feet, Dolores County is separated into two major zones. Channel slopes within Dolores County vary widely

from over 1800 feet per mile drop to the slower grade of the Dolores river of 80 feet per mile in the Rico area to 18.5 feet per mile as the river passes north out of Dolores County. From the mountains around Lizard Head Pass where the Dolores River begins to Rico there are 19 streams that enter the Dolores River. All streams have a significant water carrying capacity and very steep slopes. The total estimated size of the Dolores River drainage basin above Rico is ~75 square miles or ~48,000 acres. The most significant tributary is Silver Creek that has a history of flooding and has caused the destruction and damage to buildings in Rico during the 1911 flood and more recently contributed to mine shaft flooding under the town and land subsidence that has been observed in the town. See FEMA map of Rico Colorado.

Identification of floodplain areas within the county and towns was partially based on the most recent (1978) Flood Insurance Rate Maps (FIRM) produced by FEMA. Since 1978 rock and debris flows have changed some of the stream courses and elevations. The Town of Rico has commissioned two studies, first by Chris Wilbur of Wilbur Engineering and secondly mapping study by Computer Terrain Mapping Inc. It may be necessary to purchase land from owners and relocate those willing to safer areas. Other options to develop a rapid flood and avalanche warning system for steep mountain flooding has been offered.

Dove Creek storm in the early 1970's washed out 800 feet of city water main and feeders along Dove Creek. The Dove Creek drainage basin above the town is approximately 4800 acres and runs NNE 7.3 miles to the upper rim of the Dolores River. The elevation drop over the 7.3 mile course is 1083 feet as it reached the Town of Dove Creek. While this drainage basin is relatively small its vegetative cover is primarily sagebrush and small tufts of grass making the region prone to flash flooding and run off during heavy or severe thunderstorms. Some homes also have been constructed during the 1930's to 1970's on the banks of the present wash within the natural levee of the creek. These older homes and their inhabitants are a concern and could be candidates for relocation based on further studies of the stream and flood plain.

Dove Creek has an unnamed seasonal wash that washed out culverts and roads in August 1984. The water came down so fast that it could not drain off through debris that had collected from the storm. This wash drops approximately 60 feet over one mile as it passes through town. The drainage basin is approximately 600 to 700 acres of high desert.

The FEMA Map of the Town of Dove Creek, Colorado has a penciled in location of this unnamed wash. The wash joins Dove Creek about ½ mile south of town in a constructed wet lands. The replacement cost of the culverts and roads in 1984 dollars was \$8896. The town wants to install a storm culvert to carry storm water safely across town.

Some properties and homes lie in the identified flood plain but others in the towns and county are in flood prone areas that are of concern in the county, Rico and Dove Creek. One of the planned actions is the re-surveying of the Dolores River flood plain and flood prone areas above and around Rico and Dove Creek.

b. Wild Fire

Wild fire is defined as a forest, brush or grass fire anywhere in the county. Areas of the county that are especially susceptible to wild fire are the south flanks of the mountains that are exposed

to intense sun and daily warm rising thermal winds. This is an area covered with juniper, pinyon, fir, aspen and ponderosa pine. After decades of fire suppression, accumulating dead debris on the forest floor has increased the risk of fire that can become severe during drought periods. A total of 85 wild fires have been recorded on the NRCS fire location GIS feature within Dolores county during the time period reflected on the feature.

Additional education, communications is needed among agencies and the public. Fire districts need to be formed in the rural mountain areas of the county where resorts, cabins and summer homes. Fire mitigation efforts need to be accelerated and formalized as county policy to reduce wild fire damage especially in the wild urban interface.

c. Land Subsidence

The term land subsidence (commonly known as mine shaft cave-ins) refers to any failures in the ground that cause collapses in the earth's surface. Land subsidence can be caused by natural processes, such as the mineshaft flooding, dissolving of limestone underground, an earthquake, or volcanic activity. It can also be the result of human actions such as withdrawal of subsurface fluids or underground mining.

In Dolores County the presence of abandoned mine shafts and ground water sources increases the possibility of land subsidence. Areas that are potentially susceptible to land subsidence are located under the entire Town of Rico and surrounding area. Potential land subsidence areas were determined based on old mining claims dating back to the 1880's. Mine location information does not provide accurate information and few of these old mines have ever been mapped.

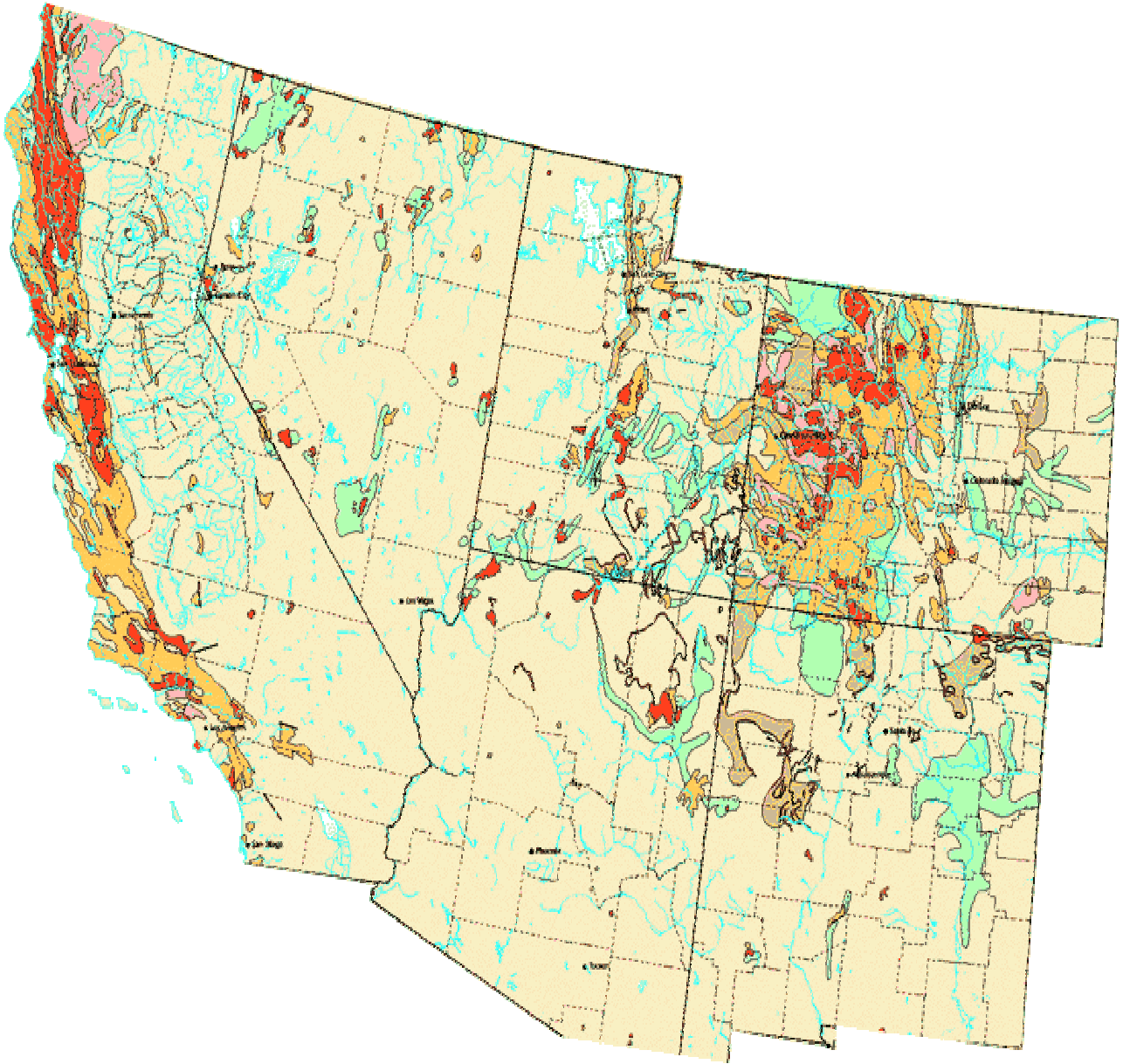
To determine the area of potential risk surrounding the Mines a GIS survey is needed to determine public policy, safety measures, land purchases, evacuation policies and procedures. The recorded maximum horizontal length, width, depth, latitude, longitude and overburden type of the mines needs to be determined to evaluate the area of risk. To this extent the areas of risk include more land than may actually be at risk from land subsidence. A more detailed geologic study of the areas above the mines is required in order to truly determine the level of land subsidence risk in these areas, which was not included in the scope of this work.

d. Landslide

Landslides are defined as any downward movement of a slope and materials under the force of gravity. The term landslide includes a wide range of ground movement, such as rock falls, deep failure of slopes, and shallow debris flows. Landslides are influenced by human activity (mining and construction of buildings, railroads, and highways) and natural factors (geology, precipitation, and topography). Landslides occur when masses of rock, earth, or debris move down a slope. Therefore, gravity acting on an overly steep slope is the primary cause of a landslide. Storms, fires, or human modifications to the land typically activate landslides.

A review of a national landslide hazard map produced by the United States Geologic Survey (USGS) was used to identify landslide risks in Dolores County. Information from USGS was used to produce an overlay in GIS for Dolores County that describes the level of landslide risk

throughout the county and is depicted below and on the detailed map “Geologic Hazards” attached. According to this analysis the northeastern corner of Dolores County including Rico area is considered a High landslide risk with slopes in the 30 to 90% range. The remainder of the county is characterized as either a medium or low landslide risk. The County areas along the upper Dolores River and the Rico to Dunton road fall in the medium landslide risk category, whereas Dove Creek is considered a low landslide risk area. The level of detail of the map below provides a general understanding of landslide hazard risks in Dolores County for planning purposes. As the topography and underlying geology have the greatest influence as to whether a landslide will occur and additional studies would be required to determine the actual vulnerability to structures at individual sites within the high or medium risk areas. The Dunton road to Rico is of special concern due to soil type and steep grades. This road connects the mountain resorts and summer homes to town. An inventory of at risk buildings could not be conducted at this time but will be conducted as part of the action plan.

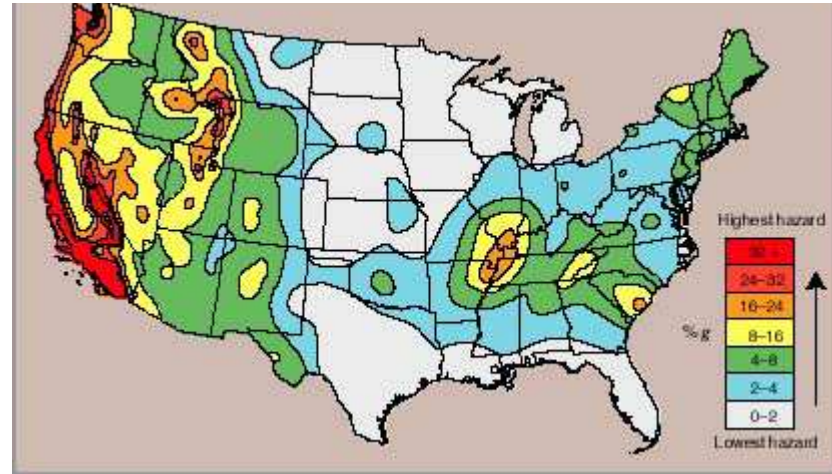


e. Earthquake

An earthquake is a sudden motion or trembling that is caused by a release of strain accumulation within or along the edge of Earth's tectonic plates. The severity of these effects is dependent on the amount of energy released from the fault or epicenter. The effects of an earthquake can be felt far beyond the site of its occurrence. Earthquakes usually occur without warning and after just a few seconds can cause massive damage and extensive casualties. Common effects of earthquakes are ground motion and shaking, surface fault ruptures, and ground failure.

Peak ground acceleration (PGA) is a measure of the strength of ground movements. The PGA measures the rate in change of motion relative to the established rate of acceleration due to gravity. Based on the national map provided by the USGS (Figure 1)^[1] that shows the PGA values for areas with a 10% chance of being exceeded over 50 years. Dolores County has an earthquake risk as it is located in the 8 to 16%g area. According to FEMA, areas with a 3%g PGA or more are considered to have a moderate to high earthquake hazard risk and should consider earthquake hazards when developing hazard mitigation plans. In Dolores County, however, the earthquake risk is relatively high compared to other portions of the state. While the probability of an earthquake is high the magnitude of past earthquakes is generally low.

Figure 1. USGS Conterminous US Seismicity Map, 2002



f. Technological Hazards

The term technological hazard refers to the origins of incidents that can arise from human activities such as the manufacture, transportation, storage, and use of hazardous materials. For the purposes of this risk assessment it is assumed that technological emergencies are accidental and that their consequences are unintended.

Hazardous materials incidents typically take two forms, fixed facility incidents and transportation incidents. The major difference between the two is that it is reasonably possible to identify and prepare for a fixed site incident, because laws require those facilities to notify state and local authorities about what is being used or produced there. Transportation incidents are substantially harder to prepare for, however, because it is difficult to determine what material(s) could be involved until the accident actually happens.

In order to profile the technological hazards in Dolores County information was compiled on the locations of facilities that store hazardous materials. Based on records provided by the Dolores County Emergency Services there are 3 facilities in the county that store hazardous materials, 1 that stores extremely hazardous substance liquid propane. Due to the past response of the HASMAT team responding to an ammonia nitrate spill and the report from the CDOT along with the difficulty in predicting truck crashes or pipeline breaks the steering committee felt the west end of the county was adequately prepared to respond to a hazardous spill.

Rico area is more prone to truck transit spills due to the narrow winding roads in the Dolores River Canyon and the higher elevation and more frequent snow fall. The severity of a spill is also

higher due to confinement in the steep canyons, the flowing river and long distance for a response team to travel from Cortez Colorado.

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g. Terrorism

The term terrorism refers to intentional criminal and malicious acts. For the purposes of this risk assessment terrorism refers to the use of Weapons of Mass Destruction (WMD), including, biological, chemical, nuclear, and radiological weapons; arson, incendiary, explosive, and armed attacks; industrial sabotage and intentional hazardous materials releases; and cyber terrorism. Due to the very rural nature of Dolores County and the absence of any industrial, military or large public buildings the county was deemed a very low priority target for terrorism.

h. Multiple Hazard Areas

For the purposes of analysis a composite hazard map was developed that illustrates the areas of the county that are subject to more than one of the previously described mapped hazards. The most notable is the Avalanche; land Subsidence, landslide and flash flood hazards in and around the town of Rico from south of the Sundial Development to the Dolores County border at Lizard Head Pass. The Rico Planning Commission could not reach agreement on the accuracy of the present GIS maps and is not included in this report. The mapping has been added as a task in the plan to refine the accuracy.

2. Non-Mapped Hazards

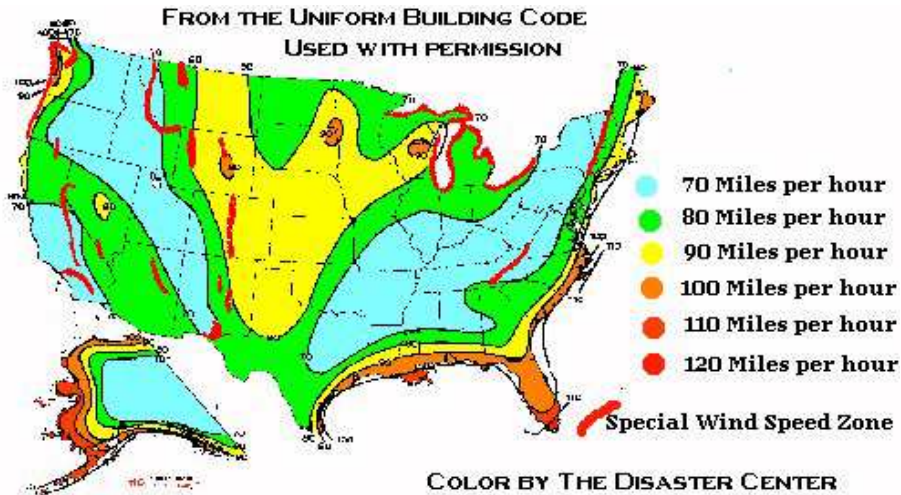
a. Severe Winter Storm

Winter storms vary in size and strength and can be accompanied by strong winds that create blizzard conditions and dangerous wind chill. There are three categories of winter storms. A blizzard is the most dangerous of all winter storms. It combines low temperatures, heavy snowfall, and winds of at least 35 miles per hour (mph), reducing visibility to only a few yards. A heavy snowstorm is one that drops 4 or more inches of snow in a 12-hour period. An ice storm occurs when moisture falls and freezes immediately upon impact. For the purposes of this risk assessment, it is assumed that all of Dolores County is has experienced severe winter storms but the eastern half of the county above 7500 feet elevation is at especially high risk from severe winter storm events.

b. Severe Wind Storms and Thunderstorms/Lightning

A severe thunderstorm as defined by the National Weather Service is a storm with hail equal to or greater than 3/4" in diameter or convective wind gusts equal to or greater than 58 mph. Lightning and general thunderstorm wind gusts pose a threat to life and/or property. Severe thunderstorms also have the potential of producing a tornado with little or no advanced tornado warning. Based on historical evidence it is assumed that all of Dolores County is at risk and the Eastern half of the county is considered a high-risk area and experiences frequent mountain thunderstorms and lightning.

According to this map the entire state of Western Colorado is located in the green zone, which is an area associated with up to 70-mph wind speeds.



Even though we have wind speed data we cannot predict the locations of this hazard but only its probability of occurring and velocity

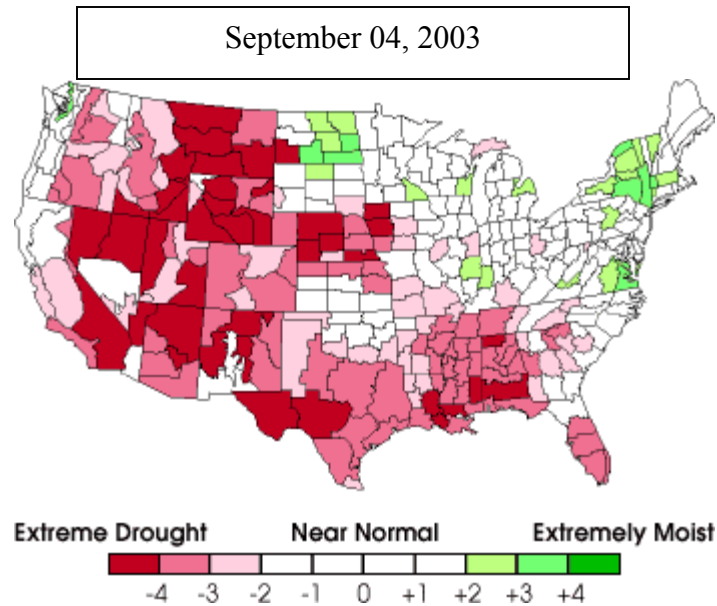
c. Tornadoes

A tornado is a violently rotating column of air extending from a thunderstorm to the ground. The most violent tornadoes are capable of tremendous destruction with wind speeds of 250 mph or more. Damage paths can be in excess of 1 mile wide and 50 miles long. Tornadoes are among the most unpredictable of weather phenomena. Tornadoes can occur in any state in the U.S. but are more frequent in the Midwest, Southeast, and Southwest.

The western part of the country experience 2 tornadoes without any property damage or injury. For planning purposes tornados were not considered.

d. Drought

Drought refers to an extended period of deficient rainfall relative to the statistical mean for a region. Drought can be defined according to meteorological, hydrological, and agricultural criteria. Meteorological drought is qualified by any significant deficit of precipitation. Hydrological drought is manifest in noticeably reduced river and stream flow and critically low groundwater tables. The term agricultural drought indicates an extended dry period that results in crop stress and harvest reduction.



The Palmer Drought Severity Index (PDSI) is a widely used measure of drought in the United States to track moisture conditions. The PDSI is defined as “an interval of time, generally in months or years in duration, during which the actual moisture supply at a given place rather consistently falls short of the climatically expected or climatically appropriate moisture supply”. Dolores County has been a federally declared drought disaster 4 of the past 7 years and in an extreme drought currently. The drought is aggravated by a shortage of irrigation water ditch capacity and the decreasing run off into the regions reservoirs used for irrigation..

VIII. Capabilities Assessment

The capability assessment describes the legal authority vested in local governments to pursue measures to mitigate the impacts of natural hazards. This capability assessment focused on the evaluation of Dolores County’s, Dove Creek’s, Rico’s and the other committed planning and implementation agencies and governments on the steering committee to use existing programs and policies to determine what vehicles are already in place to support mitigation activities. These policies and programs were identified based on a review of existing plans and programs for the county and each of the towns. Programs or regulations that related to mitigation or supported mitigation activities were selected and rated high, medium, or low based on their effectiveness for mitigation. Authority and span of control were deemed adequate to achieve the attached action item list. Limitations were identified as inadequate funding, no county level Predisaster Coordinator or planner.

X. Results

The results of the capability assessment help to provide the framework for developing recommendation for specific mitigation actions. It also helps to identify shortfalls in the local government capabilities as well as draw attention to existing successes. The capability assessment was analyzed then used to rank the mitigation strategies according to the capability of the county or the municipalities to implement the actions.

The table also outlines the needed areas for policy development, program development and action plans. Funding short falls were also identified where capability does not exist or additional data is needed.

XI. Vulnerability Estimating Potential losses

In October 2002 Dolores County purchased and received ArcView, a GIS information software package and has contracted with an engineering firm to bring the County Assessors Office database of properties and land values on line. Due to correlation and accuracy of the Rico Engineering studies to the County Assessors maps the financial impact could not be completed as planned but is a planned task for this plan under several areas.

XII. Implementation, Monitoring and Evaluation of the Plan

The “Coordinating Organizations have committed to work together to implement the plan as outlined in the planning table attached. Dolores County will take the lead to coordinate the over all plan as identified in Multi Hazard Action Plan. Other agencies will take action items within their sphere of influence and control. Coordination of plans, response and communications to the public will be especially important in the Rico – Dolores River Valleys and the heavily traveled highway 491 corridor from Moab Utah to Cortez to the south.

. This plan proposes changes in land use through education, collaboration and coordination of programs between agencies and departments and deployment as policy in the participating jurisdictions and agencies. We also anticipate involving the regional economic development loan fund to implement some of these proposals through the private sector.

The Dolores County Pre Disaster Mitigation committee will identify, improve and sustain collaborative programs focusing on real estate and insurance industries, public and private sector organizations and individuals to avoid activity that increases risk to natural hazards.

All Dolores County Pre Disaster planning meetings will be open to the public and posted at the Dolores County Court House or Rico Town Hall. Annual meetings will be held to review the plan implementation progress and assess the need for revisions to the plan as needed. The Dolores County Economic Development Specialist will monitor the plans implementation and report quarterly to the Dolores County Commissioners on the progress and revisions to the plan.