LINCOLN COUNTY ALL HAZARD MITIGATION PLAN

August 2012

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Lincoln County, New Mexico

ALL HAZARD MITIGATION PLAN

August 2012

Prepared for:

Lincoln County Mitigation Planning Group

Office of Emergency Services

Assisted by:

ecology and environment, inc.
Celebrating 40 Years of Green Solutions

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Introduction

Across the United States, natural disasters have led to mounting levels of casualties, injury, property damage, and disruption of business and government services. The effect on families and individuals can be enormous and damaged businesses cannot contribute to the economy. The time, money and effort in responding to and recovering from these events redirect public resources and attention from other important programs and problems.

For Lincoln County, this experience is recent and directly felt through major events such as the flooding in the Rio Ruidoso Valley of July, 2008. During the summer months of July and August, smaller events led to more commonplace disruptions such as flooding of bridges and roadways challenging access to those homes and businesses in the Village of Ruidoso and beyond these impasses. Some events, such as droughts and heat waves present more subtle indirect impacts to the communities of Lincoln County.

The elected and appointed officials of Lincoln County know that mitigation actions in the form of projects and programs can become long-term, cost effective means for reducing the effects of natural hazards.

The goal of mitigation is to save lives, reduce injuries, property damage and recovery times. Mitigation can reduce the enormous cost of disasters to property owners and all levels of government. In addition, mitigation can protect critical facilities, reduce exposure to liability and minimize community disruption. Preparedness, response, and recovery measures support the concept of mitigation and may directly support identified mitigation actions.

The Lincoln County Hazard Mitigation Plan utilizes a multi-agency planning process to identify hazards that can affect the county and to devise mitigation strategies to reduce or eliminate the effects of those hazards. It draws upon the State of New Mexico's Hazard Mitigation Plan which provides guidance to local governments in preparing their own mitigation plans by prioritizing mitigation goals and objectives, proposing solutions to certain mitigation problems, and identifying possible funding sources for mitigation projects.

This plan has been prepared in compliance with Section 322 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act), 42 U.S. C. 5165, enacted under Sec. 104 the Disaster Mitigation Act of 2000, (DMA2K) Public Law 106-390 of October 30, 2000. This plan identifies hazard mitigation measures intended to eliminate or reduce the effects of future disasters throughout the county. DMA2K requires rigorous local and state mitigation planning as a condition of receiving grant funding for disaster recovery and mitigation.

The plan was prepared by Ecology & Environment, Inc., of Baton Rouge, LA, for the version of the plan. This work was partially funded by FEMA.

This plan does not necessarily represent the views, policies, and procedures of FEMA, although all attempts have been made to comply with common mitigation policies, procedures, and methods employed throughout the country.

Lincoln County will continue to comply with all applicable federal laws and statutes during the periods for which it receives grant funding, in compliance with 44 CFR 13.11(c), and will amend this plan whenever necessary to reflect changes in state or federal laws and statutes as required in 44 CFR 13.11(d).

It is important to note that this document is designed as an instrument of mitigation primarily for natural and man-made disasters.

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Adopting Resolution

[INSERT UPDATED RESOLUTION]

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Distribution List

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1 County Profile

1.1 Location and Geography

Lincoln County is located in the south central portion of the State of New Mexico in the southwestern region of the United States. Lincoln County is bordered Torrance and Guadalupe Counties to the North, De Baca County to the Northeast, Chaves County to the East, Otero County to the South, Sierra County to the Southwest, and Socorro County to the West (see Figure 1). The County's total land area is approximately 4,831 square miles.

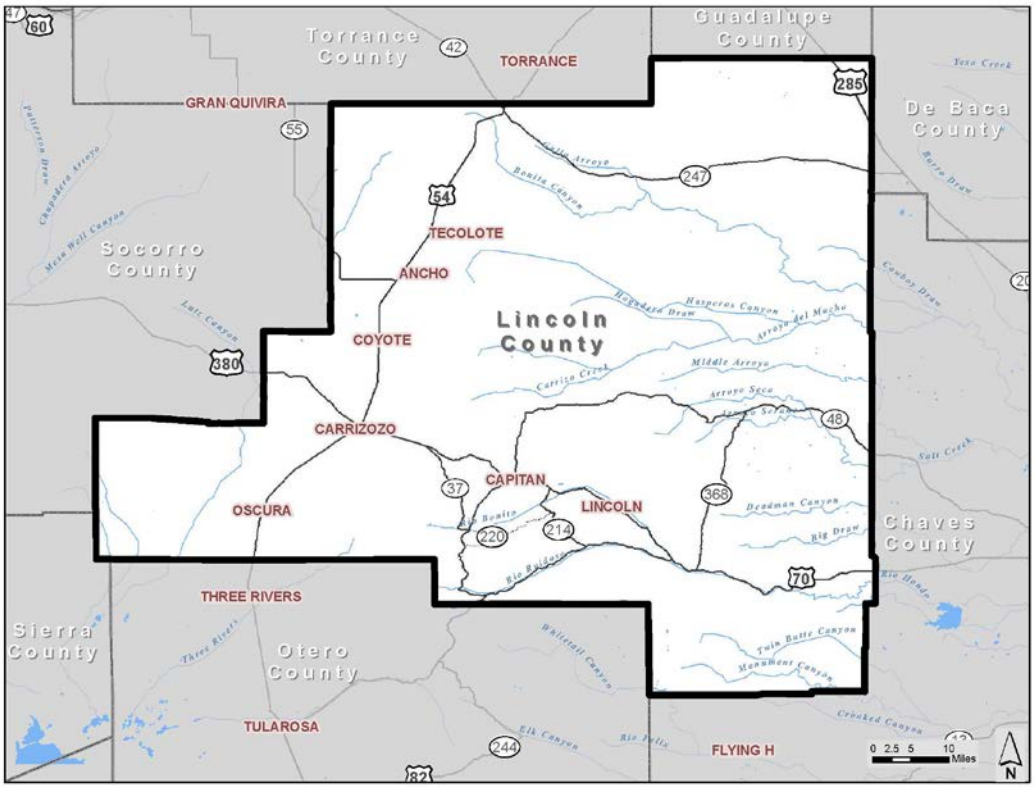

Figure 1 Location of Lincoln County

The terrain in Lincoln County varies from relatively flat prairie lands and rolling foothills to high mountain peaks. It is a rugged region in the Basin and Range Province, with green hills and large plains surrounding and separating high mountain ranges. The plains are eroded, with canyons and the beds of dry streams; the tree-covered mountains include the Sierra Blanca, Sierra Oscura, Gallinas (with 8,615-foot Gallinas Peak), Jicarilla (with 9,650-foot Carrizo Mountain), and Capitan (with 10,083-foot Capitan Peak). Much of southwestern Lincoln county is covered by the Malpais, a region of lava beds that originated from Little Black Peak. Valley of Fires National Recreation Area is in the Malpais.
http://www.britannica.com/EBchecked/topic/341673/Lincoln

1.2 Climate

Summertime high temperatures range in the 80s Fahrenheit (°F) with lows in the 40s and 50s °F. Winter temperatures vary from highs in the upper 40s and 50s °F; lows in the 20s °F. The assessment area has over 300 days of sunshine per year. Average annual precipitation is 22 inches around Ruidoso and 15 inches around Corona. The majority of precipitation is received during summer months. Snowfall in Ruidoso and Corona, is 38 and 44 inches, respectively.

Average Monthly Climate Summary for the Villages of Ruidoso and Corona
(January 1914–June 2006)

Climate Attribute	Month												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Ruidoso													
High Temperature (°F)	49	52	57	65	74	82	81	79	75	67	57	50	66
Low Temperature (°F)	19	20	24	29	35	43	48	48	41	32	23	19	32
Average Total Precipitation (inches)	1.1	1.1	1.1	0.7	0.9	1.02	3.8	4.2	2.5	1.6	0.9	0.6	21.5
Corona													
High Temperature (°F)	42	48	55	64	70	81	82	79	73	65	52	45	63
Low Temperature (°F)	18	21	26	32	40	50	54	54	48	36	27	19	35
Average Total Precipitation (inches)	0.8	0.8	0.7	0.4	1.3	1.1	1.9	2.6	1.8	1.2	1.0	1.2	14.8

Source: National Weather Service

1.3 Economy

Important economic values are year-round recreational resort facilities, tourism, historical communities and buildings, Ruidoso Downs, site seeing, nearby Mescalero Apache Reservation, and retirement communities. Ecological values include such things as watersheds, wildlife and aquatic habitats, rangeland

grazing, forest products, and viewsheds. The Bonito and other watersheds are water sources for communities inside and outside of the county. Important infrastructure includes such things as U.S. Highways (54, 70, 285, and 380), county roads, a railroad, communication towers, communities, watersheds, ski area, and historical communities

Major Employers

Services, retail trade, and construction provided the most number of jobs in Lincoln County in the past. Major employers include several companies in the hospitality and recreation industry, the health care sector, construction, as well as local government.

The Mescalero Apache tribe is the largest employer of Lincoln County residents, though it is actually located in Otero County, bordering Ruidoso to the south. The tribe provides up to 1,500 jobs, depending on the season, for the operation of the Inn of the Mountain Gods hotel, golf course, and casino and the Ski Apache resort. The nearby Ruidoso Downs Racetrack and the Billy the Kid Casino together provide an additional 600 to 1,250 jobs.

The local government and related services are other important sources of jobs. Ruidoso Municipal Schools has 452 employees, while the Village of Ruidoso provides 200 jobs, and Lincoln County provides 115. Meanwhile, the Lincoln County Medical Center employs nearly 250 people. Finally, the Wal-Mart Super Center, located in Ruidoso Downs, has the capacity to employ up to 350 people, and Sierra Blanca Constructors provides between 100 and 250 jobs.

Tourism

Tourism is also a major part of the economy of Lincoln County. Visitors are drawn to the cultural and historic significance of the County, which lays claim to Billy the Kid and Smokey Bear, as well as the natural beauty and associated recreational activities such as skiing, hiking, and fishing. Lincoln County is well-known for its “Wild West” heritage, specifically the so-called Lincoln County War of 1878, which led rise to the gunslinger Billy the Kid and his famed escape from the Lincoln County Courthouse in 1881. Visitors can learn about these events during Old Lincoln Days, held in August in the town of Lincoln. This one-street town is a National Historical Landmark, and several of its buildings make up the Lincoln State Monument. The Billy the Kid National Scenic Byway is an 84-mile loop through Lincoln County, connecting historic places such as Lincoln and Fort Stanton with the larger towns of Ruidoso and Ruidoso Downs as well as the smaller villages of San Patricio, Hondo, Capitan, and Alto. There are various tourist attractions along the route.

In Capitan, visitors can learn about Smokey Bear, the national mascot for preventing forest fires, at the Smokey the Bear Museum, the Smokey Bear Historical State Park and its corresponding visitor center, and during the annual Smokey the Bear Stampede, held every July.

San Patricio, in the Hondo Valley, is known for its horse ranches, apple orchards and thriving arts community, anchored by members of the Wyeth-Hurd families. Fort Stanton, which over the years was a military post, hospital, internment camp, jail, and halfway house, has points of interest including the Fort Stanton Museum and the Fort Stanton National Cemetery.

Ruidoso Downs is home to the Billy the Kid Scenic Byway Center and the Hubbard Museum of the American West, which celebrates horses and other icons of the American West. The City-owned and operated museum is one of the few Smithsonian affiliate museums in the Southwest, and draws between 30,000 to 50,000 visitors per year. In addition, the Ruidoso Downs Racetrack, home to the world's richest quarter horse race – the All American Futurity – is an important tourist draw. The track holds races from Memorial Day to Labor Day, during which time the local population swells to over 25,000 people.

The Village of Ruidoso also thrives on tourism. This picturesque mountain community offers multiple lodging opportunities, ranging from luxury suites to rustic cabins, as well as many restaurants, art galleries, and shops. Ruidoso is also home to the Spencer Theater for the Performing Arts and three golf courses. One of the main Ruidoso attractions is winter skiing that brings thousands of visitors each year. Ski Apache, located just south of Ruidoso on the Mescalero Indian Reservation, is the only ski resort in southern New Mexico. The nearby Inn of the Mountain Gods also provides world-class accommodations, a casino, and a golf course, and is one of the main employers of Lincoln County residents.

Carrizozo, the County seat, has a Heritage Museum, and can serve as a jumping point for the many nearby attractions. For instance, the Valley of Fires Recreation Area is one of the youngest and best-preserved lava fields in the country, and is a short drive from Carrizozo. Another nearby attraction, just 27 miles south of the town, is the Three Rivers Petroglyph National Recreation Area, which features nearly 10,000 individual rock art images. Finally, Carrizozo is just 9 miles south of White Oaks, a mining ghost town which is beginning to emerge as an artists' community.

The County also has a vast expanse of open space and natural areas for nature-lovers to explore. The Lincoln National Forest offers 225 miles of hiking trails. Within that is the White Mountain Wilderness area, which has nine trails for hiking and equestrian use only. The Capitan Wilderness Area, original home to Smokey Bear, provides 11 hiking trails. In addition, Bonito Lake and the Rio Ruidoso offer opportunities for trout-fishing.

Finally, agritourism is an emerging and promising sector of the tourism industry in Lincoln County. The purpose of agritourism is to find innovative ways to help preserve agriculture while educating tourists about local production. Visitors can learn about the culture and methods of farming, while also having the first-hand opportunity to purchase fresh, locally-grown berries, apples, honey, wines, and other products. Lincoln County is home to the Agri-Tourism Advisory Council

(ATAC) which promotes this type of enterprise by sponsoring local farmer's markets and providing other valuable services.
Source: Lincoln County Comprehensive Plan 2007

1.4 Demographic Features

Population

According to the U.S. Census Bureau, the population in Lincoln County, 21,016, is more than 94% white, followed by 3% American Indian and 1% black. People who are Hispanic, Latino, and Spanish are classified as "other race" although they may actually be of any race or origin. Race or origin can be viewed as the heritage, nationality group, lineage, or country of birth of the person or the person's parents or ancestors before their arrival in the United States. Based on the 2007 estimated census information for Lincoln County, 29% are classified as persons of Hispanic or Latino origin.

The 2007 estimated census also showed that approximately 20% of the population was under the age of 18 and 20% were senior citizens (65 years of age and older).

Housing

The total number of housing units in the county in 2007 was 16,814, with a home ownership rate of 77%. The statewide median value of owner-occupied housing units was $108,100 per unit (national average is $119,600 per unit). The median value in Lincoln County is $108,400. The county's average household size was 2.34 persons per household (8,202 households).

Income

In 2007 the median household income for Lincoln County was $40,669 per household and per capita income was $19,338. The percentage of persons below the poverty level was 14%, which is lower than the state average of 17.9% but higher than the national average of 12%.

1.5 Utilities and Infrastructure

Electricity

Lincoln County relies on two separate power companies to generate electricity. Power New Mexico (PNM) and Otero County Electric Co-Op each have a presence in the County. There are microwave towers throughout the county as well.

Natural Gas

There are several natural gas distributors serving the population of Lincoln County. Zia Natural Gas Company, a distributor from El Paso Natural Gas Company, is the main distributor for Lincoln County. The major gas pipeline runs along the Highway 54 corridor through the county. Transwestern Natural Gas also has a pipeline that runs through Lincoln County.

Water Supply

Water supply for the residents of Lincoln County comes from various sources and is not directly part of the County's activities. Domestic water is provided by each individual municipality or community within the County via community water systems or individual domestic wells. Lincoln County is not directly responsible for domestic water transmission or distribution.
Lincoln County Comprehensive Plan 2007

All of the fire districts (FDs) have access to water through hydrants or wells within the respective communities that they service. However, there is a paucity of water available for nearly all FDs. Surface water includes the Rio Ruidoso, Rio Hondo, Alto Lake, Eagle Lake, Grindstone Lake, Alto County Club Lake, Kokepelli Lake, Rain Make Lake, Copper Ridge Lake, Bonito Lake, Alto Reservoir, Silver Pond, and other streams and ponds. Tender access for water drafting and helicopter dipping to fill water buckets are available at the Alto Lake, Eagle Lake, Grindstone Lake, Alto County Club Lake, Kokepelli Lake, Rain Make Lake, Copper Ridge Lake, Bonito Lake, Alto Reservoir, and Silver Pond. There are also stock ponds and irrigation systems available on private lands, but availability depends on precipitation and landowner permission.

Transportation

Roadways. Both federal and state highways run through Lincoln County. Federal highways include U.S. Highways 54, 70, and 380. State highways include State Routes 37, 48, 220, 246, 247, and 532.

Railroads. Since 1878, when the first transcontinental railway service began across New Mexico, railways have been an important component of the state's transportation and economic network. The railways also are used to transport hazardous materials, a major concern for populated areas along the rails. The major Burlington Northern Santa Fe (BNSF) route travels through Carrizozo and parallels U.S. Route 54 on the western side of the County.

Airports. The Sierra Blanca Regional Airport serves Ruidoso and Lincoln County and is owned by the Village of Ruidoso. The paved runway extends for 8,101 feet and sits at an elevation of 6800 feet. Sierra Blanca Airport is located about 18 miles northeast of the village. The main runway is 060/240 magnetic at 6811 ft. elevation, 8100 ft. length, paved, with paved taxi strips. There is a helipad at the Lincoln County Medical Center in Ruidoso.

1.6 Agriculture

For centuries, Lincoln County ranchers have run cattle and sheep operations, with most ranches being family-owned and operated for many generations. The Hondo Valley has productive apple orchards, some dating back to the days of the Lincoln County War. In the past decade, the county has had an influx of newcomers, whose entrepreneurial endeavors have diversified the agricultural and

horticultural picture. Llamas and alpacas; specialty dairies; raspberries, hydroponic greenhouses, commercial flower and herb gardens, cherry and apple orchards; Halflingers, Arabian horses and other specialty equine breeds are now bringing money and visitors to the county.
http://lincolnextension.nmsu.edu/commdevt.html

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2 Mitigation Planning Process

2.1 Plan Authorities

Local governments play an essential role in the implementation of effective mitigation, both before and after disaster events. The Lincoln County Hazard Mitigation Plan seeks to formulate the approach, focus and goal for communities to alleviate or eliminate risk to the impact of natural hazards with consideration of the infrastructure, resource, and [x] vulnerabilities in accordance with Federal and State mitigation planning requirements.

2.1.1 Federal Mitigation Planning Requirements

Section 409 of Public Law 93-288, Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act) as amended by Public Law 100-707, 42 U.S.C. 5121 et seq, Disaster Mitigation Act 2000 and the Hazard Mitigation and Relocation Assistance Act of 1993 requires State and Local governments to develop and adopt natural hazard mitigation plans in order to be eligible for some types of federal assistance, including mitigation grants. The Act authorizes up to seven percent of Hazard Mitigation Gran Program (HMGP) funds available to a State after a disaster to be used for the development of State, tribal and local mitigation Plans.

Mitigation planning requirements are additionally set forth in various FEMA policies and guidance documents, including the Interim Final Rule of February 26, 2002, the "386" series of mitigation planning how-to-guidance, and the July 2008 "Blue Book." Section [x-x] provides a description of FEMA's six hazard mitigation programs, all of which require mitigation plans in order for communities to be eligible for grants.

2.1.2 State Hazard Mitigation Plan

The 2009 State of New Mexico Hazard Mitigation Plan fulfills the requirements of the Stafford Act and the Disaster Act of 2000. The State plan acknowledges that people and property in New Mexico are at risk from a variety of hazards that have a potential to cause widespread loss of life and damage to property, infrastructure and environment. The plan establishes hazard mitigation goals, strategies and specific measures designed to reduce the occurrence or severity of these identified hazards. It also documents procedures for implementation and administration of certain mitigation grant programs.

2.2 Mitigation Planning Overview

Hazard mitigation planning is the process of figuring out how to reduce or eliminate the loss of life and property damage resulting from hazards such as ice storms and floods. The primary purpose of hazard mitigation planning is to identify community policies, actions, and tools for implementation over the long-term that will result in a reduction in risk and potential for future losses community-wide. This is accomplished by using a systematic process of learning about the hazards that can affect a community, setting clear goals, identifying appropriate actions, following through with an effective mitigation strategy, and keeping the plan current. These activities are summarized in four basic phases:

- Organize resources
- Assess risks
- Develop a mitigation plan
- Implement the plan and monitor progress

The Disaster Mitigation Act of 2000 (DMA2K) signed into law on October 30, 2000, amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act by adding a new section, 322 – Mitigation Planning. Section 322 places emphasis on local mitigation planning. It requires local governments to develop and submit mitigation plans as a condition of receiving Hazard Mitigation Grant Program (HMGP) project grants. An Interim Final Rule for implementing Section 322 ((44 Code of Federal Regulations (CFR) Parts 201 and 206) was published in the Federal Register (FR), Volume 67, Number 38, pages 8844 – 8854, on February 26, 2002. The requirements for local plans, or Local Mitigation Plan Criteria, are found in part 201.6.

2.3 Local Mitigation Plan Criteria

The remainder of this HMP focuses on responding to each of the Local Mitigation Plan Criteria defined by the U. S. Congress in DMA 2000:

- Prerequisites
- Planning Process
- Risk Assessment
- Mitigation Strategy
- Plan Maintenance Procedures

2.3.1 Prerequisites

The Local Mitigation Plan Criteria state that the plan must satisfy three prerequisites before the plan will be reviewed by the state and FEMA. If these prerequisites have not been fulfilled, the plan will not be reviewed. The three prerequisites are:

- Adoption by the local governing body
- For multi-jurisdictional plans, each jurisdiction must adopt the plan
- For multi-jurisdictional plans, each jurisdiction must participate in the planning process.

Lincoln County's plan is not a multi-jurisdictional plan; therefore, the only criterion to be met, adoption by the local governing body, has been addressed. The resolution showing adoption of this plan by the Lincoln County Commissioners appears in the introductory elements (before the Table of Contents) of this plan.

2.4 Local Planning Process

The Lincoln County Hazard Mitigation Plan is a collaborative effort of the work of many people who comprise the Mitigation Planning Group (MPG). The MPG, under the direction of the Lincoln County Fire and Emergency Services Director, was formed in August 2008. The County retained the services of Ecology & Environment, Inc. (the contractor) to support the planning process and produce the plan.

The MPG addressed specific topics related to the development of the Lincoln County Hazard Mitigation Plan. Between meetings, members provided information to the County Fire and Emergency Services Director.

Upon formation of the MPG, a meeting was held to discuss the content of the plan. A letter of invitation was sent requesting participation from various local, tribal, state, and federal departments and agencies.

During plan development, the contractor sent sections, or parts of sections, to the Emergency Services Director, who disseminated the information to those who were unable to attend scheduled meetings, for review. All members of the MPG were kept informed via contact by email. Their input was shared with the MPG members through discussion at MPG meetings, by email, and through personal contact. The MPG members then submitted revisions or additional details. The Emergency Services Director then presented the revisions to the contractor, who incorporated them into the plan.

The contractor assembled the final draft of the plan for distribution to MPG members for review. The Lincoln County Board of Commissioners adopted a

draft version of the plan on September 15, 2009 (see Appendix A). A complete draft was sent to the New Mexico Department of Homeland Security and Emergency Management (NMDHSEM) and the Federal Emergency Management Agency (FEMA) on October 13, 2009. The plan required additional revision and was resubmitted to NMDHSEM for review on August 3, 2012. DHSEM reviewed and provided comment back to Lincoln County OES. FEMA reviewed the plan, and any desired changes were incorporated into the next draft, which was returned to FEMA in August 2012. When the plan was approved by FEMA, it was adopted by the county. FEMA accepted the adopted plan, pending adoption, on September 11, 2012.The Lincoln County Board of Commissioners adopted the final plan on September 18, 2012.

The Disaster Mitigation Act (DMA) of 2000 (DMA2K) stipulates the minimum content of all local hazard mitigation plans. The Lincoln County Hazard Mitigation Plan meets or exceeds the required content for a "standard" local hazard mitigation plan.

2.4.1 Mitigation Planning Participants

The members of the MPG and other subject matter experts who were consulted in the planning process brought to the table a wide variety of experience not necessarily related to their current jobs. Their institutional knowledge, along with the specific program experience of their current job positions, made all participants in the planning process uniquely qualified to assist the mitigation planning effort. These people, agencies, and interested groups participated by attending meetings, sharing information by email, and contributing general and specific information as needed. A list of the MPG members is provided in Table 2-1.

The Lincoln County Emergency Services Director coordinated the formation of this plan. The Lincoln County Emergency Services Director sought out the input and participation of the Local Emergency Planning Committee.

The Emergency Services Director kept agencies and subject matter experts that did not participate with the MPG on a regular basis informed of the status and content of the plan. They will receive copies of the approved plan soon after it is approved in order for them to comment and correct errors and omissions for future updates. The Emergency Services Director will continue to expand the list of interested parties as opportunities arise and will send them copies of the plan and invite their participation. In addition, the plan will be available on the county website.

The Lincoln County Hazard Mitigation Plan endorses the efforts of other local, state, and federal, agencies in addressing mitigation issues for specific hazards in their own strategic and operational plans, procedures, and regulations. The Lincoln County Emergency Services Director has asked, and will continue to ask, MPG members and other subject matter experts to provide input related to their specific agency plans, procedures, and regulations. Subsequent meetings of the

MPG will discuss and possibly incorporate specific recommendations into future updates of the plan.

Table 2-1 Mitigation Planning Group

Name	Organization	Address	Phone	Fax	Email
Travis Atwell	LCOES LC-LEPC	115 Kansas City Rd, Ruidoso	575-258-9991	575-258-9998	lcoes@bajabb.com
William Dunlap	RDFD		575-378-1624	575-378-8460	
Joe Kenmore	LCOES	115 Kansas City Rd, Ruidoso	575-258-9991	575-258-9998	jpk5fbk@gmail.com
Kim Kuhar	Lincoln NF, Smokey Bear		575-437-1004	575-630-3030	kkuhar@fs.fed.us
Lynn Lovelace	NMSF		575-354-2231		Lynn.lovelace@state.nm.us
Tom Schafer	VOR	313 Cree Meadows, Ruidoso	575-937-4649	575-937-4550	Thomasschafer@ruidoso-nm.com
Justin Shaw	RDFD		575-378-1624	575-378-8460	Jshaw@ruidosodowns.us

KEY:
LC-LEPC Lincoln County –Local Emergency Planning Committee
LCOES Lincoln County Office of Emergency Services
NF National Forest
NMSF New Mexico State Forestry
RDFD Ruidoso Downs Fire Department
VOR Village of Ruidoso

2.4.2 Planning Meetings

Lincoln County applied for an HMGP grant and was awarded the grant in June 2008. The HMGP grants are used by FEMA to help communities mitigate against future damage. FEMA and the New Mexico DHSEM dispersed the HMGP funds for mitigation activities.

Prior to the first meeting, many were invited to participate in the planning process. Representatives from fire, law, health care, schools, municipal, industry, and public utilities were invited.

To begin the planning process, Lincoln County invited members of the community with a variety of backgrounds (i.e., business, law enforcement, schools, utilities, and emergency response) to attend a project plan meeting on April 15, 2008. This was not a public meeting; rather, it was a meeting aimed at informing the MPG of the planning process because they would continue to meet with the consultant and guide the planning process. At this meeting, 13 people, and ideas on what the community felt about mitigation were addressed.

At this meeting the final roster of MPG members was determined (see Table 6-1).

Table 6-1 Hazard Mitigation MPG Members

Committee Member	Organization
Travis Atwell	Lincoln County OES
William Dunlap	Ruidoso Downs FD
Joe Kenmore	Lincoln County OES
Kim Kuhar	Lincoln NF, Smokey Bear
Lynn Lovelace	NM State Forestry
Tom Schafer	Village of Ruidoso
Justin Shaw	Ruidoso Downs FD
Bill Perry	E&E
Cara Stevens	E&E

In order to prepare the plan, two additional meetings with the MPG were held, one on October 25, 2008 where the hazards were examined and ranked. The third meeting was held on June 17, 2009, a webconference where the MPG discussed critical facilities and proposed projects. These were ranked, preliminarily and through email traffic these were finalized in June. The next project activity was at the July Lincoln County Commission meeting where the plan to roll out the plan for comment was announced. A press release was prepared informing the public about the hazard mitigation planning process, urging the public to be involved in the review process and informing the public of who to contact regarding the plan. After the last meeting a press release was prepared to keep the public involved, informing them that the draft plan was completed.

The consultant facilitated each meeting, addressing the planning process and gaining input from the MPG on local conditions and the MPG's desires. After

each meeting, ideas presented in the meeting were researched and their findings were summarized for input by the MPG. This approach allowed the MPG to play a valuable role in getting ideas and issues addressed in the plan. Each member of the MPG was an equal member in the overall process.

Representatives from the agencies in Lincoln County were invited to the MPG meetings but some were unable to a before recommending it for approval. A final review of the HMP was conducted and the MPG agreed to recommend the HMP for adoption by the local governing body, pending FEMA and New Mexico DHSEM final approval.

This plan was developed over a period of 18 months. Appendix A contains copies of the sign-in sheets for each meeting, as well as meeting minutes/notes and copies of materials handed out / used.

As stated earlier, in an effort to keep the public informed and to invite additional input, a press release was issued after the third and fourth meetings in the planning process. Copies of the press releases can be found in Appendix A.

The role of the MPG was to attend the planning meetings where they provided valuable information on Lincoln County, developed parts of the plan, and reviewed the results of the research conducted by the consultant. Tasks completed by the MPG included:

- Developing a list of potential hazards in Lincoln County (e.g., flooding, wildfires and thunderstorms)
- Assembling a list of the critical facilities in Lincoln County, e.g., hospitals, police stations and shelters
- Evaluating potential loss of vulnerable assets in Lincoln County
- Establishing goals and objectives for Lincoln County
- Determining mitigation measures that would be prudent

2.4.3 Planning Process and Funding Initiatives

The county hazard mitigation planning process is closely integrated with and is in fact dependant on FEMA's mitigation programs and initiatives. The driving force behind the entire planning effort is the Disaster Mitigation Act of 2000, which stipulates the necessity for and content of both state and local mitigation plans. DMA2K established a timeline for plan completion and describes penalties for non-compliance. States that did not have their mitigation plans approved by the specified date (November 1, 2004) were not be able to receive public assistance funding (Category C through G) for declared disasters occurring after this date nor was any jurisdiction within the state. Funding from the Pre-Disaster

Mitigation (PDM) program and the Hazard Mitigation Grant Program (HMGP) are similarly denied until the state and local mitigation plans are approved.

Another FEMA program that greatly influences the mitigation effort is the National Flood Insurance Program (NFIP). Participation in NFIP by municipalities, counties, and tribal organizations is voluntary, and currently Lincoln County does participate. Within the NFIP program is the Community Rating System (CRS), a program whereby individual communities may reduce their flood insurance rates by performing certain specified activities to enhance flood mitigation. Currently, Lincoln County is not a participating member of CRS.

The Flood Mitigation Assistance (FMA) Program is another FEMA program whereby local jurisdictions may obtain grant funds to do flood mitigation plans and projects. Other potential funding sources (not a complete list) include:

Federal

- Farm Bill Conservation Program / Farm and Ranch Land Protection Program
- FEMA Public Assistance (PA) Grants
- FEMA Hazard Mitigation Grant Program (HMGP)
- FEMA Pre-Disaster Mitigation (PDM) Grants
- FEMA / National Flood Insurance Program (NFIP) Repetitive Flood Claims (RFC) Grants
- FEMA / NFIP Severe Repetitive Loss (SRL) Grants
- FEMA / NFIP Flood Mitigation Assistance (FMA) Grants
- National Dam Safety Program/ Water Resources Development Act (WRDA)
- Housing and Urban Development Community Development Block Grants (CDBG)
- Land and Water Conservation Fund
- United States Department of Agriculture Forest Legacy Program

State

- Community Wildfire Hazard Mitigation Assistance Program
- Farmland Preservation Program
- Freshwater Wetland Protection Act/ Wetland Mitigation Fund
- Dam Restoration and Inland Water Projects Loan Program
- Sewerage Infrastructure Improvement Act Grants
- Environmental Infrastructure Financing Program
- Transportation Trust Fund Municipal Aid
- Transportation Trust Fund

2.5 Public Involvement

The county hazard mitigation planning process is closely integrated with and is in fact dependent on FEMA's mitigation programs and initiatives including the integration of public participation in the development of the Lincoln County Hazard Mitigation Plan.

2.5.1 Public Involvement

Support from the community is vital for the success of any hazard mitigation plan. The MPG provided opportunities for public participation and input throughout the planning process, prior to this draft and before approval of the finalized plan.

Lincoln County conducted multiple public meetings on the with the primary public meeting being a County Board of Commissioners meeting on September 15, 2009. Board of Commissioners meetings are a standard venue for providing opportunities for public participation and comment on issues of concern to the community. All Board meetings are open to the public and publicly noticed with published agendas.

Additionally public meetings were held in the communities of Alto and Corona in August of 2009.

The plan was also posted on the County's website for review by all stakeholders and is available for review at:

http://lincolncountynm.net/All%20Hazard%20Mitigation%20Plan.pdf.

These actions were communicated to and provided Lincoln County citizens, stakeholders, neighboring communities, agencies, businesses, academia, non-profit organizations and other interested parties an opportunity to be involved in the planning process and to take part in the decision-making process that affects the future of the communities in which they live. Public notices for meetings were posted in communities and municipalities to encourage citizens to participate in the planning process.

In particular the following organizations were invited to participate in all public meetings:

- Lincoln County Planning Director/Flood Plan Manager
- Lincoln County Under Sheriff
- Lincoln County EMS
- Upper Hondo Water and Soil District
- Ruidoso Forestry Department
- Bureau of Land Management
- Lincoln County Home Care and Hospice
- Capitan Public Works
- Ruidoso Public Works
- NM State Forestry

- USFS Forest Service
- Ruidoso Emergency Management
- Ruidoso Police Chief
- Ruidoso Downs Police Chief
- Ruidoso Fire Chief
- Ruidoso Downs Fire Chief
- Carrizozo Fire Chief
- Capitan Fire Chief
- Corona Fire Chief
- Hondo Fire chief
- Arabela Fire Chief
- Lincoln Fire Chief
- Glencoe Fire Chief
- White Oaks Fire Chief
- Nogal Fire Chief
- Bonito Fire Chief

Copies of the meeting notice, agenda and minutes of the primary Board of Commissioners meeting as well as press releases can be found in Appendix A.

The Emergency Services Director, disseminated plan related information to members of the MPG who were kept informed via contact by email. Input was shared with the MPG members through discussion at MPG meetings, by email, and through personal contact. The Lincoln County Hazard Mitigation Plan meets the required content for a "standard" local hazard mitigation plan.

2.6 Review and Incorporation of Existing Plans, Studies, Reports and Working Groups

2.6.1 Existing Planning Document Review

Existing planning documents, reports and technical information were reviewed during the development of the Hazard Mitigation Plan. Data was collected about county ordinances, wildfire protection, flood prevention, watershed planning, and general zoning for incorporation into the Lincoln County Hazard Mitigation Plan. The mitigation actions proposed in the plans were re-evaluated based on existing conditions to determine their current suitability in this plan.

Highlights of existing plans and regulations evaluated are as follows:

- DMA 2000
- Lincoln County Comprehensive Plan, 2007
- State of New Mexico Hazard Mitigation Plan
- HAZUS-MH (using Census 2000 data)
- Interviews with representatives of the critical infrastructure identified within this plan
- Comments received from elected officials and the public during each of 4 public meetings

- Comments received through review of this plan by County Officials and planning committee members

- Review of the local newspaper, the *Lincoln County News*

- Research of technical and historical data via websites of the University of New Mexico, USFS, US Parks Service, NWS, NCDC, and others"

Details of these plans were taken into consideration to determine the need to include some the findings into the mitigation actions proposed for the Hazard Mitigation Plan.

2.6.2 Local Planning Workgroup Review

Additionally, an investigation of the efforts of existing workgroups and committees that could contribute to mitigation planning was conducted to ensure the goals and objectives of suggested projects were in alignment with these efforts.

2.6.3 Other Local Planning Mechanisms

As required by the FEMA Interim Final Rule that governs mitigation planning, the project requirements from the Lincoln County Hazard Mitigation Plan shall be incorporated into other planning mechanisms, as applicable, during the routine re-evaluation and update of County plans. The County did not consider integrating components of the plan into other planning mechanisms. The MPG and E&E reviewed plans listed above to identify opportunities where components of the Hazard Mitigation Plan can be integrated or reinforced with these other plans, studies or reports.

Lincoln County is a participant in the National Flood Insurance Program (NFIP), and on December 6, 2010, Otero County was approved and issued revised Flood Insurance Rate Maps (FIRM) by FEMA to assist the jurisdiction in flood prevention and mitigation efforts. Participation in NFIP by municipalities, counties, and tribal organizations is voluntary. The Community Rating System (CRS) is a program whereby individual communities may reduce their flood insurance rates by performing certain specified activities to enhance flood mitigation. The goals of the CRS are to reduce flood losses, facilitate accurate insurance rating, and promote the awareness of flood insurance in communities using a point system program to reduce flood insurance premiums for citizens of participating communities. Participation in CRS activities such as flood damage reduction or flood preparedness will be integrated in future mitigation plan updates.

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3 Hazard Identification and Risk Analysis

3.1 Hazard Identification and Risk Assessment Overview

Section 201.6(c)(2) of the mitigation planning regulation requires local jurisdictions to provide sufficient hazard and risk information from which to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards. This information should include detailed descriptions of all the hazards that can affect Lincoln County and an analysis of Lincoln County's vulnerability to those hazards. This chapter identifies the natural hazards that can occur within Lincoln County and provides a systematic analysis of risk and vulnerability to which the population and critical infrastructure of Lincoln County are subject.

The four major steps in this risk assessment were hazard identification, hazard profiling, vulnerability assessment, and loss estimation.

- **Hazard Identification.** Because it is assumed that hazards that occurred in Lincoln County in the past may occur in the future, the hazard identification process includes reviewing the history and examining the occurrences of various hazards within Lincoln County over the past several decades. Information about past hazards was obtained from historical documents and newspapers, state and county plans and reports, interviews with local agencies, and internet websites.

- **Hazard Profiling.** This step involved determining the frequency or probability of future events, their severity, and factors that may affect their severity. Each hazard type has unique characteristics that can affect Lincoln County in different ways. The same hazard event could affect different jurisdictions in unique manners depending on building types, the age of buildings, demographics, and many other factors.

- **Vulnerability Assessment.** The results of the hazard identification and profiling indicated that some of the hazards warranted a vulnerability assessment because of their frequency of occurrence or because those hazards have caused major damage in Lincoln County. A vulnerability assessment was performed to determine the impact of frequently occurring

hazards on the built environment and how they can affect the safety of the residents of Lincoln County.

The vulnerability assessment identified locations where Lincoln County could suffer the greatest injury or property damage in the event of a disaster. This assessment identified the effects of hazard events by estimating the relative exposure of people, buildings, and infrastructure to hazardous conditions.

- **Loss Estimation.** The last step of the risk assessment was loss estimation. Loss estimation provides a relative ranking of the risk to Lincoln County-owned property and critical infrastructure from the identified hazards.

3.2 Hazard Analysis

The geographic area in which Lincoln County is located contains a number of natural and man-made hazards of sufficient likelihood of occurrence to warrant discussion. This section details the hazard identification and hazard profile steps taken in the risk assessment. It includes an identification of the natural hazards that could occur throughout Lincoln County, a description of those hazards, the damage they could cause, a historical review of hazard occurrences, and a discussion of the probability of future occurrences.

3.2.1 Hazard Identification

"The Mitigation Planning Group (MPG) identified the following 15 natural hazards as having the most significant potential impact, listed below in the order the MPG deemed most significant:

1. Wildfire
2. High Wind
3. Flood
4. Drought
5. Thunderstorms
6. Severe Winter Storms
8. Dam Failure
9. Earthquake
10. Tornadoes
11. Hazardous Materials
12. Extreme Heat

For the purposes of this plan, while profiled separately, windstorms, thunderstorms and severe winter storms are referred to generally as severe weather. Future editions of this plan could include revision and re-ranking of hazards, as well as re-evaluation of potential loss estimation based upon evolution of data available for use in the HAZUS –MH application. Future impacts have the capability of changing this plan and may necessitate revision before that identified in Section 6: Plan Maintenance.

Information about hazardous events was obtained by reviewing past state and federal declarations of disasters, conducting internet searches, and interviewing MPG members."

Table 3-1 Hazard Identification Table

Hazard	How Identified	Why Identified	Priority
Wildfire	• Input from Local Emergency Management • Input from other county representatives • NCDC and other internet research	• Significant impact on Lincoln County • Federally declared disasters • Potential for wildfires is high for Lincoln County • Possible damage to homes and businesses	High
Severe Weather (Windstorms)	• Input from Local Emergency Management • Input from other county representatives • NCDC and other internet research	• Significant impact on Lincoln County • High winds caused downed trees and power lines in Lincoln County on many occasions.	High
Flood	• Input from Local Emergency Management • Input from other county representatives • NCDC and other internet research	• Significant impact on Lincoln County • Damage to homes and businesses • Federally declared disasters in 2007 and 2008	Medium
Drought	• Input from Local Emergency Management • Input from other county representatives • Internet research	• Significant impact on Lincoln County • Parts of Lincoln County were in a severe stage of drought into 2009.	High
Severe Weather (Thunderstorms)	• Input from Local Emergency Management • Input from other county representatives • NCDC and other internet research	• Significant impact on Lincoln County • Possible damage to homes and businesses	Medium (Tropical Storms = Low)
Severe Weather (Winter Storms)	• Input from Local Emergency Management • Input from other county representatives • NCDC and other internet research	• Significant impact on Lincoln County • Many hail storms • Damage to homes and businesses	Medium

Table 3-1 Hazard Identification Table

Hazard	How Identified	Why Identified	Priority
Dam Failure	• Input from Local Emergency Management • Input from other county representatives	• Mescalero Dam is a threat originating in Lincoln County but impacting Lincoln County • Grindstone Dam is a threat in Lincoln County	Medium
Earthquake	• Input from Local Emergency Management • Input from other county representatives • Internet research	• Although there are parts of New Mexico that are at high risk for an earthquake, Lincoln County's risk is relatively low • It is possible that parts of Lincoln County would feel aftershock from the Rio Grande Rift earthquakes	Medium
Tornadoes	• Input from Local Emergency Management • Input from other county representatives • NCDC and other internet research	• Possible significant impact on Lincoln County • Damages to homes and businesses • There have been tornadoes in the past and MPG members identified some that were not reported to NCDC	High
Hazardous Material Spill / Release	• Input from Local Emergency Management • Input from other county representatives • Internet research	• Possible significant impact on Lincoln County due to narrow/ higher population areas in proximity to rail and highways utilized in transport. • Injury to persons and animals • Possible extended shelter-in-place and / or evacuations	Low

Table 3-1 Hazard Identification Table

Hazard	How Identified	Why Identified	Priority
Extreme Heat	• Input from Local Emergency Management • Input from other county representatives • NCDC and other internet research	• Although there are no declared disasters in Lincoln County for extreme heat, there are areas close to the county that have been declared as such. • There have been 4 extreme heat events reported to NCDC	Medium

3.2.2 Hazard Summary

The hazards that may impact Lincoln County are profiled below. Hazard profiles describe different hazard characteristics. If a hazard such as flooding and landslides would affect a specific geographic area in Lincoln County, the hazard profile includes a map identifying areas of Lincoln County where the hazard could occur. The hazard profile of hazards that could occur anywhere, such as tornadoes and winter storms, identifies which portions of Lincoln County may be more vulnerable to the hazard.

3.2.2.1 Previous Occurrences

Lincoln County reviewed records of past disasters and internet articles describing hazard events to prepare the hazard profile found below. A more detailed summary is found in the hazard profiles below. GIS maps were prepared that show floodplains and repetitive-loss structures, which demonstrate where flood events have been concentrated.

Note that the databases used contained very little information regarding sightings and damage reports. Table 3-2 provides a summary of the hazards that have historically impacted Lincoln County, including the date and location.

Table 3-2 Summary of Hazards that Occurred in Lincoln County

Hazard Event Date and Location	Description
Winter Storm April 24, 1997 Capitan Village of Ruidoso	• An intense upper level system fed by tropical moisture triggered a late season winter storm that covered the northern half of New Mexico with heavy snow and produced near blizzard conditions across the east central section of the state which suffered from widespread power outages and some heavy losses to sheep and cattle.

Table 3-2 Summary of Hazards that Occurred in Lincoln County

Hazard Event Date and Location	Description
Wildfire May 2000 Village of Ruidoso	• Cree Fire intensified and spread quickly on May 7 near Ruidoso destroying about 8,000 acres of forest and over a dozen homes in rural neighborhoods of northeast Ruidoso. • The fire was contained by May 12.
Flash Flood August 9, 2000 Ruidoso Downs Village of Ruidoso	• Peat gravel from new road construction clogged culverts and filled a small retention pond during heavy runoff from a storm that yield about 3 inches of rain in 2 hours. Water then overflowed from the streets into a residential area flowing across lawns and underneath trailer homes. • Damage was limited to skirting that was ripped from several homes and an empty propane tank floating away. • Damage was estimated at $20,000.
Flash Flood September 15, 2001 Village of Ruidoso/ Ruidoso Downs	• Heavy rains caused a flash flood that resulted in damages estimating over $600K.
Wildfire March 24, 2002 Alto	• A high wind gust turned a small fire into a large one that burned over 12,000 acres and 20 homes. • Damages estimated at more than $2 million.
Presidential Declaration DR# 1659 Severe Storm/Flood August 30, 2006 County-wide	• Heavy rainfall in August of 2006 caused rivers to rise • Lincoln County was approved for Public Assistance from FEMA for this disaster.
Presidential Declaration DR# 1783 Severe Storm/Flood August 14, 2008 County Wide	• Remnants of Hurricane Dolly fell over Lincoln County and caused extensive flooding • Lincoln County was approved for Public Assistance for this disaster.

3.2.2.2 Probability of Occurrence

The statistical probability of a hazard event for Lincoln County is not known, but a qualitative probability of its occurrence can be provided. Table 3-3 shows the probability of recurrence, based on varying time frames, using data from the NCDC, minor events, and from FEMA's federally declared disasters lists of major events. According to the NCDC, 4 wildfires have been reported in Lincoln County between 1996 and 2009. Although many more wildfires have occurred in Lincoln County, they were not reported to the NCDC.

Table 3-3 Probability of Hazard Recurrence (Total Events – Minor and Major)

Hazard	N	N (Yrs)	T (once every __ yrs)	P	Source / Comments
Wildfires	4	13	3.25	0.307692	NCDC
	2	7	3.5	0.285714	FEMA – FMAD, Major Events
Severe Weather (Windstorms)	29	19	0.655172	1.526316	NCDC (includes T'storms)
Flood	13	14	1.076923	0.928571	NCDC (includes F'floods)
	2	3	1.5	0.666667	FEMA - PDD, Major Events
Drought	3.5	13	3.714286	0.269231	NCDC
Severe Weather (Thunderstorms)	29	19	0.655172	1.526316	NCDC (includes High Winds and Tropical Storms)
Severe Weather (Lightning)	3	4	1.333333	0.75	NCDC
Severe Weather (Hail)	62	47	0.758065	1.319149	NCDC
Severe Weather (Winter Storm)	26	14	0.538462	1.857143	NCDC (recorded as snow and ice)
Dam Failure	0	59			None Recorded
Earthquakes	1	500			USGS estimates a 10% chance for a 5%g (PGA) quake in the next 50 years
Tornadoes	11	41	3.727273	0.268293	NCDC
Hazardous Materials	0	40			None noted since record keeping initiated (over the past ~40 years)
Extreme Heat	4	15	3.75	0.266667	NCDC

Key:
n = number of events
N = number of years in record
T = Recurrence Interval (T = N / n)
P = Probability (events per year, or average, P = 1/T)

3.2.2.3 Potential Impacts

Table 3-4 Estimated Percent of Lincoln County that Could Be Impacted By Non-Geographical Hazards at Any One Time

Hazard	Average Percentage Used in Calculating Community-Wide Loss Scenarios	Logic/Source
Wildfire	21.9%	Highest for Census Tracts 9803, 9804 and 9806 – used average of total structures in area.
Severe Weather (High Wind)	0.9%	Highest in Capitan and Sacramento Mountains - Higher for newer construction - averages these structure counts. Lowered for non-residential construction as this is more likely to be built to higher standards.
Flood	12.9%	Highest along Rio Bonito and Rio Ruidoso valleys – nexus between 9806 and 9808, small portion of 9802 and 9803.
Drought	100%	All of Lincoln County will be impacted at the same time.
Severe Weather (Thunderstorms)	12.9%	Higher of Flood or High Wind
Severe Weather (Winter Storms)	24.3%	Highest in 9803, 9804, 9806 and 9808 – weighted slightly higher for residential as these are found in higher numbers as higher elevation and more isolated roads.
Dam Failure	20.1%	Used flood + elevated numbers for non-residential due to impact focus on Rio Ruidodo (Village of Ruidoso / City of Ruidoso Downs)
Earthquake	10.0%	Assumes shielding from Sierra Blanca of earthquake originating in Socorro area (9802 and 9803, lesser for 9806 and 9808, least for 9804).
Tornadoes	5.0%	Biggest risk is NE and SE corners of Lincoln County (9802 and 9804)
Hazardous Materials	48.6%	Approximation of Number along US Routes (all Census tracts)
Extreme Heat	100%	All of Lincoln County will be impacted at the same time.

3.2.3 Hazard Profiles

3.2.3.1 Wildfire

Description of Hazard

A wildfire is any fire occurring in a wildland area (e.g. grassland, forest, brush land) except for fire under prescription and mitigation. Wildfires are part of the natural management of forest ecosystems, but may also be caused by human factors. According to the National Fire Protection Association (NFPA) over 80% of forest fires are started as a result of negligent human behavior such as smoking in wooded areas or improper extinguishing of campfires. Lightning is the second most common cause for wildfire.

There are three classes of wildland fires: surface fires, ground forest, and crown fires. A surface fire is the most common of these three classes and burns along the floor of a forest, moving slowly and killing or damaging trees. A ground fire (muck fire) is usually started by lightning or human carelessness and burns on or below the forest floor. Crown fires spread rapidly by wind and move quickly by jumping along the tops of trees.

Wildfires can occur at any time of day and during any month of the year, but the peak fire season in Lincoln County is normally from March through June. The length of the fire season and the peak months vary appreciably from year to year. Land use, vegetation, amount of combustible materials present, and weather conditions such as wind, low humidity, and lack of precipitation are the chief factors in determining the number of fires and acreage burned. Generally, fires are more likely when vegetation is dry from a winter with little snow and/or a spring and summer with sparse rainfall.

Wildfires are capable of causing significant injury, death, and damage to property. The potential for property damage from fire increases each year as more recreational properties are developed on forested land and more people use these areas. Fires can extensively affect the economy of an area, especially the logging, recreation, and tourism industries, upon which many counties depend. Major direct costs associated with wildfires are the salvage and removal of downed timber and debris and restoration of the burned area. The indirect effects of wildfires can also be catastrophic. In addition to stripping the land of vegetation and destroying forest resources, large, intense fires can harm the soil, waterways and the land itself. Soil exposed to intense heat may lose its ability to absorb moisture and support life. If burned out woodlands and grasslands are not replanted quickly, widespread soil erosion, mudflows, and siltation of rivers could result, thereby enhancing flood potential, harming aquatic life, and degrading water quality. Lands stripped of vegetation by wildfires are also subject to increased landslide hazards. The only natural cause of wildfire is lightning;

however, human carelessness and arson account for a large portion of all wildfires.

Factors that determine the potential for fire include relative humidity, moisture content of the fuel, atmospheric stability, drought, available energy of the fuel, probability of ignition, rate of spread, and the slope and fuel levels of the area. These factors are taken into account when determining the fire danger for a specific area.

- **Relative humidity**. Relative humidity is the ratio of the amount of moisture in the air to the amount of moisture necessary to saturate the air at the same temperature and pressure. Relative humidity (RH) is expressed in percent. RH is measured directly by automated weather stations or by taking wet and dry bulb readings with a psychrometer and then applying the National Weather Service psychrometric tables applicable to the elevations where the reading were taken.

- **Fuel moisture.** Fuel moistures in live herbaceous (annual and perennial), woody (shrubs, branches, and foliage) fuels, and dry (dead) fuels are calculated and represent approximate moisture content of the fuel. Fuel moisture levels are measured in 1-, 10-, 100-, and 100-hour increments.

- **The Lower Atmosphere Stability Index or Haines Index.** This index is computed from the morning soundings from Radiosonde Observation (RAOB) stations across North America. The index is composed of a stability term and a moisture term. The stability term is derived from the temperature difference at two atmospheric levels. The moisture term is derived from the dew point depression at a single atmosphere level. This index has been shown to correlate with large fire growth on initiating and existing fires where surface winds do not dominate fire behavior. Haines Indexes range from 2 to 6 for indicating the potential for large fire growth:

  2 = Very Low Potential (moist, stable lower atmosphere)
  3 = Very Low Potential
  4 = Low Potential
  5 = Moderate Potential
  6 = High Potential (dry, unstable lower atmosphere)

- **Keetch-Byram Drought Index.** This index is used to measure the effects of seasonal drought on fire potential. The actual numeric value of the index is an estimate of the amount of precipitation (in 100ths of inches) needed to bring soil back to saturation (a value of 0 being saturated). The index deals with the top 8 inches of soil profile so the maximum KBDI value is 800 (8 inches), the amount of precipitation needed to bring the soil back to saturation. As the index values increase, the vegetation is subjected to greater stress from moisture deficiency. At higher values,

living plants die and become fuel, and the duff/litter layer becomes more susceptible to fire. The KBDI ranges from 0 to 800:

KBDI 0 to 200. Soil moisture and large-class fuel moistures are high and do not contribute much to fire intensity. This is typical of spring dormant season following winter precipitation.

KBDI 200 to 400. A range of 200 to 400 is typical of the late spring, early growing season. Lower litter and duff layers are drying and beginning to contribute to fire intensity.

KBDI 400 to 600. A range of 400 to 600 is typical of late summer, early fall. Lower litter and duff layers actively contribute to fire intensity and will burn actively.

KBDI 600 to 800. This range is often associated with more severe drought with increased wildfire occurrence. Intense, deep-burning fires with significant downwind spotting can be expected. Live fuels can also be expected to burn actively at these levels.

- **The Energy Release Component.** This is the estimated potential available energy released per unit area in the flaming front of a fire. The day-to-day variations of the energy release component are caused by changes in the moisture contents of the various fuel classes, including the 1,000-hour time lag class. The energy release component is derived from predictions of the rate of heat release per unit area during flaming combustion and the duration of flaming.

- **The Ignition Component.** The ignition component is a number that relates the probability that a fire will result if a firebrand is introduced into a fine fuel complex. The ignition component can range from zero, when conditions are cool and damp, to 100 on days when the weather is dry and windy. Theoretically, on a day when the ignition component registers a 60, approximately 60% of all firebrands that encounter wildland fuels will require suppression action.

- **The Spread Component.** This is a numerical value derived from a mathematical model that integrates the effects of wind and slope with fuel bed and fuel particle properties to compute the forward rate of spread at the head of the fire. Output is in units of feet per minute. A spread component of 31 indicates a worst-case, forward rate of spread of approximately 31 feet per minute. The inputs required in to calculate the spread component are wind speed, slope, fine fuel moisture (including the effects of green herbaceous plants), and the moisture content of the foliage and twigs of living, woody plants. Since the characteristics through which the fire is burning are so basic in determining the forward rate of spread of

the fire front, a unique spread component table is required for each fuel type.

- **Slope and Fuel Levels Matrix**. The International Fire Code Institute combines slope and fuel levels to obtain a susceptibility index (Table 3-5).

Table 3-5 Wildfire Susceptibility Matrix

Fuel Class	Critical Fire Weather Frequency								
	<1 day per year			2-7 days per year			8+ days per year		
	Slope %			Slope %			Slope %		
	<40	41-40	61+	<40	41-40	61+	<40	41-40	61+
Light	M	M	M	M	M	M	M	M	H
Medium	M	M	H	H	H	H	E	E	E
Heavy	H	H	H	H	E	E	E	E	E

Source: International Fire Code Institute January 2000.

Key:

E = Extreme.
H = High
M = Medium

All of these factors are taken into account when determining the fire danger for a specific area. Because these indicators can change daily, the Fire Danger Rating System (Table 3-6) was created to show in a simple way the relative danger level to the public.

Table 3-6 Fire Danger Rating System

Rating	Basic Description	Detailed Description
Class 1: Low Danger (L) Color Code: **Green**	Fires not easily started	Fuels do not ignite readily from small firebrands. Fires in open or cured grassland may burn freely a few hours after rain, but wood fires spread slowly by creeping or smoldering and burn in irregular fingers. There is little danger of spotting.
Class 2: Moderate Danger (M) Color Code: **Blue**	Fires start easily and spread at a moderate rate	Fires can start from most accidental causes. Fires in open cured grassland will burn briskly and spread rapidly on windy days. Woody fires spread slowly to moderately fast. The average fire is of moderate intensity, although heavy concentrations of fuel – especially draped fuel -- may burn hot. Short-distance spotting may occur, but is not persistent. Fires are not likely to become serious and control is relatively easy.

Table 3-6 Fire Danger Rating System

Rating	Basic Description	Detailed Description
Class 3: High Danger (H) Color Code: **Yellow**	Fires start easily and spread at a rapid rate	All fine dead fuels ignite readily and fires start easily from most causes. Unattended brush and campfires are likely to escape. Fires spread rapidly and short-distance spotting is common. High-intensity burning may develop on slopes or in concentrations of fine fuel. Fires may become serious and their control difficult unless they are hit hard and fast while small.
Class 4: Very High Danger (VH) Color Code: **Orange**	Fires start very easily and spread at a very fast rate	Fires start easily from all causes and immediately after ignition, spread rapidly and increase quickly in intensity. Spot fires are a constant danger. Fires burning in light fuels may quickly develop high-intensity characteristics such as long-distance spotting and fire whirlwinds, when they burn into heavier fuels. Direct attack at the head of such fires is rarely possible after they have been burning more than a few minutes.
Class 5: Extreme (E) Color Code: **Red**	Fire situation is explosive and can result in extensive property damage	Fires under extreme conditions start quickly, spread furiously, and burn intensely. All fires are potentially serious. Development into high-intensity burning will usually be faster and occur from smaller fires than in the Very High Danger class (4). Direct attack is rarely possible and may be dangerous, except immediately after ignition. Fires that develop headway in heavy slash or in conifer stands may be unmanageable while the extreme burning condition lasts. Under these conditions, the only effective and safe control action is on the flanks until the weather changes or the fuel supply lessens.

source: http://www.wfas.net/content/view/34/51/

Location and Extent

New Mexico experiences, on average, 1,947 wildland fires each year that burn an average 126.5 acres apiece (246 thousand acres per year). Figure 3-1 and Table 3-7 illustrate historical fire data for the state of New Mexico from 1992 to 2006.

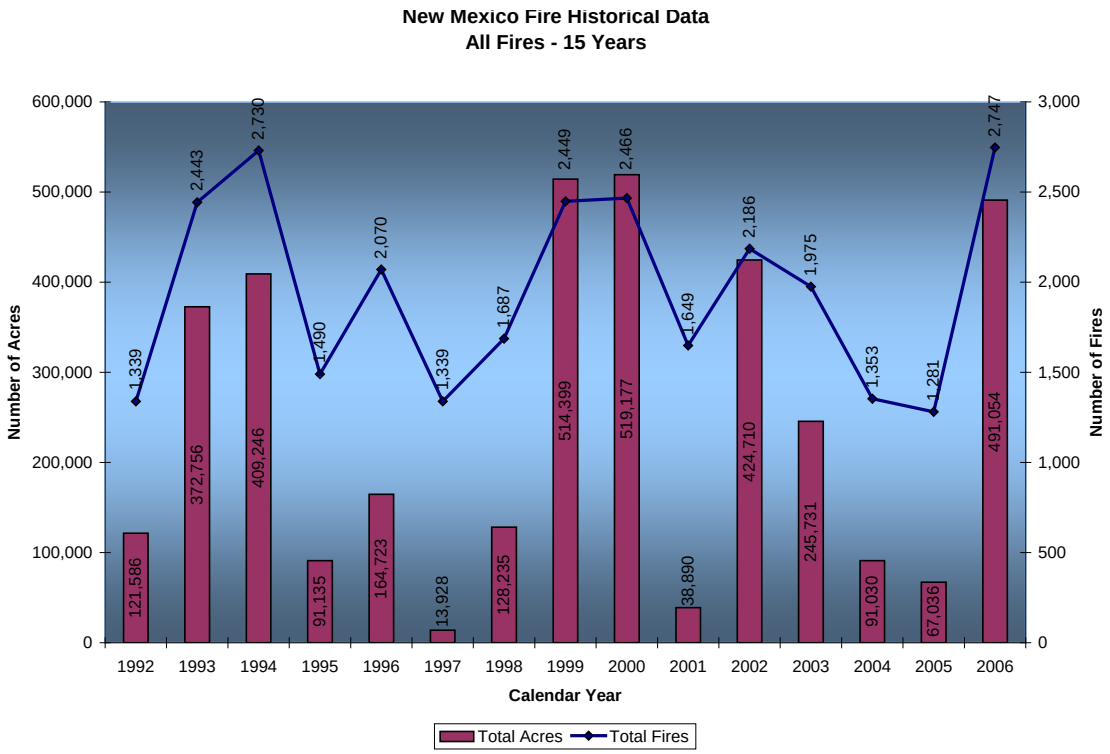


Figure 3-1 New Mexico Fire History

Table 3-7 Historical Fire Data

Year	Number of Fires	Total Acres
1992	1,339	121,586
1993	2,443	372,756
1994	2,730	409,246
1995	1,490	91,135
1996	2,070	164,723
1997	1,339	13,928
1998	1,687	128,235
1999	2,449	514,399
2000	2,466	519,177
2001	1,649	38,890
2002	2,186	424,710
2003	1,975	245,731
2004	1,353	91,030
2005	1,281	67,036
2006	2,747	491,054
Total	**29,204**	**3,693,636**
Average Number of Fires per Year	**1946.933333**	**246242.4**
Average Number of Acres per Fire	**126.4771**	

Wildfire can occur anywhere within Lincoln County. As evidenced in Figures 3-2 and 3-3, areas of particular concern include the southern and eastern portions of the County where there are medium (noted in yellow) to heavy fuel levels (noted in red) as well as Wildland Urban Interface (WUI) areas. Areas with particularly heavy fuel levels are the northeastern corner of the County, and the area east of Carizozo. The more densely populated areas around Ruidoso align with areas of heavy fuel source leading to a higher risk for wildland urban interface incidents. According to the Lincoln County CWPP, community and WUI assessments occurred December 5 through 10, 2007. Seven WUIs were identified (Table 3-8). The WUIs represent a specific response area with unique characteristics, resources, and identifiable wildfire hazards and risks. Surveys of the WUIs were conducted to identify wildfire hazards using the NFPA 1144 procedure, fuel hazards, and values at risk. The seven WUIs are Ancho, Arabela, Carrizozo, Corona, Hondo-Tinnie, Nogal-Alto-Lincoln, and White Oaks.

Table 3-8 Assessment Area Summary Information

Community	Values at Risk	Wildfire Risk of Occurrence	NFPA 1144 Hazard Rating	Contributing Factors to NFPA 1144 Ratings	Firefighting Capacity
Arabela WUI					
Arabela	• Homes • Wildlife habitat • Aesthetics • Air quality • Soil stability	Moderate	High	• Limited ingress/egress • Heavy vegetation-fuel loads • Lack of defensible space around structures • Terrain conducive to unfavorable fire behavior • Lack of structure sprinkler system • Utilities above ground	• Arabela FD • Hydrants
Ancho WUI					
Ancho	• Homes • Wildlife habitat • Rangeland • Aesthetics • Air quality • Soil stability	High	High	• Moderate fuel loads • Defensible space less than 30 feet around structures • Terrain conducive to unfavorable fire behavior • Lack of structure sprinkler system • Utilities above ground	• Corona FD with extended response time • Water is an issue

Table 3-8 Assessment Area Summary Information

Community	Values at Risk	Wildfire Risk of Occurrence	NFPA 1144 Hazard Rating	Contributing Factors to NFPA 1144 Ratings	Firefighting Capacity
Carrizozo WUI					
Carrizozo	• Homes • Businesses • Tourism • Agriculture land • Railroad • Watershed quality • Wildlife habitat • Rangeland • Aesthetics • Air quality • Soil stability	High	Low	• Light fuel loads • Electrical utilities above ground • Lack of structure sprinkler system	• Carrizozo FD • Hydrants
Corona WUI					
Corona	• Homes • Businesses • Railroad • Watershed quality • Wildlife habitat • Rangeland • Aesthetics • Air quality • Soil stability	High	Moderate	• Medium fuel loads • Defensible space 30 to 70 feet around structures • Terrain conducive to unfavorable fire behavior • Combustible decks and porches • Electrical utilities above ground • Lack of structure sprinkler system	• Corona FD • Hydrants
Hondo – Tinnie WUI					
Hondo-Tinnie	• Homes • Businesses • Major highway • Agriculture land • Watershed quality • Wildlife habitat • Aquatic habitat • Aesthetics • Air quality • Soil stability	High	Moderate	• Light fuel loads • Defensible space less than 70 feet around structures • Terrain conducive to unfavorable fire behavior • Combustible porches and decks • Lack of fixed sprinkler system in structures • Utilities above ground	• Hondo FD • Hydrants

Table 3-8 Assessment Area Summary Information

Community	Values at Risk	Wildfire Risk of Occurrence	NFPA 1144 Hazard Rating	Contributing Factors to NFPA 1144 Ratings	Firefighting Capacity
Nogal-Alto-Lincoln WUI					
Alto	• Homes • Businesses • Recreation • Tourism • Communication towers • Church camp • Watershed quality • Wildlife habitat • Aquatic habitat • Aesthetics • Air quality • Soil stability	High	High	• Non-surfaced, steep roads • Heavy vegetation-fuel loads • Lack of defensible space around structures • Terrain conducive to unfavorable fire behavior • Lack of structure sprinkler system • Utilities above ground	• Bonito FD • Ruidoso and Monjau fire lookout towers • Hydrants
Capitan	• Homes • Businesses • Tourism • Agriculture land • Watershed quality • Wildlife habitat • Aquatic habitat • Rangeland • Aesthetics • Air quality • Soil stability	High	Low	• Light fuel loads • Electrical utilities above ground • Lack of structure sprinkler system	• Capitan FD • Hydrants
Fort Stanton	• Historic buildings • Hospital • Correctional institution • Tourism • Wildlife habitat • Aquatic habitat • Aesthetics • Air quality • Soil stability	High	Low	• Medium vegetation-fuel loads • Defensible space 30-70 feet from structures • Structures with combustible sidings, porches, and decks	• Fort Stanton FD • Hydrants

Table 3-8 Assessment Area Summary Information

Community	Values at Risk	Wildfire Risk of Occurrence	NFPA 1144 Hazard Rating	Contributing Factors to NFPA 1144 Ratings	Firefighting Capacity
Glencoe	• Homes • Historic buildings • Businesses • Tourism • Recreation • Major highway • Watershed quality • Wildlife habitat • Aquatic habitat • Rangeland • Aesthetics • Air quality • Soil stability	High	High	• Non-surface road • Medium fuel loads • Defensible space less than 25 feet around structures • Terrain conducive to unfavorable fire behavior • Combustible decks and porches • Lack of fixed sprinkler system in structures • Utilities above ground	• Glencoe FD • Hydrants •
Lincoln	• Homes • Historic buildings • Businesses • Tourism • Recreation • Agriculture land • Major highway • Watershed quality • Wildlife habitat • Aquatic habitat • Aesthetics • Air quality • Soil stability	High	High	• Medium fuel loads • Defensible space less than 70 feet around structures • Terrain conducive to unfavorable fire behavior • Closeness of structures can contribute to fire spread • Lack of structure sprinkler system • Electrical utilities above ground	• Lincoln FD • Hydrants •
Nogal	• Homes • Businesses • Tourism • Recreation • Watershed quality • Wildlife habitat • Aquatic habitat • Aesthetics • Air quality • Soil stability	High	High	• Nogal Canyon limited ingress/egress with narrow road • Limited fire service access • Moderate to heavy fuel loads • Lack of defensible space around structures • Combustible structure siding, porches, and decks • Terrain conducive to unfavorable fire behavior • Utilities above ground	• Nogal FD • Hydrants

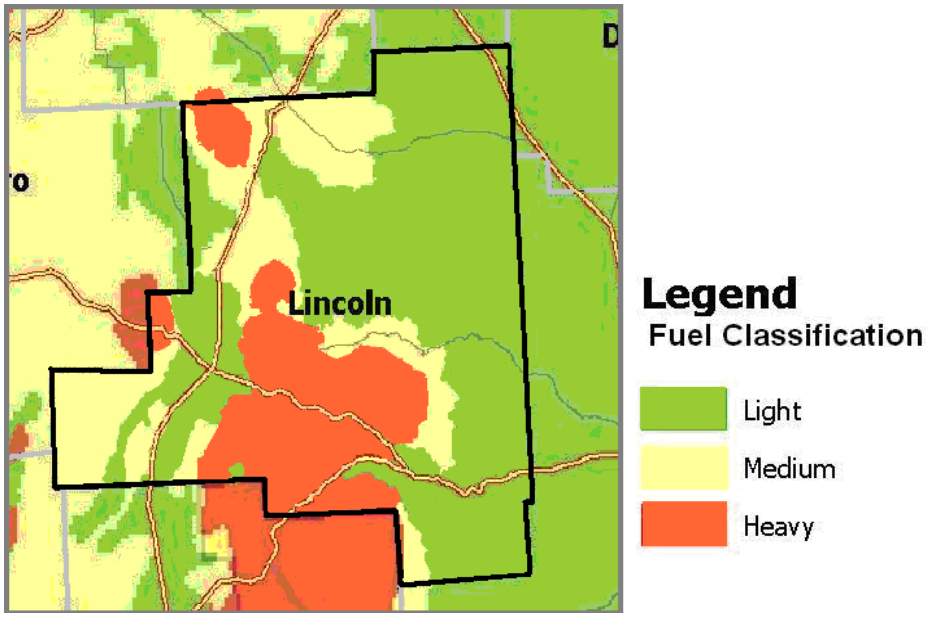
Table 3-8 Assessment Area Summary Information

Community	Values at Risk	Wildfire Risk of Occurrence	NFPA 1144 Hazard Rating	Contributing Factors to NFPA 1144 Ratings	Firefighting Capacity
			White Oaks WUI		
White Oaks	• Homes • Historic buildings • Businesses • Tourism • Recreation • Railroad • Watershed quality • Wildlife habitat • Rangeland • Aesthetics • Air quality • Soil stability	High	High	• Medium fuel loads • Defensible space less than 25 feet around structures • Terrain conducive to unfavorable fire behavior • Closeness of structures can contribute to fire spread • Combustible sidings, porches, and decks • Structures lack fixed sprinkler system • Utilities above ground	• White Oaks FD • Hydrants •

The communities of Alto, Ancho, Arabela, Glencoe, Lincoln, Nogal, and White Oaks received a high-hazard rating mainly because of the proximity of fuels, lack of defensible space, and terrain conducive to severe wildfire behavior. The communities of Corona and Hondo-Tinnie were ranked moderate-hazard because of limited defensible space around structures. Capitan, Carrizozo, and Fort Stanton received a low-hazard rating because of light fuels and sufficient defensible space around many structures.

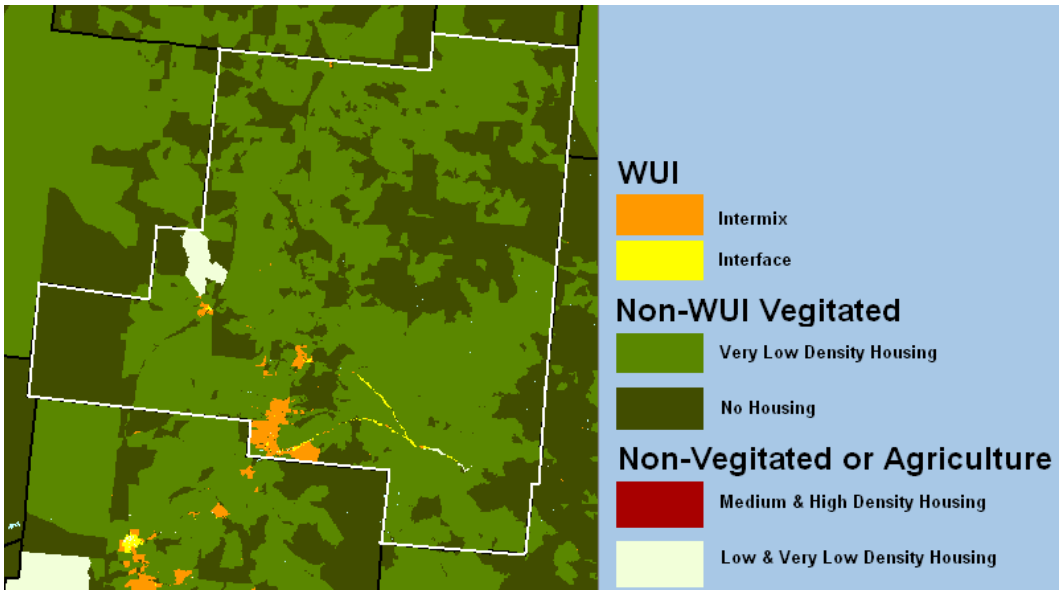
Lightning caused 36 percent of wildfires while 64 percent were human-caused. Human-caused fire is significant because these fires usually occur within the WUI and pose significant risks to social, economical, and ecological values. Even though the vast majority of wildfires in Lincoln County are suppressed before they burn large areas, wildfire risk to communities and structures is considerable given the number of annual fires that occur.

This topic is dealt with in greater detail in the Lincoln County Community Wildfire Protection Plan (CWPP) developed in June of 2008.



Source: New Mexico Resource Geographic Information System Program, http://rgis.unm.edu/intro.cfm;

Figure 3-2 Potential Wildfire Hazard Areas



Source: Univ. of Wisconsin, Madison SILVIS Lab http://www.silvis.forest.wisc.edu/projects/WUI_Main.asp

Figure 3-3 Potential Wildfire Hazard Areas

Historical Occurrences

The NCDC reported 4 wildfires for Lincoln County between the years of 1996 and 2004. These wildfires caused over $7.6 million in damages, and no deaths or injuries are reported with these events.

In May of 2000, the hot and dry weather throughout the spring culminated in a series of devastating wildfires that scorched nearly 90,000 acres of forest and

ravaged Los Alamos and the adjacent Los Alamos National Laboratory (LANL). Wildfire also threatened eastern areas of Ruidoso. A prescribed burn which was ignited May 4 on property of the Bandolier National Monument quickly escaped its project area and then was fanned by gusty winds on May 6 and May 7 into a wildfire known as the Cerro Grande Fire. Despite containment efforts on May 8 and May 9, gusty winds and hot temperatures the afternoon and evening of May 10 caused the Cerro Grande Fire to rage into a fast moving fire storm which swept into western Los Alamos and LANL property. About 250 homes and Lab buildings were lost to the fire. Another 10,000 people, included some already evacuated from Los Alamos, were later evacuated from White Rock as the Cerro Grande Fire threatened to move east May 12 through May 14. The fire, which eventually consumed nearly 48,000 acres, abated in cooler and more humid weather about May 17, but was not fully contained at month's end. The human caused Cree Fire also intensified and spread quickly on May 7 near Ruidoso destroying about 8,000 acres of forest and over a dozen homes in rural neighborhoods of northeast Ruidoso. The fire was contained about May 12. Estimated damages for Lincoln County were $2 million.

In March of 2002, 5 miles east of Alto, winds of 45 to 55 mph whipped an accidential fire into a fast moving wildfire that consumed 12,000 acres and 20 homes before crews and air tank attacks gained control in much lighter winds. Estimated damages were $5 million to Lincoln County.

Gusty winds, hot temperatures and persistent extreme dryness in forest areas set the stage for several small fires, both in Lincoln County, to become large wildfires in May 2004. Lightning is suspected to have started the Pippin wildfire in the Capitan Mountains about 15 miles northeast of Lincoln which had consumed nearly 48,000 acres by the end of the month and destroyed about 15 historic cabins dating back to near 1920. The Lookout wildfire flared from an improperly extinguished camp fire in the Gallinas Mountains just west of Corona. This 5500 acre wildfire claimed a ranch headquarters and mountain top communications facilities before it was contained. Damages from this event were estimated at $600K.

Although only 4 wildfires were reported to the National Climatic Data Center (NCDC), meetings with the MPG proved that there are many more throughout Lincoln County each year. According to the Community Wildfire Protection Plan that was completed in 2007, wildfire occurrence in Lincoln County is common. Fires were especially common in the Nogal-Alto-Lincoln Wildfire Urban Interface (WUI). Another dominant pattern of fire occurrence is along U.S. Highways 54, 70, 285, and 380.

During the period of 1987 through 2007, there were 650 fires that burned 135,669 acres. Approximately 79 percent of all wildfires burned less than 9.9 acres per fire, regardless of ignition source, while less than 1 percent of all fires burn over 1,000 acres. Lightning caused 36 percent of wildfires, and 64 percent were

human-caused. Human-caused wildfire resulted mainly from escaped fire (e.g., debris burning and campfires). The railroad accounted for 22 fires.

Wildfire history in Lincoln County was based on the number of wildfire that the Bureau of Indian Affairs, Bureau of Land Management, and New Mexico State Forestry Division responded to for the years 1987 through 2007. During this 20-year period there were 650 fires that burned approximately 132,669 acres. On average there were 32 wildfires per year with 6,783 acres burned per year. Approximately 41 percent of all wildfires in Lincoln County burn less than 0.25 acres, while less than 1 percent of all fires burn over 5,000 acres regardless of ignition source (see Table 3-9).

The most recent wildfire in Lincoln County was the 2012 Little Bear Fire. Data is still being collected as to the impact the fire had on the community.

Table 3-9 Lincoln County Wildfire History (1987-2007)

Fire Size Class (Acres)	Acres Burnt	Number of Fires	Fire Ignition Source	
			Lightning	Human
A 0 – 0.25	81	265	97	168
B 0.25 – 9.9	1949	246	59	187
C 9.9 – 99.9	2653	79	38	41
D 100 – 299.9	4312	20	14	6
E 300 – 999.9	15177	22	14	8
F 1,000 – 4,999.9	23965	14	10	4
G 5,000 – 9,999.9	87532	4	2	2

Probability of Occurrence

The threat of wildland/urban interface fires continues to be the top natural hazard facing the state. This is the judgment of the Lincoln County MPG as well. The annual probability of a large fire event in the state is 100%. There are literally hundreds of communities that are embedded in the forest, are surrounded by the forest, or have their major routes of egress surrounded by forest. The U.S. Forest Service estimates that approximately 942 thousand acres are in the New Mexican wildland/urban interface (WUI). With drought conditions persisting and more and more people locating their residences in the forest, it seems inevitable that more areas will become susceptible, more fires will occur, and that some of them will have dire consequences. Figures 3-2 and 3-3 present the nature and locations of this hazard in Lincoln County.

Table 3-10 Wildfire Hazard Probability

Hazard	n	N	T	P	Source/Comments
Wildfire	4	13	3.25	0.307692	NCDC
	2	7	3.5	0.285714	FEMA – FMAD, Major Events
KEY	n = number of events	N = number of years in record	T = Recurrence Interval (T = N/n)	P = Probability (P=1/T)	

3.2.3.2 Floods

Description of Hazard

Flooding occurs when a river, stream, lake, or other body of water overflows its banks onto normally dry land or there is an excessive pooling of surface water. These events can develop slowly or happen very quickly. These overflow areas are floodplains (Figure 3-4).

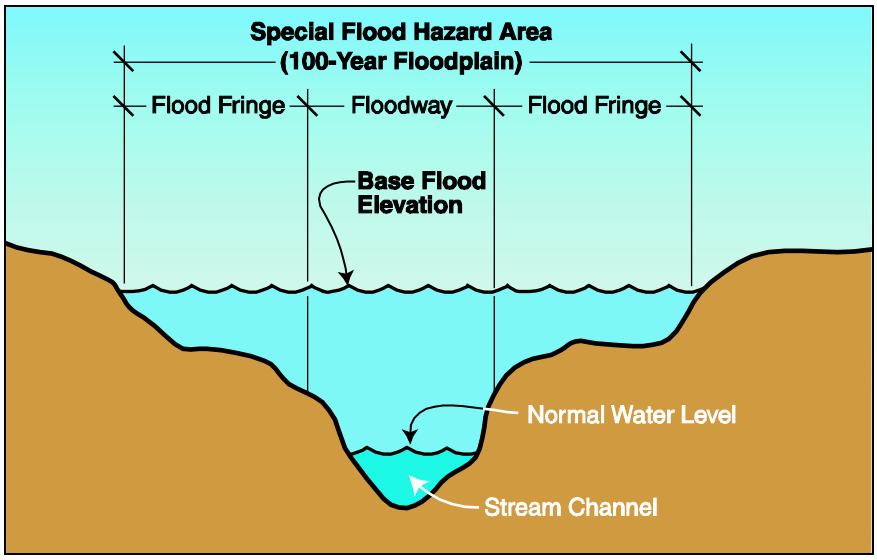


Figure 3-4 Flood Definition

Riverine floods are described in terms of their extent (including the horizontal area affected and the vertical depth of floodwaters) and the related probability of occurrence. Flood studies use historical records to determine the probability of occurrence for different extents of flooding. The flood recurrence intervals, shown in Table 3-11, are expressed as the percentage chance that a flood of a specific extent will occur in any given year. Alluvial fans and alluvial fan flood hazards do exist in the state. Alluvial fan flood hazard characteristics include heavy sediment/debris loads and high velocity flows. Flash floods are usually the result of excessive precipitation or rapid snowmelt and can occur suddenly. Flash floods cannot be predicted.

Table 3-11 Flood Recurrence Intervals

Flood Recurrence	Chance of Occurrence in Any Given Year
10 year	10%
50 year	2%
100 year	1%
500 year	0.20%

In 1968, Congress created the National Flood Insurance Program (NFIP) in response to the rising cost of taxpayer-funded disaster relief for flood victims and

the increasing amount of damage caused by floods. The Mitigation Division, a component of the Federal Emergency Management Agency (FEMA), manages the NFIP and oversees the floodplain management and mapping components of the program.

Nearly 20,000 communities across the United States and its territories participate in the NFIP by adopting and enforcing floodplain management ordinances to reduce future flood damage. In exchange, the NFIP makes federally backed flood insurance available to homeowners, renters, and business owners in these communities.

The NFIP Community Rating System (CRS) was implemented in 1990 as a program to recognize and encourage community floodplain management activities to go beyond minimum NFIP standards. The National Flood Insurance Reform Act of 1994 codified the CRS in the NFIP. Under the CRS, flood insurance premium rates are adjusted to reflect the reduced flood risk resulting from community activities that meet the three goals of the CRS: (1) reduce flood losses; (2) facilitate accurate insurance rating; and (3) promote the awareness of flood insurance.

Flood damage is reduced by nearly $1 billion a year through partnerships with NFIP and CRS communities, the insurance industry, and the lending industry. Buildings constructed in compliance with NFIP building standards also suffer approximately 80% less damage annually than those not built in compliance. Further, every $3 paid in flood insurance claims saves $1 in disaster assistance payments.

The NFIP is self-supporting for the average historical loss-year, which means that operating expenses and flood insurance claims are not paid for by the taxpayer but through premiums collected for flood insurance policies. The program has borrowing authority from the U.S. Treasury for times when losses are heavy; however, these loans are usually paid back with interest.

To obtain secured financing to buy, build, or improve structures in Special Flood Hazard Areas (SFHAs), flood insurance must be purchased. Lending institutions that are federally regulated or federally insured must determine if the structure is located in a SFHA and must provide written notice requiring flood insurance.

Flood insurance is available to any property owner located in a community participating in the NFIP. Any area is susceptible to flooding, although to varying degrees. In fact, 25% of all flood claims occur in low-to-moderate risk areas.

The most widely adopted design and regulatory standard for floods in the United States is the 1% annual chance flood and this is the standard formally adopted by FEMA. The 1% annual flood, also known as the base flood elevation, has a 1% chance of occurring in any particular year. It is also often referred to as the “100-

year flood" since its probability of occurrence suggests it should only occur once every 100 years. Experiencing a 100-year flood does not mean a similar flood cannot happen for the next 99 years; rather, it reflects the probability that over a long period of time, a flood of that magnitude should only occur in 1% of all years.

Ten (10) NFIP policies were in force in Lincoln County at the beginning of 2009, for a total flood insurance coverage of $400,000 (Table 3-12). No payments have been paid out in Lincoln County for flood damage since the establishment of the NFIP in 1978. At present, there are no identified repetitive-loss properties in Lincoln County.

Table 3-12 National Flood Insurance Program Statistics

NFIP Flood Insurance Statistics for Lincoln County (1/1/78-06/30/09)	
Policies in-force	10
Insurance in-force	$400,000
Premiums in-force	$3,739
Total losses	2
Total payments	$0

FEMA Flood Insurance Rate Maps (FIRM) exist for Lincoln County (dated 3/28/78), the Village of Ruidoso (3/15/94), Ruidoso Downs (7/5/82), Carrizozo (8/22/75) and Capitan (6/25/76). These maps are included as Appendix B.

Flood zones as identified throughout this plan are defined as (Figure 3-4):

- **A Zone**. The 100-year or base floodplain elevation (BFE). These floodplains are mapped by approximate methods; BFEs are not determined. This is often called an unnumbered A zone or an approximate A zone. Because detailed analyses are not performed for such areas, no depths or base flood elevations are shown within these zones

- **AE Zone**. Base floodplain where base flood elevations are provided.

- **AH Zone**. Shallow flooding in base floodplain. BFEs are provided.

- **Zone X (shaded):** Area of moderate flood hazard, usually the area between the limits of the 100-year and the 500-year floods.

- **Zone X (unshaded):** Area determined to be outside the 500-year flood.

- **Zone D:** Area of undetermined but possible flood hazards.

Location and Extent

Table 3-13 lists the major causes of riverine flooding vs. flash flooding. Additionally, flash flooding can affect large portions of the County. Flash flooding is the second greatest weather hazard in New Mexico. Statistics based on storm data for 1959 to 2006 show that New Mexico ranks tenth in the nation in flash flood deaths per capita. The flash flooding problem stems from a number of factors.

Table 3-13 Flooding vs. Flash Floods – Causes

Riverine Floods	Flash Floods
Low lying, relatively undisturbed topography	Hilly/mountainous areas
High season water tables	High velocity flows
Poor drainage	Short warning times
Excess paved surfaces	Steep slopes
Constrictions – filling	Narrow stream valleys
Obstructions – bridges	Parking lots and other impervious surfaces
Soil characteristics	Improper drainage

During the summer (June through August), thunderstorm frequency in certain parts of New Mexico is among the highest in the nation. Excessive moisture during the summer can lead to large volume runoffs enhanced by the terrain.

Most of the flash floods in New Mexico are associated with the summer monsoon season. Approximately 60% of all flash floods in the state occur in July and August. The monsoon season generally dissipates in the northern part of the state in early September.

In mid- to late summer the Pacific winds bring humid subtropical air into the state. Solar heating triggers afternoon thunderstorms that can be devastating. Because of too much rain, in too small an area, in too short a time, flash flooding may result. These flash floods generally travel down arroyos (normally dry streambeds) and can produce a rapid rise in water level, high velocity, and large amounts of debris, which can lead to significant damage that includes uprooting trees, undermining buildings and bridges, and scouring new channels.

The intensity of flash flooding is a function of the intensity and duration of rainfall, steepness of the watershed, stream gradients, watershed vegetation, natural and artificial flood storage areas, and configuration of the streambed and floodplain. Dam failure and ice jams may also lead to flash flooding. Urban areas are increasingly subject to flash flooding due to the removal of vegetation, replacement of ground cover with impermeable surfaces, and construction of drainage systems. Local drainage floods may occur outside of recognized drainage channels or delineated floodplains from a combination of locally heavy

precipitation, a lack of infiltration, inadequate facilities for drainage and storm water conveyance, and increased surface runoff.

Winter flash flood events usually result from unseasonably high-level rain on top of a snow pack. Excessive runoff allows the combined release of the water in the snow pack along with the rain. These can be flash flood events lasting less than a day, or they can evolve into longer-term flooding events lasting from one day to a couple of weeks. Winter flooding occurs between November and February and usually affects the southwest portion of the state.

Most spring events occur between April and June. They vary between winter type events where the rain falls over an old snow pack in or near the mountains to events in the eastern plains, which are often associated with cold fronts, abundant moisture from the Gulf of Mexico, and upslope conditions.

Figure 3-5 demonstrates that seasonal flooding and flashfloods may impact large portions of Lincoln County. Additionally, the extent of the impact from flooding is best demonstrated on the County's Flood Insurance Rate Maps which can be accessed through the Lincoln County Planning Department.

There is an expectation that Lincoln County will experience at least one flood event a year. Based on available data it is expected that areas within identified floodplains would experience one to ten feet of inundation impacting structures and the ability to navigate flooded transportation routes. In the aftermath of the 2012 Little Bear Fire, it has been noted that areas that were previously not shown in the flood plain are being more severely impacted by flood events, particularly the Rio Bonito and Eagle Creek, and will be addressed more fully in the next update. Examples of flood events and their extents include the 2008 Ruidoso Flood (discussed below) where the peak flow measured at the Hollywood Station registered 1630 cubic feet per second. In 2006, a flash flood in Alamogordo roared through the middle of town inundating areas from First Street to Tenth Street.

In addition to the potential for annual flooding events, data is available from the County Planning Department (provided by FEMA) regarding 100-year flood events in Lincoln County for the following rivers (data is feet above river bed):

- Carrizo Creek : 12'+-
- Cedar Creek : 9' +-
- Rio Bonito: 10'+-
- Rio Ruidoso: 20'+-
- Rio Hondo: 20' +-
- Salado Creek: 10'+-

In all areas of the County bridges/crossings are going to be under the base flood elevation according to the 1% flood chart. This will be a severe risk to the County

of losing road infrastructure, and necessitating water crossing rescues of County residents that will be stranded.

The worst case scenario for flooding would result from failure of the Lake Mescalero, Bonita, Alto and Grindstone dams which would result in the water flow in the Rio Ruidoso increasing to 40 feet above the streambed through Ruidoso and Ruidoso Downs. After Ruidoso Downs it would be 20 feet above the streambed through the Hondo Valley.

Inundation levels for communities of concern in Lincoln County are illustrated on the maps identified in Table 3-14. No hazard areas with assigned flood depths were included. Additional data may be obtained through the Lincoln County Flood Manager. It must be noted that, due to a lack of project funding, the most current set of FIRMs does not include the entire County and there may be additional areas that will be impacted by flood events for which data is not available.

Table 3-14 Lincoln County FIRMs – Community Maps and Flood Hazard Areas

Community	Community Number	Panels	Flood Hazard Areas
Capitan, Village of	350098	1615, 1625	Special Flood Hazard Areas (Zone A) along Salado Creek , Magado Creek, Oso Creek and Spring Canyon Creek
Carrizozo, Town of	350110	1250, 1275	Special Flood Hazard Areas (Zone A) at the east end of town and along the Nogal Arroyo
Corona, Village of	350099	0090,0305	Special Flood Hazard Area (Zone A) along County Line Road
Mescalero Apache Indian Reservation	350041	2055, 2065	Maps not in data set.
Ruidoso, Village of	350033	1890, 1895, 1910, 1950, 2052, 2055, 2056, 2057, 2058, 2059, 2066, 2067, 2080, 2100	Special Flood Hazard Area (Zone AE) along the Rio Ruidoso
Ruidoso Downs, City of	350034	2059, 2080, 2085	Special Flood Hazard Area (Zone AE) along the Rio Ruidoso

Figure 3-6 illustrates that areas of highest potential flooding impact are water bodies located along transportation routes such as Highway 70 and nearest to population centers like Hondo, Ruidoso Downs and Ruidoso.

Flood gauges maintained by USGS are located at the following locations:

- Rio Hondo at Diamond A Ranch near Roswell, NM
- Rio Hondo above Chavez Canyon near Hondo, NM
- Rio Ruidoso at Hollywood, NM

- Rio Ruidoso at Ruidoso, NM
- Eagle Creek below South Fork near Alto, NM
- Bonito Lake near Alto, NM
- Rio Bonito at Highway 48 Bridge near Alto, NM

According to the report New Mexico Flood History, excessive runoff of the Rio Ruidoso is the principal cause of flooding in Ruidoso. The Rio Ruidoso is a perennial river which flows approximately 6 miles through the village in an easterly direction. The source of the Rio Ruidoso is on the eastern slope of Sierra Blanca at an elevation of nearly 12,000 feet. The drainage area at the Hollywood gaging station is 125 square miles.

Excessive flow in the tributaries of the Rio Ruidoso causes the remaining flood problems in the community. The major tributaries to the Rio Ruidoso from upstream to downstream are: Brady Canyon, an intermittent stream which flows southeasterly; Carrizo Creek, a perennial stream which rises on the southeast slope of Sierra Blanca, then flows to the northeast; Cedar Creek, a perennial stream which flows southeasterly; and Cherokee Bill Canyon, which contains a northeasterly flowing intermittent stream. Cherokee Bill Canyon flow originates in the Sacramento Mountains.

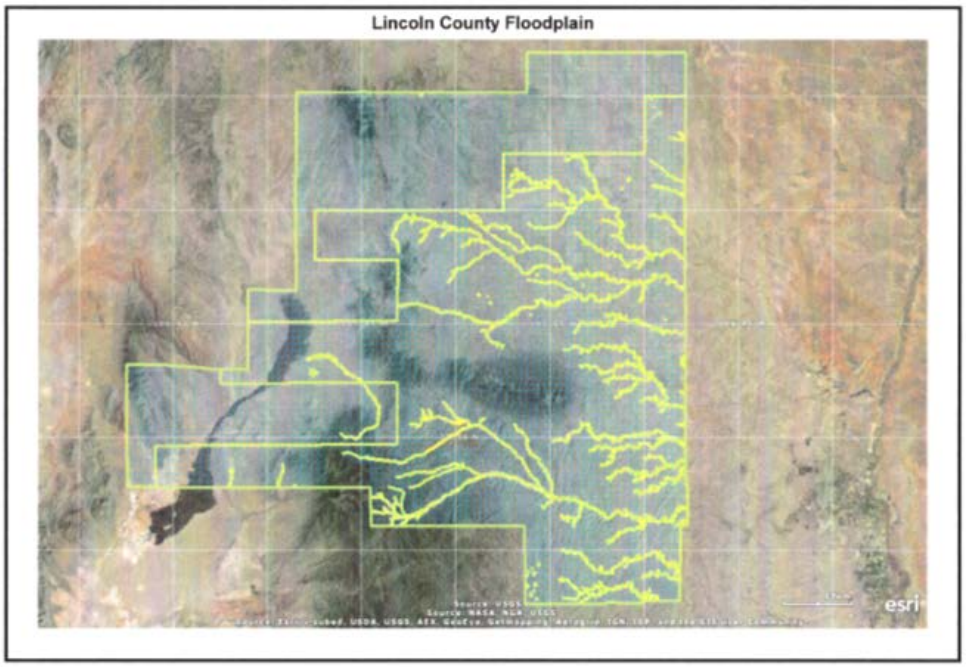


Figure 3-5 Lincoln County Flood Plain

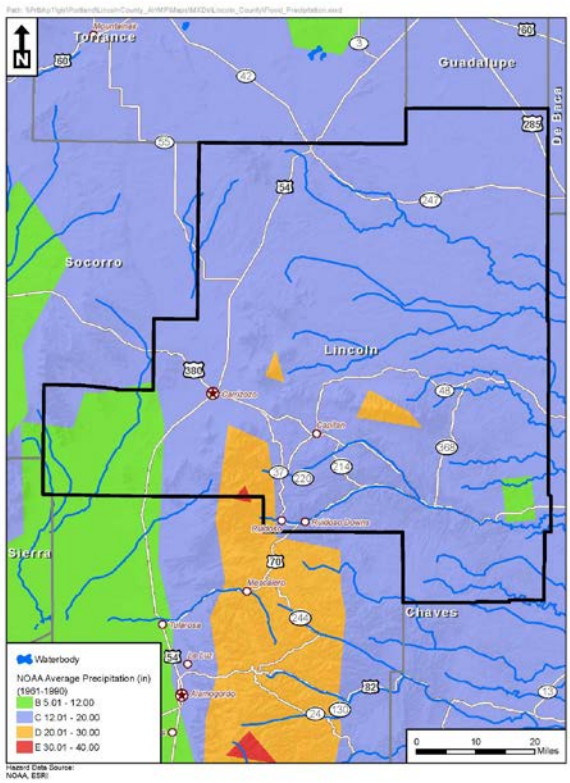


Figure 3-6 Potential Flood Impact Areas and Precipitation

Historical Occurrences

Information from the NCDC indicated that 13 flood events were reported in Lincoln County between May 1994 and February 2009. The total property damages associated with these events were estimated at $25.6 million, 2 deaths and no injuries. Of these 13 occurrences, 1 was a flood event and the remaining 12 events were flash floods.

A few flood events need particular mention because of the damages associated with them:

In September of 2001, heavy rain estimated at 2 to 3 inches swept over Ruidoso producing heavy runoff into Gavilan, Eagle and Paradise Canyons which swept south filling these normally dry arroyos to near record water levels. Hull Road and Gavilan Canyon Road suffered heavy asphalt removal while the mud and debris at one time threatened several road bridges. Runoff was aggravated by soils wet from several days of late summer rain and also the heavy runoff from nearby fire scorched forest areas. This flash flood event cost Lincoln County over $600 K in damages.

In July of 2008, widespread, serious flooding occurred from the upper canyon of the Rio Ruidoso downstream through the towns of Ruidoso, Hollywood and

Ruidoso Downs as far east as Fox Caves. Flooding also occurred along the Rio Bonito from the dam at Bonito Lake downstream to State Road 48. Flooding was extensive in Ruidoso, not only along the Rio Ruidoso, Cedar Creek and other small streams, but also throughout the town from the 6 to 7 inches of rainfall that fell there. One man was killed when he was swept away by the raging Rio Ruidoso, but no other substantial injuries were reported. A total of 500 structures, including campers and mobile homes were damaged. Around 200 houses were damaged, and some were completely destroyed. At least 13 bridges were washed out and several cars were washed downstream. Several dozen recreational vehicles and campers were damaged at an RV park at Ruidoso Downs. Former hurricane Dolly brought tropical moisture into New Mexico, dumping up to seven inches of rain around Ruidoso. This caused the Rio Ruidoso and Rio Bonito to rise well above flood stage and resulted in widespread and serious flooding around Ruidoso. This event cause over $25 million in damages in Lincoln County.

Probability of Occurrence

Table 3-15 provides probability data for flood events in Lincoln County.

Table 3-15 Flood Hazard Probability

Hazard	n	N	T	P	Source/Comments
Flood	13	14	1.076923	0.928571	NCDC (includes F'floods)
	2	3	1.5	0.666667	FEMA - PDD, Major Events
KEY	n = number of events	N = number of years in record	T = Recurrence Interval (T = N/n)	P = Probability (P=1/T)	

3.2.3.3 Drought

Description of Hazard

Drought is a condition of climatic dryness that reduces soil moisture, water, or snow levels below the minimum necessary for sustaining plant, animal, and economic systems. Drought conditions are usually not uniform over the entire state. Local and regional differences in weather, soil condition, geology, vegetation, and human influence need to be considered when assessing the impact of drought on any particular location.

The most commonly used drought definitions are based on meteorological, agricultural, hydrological, and socio-economic effects.

- **Meteorological** drought is defined as a period of substantially diminished precipitation duration and/or intensity. The commonly used definition of meteorological drought is an interval of time, generally on the order of months or years, during which the actual moisture supply at a given place consistently falls below the climatically appropriate moisture supply.

- **Agricultural** drought occurs when soil moisture is inadequate and does not meet the needs of a particular crop at a particular time. Agricultural drought usually occurs after or during meteorological drought but before hydrological drought and can affect livestock and other dry-land agricultural operations.

- **Hydrological** drought refers to deficiencies in surface and subsurface water supplies. It is measured as stream flow, snow pack, and as lake, reservoir, and groundwater levels. There is usually a delay between lack of rain or snow and less measurable water in streams, lakes, and reservoirs. Therefore, hydrological measurements tend to lag behind other drought indicators.

- **Socioeconomic** drought occurs when physical water shortages start to affect the health, well-being, and quality of life of the people or when the drought starts to affect the supply and demand of an economic product.

Although different types of drought may occur at the same time, they can also occur independently of one another. Drought differs from other natural hazards in three ways. First, the onset and end of a drought are difficult to determine due to the slow accumulation and lingering effects of an event after its apparent end. Second, the lack of an exact and universally accepted definition adds to the confusion of its existence and severity. Third, in contrast to other natural hazards, the impact of drought is less obvious and may be spread over a larger geographic area. These characteristics have hindered the preparation of drought contingency or mitigation plans by many governments.

Location and Extent

Lincoln County, along with the rest of New Mexico, is entering the fifth year of a drought, which magnifies the challenge of balancing limited water supplies with growing demand. A drought is caused by a variety of factors. Scientists who study climate changes believe that conditions in the North Atlantic Ocean and the Eastern Pacific Ocean play a significant role in determining the amount of precipitation that New Mexico and the rest of the country receive. Studies show current conditions in those two oceans are similar to conditions that existed during the severe drought of the late 1940s and 1950s in New Mexico.

Drought is a regular event in all areas of Lincoln County, occurring in recurring cycles. Experts predict that drought conditions are likely to continue for the foreseeable future. As illustrated by a weekly snapshot in Figure 3-7, the vegetation condition across the County may range from pre-drought to severe drought conditions.

Approximately 80% of the County (unincorporated Lincoln County) is reliant on wells for water supply which may be impacted by severe drought conditions.

In every drought, agriculture is adversely impacted, especially in non-irrigated areas such as dry land farms and rangelands. Droughts impact individuals (farm owners, tenants, and farm laborers), the agricultural industry, other agriculture-related sectors, and other industries such as tourism and recreation. There is increased danger of forest and wildland fires. Loss of forests and trees increases erosion, causing serious damage to aquatic life, irrigation, and power development by heavy silting of streams, reservoirs, and rivers. Primary areas of concern for droughts impact on agriculture are north Highway 380 and the Hondo Valley.

Drought status is calculated using several indices that measure how much precipitation for a given period of time has deviated from historically established norms. The Palmer drought severity index (PDSI) is used by the U.S. Department of Agriculture (USDA) to determine allocations of grant funds for emergency drought assistance.

The Palmer index (Table 3-16) is based on the supply-and-demand concept of the water balance equation, taking into account more than the precipitation deficit at specific locations. The PDSI provides a measurement of moisture conditions that are “standardized” so that comparisons using the index can be made between locations and months.

Table 3-16 Palmer Drought Severity Index

PDSI Classifications	
4.00 or more	Extremely wet
3.00 to 3.99	Very wet
2.00 to 2.99	Moderately wet
1.00 to 1.99	Slightly wet
0.50 to 0.99	Incipient wet spell
0.49 to -0.49	Near normal
-0.50 to -0.99	Incipient dry spell
-1.00 to -1.99	Mild drought
-2.00 to -2.99	Moderate drought
-3.00 to -3.99	Severe drought
-4.00 or less	Extreme drought

Source: http://drought.unl.edu/whatis/indices.htm

According to the New Mexico Drought Plan, the latest predictions call for a deepening of the drought in the next few years, even though 2006 was one of the wettest years on record. It is expected that Lincoln County could experience normal to extreme drought conditions.

One final measurement of drought, although one that is highly temporal is the Vegetation Drought Response Index (VegiDRI) which is available for two-week intervals (Figure 3-6).

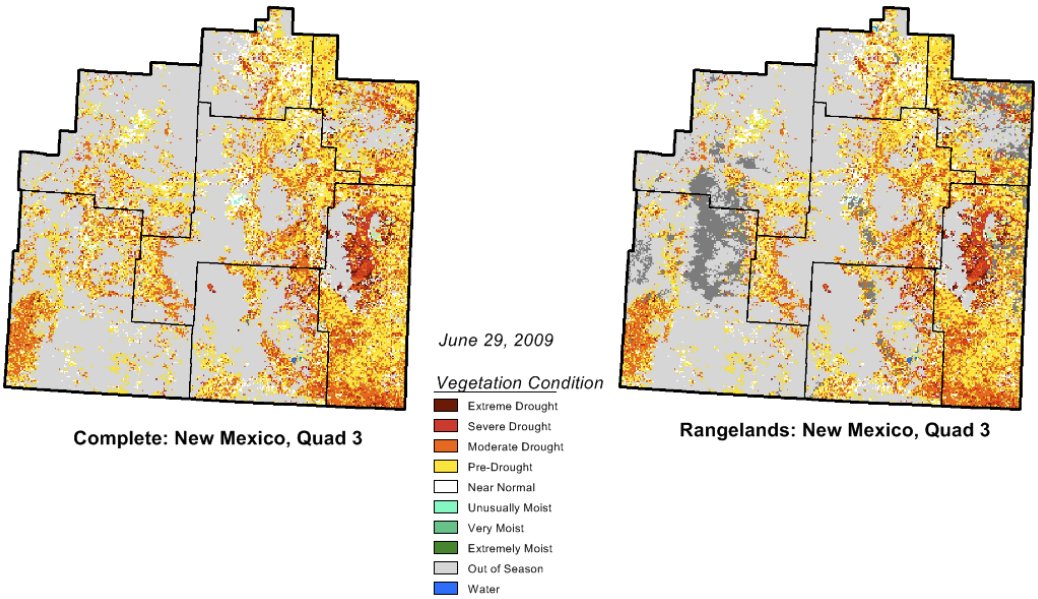


Figure 3-7 SE New Mexico VegiDRI Map (week of June 29, 2009)
Source: www.drought.unl.edu/vegidri/VegiDRI_Main.htm

Historical Occurrences

Thirty-three drought events for Lincoln County have been recorded by the NCDC, but no deaths, injuries, or estimated monetary damages were recorded. Even though the details regarding these events were lacking in the NCDC data, according to the MPG, Lincoln County has experienced losses from drought events.

Probability of Occurrence

Over the past 10 years (120 months), New Mexico has had 50 months of drought. Based on this, Lincoln County can anticipate at least some drought conditions every other year (42% probability).
Source: http://www.seo.state.nm.us/faq_index.html

Table 3-17 Drought Hazard Probability

Hazard	n	N	T	P	Source/Comments
Drought	3.5	13	3.714286	0.269231	NCDC
KEY	n = number of events	N = number of years in record	T = Recurrence Interval (T = N/n)	P = Probability (P=1/T)	

3.2.3.4 Severe Weather

3.2.3.4.1 Windstorms

Definition of Hazard

Wind is the motion of air relative to the earth's surface. In the mainland U.S. the mean annual wind speed is reported to be 8 to 12 mph, with frequent speeds of 50 mph and occasional wind speeds more than 70 mph. Large-scale extreme wind phenomena are experienced over every region of the United States and its territories. High winds can result from thunderstorm inflow and outflow, downburst winds when the storm cloud collapses, strong frontal systems or gradient winds (high or low-pressure systems) moving across a region. High winds are defined as speeds reaching 50 mph or more, either sustained (continuous) or gusting.

Although various scales can be used to measure the effects of wind, the Beaufort Wind Scale is specifically adapted to wind effects on land. Table 3-18 summarizes the correlation of wind speed with visible effects of the wind speed (land conditions) and how these correspond to the Beaufort Scale. Lincoln County has experienced all 12 categories listed below.

Table 3-18 Beaufort Scale

Beaufort Number	Wind Speed (mph)	Description	Land Conditions
0	0	Calm	Calm. Smoke rises vertically.
1	1-3	Light air	Wind motion visible in smoke.
2	4-7	Light breeze	Wind felt on exposed skin. Leaves rustle.
3	8-12	Gentle breeze	Leaves and smaller twigs in constant motion.
4	13-18	Moderate breeze	Dust and loose paper rises. Small branches begin to move.
5	19-24	Fresh breeze	Smaller trees sway.
6	25-31	Strong breeze	Large branches in motion. Whistling heard in overhead wires. Umbrella use becomes difficult.
7	32-38	Near gale	Whole trees in motion. Effort needed to walk against the wind.
8	39-46	Gale	Twigs broken from trees. Cars veer on road.
9	47-54	Strong gale	Light structure damage.
10	55-63	Storm	Trees uprooted. Considerable structural damage.
11	64-73	Violent storm	Widespread structural damage.

12	73-95	Hurricane	Considerable and widespread damage to structures.

Windstorms are defined here as both high-velocity straight-line winds and violent wind gusts not associated with thunderstorms. Dust storms are strong windstorms that fill the air with thick dust, sometimes reducing visibility to resemble a dense fog. Other wind events include wet or dry microbursts that may produce damaging convective winds and dust devils, even on a clear and otherwise calm day.

Location and Extent

The majority of serious wind events occur in June and July. Spring and fall events are mostly associated with dry microbursts, when lower level moisture is often lacking. March, April, and May have a large number of events related to springtime winds. New Mexico has an average of more than ten wind events per year, equaling a probability of 100%. Dust storm probability is 27% per year.

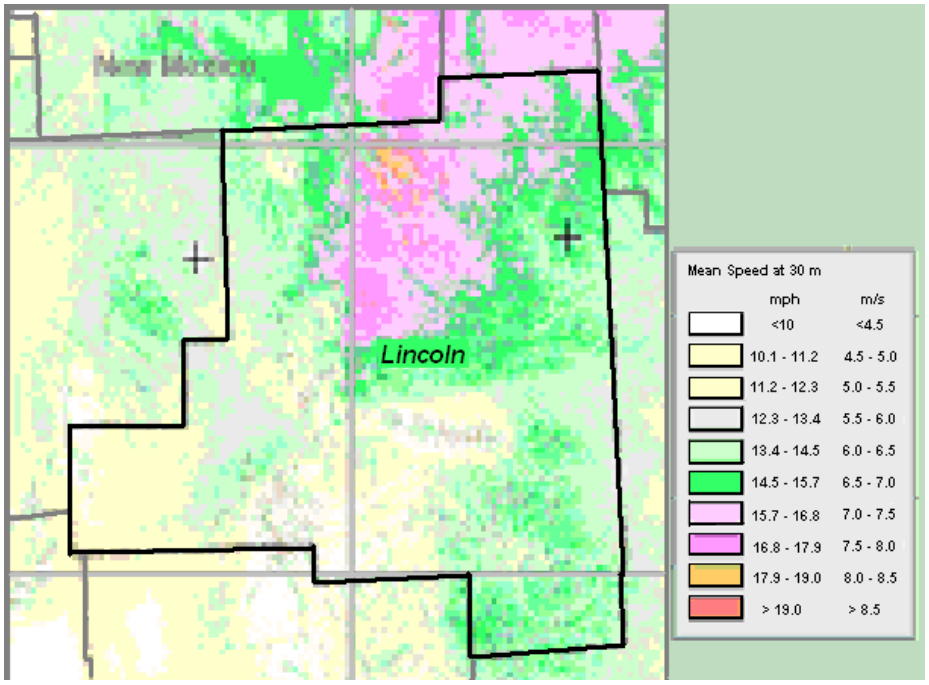
No areas of Lincoln County are immune from damaging high winds, especially in the spring, but extremely high-velocity wind over a prolonged period is rare. Such occurrences can result in downed power lines, roof damage, trees being blown down, and difficulty in controlling high- profile vehicles on the highways. Microburst wind damage is more common since it is often associated with powerful downdrafts originating from thunderstorms. These winds are of relatively short duration. Certain areas of Lincoln County are subject to hazardous dust storms when high winds blow over terrain that is relatively devoid of vegetation. Localized dust storms can arise unexpectedly when high winds pick up dust and debris from construction sites.

One type of wind event is the gap wind or canyon wind. This occurs as the wind rushes over mountain passes, “gaps,” in the ridgeline of a mountain chain. Wind speeds are generally strongest at narrow canyon openings. Another type of wind event is referred to as the spillover wind, which occurs when cold air to the east of the mountains has a sufficient depth (approximately 10,000 feet above sea level) to overtop mountain ranges and spill over to the west.

Large-scale dust storms occasionally occur in the White Sands region of New Mexico. Major dust events can transport mineral aerosols (dust) for long distances, obscuring vision for motorists and causing breathing problems for people with respiratory difficulties. These dust storms impact portions of Lincoln County, including the Carrizozo area.

The National Oceanic and Atmospheric Administration (NOAA) wind data from White Sands National Monument indicated winds at approximately 10,000 feet above ground level in excess of 50 knots. Reduced visibility continued long after the active production of blowing dust ended.

Figure 3-8 shows average wind speeds in Lincoln County.



Source: http://www.awstruewind.com/inner/windmaps/maps/NorthAmerica/UnitedStates/NewMexico/NM_SPD30m.pdf

Figure 3-8 Average Wind Speeds in Lincoln County

Historical Occurrences

A large dust storm was reported in March 1977 that originated in the White Sands area. Dust from White Sands was visible on the geostationary operational environmental satellite (GOES) imagery. It formed a plume more than 250 miles long and blew eastward through Roswell, across eastern New Mexico to Clovis and then into the Texas Panhandle, where it eventually dissipated.

Another major dust storm event occurred in the White Sands area on April 9, 1999, when large clouds of milky white dust were observed overtopping the nearby Sacramento Mountains and blowing to the northeast. The dust storm started quickly and lasted for more than 8 hours, with visibilities reduced to as low as 1.5 miles and winds gusting to at least 38 knots (44 mph).

Probability of Occurrence

See Table 3-21.

3.2.3.4.2 Thunderstorms

Description of Hazard

Thunderstorms are produced when warm moist air is overrun by dry cool air. As the warm air rises, thunderheads form and cause strong winds, lightning, hail, and heavy rains. Atmospheric instability can be caused by surface heating or by upper tropospheric (>50,000 feet) divergence. Rising air parcels can also result from airflows over mountainous areas. Generally, upper tropospheric "air mass" thunderstorms form on warm-season afternoons and are not severe. The latter "dynamically driven" thunderstorms, which generally form in association with a cold front or other regional atmospheric disturbance, can become severe, thereby producing strong winds, frequent lightning, hail, downburst winds, heavy rain, and occasional tornadoes.

Thunderstorms may have different characteristics in different regions of the state. Across the eastern plains, thunderstorms tend to be more organized, long-lived, and occasionally severe, producing large hail, high winds, and tornadoes. Thunderstorms in the western part of the state tend to be less severe on average, occasionally producing life-threatening flash floods and small hail accumulations.

The National Weather Service (NWS) definition of a severe thunderstorm is a thunderstorm that produces any of the following: downbursts with winds of 58 miles (50 knots) per hour or more (often with gusts of 74 miles per hour or more), hail 0.75 of an inch in diameter or more, or a tornado. Typical thunderstorms can be 3 miles wide at the base, rise to 40,000 to 60,000 feet into the troposphere, and contain half a million tons of condensed water. Severe thunderstorms are reported each year in nearly all New Mexico counties.

Thunderstorm frequency is measured in terms of incidence of thunderstorm days or days on which thunderstorms are observed. The NCDC reports 29 thunderstorm events since July 1989 causing no deaths, 2 injuries, $615,000 in property damage.

Lightning is defined as a sudden and violent discharge of electricity, usually from within a thunderstorm, due to a difference in electrical charges. Lightning is a flow of electrical current from cloud to cloud or cloud to ground. Nationwide, lightning causes extensive damage to buildings and structures kills or injures people and livestock, starts forest and wildfires, and disrupts electromagnetic transmissions. Lightning is extremely dangerous during dry lightning storms because people often remain outside rather than taking shelter. To the general public, lightning is often perceived as a minor hazard. However, lightning-caused damage, injuries, and deaths establish lightning as a significant hazard associated with any thunderstorm.

Damage from lightning occurs four ways:

1. Electrocution or severe shock of humans and animals;
2. Vaporization of materials along the path of the lightning strike;
3. Fire caused by the high temperatures (10,000 to 60,000°F); and
4. A sudden power surge that can damage electrical or electronic equipment.

Large outdoor gatherings (sporting events, concerts, campgrounds, etc.) are particularly vulnerable to lightning strikes. New Mexico ranks sixth in the nation in lightning fatalities with 0.55 deaths per million people annually.

The NCDC reports three lightning events between the years of 1995 and 1997, which caused 11 injuries: 8 in Alto and 3 in Capitan. Although only three events were recorded with the NCDC, it is assumed that more lightning events occur each year in Lincoln County.

While the entire state is at risk for lightning events, some areas of the state have higher concentrations of these events Figure 3-9 shows areas of lightning density in the state. According to the figure, Lincoln County lies within an area that has mean annual flash density levels of over 3 $km^{-2}yr^{-1}$.

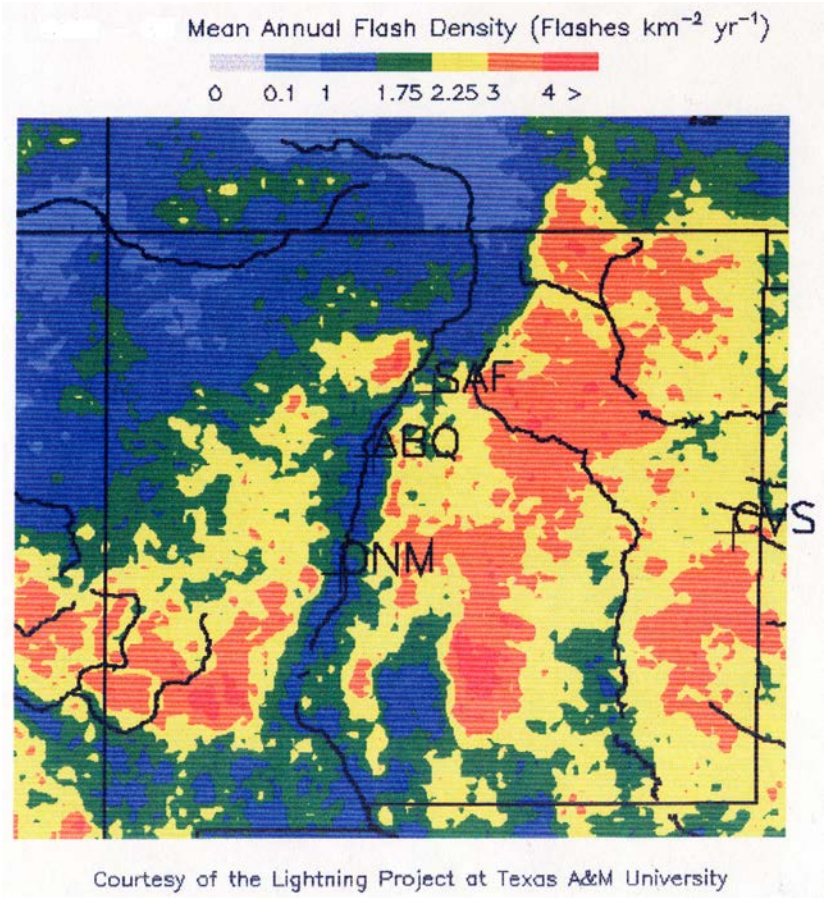


Figure 3-9 Lightning Density

The frequency and character of cloud-to-ground lightning can be categorized on a scale of 1 to 6 (Table 3-19). Lincoln County consistently experiences storms rating 5 or higher, and it is unlikely that this trend will change.

Table 3-19 Lightning Activity Level

Category of Severity	Cloud and Storm Development	Counts of cloud-to-ground strikes every 5 minutes	Counts of cloud-to-ground strikes every 15 min	Average cloud-to-ground strikes per minute
1	No thunderstorms	-	-	-
2	Cumulus clouds are common but only a few reach the towering stage. A single thunderstorm must be confirmed in the rating area. The clouds mostly produce virga but light rain will occasionally reach ground. Lightning is very infrequent.	1-5	1-8	<1
3	Cumulus clouds are common. Swelling and towering cumulus cover less than two-tenths of the sky. Thunderstorms are few, but two to three storms occur within the observation area. Light to moderate rain will reach the ground, and lightning is infrequent.	6-10	9-15	1-2
4	Swelling cumulus and towering cumulus cover two-tenths to three-tenths of the sky. Thunderstorms are scattered but more than three must occur within the observation area. Moderate rain is commonly produced, and lightning is frequent.	11-15	16-25	2-3
5	Towering cumulus and thunderstorms are numerous, covering more than three-tenths of the sky and occasionally obscuring the sky. Rain is moderate to heavy, and lightning is frequent and intense.	>15	>25	>3
6	Dry lightning outbreak. (LAL of 3 or greater with majority of storms producing little or no rainfall.)	-	-	-

Source: http://www.crh.noaa.gov/gid/?n=fwfintro

Hail is frozen water droplets formed inside a thunderstorm cloud during the strong updrafts of warm air and downdrafts of cold air, when the water droplets are carried well above the freezing level to temperatures below 32°F; the frozen

droplet begins to fall, carried by cold downdrafts, and may begin to thaw as it moves into warmer air toward the bottom of the thunderstorm. This movement up and down inside the cloud through cold then warmer temperatures causes the droplet to add layers of ice, sometimes becoming quite large, sometimes round or oval shaped and sometimes irregularly shaped, before it finally falls to the ground as hail.

Hail usually occurs during severe thunderstorms, which also produce frequent lightning, flash flooding, and strong winds, with the potential of tornadoes. The hail size ranges from smaller than a pea to as large as a softball and can be very destructive to buildings, vehicles, and crops. Even small hail can cause significant damage to young and tender plants. Hail usually lasts an average of 10 to 20 minutes but may last much longer in some storms. Hail causes $1 billion in damage to crops and property each year in the U.S.

Location and Extent

No part of the state is immune from hailstorms. According to The National Climatic Data Center, Lincoln County had 51 reported hail events between 1962 and February 2009. There were no reported deaths, injuries or damages in dollar estimates. Once the summer monsoon starts, thunderstorms often develop in the afternoons and evenings. Mountainous areas usually see more storms than the plains and desert, although mountain storms tend to be less severe and produce smaller hail. In the plains and over the desert, monsoon thunderstorms sometimes reach severe levels and can produce large hail. Table 3-20 shows hail sizes and possible damages form hail events.

Table 3-20 Combined National Oceanic and Atmospheric Administration (NOAA)/ Tornado and Storm Research Organization (TORRO) Hailstorm Intensity Scales

Size Code	Intensity Category	Typical Hail Diameter (inches)	Approximate Size	Typical Damage Impacts
H0	Hard Hail	Up to 0.33	Pea	No damage
H1	Potentially Damaging	0.33 to 0.60	Marble or Mothball	Slight damage to plants, crops
H2	Potentially Damaging	0.60 to 0.80	Dime or grape	Significant damage to fruit, crops, vegetation
H3	Severe	0.80 to 1.20	Nickel to Quarter	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored
H4	Severe	1.2 to1.6	Half Dollar to Ping Pong Ball	Widespread glass damage, vehicle bodywork damage
H5	Destructive	1.6 to 2.0	Silver dollar to Golf Ball	Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries

Table 3-20 Combined National Oceanic and Atmospheric Administration (NOAA)/ Tornado and Storm Research Organization (TORRO) Hailstorm Intensity Scales

Size Code	Intensity Category	Typical Hail Diameter (inches)	Approximate Size	Typical Damage Impacts
H6	Destructive	2.0 to 2.4	Lime or Egg	Aircraft bodywork dented, brick walls pitted
H7	Very destructive	2.4 to 3.0	Tennis ball	Severe roof damage, risk of serious injuries
H8	Very destructive	3.0 to 3.5	Baseball to Orange	Severe damage to aircraft bodywork
H9	Super Hailstorms	3.5 to 4.0	Grapefruit	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open
H10	Super Hailstorms	4.0+	Softball and up	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open

Sources: www.noaa.gov and www.torro.org

Historical Occurrences

Hail as large as 2.75 inches has been reported in Lincoln County, but Lincoln County should expect to have hail the sizes of the entire TORRO range.

Probability of Occurrence

See Table 3-21.

3.2.3.4.3 Severe Winter Storms

Description of Hazard

Severe winter storms can vary in size and strength and include heavy snowstorms, blizzards, ice storms, freezing drizzle or rain, sleet, and blowing and drifting snow. Extremely cold temperatures accompanied by strong winds result in potentially lethal wind chills.

A variety of weather phenomena and conditions can occur during winter storms. The following are NWS-approved definitions of winter storm elements:

- **Heavy snowfall** - the accumulation of 6 or more inches of snow in a 12-hour period or 8 or more inches in a 24-hour period.

- **Blizzard** - the occurrence of sustained wind speeds in excess of 35 mph accompanied by heavy snowfall or large amounts of blowing or drifting snow.

- **Ice storm** - an occurrence where rain falls from warmer upper layers of the atmosphere to the colder ground, freezing upon contact with the ground and exposed objects near the ground.

- **Freezing drizzle/freezing rain** - the effect of drizzle or rain freezing upon impact on objects that have a temperature of 32° F or below.

- **Sleet** - solid grains or pellets of ice formed by the freezing of raindrops or the refreezing of largely melted snowflakes. This ice does not cling to surfaces.

- **Wind chill** - an apparent temperature that describes the combined effect of wind and low air temperatures on exposed skin.

The wind chill temperature is a measure of how cold the wind makes real air temperature feel to the human body. Since wind can dramatically accelerate heat loss from the body, a blustery 30° day would feel just as cold as a calm day with 0° temperatures. On November 1, 2001, the NWS released a scientifically accurate equation, which is used for calculating wind chill. (Figure 3-10: Please note that it is not applicable in calm winds or when the temperature is more than 50°F.)

Wind (mph) \ Temperature (°F)	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45	26	29	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times: 30 minutes, 10 minutes, 5 minutes

$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

Where, T= Air Temperature (°F) V= Wind Speed (mph) *Effective 11/01/01*

Source: National Weather Service and NOAA

Figure 3-10 Wind Chill Chart

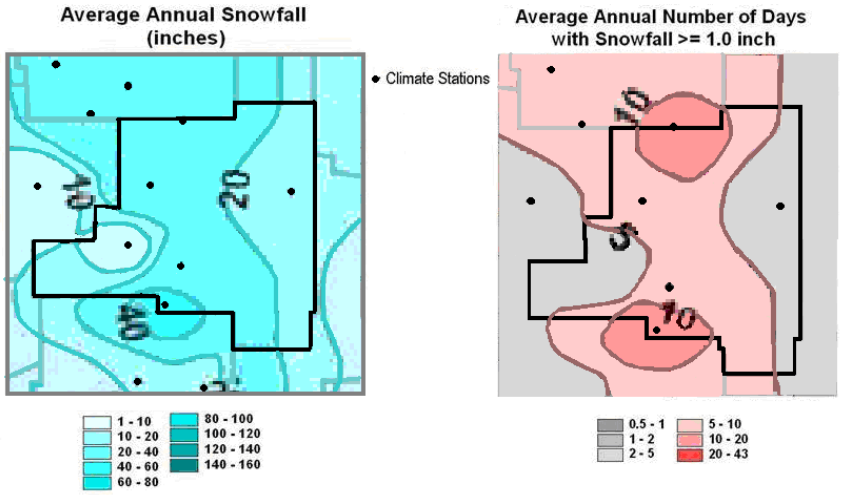
Location and Extent

A severe winter storm for Lincoln County as defined by the NWS is 4 or more inches of snowfall below 7,500 feet elevation or 6 or more inches of snowfall

above 7,500 feet elevation in a 12- hour period, or 6 or more inches of snowfall below 7,500 feet elevation or 9 inches of snowfall above 7,500 feet elevation in a 24-hour period.

Most winter precipitation in New Mexico is associated with Pacific Ocean storms as they move across the state from west to east. As the storms move inland, moisture falls on the coastal and inland mountain ranges of California, Nevada, Arizona, and Utah. If conditions are right, the remaining moisture falls on the slopes of New Mexico's high mountain chains.

Much of the precipitation that falls as snow in the mountain areas may occur as either rain or snow in the valleys. The average annual snowfall ranges from about 3 inches in the southern desert and southeastern plains to more than 100 inches in the northern mountains (Figure 3-11). It can, on rare occasions, exceed 300 inches in the highest mountains. January is usually the coldest month, with average daytime temperatures ranging from the middle 50s in the southern and central valleys to the middle 30s in the higher elevations. Minimum temperatures below freezing are common in all sections of the state during the winter. Subzero temperatures are rare, except in the mountains. The lowest temperature ever officially recorded was -50° F at Gavilan on February 1, 1951. An unofficial low temperature of -57° F at Ciniza was reported by the press on January 13, 1963 (Source: http://www.wrcc.dri.edu/narratives/NEWMEXICO.htm).



Source: National Weather Service, Albuquerque Office

Figure 3-11 Lincoln County Snowfall Distributions

Historical Occurrences

The NCDC has reported 26 severe winter weather events in Lincoln County between 1995 and 2009. These storms resulted in 4 deaths, 6 injuries, and over $4.25 million in property damage and over $5.27 million in crop damage.

In December 1997, a series of heavy snow events produced totals of 15 to 30 inches across eastern and central New Mexico just before Christmas. Periods of light snow actually began about the 20th and then intensified during the 22nd through the 25th as tropical moisture began to feed a large, nearly stationary upper level low over southwest New Mexico. Lincoln County experienced road closures that lasted 2 weeks, into January. The total damages, including that of other counties, exceeded $6.5 million but indirect damages exceeded $20 million.

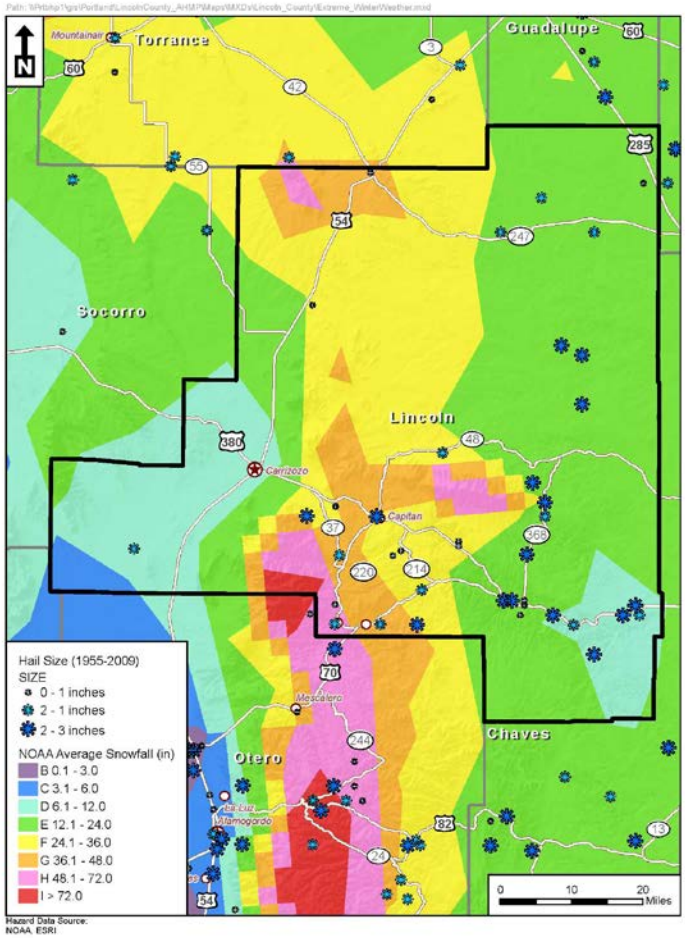


Figure 3-12 Average Snowfall and Hail Events

<u>Probability of Occurrence</u>

No part of Lincoln County is immune from the hazard of severe winter storm, whether extreme cold, heavy snow, ice storm, or other cold weather conditions. The mountainous areas of Lincoln County are more likely to receive snow and cold than the plains and desert, but residents of high altitude areas are more likely to be prepared for these conditions, even if they become extreme. Severe winter weather is much more likely to have a serious impact on major population centers and transportation routes, most of which are not located in the high mountains. The plains and desert areas are more susceptible to high winds that contribute to the drifting of snow, and a snow storm that would hardly be noticed in the higher

altitudes could present a serious hazard to people in the lower altitudes. If a severe winter storm were to cause a power failure, as would be likely with an ice storm, the effect could be very serious. Any accumulation of ice or snow on the roads is a hazardous situation and can lead to widespread road and highway closures that can strand motorists.

The regulations regarding road closure are found in Section 66-7-11 NMSA 2005. New Mexico State Police have the power to close certain highways in emergencies. "Notwithstanding any rule, regulation, or agreement of the state highway department, the New Mexico State Police, in cases of emergency where the condition of a state highway presents a substantial danger to vehicular travel by reason of storm, fire, accident, spillage of hazardous materials or other unusual or dangerous conditions, may close the highway to vehicular travel until the New Mexico State Police determines otherwise. The state highway department shall be notified of the highway closure as soon as practicable."

This regulation is broad enough to allow for closure for any type of winter storm event, but it is also difficult to define what constitutes "dangerous conditions."

Table 3-21 Severe Hazard Weather Probability

Hazard	n	N	T	P	Source/Comments
Severe Weather (Thunderstorms)	29	19	0.655172	1.526316	NCDC (includes High Winds and Tropical Storms)
Severe Weather (Lightning)	3	4	1.333333	0.75	NCDC
Severe Weather (Hail)	62	47	0.758065	1.319149	NCDC
Severe Weather (Winter Storm)	26	14	0.538462	1.857143	NCDC (recorded as snow and ice)
KEY	n = number of events	N = number of years in record	T = Recurrence Interval (T = N/n)	P = Probability (P=1/T)	

3.2.3.5 Dam Failure

Description of Hazard

Another flood hazard that can affect parts of Lincoln County is dam failure. A dam impounds water in an upstream area or reservoir. The amount of water impounded is measured in acre-feet (i.e., the volume of water that covers an acre of land to a depth of 1 foot).

Any malfunction or abnormality outside the design assumptions and parameters that adversely affects a dam's primary function is considered a dam failure. A catastrophic dam failure is characterized by a sudden, rapid, and uncontrolled release of impounded water. The sudden release of water may result in downstream flooding affecting life, property, or both. Flooding, earthquakes, blockages, landslides, lack of maintenance, improper operation, poor construction, vandalism, or acts of terrorism can cause dam failures. The sudden release of the impounded water can occur during a flood that overtops or damages a dam, or it can occur on a clear day if the dam has not been properly constructed or maintained. The threat of a dam failure increases as existing dams get older.

Many dams have been built as retention basins and amenity ponds in new developments. Many small dams are on streams or drainages that are not mapped as floodplains or subject to floodplain regulations. Even when the stream is mapped, the floodplain is usually not based on a dam-breach inundation map, leaving downstream residents unaware of the potential dangers.

The Office of the State Engineer, Dam Safety Bureau regulates the design, construction, reconstruction, modification, removal, abandonment, inspection, operation, and maintenance of dams more than 10 feet high or dams that store more than 10 acre-feet of water. Federal dam owners are required to obtain a permit for a new dam; however, the Office of the State Engineer by law does regulate the continued safety of federal dams. Dams 10 feet or less in height, or dams that store 10 acre-feet or less, generally are not regulated and are considered non-jurisdictional dams. However, if a non-jurisdictional dam threatens life and property due to an unsafe condition, the state engineer can issue a safety order to the owner requiring action to remove the threat.

Standard practice among federal and state dam safety offices is to classify a dam according to the potential impact a dam failure (breach) or mis-operation (unscheduled release) would have on downstream areas. The hazard potential classification system categorizes dams based on the probable loss of human life and the impacts on economic, environmental, and lifeline facilities, such as critical transportation systems and utilities. The Dam Hazard Potential Classification definitions are shown in Table 3-22.

Table 3-22 Dam Hazard Potential Classifications

Category	Loss of Life	State Ranking
Low	None Expected	Low economic or environmental losses. Losses principally limited to dam owner's property
Significant	None Expected	Economic loss, environmental damage and disruption of lifeline facilities. Predominantly located in rural areas
High	Expected	Based only on loss of life

Location and Extent

Of the 495 dams in the state, 395 dams come under the jurisdiction of the Office of the State Engineer, Dam Safety Bureau. Of these, 178 dams are classified as having a high hazard potential and 88 dams are classified as having a significant hazard potential. The remaining 100 dams are under federal jurisdiction, including the Bureau of Indian Affairs (BIA), the Bureau of Reclamations, and the U.S. Army Corps of Engineers (USACE).

According to the National Inventory of Dams (NID) there are 4 dams located in Lincoln County. Dams in neighboring jurisdictions that may also impact Lincoln County include the Lake Mescalero Dam. Table 3-23 provides an overview of those facilities using data from the NID. No dam hazard potential classifications were provided in the data but information provided by County Emergency Services classifies all dam structures in the County as High hazard for planning purposes.

Table 3-23 Overview of Dams in Lincoln County

Name	River	Owner	Purpose	EAP? (Y/N)	Classification
Bonito Dam	Rio Bonito	City of Alamogordo	Water Supply	N	Not provided
Alto Lake Dam	Eagle Creek	Village of Ruidoso	Water Supply	N	Not provided
Grindstone Canyon Dam	Grindstone Canyon	Village of Ruidoso	Water Supply	N	Not provided
Upper Rio Hondo Site No. 1 Dam	Salado Creek and Gyp Spring Canyon	Upper Rio Hondo Soil & Water Conservation District	Flood Control	N	Not provided
Lake Mescalero	N/A	BIA	Water Supply, Recreation	Y	High

The location of these dams in illustrated in Figure 3-13.

In 2005, the Office of the State Engineer adopted new regulations for dams. The regulations address the requirements for design and construction of new dams, modifications, or alterations to existing dams and the continued safe operation and maintenance of existing dams.

Downstream impacts from a dam failure incident may be severe. As noted in the flood portion of this section, the worst case scenario for flooding would result from failure of the Lake Mescalero and Grindstone Canyon dams which would result in the water flow in the Rio Ruidoso increasing to 40 feet above the streambed through Ruidoso and Ruidoso Downs. After Ruidoso Downs it would be 20 feet above the streambed through the Hondo Valley. The extent of potential impact of a dam failure is described in dam-specific Emergency Action Plans (EAP) that are maintained by the facility and should be provided to County Emergency Services. A new requirement for owners of dams that are classified as having a high or significant hazard potential is preparation, maintenance, and exercise of an EAP. An EAP identifies defensive action to prevent or minimize property damage, injury, or loss of life due to an emergency at the dam. Dam owners who have not developed EAPs will need assistance in fulfilling this new requirement. Both the Lake Mescalero and Grindstone Dams have EAPs, but those documents are not included in this plan as they are case sensitive and not for public viewing. The County does not own any of the identified dams, and at the date of adoption of this plan has not received additional data on impacts resulting from a dam failure at each facility.

The development of EAPs is addressed in the Mitigation Strategies as an action item. Each EAP has an inundation map based on modeling the dam failure under various operating conditions and an evacuation map that has been prepared from the inundation map. There is no state map showing all inundation zones. Local mitigation plans will contain information on dams classified as high and significant hazard potential and inundation maps within their jurisdictions as the information becomes available. An example EAP is listed on the Office of the State Engineer website to assist owners in preparing their EAP.

Since 2005, the Dam Safety Bureau has been using the new dam safety regulations to assess whether dams are deficient. As of spring 2007, the Dam Safety Bureau identified 63 deficient dams classified as having a high hazard potential and 23 deficient dams classified as having a significant hazard potential. Owners of these dams have been advised of the safety deficiency. The State Engineer has taken action against unsafe water storage dams that pose an immediate threat to life and property by ordering storage restrictions. Unfortunately, storage restrictions are not an option for flood control dams because the normal operating condition of the reservoir is empty. Safety-deficient flood control dams still offer some flood protection but will fail and cause catastrophic consequences during extreme storm events. Where owners are unable, or unwilling to upgrade their flood control dams a dilemma exists. Should an order to the breach the dam be issued, resulting in flooding, or allow

the unsafe dam to remain, knowing that an extreme storm may cause the dam to fail.

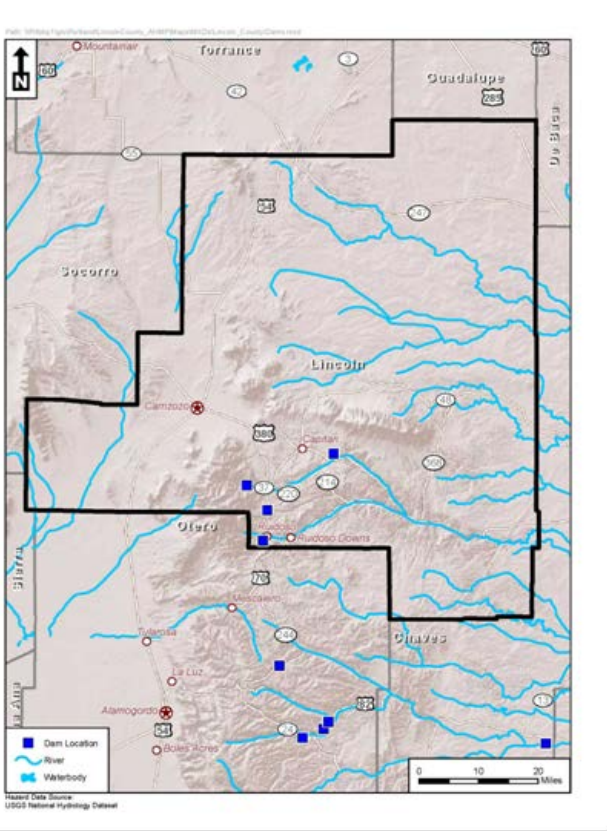


Figure 3-13 Dams in Lincoln County

Historical Occurrence

There have been no recorded Dam Failure events in Lincoln County.

Probability of Occurrence

There is a low probability of a dam failure incident in Lincoln County, however the presence of dam facilities in the jurisdiction drove the hazards inclusion in this planning document.

Table 3-24 Dam Failure Hazard Probability

Hazard	n	N	T	P	Source/Comments
Dam Failure	0	59			None Recorded
KEY	n = number of events	N = number of years in record	T = Recurrence Interval (T = N/n)	P = Probability (P=1/T)	

3.2.3.6 Earthquakes

Description of Hazard

An earthquake is a shaking of the earth resulting from the release of energy due to sudden slip along a fault, which initiates at the earthquake hypocenter. This energy release propagates as elastic seismic waves that transport energy to the earth's surface.

Earthquakes typically strike without warning and may range in intensity from tiny motions only detectable by sensitive instruments to slight tremors to highly damaging shocks. The perceived motion in felt earthquakes can last from a few seconds to more than 5 minutes, and damaging earthquakes can produce aftershocks that persist from weeks to years. The actual movement of the ground in an earthquake is seldom the direct cause of injury or death. Casualties typically result from falling objects and debris or from forces that damage or demolish buildings and other structures. Disruption of communications, electrical power supplies, and gas, sewer, and water lines should be expected in a large earthquake. Earthquakes can trigger fires, dam failures, landslides, or releases of hazardous material, compounding their hazards.

The vibration or shaking of the ground during an earthquake is described by the time history of its ground motion (when recorded, this history is called a seismogram). The severity of ground motion generally increases with the amount of energy released and decreases with distance from the earthquake hypocenter. Earthquakes generate elastic waves, both in the earth's interior (body waves) and along the earth's surface (surface waves). P (primary) waves in the earth's interior are physically similar in character to sound waves in air. P waves have a back-and-forth (longitudinal) motion along their direction of travel. They move through the shallow earth at speeds between approximately 1 to 4 km/s (roughly 2,000 to 9,000 miles/hour). P waves typically produce predominantly vertical forces on buildings. S (secondary) waves, also known as shear waves, have a side-to-side motion relative to their direction of travel. S waves are slower (by about a factor of 0.6) than P waves. S waves can cause significantly more damage than P waves because their amplitudes are typically larger and their shear motion produces horizontal forces on buildings, which are typically much less able to sustain without damage. Surface waves generate both shear and vertical forces and can be highly damaging in areas where development has occurred in low-seismic velocity basins (Mexico City is an example of this).

Earthquakes are commonly described in terms of magnitude and intensity. Magnitude is a fixed property of the earthquake source estimated from seismograms and is proportional to the logarithm of the total energy released (an increase of 1 in earthquake magnitude indicates an approximately 32-fold increase in energy). Intensity, in contrast, varies spatially and with local geology and describes the effects of ground motion at specific locations. Thus, a large, distant

earthquake can generate the same intensity at a given site than a much smaller, local earthquake.

There are several generally consistent magnitude scales used by the scientific and hazard community, based on different observable characteristics of seismic waves. The Richter Scale is the original magnitude scale and is technically applicable only to southern California. The three extensively quoted scales are the body wave magnitude, m_b the surface wave magnitude, M_s, and the moment magnitude, m_w. Body and surface wave magnitudes vary because they are based on the amplitudes of observed body and surface waves, respectively, which can vary in relative size for a given earthquake. (For example, earthquakes with shallower hypocenters generally produce corresponding larger surface waves than those with deeper hypocenters.) The moment magnitude is based on the fundamental forces produced by the earthquake fault motion and is coming into increasing use as the de facto measure of earthquake size. All three magnitudes usually agree to within 0.5 of a magnitude unit, with large departures only commonly occurring for very large earthquakes (magnitudes in excess of 7.5).

The commonly used Modified Mercalli Intensity (MMI) scale is based on the amount of shaking and specific kinds of damage to manmade objects or structures. This scale has 12 classes and ranges from I (not felt) to XII (total destruction).

A quantitative method of expressing an earthquake's severity is to compare its acceleration history (commonly the peak acceleration) to the normal acceleration due to gravity (g = 9.8 meters per second squared or 980 cm/sec/sec). Peak ground acceleration (PGA) measures the rate of change of motion relative to the rate of acceleration due to gravity and is proportional to the forces exerted on a structure. For example, an acceleration of the ground surface of 244 cm/sec/sec equals a PGA of 25.0 percent. A higher PGA means a higher level of ground acceleration and a higher probability of structural damage. Ordinary structures typically begin to be damaged structurally at about 10% PGA. Figure 3-14 shows the PGA with a 10% probability over the next 50 years for Lincoln County. Table 3-25 illustrates the comparison of scales of magnitude and intensity.

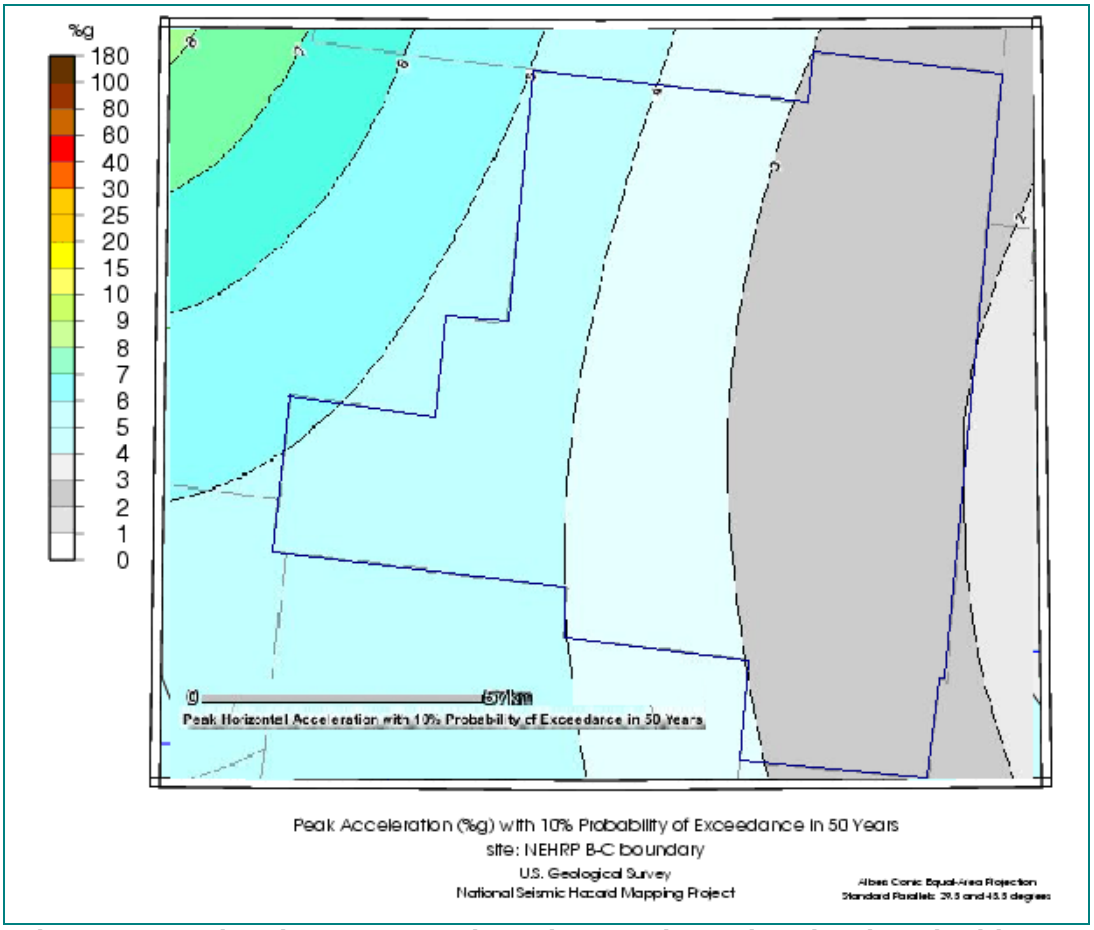


Figure 3-14 Lincoln County Projected Ground Acceleration (PGA) with a 10% Probability Over the Next 50 Years

Table 3-25 Peak Ground Acceleration (PGA) /Modified Mercalli Intensity(MMI) Comparison

Mercalli Scale	PGA (g)	Full Description
I.	<0.17	Not felt. Marginal and long period effects of large earthquakes.
II.	0.17 to 1.4	Felt by persons at rest, on upper floors, or favorably placed.
III.		Felt indoors. Hanging objects swing. Vibration similar to passing of light trucks. Duration estimated. May not be recognized as an earthquake.
IV.	1.4 to 3.9	Hanging objects swing. Vibration similar to passing of heavy trucks. Standing motor cars rock. Windows, dishes, doors rattle. Glasses clink in the upper range of IV, wooden walls and frame creak.
V.	3.9 to 9.2	Felt outdoors; direction estimated. Sleepers wakened. Liquids disturbed, some spilled. Small unstable objects displaced or upset. Doors swing, close, open. Pendulum clocks stop, start.

Table 3-25 Peak Ground Acceleration (PGA) /Modified Mercalli Intensity(MMI) Comparison

Mercalli Scale	PGA (g)	Full Description
VI.	9.2 to 18	Felt by all. Many people are frightened and run outdoors. People walk unsteadily. Windows, dishes, glassware broken. Books, etc., fall off shelves. Pictures fall off walls. Furniture moved. Weak plaster and masonry D cracked. Small bells ring. Trees, bushes shaken.
VII.	18 to 34	Difficult to stand. Noticed by drivers of motor cars. Hanging objects quiver. Furniture broken. Damage to masonry D, including cracks. Weak chimneys broken at roofline. Fall of plaster, loose bricks, stones, tiles, cornices. Some cracks in masonry C. Waves on ponds. Small slides and caving in along sand or gravel banks. Large bells ring. Concrete irrigation ditches damaged.
VIII.	34 to 65	Steering of motor cars affected. Damage to masonry C; partial collapse. Some damage to masonry B. Fall of stucco and some masonry walls. Twisting, fall of chimneys, factory stacks, monuments, towers, elevated tanks. Frame houses moved on foundations. Decayed piling broken off. Branches broken from trees. Changes in flow or temperature of springs and wells. Cracks in wet ground and on steep slopes.
IX.	65 to 124	General panic. Masonry D destroyed; masonry C heavily damaged, sometimes with complete collapse; masonry B seriously damaged. (General damage to foundations.) Serious damage to reservoirs. Underground pipes broken. Conspicuous cracks in ground. In alluvial areas sand and mud ejected, earthquake fountains, sand craters.
X.	>124	Most masonry and frame structures destroyed with their foundations. Some well-built wooden structures and bridges destroyed. Serious damage to dams, dikes, embankments. Large landslides. Water thrown on banks of canals, rivers, lakes, etc. Sand and mud shifted horizontally on beaches and flat land. Rails bent slightly.
XI.		Rails bent greatly. Underground pipelines completely out of service.
XII.		Damage nearly total. Large rock masses displaced. Lines of sight and level distorted. Objects thrown into the air.

Source: http://www.abag.ca.gov/bayarea/eqmaps/doc/mmigif/m10.html

Masonry A: Good workmanship, mortar, and design; reinforced, especially laterally, and bound together by using steel, concrete, etc.
Masonry B: Good workmanship and mortar; reinforced but not designed in detail to resist lateral forces.
Masonry C: Ordinary workmanship and mortar; no extreme weaknesses such as failing to tie in at corners, but neither reinforced nor designed against horizontal forces.
Masonry D: Weak materials, such as adobe; poor mortar; low standards of workmanship; weak horizontally.

Location and Extent

Earthquakes may occur anywhere within Lincoln County. The tectonic map (Figure 3-15) of Southern New Mexico illustrates the major uplifts, basins and faults in the region. Lincoln County lies on the Pecos Slope but includes the northern parts of the Tularosa Basin, Obscura Uplift and the Carrizozo Volcanic Field. Several intrusions form the foundations for the various mountain visible in Lincoln County: Sierra Blanca, Capitan Mountains, etc.

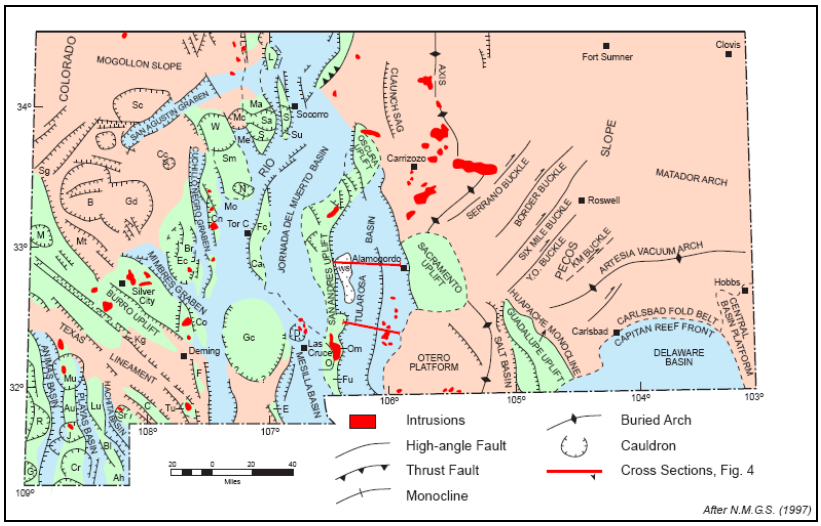


Figure 3-15 Tectonic Map of Southeast New Mexico
Source: NM Geologic Survey, 1997

Historical Occurrences

The NCDC has not recorded an earthquake in Lincoln County in the recent past nor have any been included in any federally declared disasters relating to earthquakes.

Probability of Occurrence

Since there are no recorded events, the probability for this event in Lincoln County is low; however, if Lincoln County is affected by any earthquake, this plan should be updated to read as such.

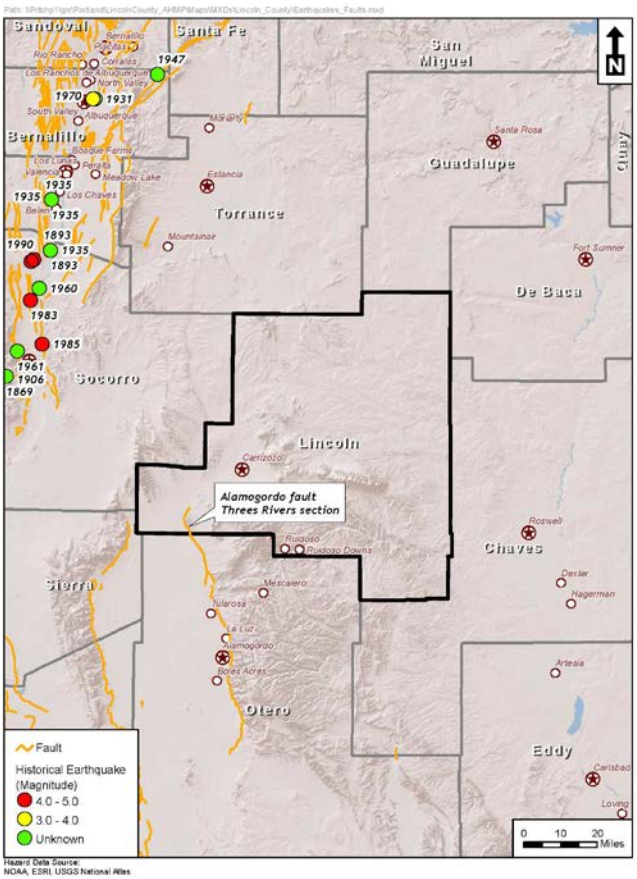


Figure 3-16 Fault Lines in Lincoln County

Table 3-26 Earthquake Hazard Probability

Hazard	n	N	T	P	Source/Comments
Earthquakes	1	500			USGS estimates a 10% chance for a 5%g (PGA) quake in the next 50 years
KEY	n = number of events	N = number of years in record	T = Recurrence Interval (T = N/n)	P = Probability (P=1/T)	

3.2.3.7 Tornadoes

Description of Hazard

A tornado is an intense rotating column of air, extending from a thunderstorm cloud system. Average winds in a tornado, although never accurately measured, are thought to range between 100 and 200 mph, but some may exceed 300 mph. The following are NWS definitions of a tornado and associated terms:

- **Tornado** - A violently rotating column of air that is touching the ground.
- **Funnel cloud** - A rapidly rotating column of air that does not touch the ground.
- **Downburst** - A strong downdraft, initiated by a thunderstorm that induces an outburst of straight-line winds on or near the ground. They may last anywhere from a few minutes in small-scale microbursts to 20 minutes in larger, longer macro-bursts. Wind speeds in downbursts can reach 150 mph and therefore can result in damages similar to tornado damages.

Tornadoes are classified by the degree of damage they cause. On February 1, 2007, the Fujita scale was replaced by the more accurate Enhanced Fujita Scale (Table 3-27). The **Enhanced Fujita Scale**, or **EF Scale**, rates the strength of tornadoes in the United States by the damage they cause. Implemented in place of the Fujita scale, it was used starting February 1, 2007. The scale has the same basic design as the original Fujita scale, with six categories from 0 to 5 representing increasing degrees of damage. It was revised to reflect better examinations of tornado damage surveys and to align wind speeds more closely with associated storm damage. The new scale takes into account how most structures are designed and is thought to be a much more accurate representation of the surface wind speeds in the most violent tornadoes. Source: http://www.spc.noaa.gov/efscale/ However, because none of the tornadoes recorded on or before January 31, 2007 will be re-categorized, maintaining the Fujita scale will be necessary when referring to previous events (Sourcehttp://www.spc.noaa.gov/efscale/)

Table 3-27 Enhanced Fujita (EF) Scale

Enhanced Fujita Category	Wind Speed (mph)	Potential Damage
EF0	65 to 85	**Light damage.** Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over.
EF1	86 to110	**Moderate damage.** Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.

Table 3-27 Enhanced Fujita (EF) Scale

Enhanced Fujita Category	Wind Speed (mph)	Potential Damage
EF2	111 to135	**Considerable damage.** Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
EF3	136 to165	**Severe damage.** Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance.
EF4	166 to200	**Devastating damage.** Well-constructed houses and whole frame houses completely leveled; cars thrown and small missiles generated.
EF5	>200	**Incredible damage.** Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air more than 109yards; high-rise buildings have significant structural deformation; incredible phenomena will occur.

source: http://www.spc.noaa.gov/efscale/

A tornado path averages 4 miles, but on rare occasions may reach up to 300 miles in length. Widths average 300 to 400 yards, but severe tornadoes have cut swaths a mile or more in width or have formed groups of two or three funnels traveling together. On average, tornadoes move between 25 and 45 mph, but speeds of up to 70 mph over land have been reported. Tornadoes rarely last more than a couple of minutes over a spot or more than 15 to 20 minutes in a 10-square mile area.

Damages from tornadoes result from extreme wind pressure and windborne debris. Because tornadoes are generally associated with severe storm systems, they are often accompanied by hail, torrential rain, and intense lightning. Depending on their intensity, tornadoes can uproot trees, bring down power lines, and destroy buildings. Flying debris is the main cause of serious injury and death.

Nearly 70% of the deaths from tornadoes occur inside residential structures. Of these, more than 40% are in mobile homes, which are easily overturned and destroyed due to the low wind resistance of the structure.

Location and Extent

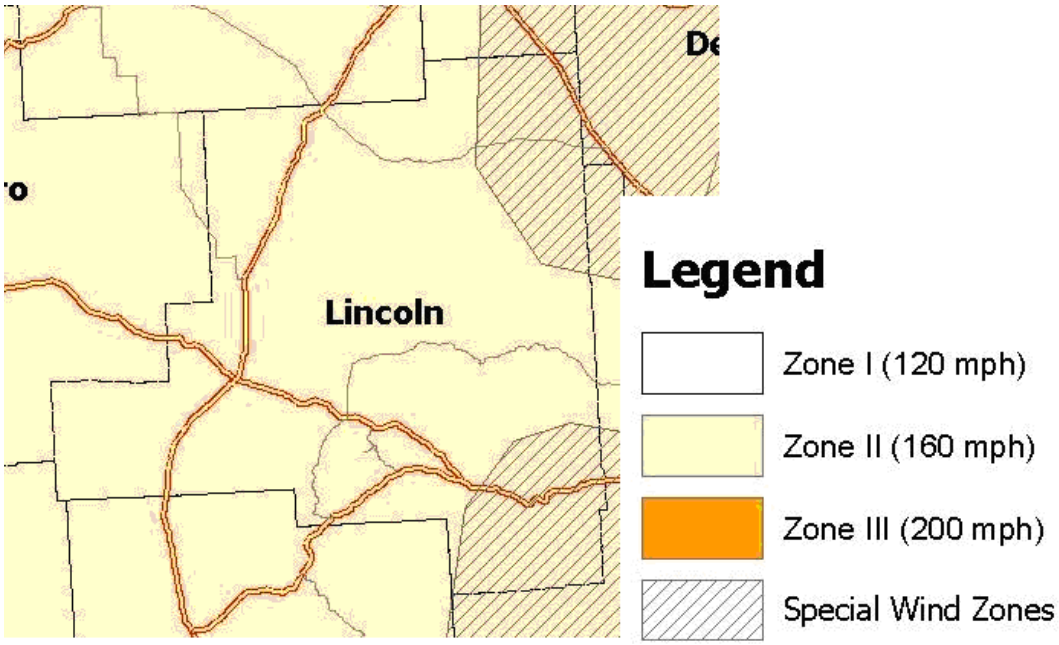
New Mexico lies along the southwestern edge of the nation's maximum frequency belt for tornadoes, often referred to as "tornado alley," which extends from the Great Plains through the central portion of the U.S. Broadly speaking, the eastern portions of New Mexico have a higher frequency of tornadoes; however, every county in the state has the potential to experience tornadoes.

Table 3-28 shows relationship of wind speeds to the number of recorded tornadoes and the resultant risk. The publication "FEMA 320 Taking Shelter from the Storm" (March 2004) describes how residents can determine their tornado risk.

Table 3-28 Tornado Risk Table

		Wind Zone			
		I	II	III	IV
Number of Tornadoes per 3,700 Square Miles	<1	Low Risk	Low Risk	Low Risk	Moderate Risk
	1-5	Low Risk	Moderate Risk	High Risk	High Risk
	6-10	Low Risk	Moderate Risk	High Risk	High Risk
	11-15	High Risk	High Risk	High Risk	High Risk
	>15	High Risk	High Risk	High Risk	High Risk

Low Risk	High-wind shelters are a matter of homeowner preference
Moderate Risk	Shelter should be considered for protection from high winds
High Risk	Shelter is the preferred method of protection from high winds



NOTE: SPECIAL WIND ZONE denotes special wind regions that, along with mountainous terrain and gorges, should be examined for unusual wind conditions.

Figure 3-17 Lincoln County Wind Zones

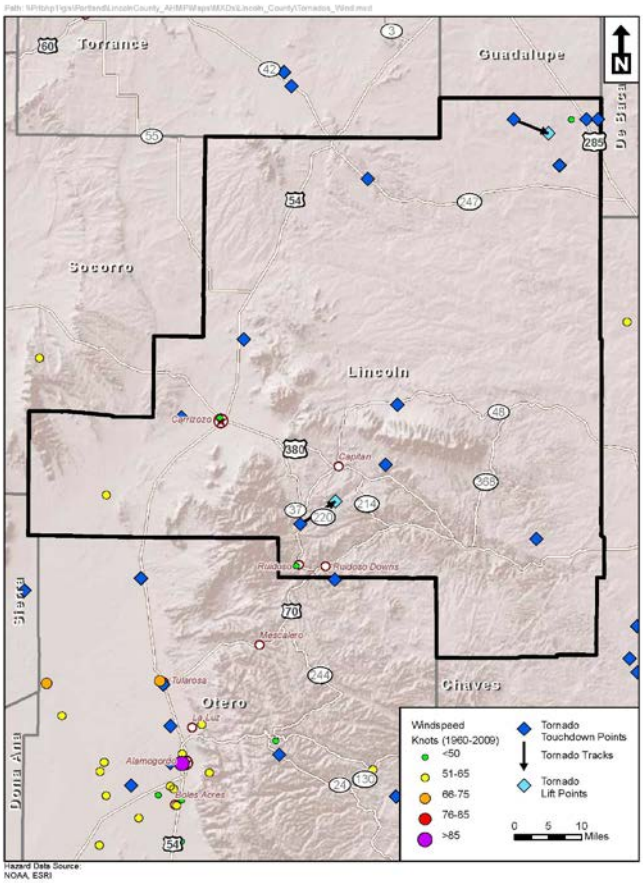


Figure 3-18 Tornado Events in Lincoln County

Historical Occurrences

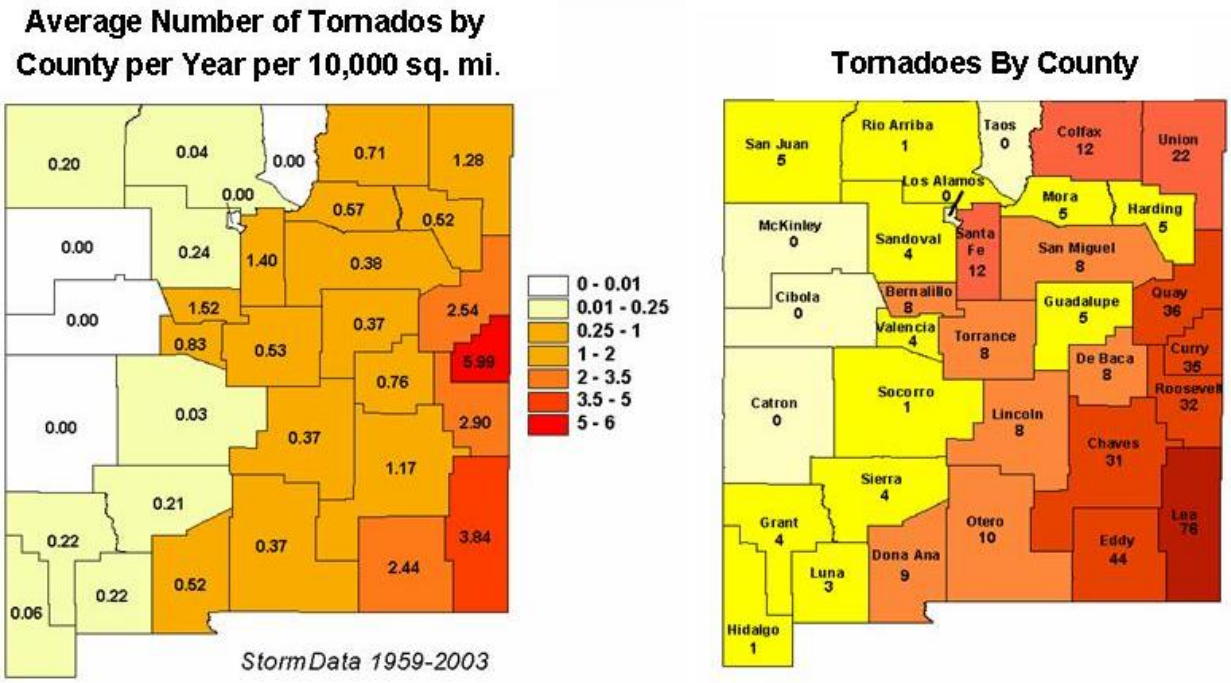
NCDC reported 11 tornado events between May 1957 and February 2009 that have caused no injuries or deaths and $11,000 in property damage in Lincoln County.

According to the NCDC recent significant tornado events include an F0 tornado that hit Lincoln County, just east of Capitan, in June 2007, causing more than $10,000 in damages. Other tornadoes have occurred in Lincoln County, according to the MPG, but the NCDC has not recorded them.

Probability of Occurrence

Figure 3-17 shows that Lincoln County lies within two different tornado risk zones. The far eastern portion of the state along the Texas border is in Wind Zone III. This means that portions of Lincoln County could see wind speeds of 160 to 199 mph, which correspond to an EF4 tornado classification.

Figure 3-19 shows that the number of tornadoes approximates the wind zone map above.



Source: National Weather Service, Albuquerque Office

Figure 3-19 County Distribution of Tornadoes

Table 3-29 Tornado Hazard Probability

Hazard	n	N	T	P	Source/Comments
Tornadoes	11	41	3.727273	0.268293	NCDC
KEY	n = number of events	N = number of years in record	T = Recurrence Interval T = N/n)	P = Probability (P=1/T)	

3.2.3.8 Hazardous Materials

The possibility exists for a transportation-related hazardous materials release primarily on US Route 54, a north-south roadway, which runs from El Paso, through Carrizozo, north to Corona, and continues northeast through several states. Also passing through Lincoln County in the US 54 corridor is the Union Pacific railroad. No recent spills relating to transportation are reported by county emergency services. In the event of a significant incident, this section may need revision.

Probability of Occurrence

Table 3-30 Hazardous Materials Incident Probability

Hazard	n	N	T	P	Source/Comments
Hazardous Materials	0	40			None noted since record keeping initiated (over the past ~40 years)
KEY	n = number of events	N = number of years in record	T = Recurrence Interval (T = N/n)	P = Probability (P=1/T)	

3.2.3.9 Extreme Heat

Description of Hazard

Extreme heat, or heat wave, is defined by the NWS as a temperature of 10° or more above the average high temperature for the region, lasting for several weeks. This condition is definitely a public health concern. During extended periods of very high temperatures or high temperatures with high humidity, individuals can suffer a variety of ailments, including heatstroke, heat exhaustion, heat syncope, and heat cramps.

- **Heatstroke** is a life-threatening condition that requires immediate medical attention. It exists when the body's core temperature rises above 105°F as a result of environmental temperatures. Patients may be delirious, stuporous, or comatose. The death-to-care ratio in reported cases in the U.S. averages about 15%.

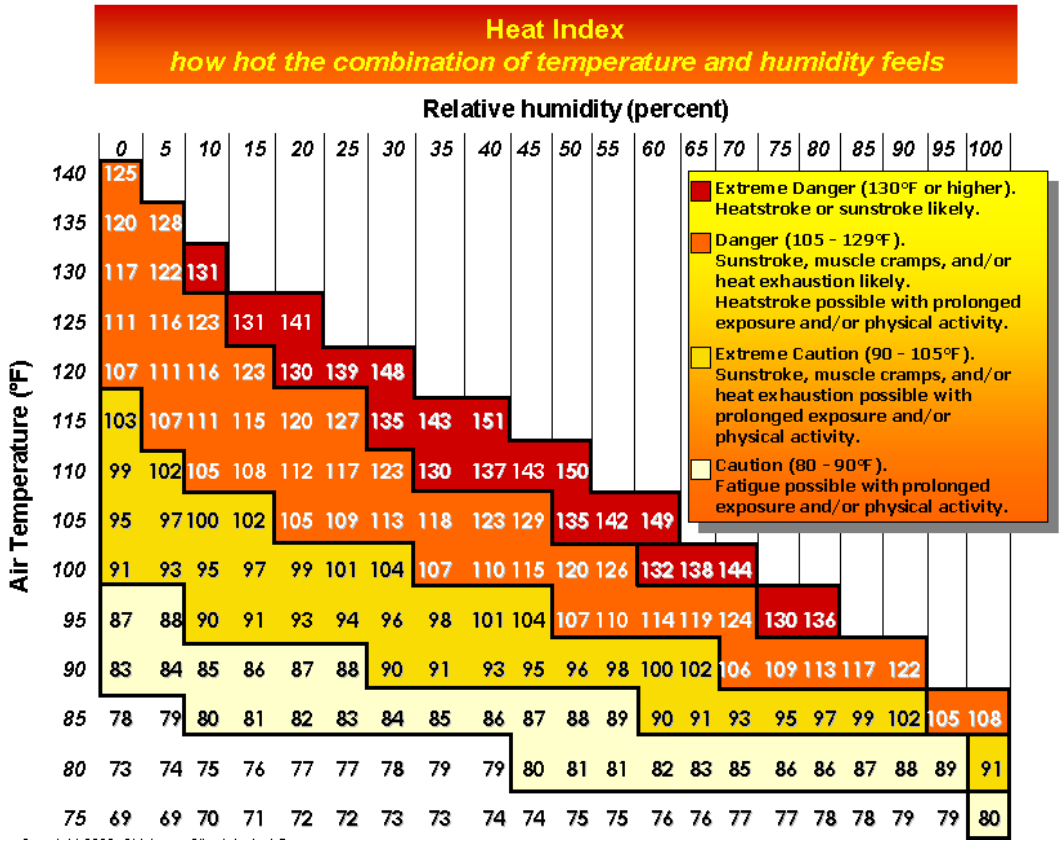
- **Heat exhaustion** is much less severe than heatstroke. The body temperature may be normal or slightly elevated. A person suffering from heat exhaustion may complain of dizziness, weakness, or fatigue. The primary cause of heat exhaustion is fluid and electrolyte imbalance. The normalization of fluids will typically alleviate the situation.

- **Heat syncope** is typically associated with exercise by people who are not acclimated to exercise. The symptom is a sudden loss of consciousness. Consciousness returns promptly when the person lies down. The cause is primarily associated with circulatory instability because of heat. The condition typically causes little or no harm to the individual.

- **Heat cramps** are typically a problem for individuals who exercise outdoors but are unaccustomed to heat. Similar to heat exhaustion, it is thought to be a result of a mild imbalance of fluids and electrolytes.

The elderly, disabled, and debilitated are especially susceptible to heat stroke. Large and highly urbanized cities can create an island of heat that can raise the area's temperature by 3°F to 5°F. Therefore, urban communities with substantial populations of elderly, disabled, and debilitated people could face a significant medical emergency during an extended period of excessive heat. The highest temperature recorded in New Mexico was 122°F on June 27, 1994 at the Waste Isolation Pilot Plant (WIPP) site.

In 1979, meteorologist R.G. Steadman developed a heat index to illustrate the risks associated with extreme summer heat. The heat index shows the relationship of the ambient air temperature and relative humidity to the apparent temperature of exposed skin (http://www.srh.noaa.gov/ffc/html/gloss1.shtml) (see Figure 3-20).



Source: http://www.ima.army.mil/southwest/sites/divisions/Safety/Heat%20Index.gif

Figure 3-20 Heat Index

Location and Extent

All of Lincoln County has the potential to be impacted by extreme heat often reaching Extreme Caution or Danger levels, however in review of history and average temperature, it seems most likely that extreme heat events would occur in the eastern or western panhandle portions of the County. Figure 3-21 illustrates these areas as the areas with the highest average temperature in the County (red and yellow). New Mexico is partially an arid desert state, and summer temperatures often exceed 100°F under normal conditions. Nighttime temperatures are typically cool due to low humidity, and even though daytime temperatures may be high, people experience relief at night. Heat waves in which daily high temperatures exceed 110° F for many days in a row are rare. Such a heat wave in the higher altitudes would probably have a more damaging effect because people would not be expecting such hot conditions. However, any part of the state that experienced the humidity/temperature combination could suffer ill effects from the event. A heat wave would also have a drying effect on vegetation, facilitating the ignition of wildfires. If a heat wave were coupled with a power failure, the effect on the population would be much more severe because air conditioning systems would fail. In fact, periods of excessive heat usually result in high electrical consumption for air conditioning, which in turn can cause

power outages and brownouts. While the Public Service Company of New Mexico (PNM) reports no widespread power failures due to overuse, the large numbers of new homes and conversion to air conditioning from evaporative coolers, could put a strain on the electrical grid.

In general, it is safe to say that there is no area of the state that is immune from the hazards of a heat wave.

A unique aspect of the effects of extreme heat in New Mexico is the fact that UVB radiation also increases with increasing altitude, or distance above the surface of the earth. For every 1,000 feet of altitude, the UV radiation increases by about 4%. This means that approximately 20% more UV radiation reaches the earth's surface in Santa Fe than in a city that is at similar latitude but at sea level. This can exacerbate heat effects at high altitude.

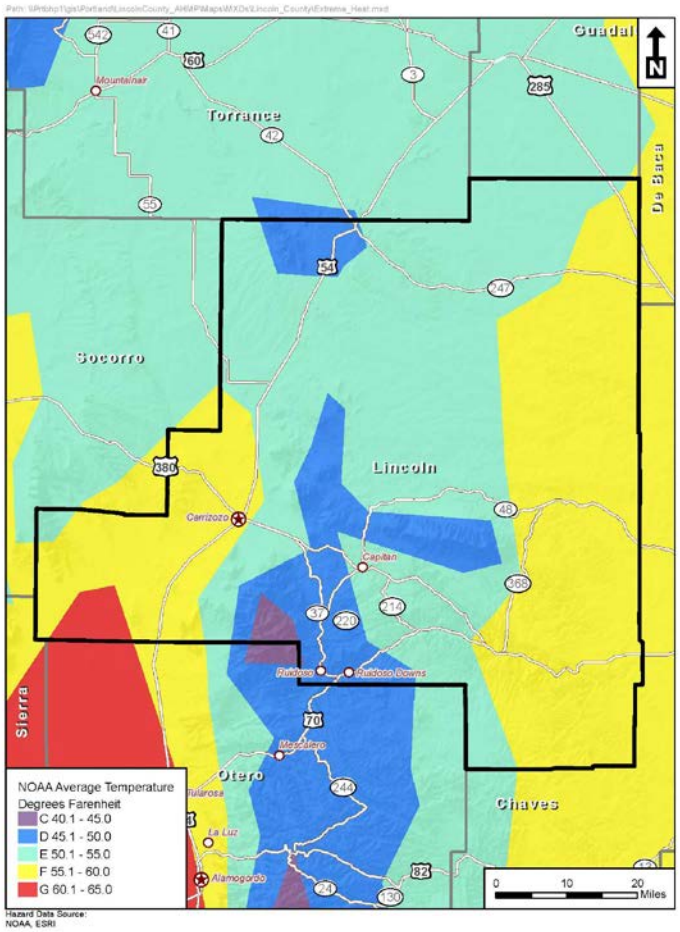


Figure 3-21 Lincoln County Average Temperatures

Probability of Occurrence

The NCDC reports 4 events of extreme heat from 1994 – 2000 (Figure 3-21 presents average high temperatures for the SE corner of New Mexico). There were no deaths, injuries, or monetary losses reported with these events but they cause areas to be much more susceptible to other hazards such as drought and wildfires.

According to the Office of the Medical Investigator, there are no recorded events of extreme heat causing death or injury within Lincoln County or the state of New Mexico.

Table 3-31 Extreme Heat Hazard Probability

Hazard	n	N	T	P	Source/Comments
Extreme Heat	4	15	3.75	0.266667	NCDC
KEY	n = number of events	N = number of years in record	T = Recurrence Interval (T = N/n)	P = Probability (P=1/T)	

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4 Vulnerability Analysis

This section of the Otero County Hazard Mitigation Plan provides a vulnerability assessment for the natural hazards that, based on the Risk Index calculation, are considered to pose a high, moderate, or low risk to Otero County. No further analysis will be conducted on natural hazards classified to pose no risk for Otero County

4.1 Identification of Assets

An inventory of Lincoln County's geo-referenced assets was identified and created in order to identify and characterize population and property potentially at risk to the identified hazards. By understanding the type and number of assets that exist and where they are located in relation to known hazard areas, the relative risk and vulnerability for such assets can be assessed. Three categories of assets were evaluated using statistical analysis and research to determine vulnerabilities, as follows:

- Socioeconomic: Includes demographic data regarding the people residing in Lincoln County as delineated by US Census 2000, American Community Survey (ACS) 2005-2009 and the Bureau of Business and Economic Research 2005 data.

- Physical Environment: Includes a description of physical properties of residential, commercial, industrial, agricultural, religious and educational structures.

- Critical Facilities and Infrastructure: Includes medical facilities, fire service, government, natural gas, water, wastewater and utility facilities. These also include non-emergency facilities that provide critical services and functions to vulnerable sectors of the Lincoln County population. Data for critical facilities was obtained from HAZUS-MH, MPG, and participating jurisdictions.

4.2 Socioeconomic Assets

4.2.1 Population Characteristics

The U.S. Census Bureau reports that there are 14,108 housing units in Lincoln County supporting a population of 19,411 (see Table 4-1). These figures point to an unusual aspect of Lincoln County housing, namely a large transitory population as it is a vacation destination for many in-state and out of state travelers. This transitory nature increases impact of hazards as many homes are unoccupied during times of greatest hazards (as in wildfire season) and higher population count than portrayed in Table 4-1 for hazards such as severe winter storms – as Lincoln County is a skiing destination.

Table 4-1 Lincoln County Population

Name	Total 2000 Population	Total 1990 Population	Total 1980 Population
Lincoln County	19,411	12,219	10,997

Source: http://www.census.gov.

As Table 4-1 indicates, Lincoln County's population has increased since 1980, with a net gain of 8,414 people since the 1980 census. Based on the population data one would expect to see continued infrastructure growth (and increasing hazard exposure) in Lincoln County in the years to come.

4.2.2 Socioeconomic Vulnerability

Various socioeconomic factors contribute to the risk that some populations may be more affected by a disaster than others. Some of these factors are personal wealth, age, gender, and race. Vulnerable subgroups of populations for Lincoln County were determined using Census 2000 data, or the estimated 2007 data, if available (Table 4-2).

- Income and Wealth: Lack of individual and community wealth can mean fewer available resources for recovery. The number of families below the poverty level can indicate areas that may be impacted more severely by disaster events because of this lack of resources. (For example, a poor family may not own a vehicle that would enable them to immediately evacuate the area). The number of people below the poverty level in 2000 in Lincoln County was 2,911 or 14% of the population.

- Age: The population that is under 18 and over 65 years old is more likely to need additional assistance during a disaster, so large concentrations of populations in either of these subgroups could pose complications during a disaster. According to 2007 estimated U.S. Census data, there were 4,304 persons (20.7% of Lincoln County's population) under 18 years old and 4137 persons (19.9% of Lincoln County's population) more than age 65.

- Gender: Women also are more vulnerable to disastrous events. The female population in Lincoln County is equal to the total male population. The 2007 census reports the female population at approximately 51% (10,583 females).

- Ethnicity: The percentage of the population of non-white residents in Lincoln County is approximately 5.6 % (1,164 persons).

Table 4-2 Vulnerable Subgroups in Lincoln County, NM, as a percent of state population.

County	Population 2008 est.	Persons Below Poverty	Children 18 Years and Under	Persons 65 Years and Over	Female	Non-White
Lincoln	20,793	2,911 or 14%	4304 or 20.7%	4137 or 19.9%	10,583 or 50.9%	1,164or 5.6%

Source: U.S. Census 2000, 2007, 2008.

4.3 Physical Environment Assets

While social vulnerability depends on factors such as population trends and ethnicity, physical vulnerability relates to structures that could be damaged (i.e., the "built" environment).

Economic vulnerability of an area or community relates to the cost of loss of its buildings. For example, downtowns and central business districts may be considered vulnerable areas of a community because commercial structures and public buildings are concentrated in those districts (see Table 4-3).

Table 4-3 Building Stock Exposure in Lincoln County

County	Residential	Commercial	Industrial	Agricultural	Religious	Government	Educational	Total
Lincoln[1]	$1.76B	$192M	$21.2M	$4.7M	$11.8M	-	$8.8M	$2.00B
Lincoln[2]	$2.44B	$366M	$28.2M	$6.5M	$24.7M	$29.4M	$27.2M	$2.92B

Source: (1) NM State HMP from U.S. Bureau of the Census 2000; (2) HAZUS-MH using US Census 2000, RSMeans and other sources – see Appendix C for greater detail – State HMP does not specify government data for Lincoln County.

Note: Since FEMA's Hazards U.S. Multi-Hazard (HAZUS-MH) loss estimate data remained unchanged since 2004, additional sources were used to update Table 4-3 in 2007 to reflect recent residential property development. This table has been developed from information in HAZUS-MH (Level 1). The values in the table are only indicators for information purposes and should not be viewed literally for analytical purposes. For analytical purposes, Level 2 data must be used (where specific local information can be keyed in to replace the data in the national database) for greater accuracy. However, there are no Level 2 HAZUS data for New Mexico. This data limitation is addressed in Section 7, Mitigation Strategies. HAZUS-MH Levels are as follows:

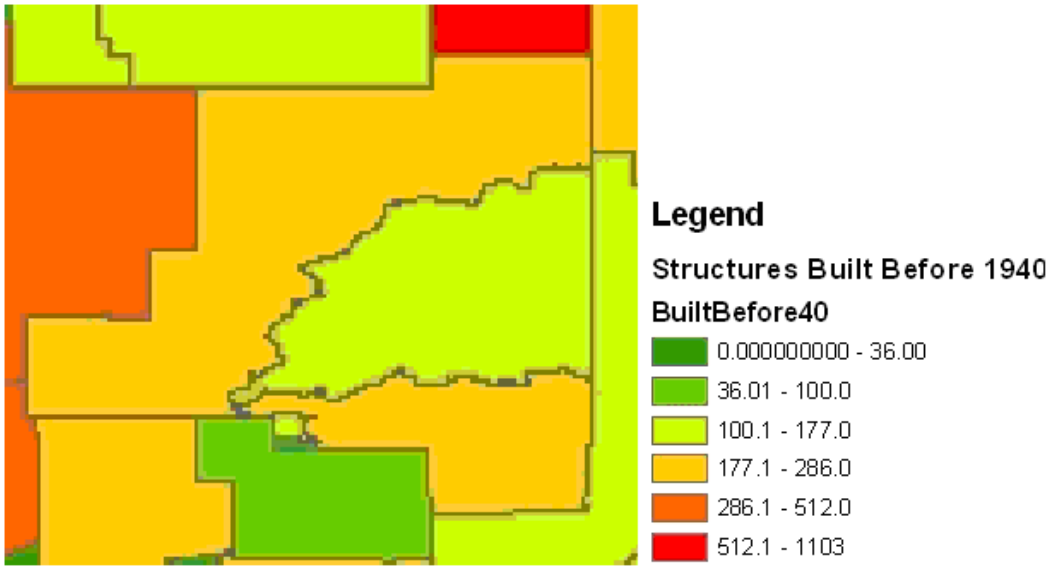
Level 1: National data sets are used for analysis, extrapolated to state-specific data based upon broad modeling assumptions.

Level 2: National data are modified by specific known local data for more site-specific results.

Level 3: Users may supply their own techniques to study special conditions such as dam break and tsunami, although engineering and other expertise is typically needed at this level.

4.3.1 Vulnerabilities of the Built Environment

The condition of the structure is a key determinant of its hazard vulnerability. Generally, older structures are more vulnerable to damage from high winds and ground movements, particularly if they were built prior to the adoption of stringent building codes. Figure 4-1 shows the census tracts that have a larger percentage of older structures. Of a total number of 15,298 housing units in Lincoln County, approximately 873 or 4.7% of the structures were built prior to 1940. These older structures may be in poor condition and not able to weather storms due to poor building quality, plumbing, etc. and are more prone to damage by wind, winter storms, and earthquakes.



Source: Federal Emergency Management Agency Hazards U.S. – Multi-Hazard (HAZUS-MH)

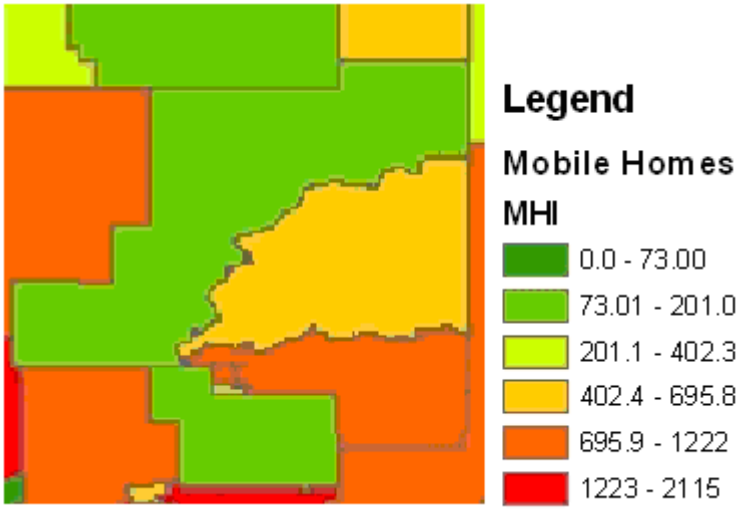
Figure 4-1 Structures Built before 1940

Another important factor is how likely structures are to fail when they are subjected to wind pressure that exceeds their design. In general, building damages can range from cosmetic to complete structural failure, depending on wind speed, movement, and the location of the building. Strong winds can rip roofs off houses, overturn manufactured homes, or cause total failure of poorly constructed structures. Unreinforced masonry buildings typically fail under severe earthquake conditions and gable-ended roofs are especially vulnerable to strong winds.

Manufactured housing units are of particular interest due to a frequent inability to withstand high winds and are often located in areas susceptible to flooding.

Figure 4-2 maps the number of manufactured homes by census tract. The state has approximately 144,000 manufactured homes, which represents 22% of all the structures. Lincoln County has approximately 3,405 manufactured homes.

More than half (55.4%) of all the structures in Lincoln County are constructed of wood, followed by manufactured housing and masonry structures (Table 4-4). Approximately 1.5% of the structures in Lincoln County are made of un-reinforced masonry, which is very vulnerable to damage from earthquakes. These are typically adobe structures.



Source: Federal Emergency Management Agency Hazards U.S. – Multi-Hazard

Figure 4-2 Manufactured Homes by Census Tract

Table 4-4 Building Types in the State, Lincoln County

County	Concrete	Manufactured Housing	Masonry	Precast	Un-reinforced Masonry	Wood	Total
Lincoln	33	3,405	2,481	14	215	7,639	13,787

Source: Federal Emergency Management Agency Hazards U.S. – Multi-Hazard (HAZUS-MH)

4.3.2 Effect of Growth and Development on Vulnerability

Lincoln County has experienced growth in its housing stock due to the investment by resident and non-resident property owners as a desirable seasonal travel destination. The winter season offerings of skiing is the major contributing factor, however it is also a growing retirement destination.

This has resulted in an exacerbation of unregulated growth in subdivisions and development of homes without consideration of how Lincoln County and its emergency services will support these property owners in times of emergencies. As Lincoln County is one of the smaller jurisdictions within the state, the State of New Mexico serves as the regulator and issuer of building permits within Lincoln County. Although Lincoln County has the right to object to the issuance of building permits, there exists a problem of the permits passing unchallenged until

after acted upon and Lincoln County commission being presented with requests to improve roads, developed originally as private roads, so that persons who buy these homes can have safer access in winter and during heavy rains.

Additionally, the seasonal nature of some property use means that these structures are un-occupied during summer wildfire season. Owners or those facility management companies retained to oversee care when not occupied need to be made aware of the issues these un-occupied structures present in the overall management of the urban-wildfire interface zones.

The pattern underlying these issues will not alter in the foreseeable future.

4.4 Critical Facilities

Local hazard mitigation plans are required to identify critical facilities, whether public or private, within their jurisdictions and to propose mitigation strategies to protect them. These critical facilities in both the private and public sectors are defined as facilities that provide essential products and services to the general public, are necessary to preserve the welfare and quality of life in the county, or fulfills important public safety, emergency response, and/or disaster recovery functions. Critical facilities in the county include police and fire stations, schools, water systems, and municipal buildings.

Critical facilities as used here are assets owned by the state, county, Village of Ruidoso, City of Ruidoso Downs, or non-governmental organizations that are vital to the health, safety, and wellbeing of Lincoln County citizens during a natural disaster. Critical facilities, as determined by the Mitigation Planning Group (MPG) include:

- Medical Facilities
  - Lincoln County Medical Center
- Shelters
  - Gateway Church
  - Nazarene Church
- Emergency Services
  - Village of Ruidoso Police Department
  - Village of Ruidoso Fire Station #1
  - City of Ruidoso Downs Fire Station
  - Lincoln County Emergency Operations / Dispatch Center
- Government
  - Village of Ruidoso City Hall
  - City of Ruidoso Downs City Hall
  - Lincoln County Court House
  - Lincoln County Detention Center
- Utilities

  - PNM Substation
  - City of Ruidoso Downs Drinking Water Well (Griffith Spring Well)
- Retail / Tourism
  - Wal-Mart Super Center
  - Ruidoso Downs Race Track/Billy the Kid Casino
  - Foxworth Lumber Yard

4.5 Public Sector-Owned or Operated Critical Facilities

Local hazard mitigation plans are required to identify critical facilities, whether public or private, within their jurisdictions and propose mitigation strategies to protect them. Mitigation plans such as this one are locally focused and do not address state-owned facilities, recognizing that these facilities are generally addressed in the mitigation planning of the state.

The exclusion of a building from the list does not mean that it houses an unimportant function; it just means that the MPG and department representatives determined that the activities and functions carried out at those locations were not vital to the immediate health and safety of the residents of Lincoln County. Any buildings excluded from this list will be reevaluated during future updates.

4.6 Methodology

In development of the listed facilities, the MPG was asked to determine locations where critical functions are carried out. The location of each facility was then compared with known hazard areas (based on the risk assessment section). The potential damages to each location were estimated based on a number of factors, including square footage and annual operating budgets. FEMA guidance on relation of square footage to facility replacement value was applied, as well as FEMA guidance on the relationship of facility function to content value. Facility management was then contacted to confirm content value, and where guidance did not accurately reflect known content value, the actual values were utilized. Finally, facility management was asked to supply annual operating budget totals for estimation of daily impact due to loss of operational capacity.

4.7 Facility Vulnerability Summary

Based on the information presented in this section, public-owned or operated buildings, infrastructure, and critical facilities were ranked according to their vulnerability from the high-risk hazards. As additional data and mapped locations of state or county-owned or operated buildings, infrastructure, and critical facilities is collected, better details on their vulnerability will be generated and updated in future revisions of this document.

The best way to identify which properties are subject to specific hazards is to overlay a map on which those facilities are located onto a map showing the probability of each hazard. Unfortunately, those maps do not exist. We do not have maps, digital or otherwise, showing state facility locations. We do have

maps of some hazard probabilities (earthquake, flood), but all maps need to be in the same scale to be readily comparable.

4.7.1 Wildfire and Wildland/Urban Interface Fire

Most of the identified facilities are not located in areas that are subject to an unusual wildfire hazard or have implemented concepts of defensible space. However, critical infrastructure, especially transportation routes, pipelines, electricity transmission lines and communications towers are sometimes located in a forest environment.

Smoke from wildfires can endanger the health of patients in health care facilities and can force evacuation of residents if the smoke becomes extreme. Evacuation of correctional facilities would pose a serious logistical problem, whether due to direct fire danger or smoke.

4.7.2 Severe Weather

Identified facilities are as vulnerable to severe weather as all other property. Special concerns may arise over critical facilities such as electricity transmission lines and communications towers being affected by lightning, ice, and windstorms and highways closing due to severe winter conditions, and power failures that occur as a secondary effect of severe weather would affect confined populations, communications systems, and just about every other segment of the population.

4.7.3 Flood

Most of the identified facilities are not located in flood-prone areas however the Ruidoso Downs racetrack and associated barns are within the flood plain of Rio Ruidoso. The associated public buildings (the casino, etc.) are not within routine flood zones. Certain segments of other identified facilities may be subject to occasional flooding, such as low points on highways.

4.7.4 Earthquake

The effect of earthquakes on the identified critical facilities is largely an unknown because there have been no serious earthquakes in Lincoln County. Nevertheless, the central corridor of the state from Socorro County to Rio Arriba County is a moderate earthquake zone and this is the presumed source of impact to identified facilities in Lincoln County. Recently built facilities are constructed to a relatively high earthquake standard, but there are many older buildings and critical facilities that were not designed with earthquake resistance in mind. It is not known whether any of these facilities have been or need to be examined for mitigation action. Areas of particular concern are highway bridges and overpasses, railroad facilities, hazardous material locations such as tank farms and pipelines.

4.7.5 Drought

While drought does not cause damage to buildings and critical facilities in general, all places where people live and work are subject to drought effects. State properties can engage in drought mitigation through water conservation

plans, practices, and educational programs. Hospitals and other places with confined populations need to develop contingency plans to address a critical water shortage.

4.7.6 Extreme Heat

Heat can affect roadways, runways, and some equipment, but it is generally a health risk, not a structural hazard. Periods of extreme heat can also place additional demands upon the electrical grid. Brown outs and black outs could dramatically increase vulnerability, particularly to those facilities associated with the housing and care of vulnerable populations.

4.7.7 Dam Failure

The issues relating to dam failure are a significant issue for several of the identified facilities due to the close proximity of Mescalero Lake and Grindstone Lake to Ruidoso and Ruidoso Downs (these communities are within the inundation zones of these reservoirs) and Bonito Lake (which threatens Alto and the associated critical facilities there). These facilities bear the same threat generally held by the communities in which they are located.

4.8 Potential Losses in Local Jurisdictions

The potential losses to identified vulnerable structures in each county are best determined at the local level and reported in local mitigation plans. Not every community has a mitigation plan in place, and those that do have not consistently provided critical facilities data. The Disaster Mitigation Act of 2000 (DMA2K) does not require this of local mitigation plans. Due to the lack of data on local critical facilities, potential losses have been generalized statewide based on data from FEMA's Hazards U.S. Multi-Hazard (HAZUS-MH) beta version. HAZUS-MH is one of the principal planning tools available to state and local governments. However, with Level 1 data being the only HAZUS data for New Mexico at this time, HAZUS is of little use beyond some very general assumptions. HAZUS Level 1 data does not necessarily present an accurate picture of reality. The state must input specific data in a wide range of parameters to make Level 1 data more accurate. Given sufficient funding, the Department of Homeland Security and Emergency Management will focus significant effort on improving HAZUS data in order for it to be helpful to state and local mitigation planners.

Critical Facility Maps are provided in Appendix E of this plan.

4.9 Jurisdictional Vulnerability

4.9.1 Assessing Vulnerability: Identifying Assets

In order to assess the inventory assets (infrastructure) in Lincoln County, the MPG used the method described in FEMA's "Understanding Your Risks; Identifying Hazards and Estimating Losses." This method calls for using Hazard

U.S. Multi-Hazard (HAZUS-MH) software to determine the total number and value of buildings and people in both the entire county and in the hazard area. This information was compiled and is found in the County-wide Asset Inventory Worksheets located in Appendix B. The total infrastructure values associated with each of the respective hazard areas are:

- Potential Wildfire Losses: $115,235,097
- Potential High Wind Losses: $ 703,862
- Potential Flood Losses: $ 52,432,841
- Potential Drought Losses: $481,778,397
- Potential Thunderstorms Losses: $ 52,432,841
- Potential Severe Winter Storms Losses: $106,290,907
- Potential Tropical Storm Losses: $ 52,432,841
- Potential Dam Failure Losses: $100,250,063
- Potential Earthquake Losses: $ 48,177,840
- Potential Tornadoes Losses: $ 24,088,920
- Potential Hazardous Materials Losses: $375,261,908
- Potential Extreme Heat Losses: $481,778,397

The potential flood losses were based on the 100-year and 500-year floodplains and how the floodplains were mapped in comparison with where the population resided. The MPG accepted the data from HAZUS. These same guidelines were used to estimate potential dollar losses for other hazards such as floods, hurricanes, tornadoes, land subsidence, nuisance pests, hazardous material incidents on highways and at fixed facilities, wildfires, thunderstorms and lightning, terrorism, drought, winter storms, and hailstorms. Table 4-5 provides an estimate of the percent of Lincoln County that could be impacted by a non-geographical hazard at any one time.

Table 4-5 Estimated Percent of Lincoln County that Could Be Impacted By Non-Geographical Hazards at Any One Time

Hazard	Average Percentage Used in Calculating Community-Wide Loss Scenarios	Logic/Source
Wildfire	21.9%	Highest for Census Tracts 9803, 9804 and 9806 – used average of total structures in area.
High Wind	0.9%	Highest in Capitan and Sacramento Mountains - Higher for newer construction - averages these structure counts. Lowered for non-residential

Table 4-5 Estimated Percent of Lincoln County that Could Be Impacted By Non-Geographical Hazards at Any One Time

Hazard	Average Percentage Used in Calculating Community-Wide Loss Scenarios	Logic/Source
		construction as this is more likely to be built to higher standards.
Flood	12.9%	Highest along Rio Bonito and Rio Ruidoso valleys – nexus between 9806 and 9808, small portion of 9802 and 9803.
Drought	100%	All of Lincoln County will be impacted at the same time.
Thunderstorms	12.9%	Higher of Flood or High Wind
Severe Winter Storms	24.3%	Highest in 9803, 9804, 9806 and 9808 – weighted slightly higher for residential as these are found in higher numbers as higher elevation and more isolated roads.
Tropical Storm	12.9%	Same as Thunderstorm
Dam Failure	20.1%	Used flood + elevated numbers for non-residential due to impact focus on Rio Ruidodo (Village of Ruidoso / City of Ruidoso Downs)
Earthquake	10.0%	Assumes shielding from Sierra Blanca of earthquake originating in Socorro area (9802 and 9803, lesser for 9806 and 9808, least for 9804).
Tornadoes	5.0%	Biggest risk is NE and SE corners of Lincoln County (9802 and 9804)
Hazardous Materials	48.6%	Approximation of Number along US Routes (all Census tracts)
Extreme Heat	100%	All of Lincoln County will be impacted at the same time.

Table 4-6 shows the potential dollar losses to the community from each hazard based on the percentages found in Table 4-5. It is unlikely that a hazard would occur that would adversely affect all of them at the same time, but the potential for damage exists.

Table 4-6 Potential Dollar Losses to the Community

	Potential Losses (in $)							
Hazard	Residential	Commercial	Industrial	Agricultural	Religious / Non-Profit	Government	Education	Utilities[1]
Wildfire	$ 806,034,854	$ 91,425,051	$ 2,824,436	$ 648,565	$ 6,168,997	$ 7,362,158	$ 6,805,890	N/A
High Wind	$ 122,126,493	$ 365,700	$ 28,244	$ 6,486	$ 246,760	$ 29,449	$ 27,224	N/A
Flood	$ 366,379,479	$ 36,570,021	$ 1,412,218	$ 648,565	$ 2,467,599	$ 5,889,726	$ 5,444,712	N/A
Drought	$2,442,529,861	$365,700,205	$28,244,362	$6,485,650	$24,675,989	$29,448,632	$27,223,558	N/A
Thunderstorms	$ 366,379,479	$ 36,570,021	$ 1,412,218	$ 648,565	$ 2,467,599	$ 5,889,726	$ 5,444,712	N/A
Severe Winter Storms	$ 732,758,958	$ 73,140,041	$ 2,824,436	$ 0	$ 4,935,198	$11,779,453	$13,611,779	N/A
Tropical Storm	$ 366,379,479	$ 36,570,021	$ 1,412,218	$ 648,565	$ 2,467,599	$ 5,889,726	$ 5,444,712	N/A
Dam Failure	$ 366,379,479	$ 73,140,041	$ 2,824,436	$ 648,565	$ 4,935,198	$ 9,718,049	$ 8,983,774	N/A
Earthquake	$ 244,252,986	$ 36,570,021	$ 2,824,436	$ 648,565	$ 2,467,599	$ 2,944,863	$ 2,722,356	N/A
Tornadoes	$ 122,126,493	$ 18,285,010	$ 1,412,218	$ 324,283	$ 1,233,799	$ 1,472,432	$ 1,361,178	N/A
Hazardous Materials	$ 122,126,493	$310,845,174	$14,122,181	$1,621,413	$ 6,168,997	$22,086,474	$20,417,669	N/A
Extreme Heat	$2,442,529,861	$365,700,205	$28,244,362	$6,485,650	$24,675,989	$29,448,632	$27,223,558	N/A

Notes: 1 – US Census data not specified for utilities.

4.9.2 Assessing Vulnerability: Estimating Potential Losses

In order to estimate the potential dollar losses to vulnerable structures, the MPG used the process outlined in FEMA's "Understanding Your Risks; Identifying Hazards and Estimating Losses." This process calls for completing two worksheets: the Vulnerable Asset Inventory Worksheet and the Loss Estimate Worksheet.

Fifteen vulnerable critical facilities were identified in the asset inventory. Loss estimates worksheets were completed for each hazard and included the vulnerable critical facilities that might be affected by that hazard. The purpose of providing the vulnerable critical facilities was to generate a list of the most needed projects - retrofitting of critical facilities, which is a state priority. This exercise was an attempt to perform a preliminary cost-benefit analysis to determine what mitigation projects would be cost beneficial. It was not the intent of the MPG to make gross assumptions to estimate total losses. Gross losses are based on the county-wide asset inventory.

4.9.2.1 Vulnerable Asset Inventory Worksheet

To complete this worksheet, information is collected on each facility that was identified as vulnerable. This information is used to calculate the estimated losses on the next worksheet. Each data element on the spreadsheet and its source is described below:

- Size of Building – squared footage is gained from a site visit
- Replacement Value – expressed in cost per square foot and reflects the present day cost of labor and materials to construct a similar building
- Contents Value – based on the type of facility and then multiplying it by the replacement value
- Function, Use, or Value – represents the value of a building's use or function that would be lost if it were damaged or closed, if available, the Annual Operating Budget of the priority critical facility is used for this element
- Displacement Cost – average time in days that the building's occupants typically must operate from a temporary location while repairs are made to the original building due to a hazard event
- Occupancy or Capacity – how many people the structure is designed to hold or service

Asset Inventory Worksheets for Otero County are provided in Appendix B of this plan.

4.9.2.2 Loss Estimate Worksheet

After obtaining the above information for each vulnerable facility, an estimated loss for each hazard event was calculated to arrive at a total loss (in dollars) to the community for each type of hazard. In order to arrive at a total loss, four components were examined:

- Structure Loss – determined by taking the structure's replacement value and multiplying it by the percent damage
- Contents Loss – determined by taking the contents loss and multiplying it by the percent damage
- Structure Use Loss – daily average operating cost multiplied by the functional downtime, which is the average time in days during which a business or service is unable to provide its services due to a hazard event
- Function Loss - daily average operating cost multiplied by the displacement time, which is the average time in days that the building's occupants typically must operate from a temporary location while repairs are made to the original building due to a hazard event

The four categories of loss are then summed to arrive at the total loss for the hazard examined.

The total potential loss for all structures in Lincoln County is approximately $2.924B (see Appendix C). The potential loss includes residential properties, commercial, religious/non-profit, governmental, and educational facilities. It is unlikely that a hazard would occur that would adversely affect all of them at the same time but the potential for damage exists.

The loss estimation was performed for each hazard, taking into account the possibility that a vulnerable critical facility may be affected by a hazard and the estimated percentage of damage due to that hazard. As indicated on the Loss Estimation Worksheets (Appendix C), the following are the total estimated losses for the vulnerable priority critical facilities and for each hazard:

- Wildfire $ 361,969
- High Wind $ 40,140
- Flood $ 1,930,041
- Drought $ 111,275
- Thunderstorm $ 1,930,041
- Severe Winter Storm $ 116,315
- Tropical Storm $ 1,930,041

- Dam Failure $ 1,696,274
- Earthquake $ 180,225
- Tornado $ 7,041,781
- Hazardous Materials (release) $ 35,860
- Extreme Heat $ 1,498,574

Each hazard has a unique set of characteristics that can produce different effects and impact the community differently, depending on the magnitude, duration, and intensity. Furthermore, the same hazard events will affect different parts of Lincoln County in different ways, based on geography, development, population distribution, and age of buildings.

Flooding is easily mapped from previous trends; however, the other hazards (wildfires, tornadoes, and thunderstorms/lightning) are harder to map due to the potential to affect areas of Lincoln County differently, the inconsistency of existing data, lack of trend data, and the lack of feasibility that these hazards would affect the entire county. For example, the nature of tornadoes is that they strike at random and the number and severity of past events is not necessarily a predictor of future occurrences. Therefore, loss estimation is more difficult to predict for these types of hazards.

Existing disaster data is limited for use in predicting potential losses. The FEMA How-to-Guide gives no guidance on estimating potential losses for winter storms, hurricanes, hazardous materials incidents, hailstorms, drought, thunderstorms/ lightning, or terrorism. Very limited guidance is given for tornadoes and wildfires. To complete the loss estimate worksheets, vulnerable critical facilities that the MPG identified were used to complete a potential dollar loss per hazard event based on educated assumptions.

Loss estimate worksheets for Otero County are provided in Appendix C of this plan.

4.9.2.3 Assessing Vulnerability: Analyzing Development Trends

Lincoln County, like many of New Mexico's counties that cannot afford building permitting and inspection groups relies on the State of New Mexico to provide these services. Issues exist with the issuance of permits for build subdivision and individual homes by state personnel without clear understanding of the appropriateness of the site selection relative to support infrastructure which ultimately fall to the counties where development is in unincorporated areas. To address this short sight, counties have the authority of review and rejection where issues exist.

As with other counties, Lincoln County includes several examples of unwise development that were allowed in previous times and continue to present

problems ranging from requests for roadway construction and/or emergency services support. In Lincoln's case, this is exacerbated by the demand by potential landowners external to Lincoln County seeking second or vacation homes in the county, or retirement homes on lands that appears well priced compared to real estate markets in distant locations. In some cases, local developers seek to exploit the lack of understanding on the part of land buyers and speculators where land can and should be developed.

This trend is not likely to abate despite recent (spring and summer 2009) downturns in the housing market.

Table 4-7 Estimated Dollar Losses Per Year

Hazard	Cost (dollars)	n	n	Projected Yearly Cost ($)	Source/Comments
Wildfires	$ 7,600,000	4	13	$ 584,615	NCDC
High Winds	$ 615,000	29	19	Included in T'storms	NCDC (includes T'storms)
Flood	$ 25,667,000	13	14	$ 1,833,357	NCDC (includes F'floods)
Drought	$ 3,030,303	3.5	33	$ 91,827	NM - State declared emergency (Major Event) - cost represents state-wide indirect cost estimate, normalized (divided by 33 - "N" value differs from the Table 6-4)
Thunderstorms	$ 615,000	29	19	$ 32,368	NCDC (includes High Winds)
Lightning	$ -	3	4	$ -	NCDC – leads to wildfires
Hail	$ -	62	47	$ -	NCDC
Winter Storm	$ 1,166,667	26	14	$ 83,333	NCDC (recorded as snow and ice)
Dam Failure	$ -	0	59		None Recorded
Earthquakes	$ -				No data
Tornadoes	$ 11,000	11	41	$ 268	NCDC – cost is underestimated as only one of the 11 events had response/recovery $$ associated with it.
Hazardous Materials					No incidents reported
Extreme Heat	$ -	4	15		NCDC - $$ values not assigned
Total				**$ 2,041,155**	

Key:
n = number of events
N = number of years in record

4.10 Analysis of Vulnerability

4.10.1 Jurisdictional Vulnerability

Lincoln County was scored according to its non-hazard vulnerability points based on the information presented below (Table 4-8). These points were assigned as one point for low, two points for medium, and three points for high vulnerability to the various subgroups. These points were then added together for Lincoln County to determine the total non-hazard vulnerability points.

Table 4-8 Non-Hazard Vulnerability Points

County	Total Population	Social Vulnerability	Structural Age Vulnerability	Economic Vulnerability	Structural Type Vulnerability	Total Non-Hazard Vulnerability Points
Lincoln	**L**	**L**	**M**	**M**	**M**	**8**
Low	< 40,000	<120%[1]	<5%	<$1M	<25%	
Medium	40,000 – 100,000	120%-130%[1]	5% – 15%	$1M – $8M	25% – 35%	
High	>100,000	>130%[1]	>15%	>$8M	>35%	

Note:
[1] Social vulnerability categories may have double-counted segments of the population, leading to more than 100%.

4.10.2 Critical Infrastructure Vulnerability

4.10.2.1 Transportation Systems

The NM Department of Homeland Security and Emergency Management identified several potential evacuation route chokepoints and problem areas. For example, the Ruidoso area, which is extremely crowded during the peak tourist season, is susceptible to wildfire. There are several chokepoints en route to Ruidoso, including U.S. Route 70.

The major highways that pass through Lincoln County carry a variety of traffic ranging from commuters to hazardous materials. According to the Lincoln County Office of Emergency Services, local plans are in place for response to hazardous material accidents on highways and railroads.

There are several railroad junctions in the state, which, if not fully operational could become chokepoints to passenger and freight service.

Lincoln County had a total transportation system dollar exposure of $2.8 million (Table 4-9). Of these transportation systems, highways make up more than 85.5% of the cost. Railways and runways make up the balance of the total exposure value.

Table 4-9 Transportation System Dollar Exposure (value in thousands of dollars), Lincoln County

County	Highway	Railway	Bus Facilities	Airports	Runways	Total
Lincoln	$2,393,597	$91,982	$1,046	$47,088	$268,531	$2,802,244

Source: Federal Emergency Management Agency Hazards U.S. – Multi-Hazard

Note: The following is a list of transportation system components used in HAZUS:

- A railway transportation system consists of tracks, bridges, tunnels, stations, fuel, dispatch, and maintenance facilities.
- A bus transportation system consists of urban stations, fuel facilities, dispatch, and maintenance facilities.
- An airport transportation system consists of control towers, runways, terminal buildings, parking structures, fuel facilities, and maintenance and hanger facilities.

4.10.2.2 Utilities

As with transportation systems, utility systems are also subject to various natural hazards. In terms of dollar exposure of utility systems, the total value for the state is approximately $6 billion. The total value for Lincoln County is $66,413 (Table 4-10).

Table 4-10 Utility System Dollar Exposure (value in thousands of dollars) in Lincoln County

County	Potable Water	Waste Water	Oil Systems	Natural Gas	Electric Power	Communications	Total
Lincoln	-	63,936	-	2,093	-	384	66,413

Source: Federal Emergency Management Agency Hazards U.S. – Multi-Hazard (HAZUS-MH)

Note: The following is a list of utility system components used in HAZUS:

- A potable water system consists of pipelines, water treatment plants, control vaults and control stations, wells, storage tanks, and pumping stations.
- A wastewater system consists of pipelines, wastewater treatment plants, control vaults and control stations, and lift stations.
- An oil system consists of pipelines, refineries, control vaults and control stations, and tank farms.
- A natural gas system consists of pipelines, control vaults and control stations, and compressor stations.
- An electric power system consists of generating plants, substations distribution circuits, and transmission towers.
- A communication system consists of communications facilities, communications lines, control vaults, switching stations, radio/TV stations, weather stations, or other facilities.

4.11 Conclusions

This hazard analysis and risk assessment is based on the best and most up-to-date available data from state and local sources. It presents a reasonable range of hazards that have affected Lincoln County (and state in the past). By extrapolation, those same hazards can be expected to affect Lincoln County in the future.

Nevertheless, there are a number of conclusions can make from the hazard analysis and risk assessment:

- Lincoln County and State-owned and critical facilities are no more exposed to natural hazards than are other structures in the same general vicinity. In many ways, these structures are less exposed to natural hazards than other structures due to existing understanding of commonly occurring events, such as floods, and the deliberate consideration of these hazards in the situation (locating) of these structures.

- Critical facilities deserve additional mitigation attention because of the higher potential life and property loss or environmental harm in the unlikely event that they suffer significant damage.

- Lincoln County building stock is weighted more heavily in the area of second homes (vacation homes) than most other counties in the state. This means that a larger than average number of unoccupied structures require greater vigilance to catch impacts than might otherwise be seen in other counties of the state. This is particularly true for wildfires and the WUI.

- As with other counties in the state, Lincoln has within its borders a sovereign native government that places additional challenges in the furtherance of hazard mitigation planning and actions. Also related to this is the presence within Lincoln County or proximal threat from dams owned or operated by jurisdictions other than Lincoln County. Lincoln County requires support in the coordination of these activities with the State of New Mexico, the Bureau of Indian Affairs, neighboring Otero County, and local jurisdictions contained within Lincoln and neighboring Otero County. This is particularly true in mitigation activities involving Mescalero Lake (owned by the Mescalero Tribe), Grindstone Lake (owned by the Village of Ruidoso) and Bonito Lake (owned by the City of Alamogordo). This plan includes a mitigation project that addresses these issues and represents a prime opportunity for collaborative interaction between Lincoln County, the Mescalero Tribe and Otero County; Lincoln County and the Village of Ruidoso; and Lincoln County and the City of Alamogordo.

It is important to note that, although some hazards are classified as low or moderate in probability of occurrence, it does not mean that they cannot affect Lincoln County in any significant way, only that such an occurrence is relatively less likely. The hazard analysis in this document provides helpful insights for planning purposes and determination of priorities, but it cannot offer guarantees.

Critical Facilities

After completing the county-wide assessment of vulnerable infrastructure, the MPG focused its analysis on those facilities that were determined to be "critical." A critical facility is defined as a facility in either the public or private sector that provides essential products and services to the general public or is otherwise necessary to preserve the welfare and quality of life in Lincoln County or fulfills important public safety, emergency response, and/or disaster recovery functions. The critical facilities in Lincoln County include police and fire stations, schools, water systems, and municipal buildings.

Vulnerable Priority Critical Facilities. The MPG further identified "priority" critical facilities as those critical facilities that are vulnerable to a hazard and determined whether they could benefit from some type of mitigation measure and

if the loss of the facility would significantly impact the community's ability to recover from a hazard event.

To map Lincoln County's critical facilities and to determine which are the most likely to be affected by hazards, the contractors used GIS software. The hazards most likely to impact Lincoln County are floods and wildfires, although severe thunderstorms were ranked equally high as these initiate floods and wildfires.

The analysis revealed the following:

- Most critical facilities are well sited with respects to the major hazards of wild fires, high winds and flooding with the exception of the Ruidoso Downs Race Track which lies in the flood plain of Rio Ruidoso. In this case the race track club house and other spectator buildings are well situated outside the flood plain but the barns/stables lie to the east of the track, in the flood plain.

- Special consideration needs to be given to all the facilities located in Ruidoso and Ruidoso Downs (as well as many residences and businesses not specifically included in the critical facilities list with regards to the threat posed by dam rupture. Both Mescalero Lake and Grindstone Lake could potentially threaten these locales with inundation above the 500-foot flood event level. Loss of either of these dams could present the communities with a serious search and rescue need.

- Wildfires are a well-recognized threat in Lincoln County. All of the critical facilities appear to utilize wildfire interface construction best practices, including some form of defensive space.

5 Mitigation Strategies

5.1 Goals and Objectives of Hazard Mitigation

The ultimate mission of all hazard mitigation is the protection and preservation of life and property from the effects of the occurrence of natural hazards. Local governments can make progress toward this goal through coordinated planning and financing to achieve the specific objectives set forth in their hazard mitigation plans. To this end, the MPG's strategy has been to develop several methods for mitigating the hazards identified in Chapter 3, Hazard Identification and Risk Analysis, as the most likely hazards to have severe consequences in Lincoln County: wildfire, high wind, flood, drought, thunderstorms, severe winter storms, tropical storms, dam failure, earthquakes, tornadoes, hazardous materials, and extreme heat, The MPG has developed goals and objectives and has suggested action items that can provide directions and methods for mitigating these hazards.

5.1.1 Mitigation Goals

The overarching goal of mitigation identified by the MPG is to:

- Reduce or eliminate hazardous conditions that cause loss of life or inflict injury;
- Reduce or eliminate hazardous conditions that cause property damage;
- Reduce or eliminate hazardous conditions that degrade important natural resources; and
- Reduce or eliminate hazardous conditions that impact the community's recovery time in emergency response.

The focus of these goals are to reduce especially repetitive costs associated with disasters to property owners and all levels of government including the protection or retrofit of critical facilities, reducing exposure to liability and minimizing community disruption.

5.1.2 Mitigation Strategy Objectives

Mitigation strategies in this Hazard Mitigation Plan address critical facilities and any known repetitive-loss structures. Preparedness, response, and recovery measures that were identified to support the concept of mitigation and may directly support identified mitigation actions by

1. *Increasing awareness of hazards and their effects*;
2. *Decreasing the possibility of impact from the most significant threats*;
3. *Decreasing the vulnerability of critical and non-critical facilities*;
4. *Increasing established response mechanisms by enhancing partnerships*; and
5. *Increasing coordination between levels of government regarding incidents and response mechanisms*.

The HMP is intended to facilitate these goals and actions and to focus on the county's top priorities for hazard mitigation projects and action items. If other hazards that currently are not deemed significant do become significant in the future, updates to this plan will include mitigation strategies to address them. Critical facilities that lie within high-hazard areas will receive special attention, and especially property that has suffered repeated losses, regardless of whether or not the loss was during a state- or federal-declared disaster.

Mitigation strategies in this Hazard Mitigation Plan address critical facilities and any known repetitive-loss structures. Critical facilities that lie within high-hazard areas deserve special attention, and mitigation strategies need to be developed for property that has suffered repeated losses, regardless of whether or not the loss was during a state- or federal-declared disaster.

Strategies reflect what Lincoln County, state, and federal governmental agencies and non-governmental organizations (NGO) within Lincoln County would like to mitigate.

5.2 Mitigation Strategies

5.2.1 Identification and Analysis of Mitigation Measures

Lincoln County has identified several hazard mitigation projects that would benefit the county. These were identified in the MPG meetings, which included input from representatives from governmental organizations, local business, and private citizens. These are addressed in detail below.

5.2.1.1 General Hazard Mitigation Activities

Some activities proposed address more than one hazard. Some of the projects listed below are general. Others specifically relate to one hazard but have usefulness to all hazards identified:

- The MPG recognized that the process of mitigation project implementation should consist of both activities normally pursued by Lincoln County with its own funds but several require external support to make these happen. Lincoln County's emergency services director will research and seek out these opportunities and the MPG (and officers of the county government) will support this research effort.

- Given the role of the State in development and administration of building codes, Lincoln County does not have responsibility in the area of issuing and enforcement of building permits. Lincoln County however does have review and pre-issuance right to oppose projects that are not well thought out. Lincoln County will seek to proactively utilize this right and explore the increase in capacity to review these applications to the state in a timely manner. A significant and persistent problem has been allowed to grow over the years where subdivision and individual houses are built in locations that are difficult (or impossible) for emergency services to support in times of emergencies. Through this activity, expansion of existing subdivisions and initiation of new subdivisions may possibly be addressed to begin the process of improving the quality of construction, proper siting of new development and assurance that development is supported with emergency services and infrastructure capable of withstanding impact from hazards.

5.2.1.2 Public Awareness

Insurance industry and emergency management research has demonstrated that awareness of hazards is not enough. People must know how to prepare for, respond to, and take preventive measures against threats from natural and technological hazards. This research has also shown that a properly run local information program is more effective than national advertising or public campaigns.

Although concerted local and statewide efforts to inform the public exist, lives and property continue to be threatened when segments of the population remain uninformed or chose to ignore the information available. Educating the public about these life- and property-saving techniques must remain a high priority item at the local, state, and federal level. Compounding this problem is that for Lincoln County a significant number of property owners are not always present in second (vacation) homes when threats are present (for example wildfire season does not coincide with winter snow skiing season). One project identified by the MPG includes:

- Public education campaign focusing on public service announcements (PSA) addressing the specific challenges to homeowners during wildfire season, including focus on seasonal population and coordination of care when not present in the community. Although these efforts focus on wildfire protection and mitigation, approach and materials developed may transcend to other hazards identified in this plan.

5.2.1.3 Wildfire Specific Mitigation Steps

Lincoln County is fortunate to have in place a recently updated Community Wildfire Protection Plan. Within the focus of this plan is identification of threats and formulation of mitigation activities specific to the topic of the wildland-urban interface (WUI). In development of the hazard mitigation plan, the MPG (which includes many members also part of the CWPP development process), identified two specific projects, the one just stated above (community outreach) and:

- Lincoln County will work with its major electrical services provider, PNM to assure routine maintenance of right-of-ways. This process is an ongoing activity that will be continued throughout the life of the plan.

5.2.1.4 Floodplain Management and Construction/Use Ordinances

Improved floodplain management, including land-use planning, zoning, and enforcement at the local level can reduce flood related damages. The use of the National Flood Insurance Program (NFIP) is critical to the reduction of future flood damage costs to the taxpayer.

Lincoln County joined the NFIP on March 28, 1978 (Table 6-9). Lincoln County developed a Floodplain Damage Prevention Ordinance as part of its county regulations, which addresses methods and practices to minimize flood damage to new and substantial home improvement projects, as well as zoning and sub-division regulations. The County manages its NFIP program through:

- Restricting or prohibiting uses that are dangerous to health, safety or property in times of flood, or cause excessive increases in flood heights or velocities.

- Requiring that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction.

- Controlling the alteration of natural floodplains, stream channels and natural protective barriers, which are involved in the accommodation of flood waters.

- Controlling filling, grading, dredging and other development which may increase flood damage.

- Preventing or regulating the construction of flood barriers which will unnaturally diverts flood waters or which may increase flood hazards to other lands.

The County Planning Director serves as the County Flood Plain Manager is tasked with administering and implementing the provisions of the County Floodplain Ordinance.

Table 5-1 National Flood Insurance Program

Name	Community Identification Number	Initial FHBM[1] Identified	Initial FIRM[2] Identified	Current Effective Map Date
Lincoln County	350122	3/28/1978		3/28/1978
Capitan	350098	6/25/1976		6/25/1976
Carrizozo[3]	350110	8/22/1975		8/22/1975
Corona[3]	350099			
Ruidoso	350033	6/7/1974	3/2/1983	3/15/1994
Ruidoso Downs	350034	5/31/1974	7/5/1982	7/5/1982

Notes: 1. FHBM = Flood Hazard Boundary Map. 2. FIRM = Flood Insurance Rate Map. 3. Carrizozo was suspended from the NFIP effective 8/22/76 and Corona has never participated independently in the NFIP.
Source: http://www.fema.gov/cis/NM.html. Extracted from FEMA database on 8/29/09.

Public education plays an important role in floodplain management. An effective education program should be implemented to show citizens the importance of building codes and ordinances and how cost-effective they could be in reducing future damages.

Projects identified by the MPG (see the Action Plan in Chapter 7) relating to flood plain management are as follows:

- Review and seek elimination of low water crossings based on prioritization that is driven from emergency needs. Numerous low water crossings exist within Lincoln County and are quickly impacted during rain events. By reviewing and acting, Lincoln County decreases response time during emergencies. It should be noted that this improvement does not necessarily relate to flood events.

- Review and seek improvement of roads repetitively subjected to washouts. By addressing roads and bridges that have been repeatedly subject to damage during flooding, Lincoln County improves response and evacuation capability. Recovery time following flood events also decrease.

5.2.1.5 Response Process Improvement

Improved response processes decrease the severity of community emergencies such as floods and wild fires, as well as personal emergencies such as ambulance runs and household fires. The Lincoln County Commission and the response organizations of the county actively pursue response process improvement through internal sources of funding as well as grant funds made available from the state and federal government. In regards to response improvement, the MPG identified several projects that relate to mitigation:

- All jurisdictions are in constant need for response process improvement, for a smaller jurisdiction such as Lincoln County, it is more pressing due to competition from larger communities. Lincoln County bears greater threats from hazards and has seen recent measurable impact from these threats that result in post disaster funding. The MPG feels that mitigation funding opportunities that present themselves in association to post disaster mitigation should be utilized for potentially non-traditional improvements and will seek better understanding of the rules associated with mitigation programs for the purpose of augmenting available funds for response process improvement.

- Working in concert with Otero County and Mescalero tribal government, Lincoln County will seek to improve coordination of monitoring and reporting process improvements for Mescalero Lake Dam where challenges exist in the management of the release of water prior to and during heavy rainfall events. The proximity of the dam's discharge to Ruidoso and the proximity of Lincoln County's most heavy concentration of people, businesses and critical facilities to Rio Ruidoso necessitate this effort.

- Continuing the development of understanding among Lincoln County's first responders to the nature of hazardous materials threat following a transportation accident is needed to the technician level. Lincoln County's response organizations will seek opportunities and will utilize internal and external funding to obtain higher level training for a cadre of personnel.

- Lincoln County's emergency response organizations and its emergency management group will seek to improve coordination of efforts specifically with the Village of Ruidoso's Water Department as it bears management / operational responsibility for Grindstone Dam. Like Mescalaro Lake, Grindstone Lake is an extremely close proximity hazard when it comes to management of heavy rainfall events.

- Similar to the need to develop technical capabilities in response to hazardous materials response, Lincoln County needs capability to better response to floods. A water rescue capability will be developed (further enhanced) through efforts of Lincoln County's first response organizations.

- In general, Lincoln County's response organizations will pursue cross training of personnel, including those in government but not specifically tasked with first response, so that effective collapse of functionality with reassignment of personnel in times of emergency can more swiftly be obtained.

Hazard mitigation funding is not generally applicable to response process improvement however the County Emergency Services Director should increase awareness of hazard mitigation funding opportunities and leverage where possible to benefit response preparedness improvements.

5.2.1.6 Protection of the Public from Man-Made Hazards

US Route 54 is a well traveled highway that passes through Lincoln County seat: Carrizozo. Other US Routes transect Lincoln County, including US Routes 70 and 380. Route 54 is a critical transportation corridor connecting El Paso, Texas to location in Lincoln County before moving northeastward to the Texas panhandle and locations east. US Routes 70 and 380 travel roughly west to east (380 from Interstate 25 near Socorro through Carrizozo to the southeast corner of Lincoln County and 70 from Route 54 in Tularosa up to Ruidoso before heading east along the Rio Ruidoso valley before joining with 380 in the southeast corner of Lincoln County and jointly heading to Roswell). The Route 54 corridor also includes the north-south Union Pacific railroad track that services El Paso and Amarillo. Although no significant hazardous material spills have been noted in Lincoln County, concerns over the tight clustering of population centers in narrow strips along these highways/corridor and the potential for significant impact follow an accident prompted the MPG to list the following projects:

- Lincoln County will seek funding and conduct a hazardous materials flow study (augmenting statewide efforts currently under discussion). The ultimate goal of this effort is to allow Lincoln County emergency management and response organizational understanding of the nature of hazardous material spill threat and offer the county the tools necessary to evaluate routing of these shipments through the county.

5.2.1.7 Early Warning

With sufficient warning of a flood, a community and its residents can take protective measures such as moving personal property, cars, and people out of harms way. This system, when developed must be coupled with other methods of warning the general public, carrying out appropriate tasks, and coordinating the flood response plan with operators of critical facilities. A comprehensive education and outreach program is critical to the success of early warning systems so that the general public, operators of critical facilities, and emergency response personnel will know what actions to take when warning is disseminated.

Lincoln County's Emergency Operations Plan gives details of its public alert system. The activation of this system and timely release of emergency information to the public by all available media is vitally important. A project identified by the MPG follows:

- Conduct a study on the best and most cost effective placement of evacuation and notification sirens for Lincoln County. Siren systems can be used to alert citizens that there is a need to evacuate the area. It should be determined if the coverage will be effective in rural areas of Lincoln

County, as well. Lincoln County is already undertaking the placement of reverse 911 to mitigate the difficulties of siren placement throughout the vast area that is Lincoln County.

- Specific to the threats posed by close proximity dams (Mescalero Lake, Grindstone Lake and Bonito Lake), Lincoln County will explore the nature of remote monitoring and alerting that exists at each of these facilities. Where warranted, Lincoln County will work with the facility owners (the Mescalero Tribe, the Village of Ruidoso and the City of Alamogordo, respectively) to formulate approaches, sources of funding and implement approaches to create an alert network that includes Lincoln County and potentially impacted communities downstream from these resources.

5.2.2 Evaluation Methodology

In order to evaluate potential actions, the MPG used the STAPLEE criteria, outlined in FEMA's *Developing the Mitigation Plan* (FEMA 386-3), which provides a systematic approach to weighing the pros and cons of potential mitigation actions. STAPLEE stands for Social, Technical, Administrative, Political, Legal, Economic, and Environmental. Each of these criteria consist of several factors that should be considered when evaluating the appropriateness of each potential action.

Table 5-2 STAPLEE Criteria Evaluation by MPG

STAPLEE CATEGORY	CATEGORY DESCRIPTION	EVALUATION CRITERIA
Social	Public support of the overall implementation strategy and specific mitigation actions.	• Compatibility with present and future community values • Effect on cultural values or resources. • Effect on segments of the population • Effect on established neighborhoods, voting districts, or relocation impact
Technical	Actions with reasonable solutions, given the present technological requirements of the proposed project.	• Feasibility of action- can actually be accomplished • Long-term solution • Reduction of primary or secondary impacts.

Table 5-2 STAPLEE Criteria Evaluation by MPG

STAPLEE CATEGORY	CATEGORY DESCRIPTION	EVALUATION CRITERIA
Administrative	Availability of anticipated administrative capabilities including staffing, funding, and maintenance requirements for the proposed mitigation action.	• Current administrative capability (staff, technical experts, and/or funding) to implement the action, or whether it can be readily obtained. • Ability to maintain projects.
Political	Current community and state political support related to the environment, economic development, safety, and emergency management.	• Political support for implementation and monitoring • Availability of department, agency or representative willing to help see the action to completion • Public support to ensure the success of the action.
Legal	Legal authority at the state, tribal, or local level to implement the action.	• State, tribe, or community authority to implement the proposed action. • Potential legal consequences (liability) to the action.
Economic	Benefit and costs associated with proposed actions.	• Costs seen reasonable considering likely benefits • Probability of financial burden placed on the tax base or local economy to implement this action • Contribution to other community economic goals, such as capital improvements or economic development • Availability of outside sources of funding
Environmental	Impact on the environment consistent with sustainable and environmentally healthy communities	• Affect on the environment and natural resources • Affect on endangered species • Compliance with local, state, and federal environmental laws or regulations • Consistency with community environmental goals.

5.2.2.1 STAPLEE Criteria Scoring

Each potential mitigation action was assessed by ranking each factor in each of the categories (social, technical, administrative, political, etc.) and by then adding up the total score. Rankings were as follows:

0 = Poor: The mitigation method does not meet basic criteria established under the evaluation category.

1 = Fair: The mitigation method meets the basic criteria established under the evaluation category.

2 = Good: The mitigation method exceeds the basic criteria established under the evaluation category.

3 = Excellent: The mitigation method exceeds the basic established criteria in an innovative or new way.

The maximum score possible is 72:

- Social = 12 (4 factors ranked as excellent (3)
- Technical = 9 (3 factors ranked as excellent (3)
- Administrative = 9 (3 factors ranked as excellent (3)
- Political = 9 (3 factors ranked as excellent (3)
- Legal = 9 (3 factors ranked as excellent (3)
- Economic = 12 (4 factors ranked as excellent (3)
- Environmental = 12 (4 factors ranked as excellent (3)

5.2.3 Implementing Mitigation Measures

The inclusion of any specific action item in this document does not commit Lincoln County to implementation. Each item will be considered in terms of the available staff and funding resources. Certain items may require regulatory changes or other decisions that must be implemented through standard processes, such as changing regulations. This plan is intended to offer priorities based on an examination of hazards.

Benefit-cost analysis (BCA) compares the benefits of mitigation measures to the costs, and is a technique used for evaluating the cost-effectiveness of mitigation measures. FEMA requires a BCA for all mitigation projects that receive FEMA funding.

The MPG discussed the potential costs associated with each type of mitigation measure identified in Appendix D, and decided that any project could be cost effective if it’s scope were properly tailored to the situation.

After discussing the possible costs of the various mitigation measures, the MPG decided that instead of working on developing a very generic BCA at this time for projects that may not ever be authorized, we would wait until a project was determined to be feasible. An estimated cost to implement the action item was, however, provided in the action plan.

5.2.4 Mitigation Action Financing

The mitigation strategies described here, including funding for mitigative actions, are part of an overall, general plan for preventing or mitigating beforehand potentially hazardous situations. However, far less mitigation funding is available than is needed, and there is intense competition for what is available. The Department of Homeland Security and Emergency Management (DHSEM) is sometimes able to offer grant applicants technical assistance in planning and executing specific projects, but federal pre-disaster mitigation funding must be authorized annually by Congress. Post-disaster mitigation funding is based on disaster costs arising from a Stafford Act disaster declaration.

Often grant funding is for specific types of projects, and potential grant recipients must use what is available to them, regardless of priority. The Federal Emergency Management Agency (FEMA) allocates grants to local governments based upon recommendations from the state. The state in turn prioritizes grant applications based upon the needs of a given applicant in a given situation.

Considering these limitations, it is not possible to predict the amount of mitigation grant funding that will be available in the future, and so funding has not been considered a limiting factor in developing mitigation strategies and action items for this plan.

Other factors, such as special considerations with respect to National Environmental Policy Act (NEPA) regulations and the National Historic Properties Act (NHPA) can impose limitations on spending federal funds, making some actions so difficult as to become all but impossible. For planning purposes, the MPG has not considered these limitations either. When the time actually comes for deciding to pursue a specific project with federal funding, all of these factors will come into play.

The methodology used here to determine action item priorities was based upon a consensus of the MPG. Factors considered were cost effectiveness, environmental impact, and technical feasibility. However, nothing in this plan should be construed as an absolute. Rather, the priorities identified in this plan are to be viewed as guidelines for Lincoln County and its partners in hazard mitigation within the county, not as requirements. Lincoln County needs to assess its evolving vulnerability to the hazards it faces and make its own priority determinations. This may result in continual change in the ranking of hazards.

5.3 Summary of Mitigation Strategies

The following are suggested actions that the MPG believes will reduce the effect that a disaster could have on Lincoln County. These are presented in order of priority for action based upon the MPG and selected government / emergency services representatives.

5.3.1 Mitigation Actions

1. **Leverage hazard mitigation funding to improve mitigation processes**

Hazards:

Wildfire	Earthquake
Severe Weather	Tornado
Flood	Extreme Heat
Drought	Hazardous Materials
Dam Failure	

Comments: Hazard mitigation funding is not generally applicable to response process improvement; however, the County Emergency Services Director should increase awareness of hazard mitigation funding opportunities and leverage where possible to benefit response preparedness improvements.

How this Action Contributes to the Mitigation Strategy: Response process improvement represents one of the most significant methods of mitigating the impact of a hazard through decrease in time between notification of an emergency and initiation of response and by assuring the proper resources and techniques are in the hands of well trained responders.

Responsible Organizations/Individuals: County Emergency Services Director, MPG, other County response agencies, as applicable

Estimated Expenses: Time (employee time) and materials (travel related expenses to go to meetings and publication expenses when applying for grants, etc.)

Timeframe: Immediately and extending throughout the plan's 60 month life cycle.

Funding Sources: County and state budgets, state grants, and FEMA grants.

STAPLEE Score: 42

Prioritization: 1

2. **Notification systems and siren improvement.**

Hazards:

Earthquake	Flood
Dam Failure	Tornadoes
Severe Weather	

.

Comments: Conduct a study on the best and most cost effective placement of evacuation and notification sirens for the County. Develop capacity to utilize reverse 911 throughout the County.

How this Action Contributes to the Mitigation Strategy: Improvement of alerting systems that recognizes the remoteness / clustering of population will only improve response to calls to evacuate in the face of hazards, saving lives, and increasing lead time for population to safeguard property.

Responsible Organizations/Individuals: County Emergency Services Director

Estimated Expenses: Purchase of hardware/software, time and materials for installation, optimization and testing.

Timeframe: Ongoing – reverse 911 system in implementation stage. Next 12 months to optimize alerting protocols and test systems. Operational immediately but functioning on a daily basis within the next 3 to 4 months. Placement of additional sirens will be an ongoing process throughout the life of this plan.

Funding Sources: County and state budgets, state grants, and FEMA grants.

STAPLEE Score: 40

Prioritization: 7

3. **Mescalero tribal emergency management – hazard mitigation coordination improvement.**

Hazards:

Wildfire	Earthquake
Severe Weather	Tornado
Flood	Extreme Heat
Drought	Hazardous Materials

Dam Failure

Comments: Initiate (re-establish) contact with Mescalero tribal government to determine who is the new emergency management coordinator, possibly utilizing responder to responder relationships (which are maintained) to improve emergency management to emergency management coordination. Seek out opportunities for emergency management of Lincoln and Otero Counties to participate jointly in planning with Mescalero emergency management.

How this Action Contributes to the Mitigation Strategy: Coordination between these three jurisdictions already reaps mitigative impact in the area of wildfire response efficiencies. Efforts described here will improve on the wildfire area as well as lead to better management practices and alert notification relating to reservoirs on the tribal lands. These reservoirs lie immediately uphill from the Village of Ruidoso and pose flash flooding hazard to Rio Ruidoso valley communities. Improvements may lead to lives saved and property loss minimization.

Responsible Organizations/Individuals: County Emergency Services Director, Otero County Emergency Manager, Mescalero Nation Emergency Manager, emergency response organizations, State and Federal agencies

Estimated Expenses: Time and materials (mainly personnel and meeting space). Possibly SCADA system with remote status/response alert capability accessible by all parties and the public.

Timeframe: Immediate action item – over next 12 months develop a routine meeting schedule for all parties to discuss issues and formulate action items. With funding secured (tribal government can tap into funding streams not available to county / local government), dam monitoring and alerting systems would require study and design (12 months) and installation (up to 12 additional months). Activity for life cycle of this plan.

Funding Sources: County, state and tribal budgets, state grants, and federal grants.

STAPLEE Score: 41

Prioritization: 8

4. **Village of Ruidoso water department coordination improvement**

Hazards:

Flood	Dam Failure
Severe Weather	Earthquake

Comments: Establishing better working relationships between the County and Village of Ruidoso relative to the Grindstone Dam. By increasing mitigation efforts in conjunction with other levels of government and sovereign nations, some of the damages that arise from Grindstone Dam failure or overtopping can be reduced, therefore, reducing the level of impact received by the County.

How this Action Contributes to the Mitigation Strategy:

Responsible Organizations/Individuals: MPG, County Emergency Services Director, other levels of government (particularly the Village of Ruidoso and its Water Department, but also Federal, state, and local), sovereign nations within the County

Estimated Expenses: Time and materials (mainly personnel and meeting space)

Timeframe: Immediately actionable – ongoing for the life of this plan.

Funding Sources: Village, county and state budgets, state grants, and FEMA grants.

STAPLEE Score: 40

Prioritization: 11

5. **Response process optimization**

Hazards: All hazards.

Comments: County response personnel all need to use the same methods to respond effectively to a disaster. Cross train County personnel for various response roles/responsibilities, initiate resource deployment planning, and conduct a needs and capability assessment for response processes.

How this Action Contributes to the Mitigation Strategy: A more effective response leads to less damage and increases safety, both important goals of mitigation.

Responsible Organizations/Individuals: Local emergency manager, LEPC members, and other county emergency response agencies.

Estimated Expenses: Time (participant and instructor/speakers) and materials (training supplies, meeting venue and travel related expenses, if training is not local)

Timeframe: 12 months for training of applicable personnel on response background materials (possibly using NIMS-related curriculum) – actually an ongoing process already underway and destined to proceed into the future indefinitely (NIMS strategy is an ever improving system). Immediately actionable as soon as funding source(s) identified.

Funding Sources: County and state budgets, state grants, and FEMA grants.

STAPLEE Score: 42

Prioritization: 13

6. **Research funding opportunities for a vulnerability assessment to assist mitigation planning in the county.**

Hazards:

Wildfire	Earthquake
Severe Weather	Tornado
Flood	Extreme Heat
Drought	Hazardous Materials
Dam Failure	

Comments: The County Emergency Services Director can research and seek out different grants and funding methods to finance and conduct a response capability and needs assessment relative to the hazards identified in this plan.

How this Action Contributes to the Mitigation Strategy: By knowing which areas are the most vulnerable, the county can take appropriate measures to protect life and property, possibly reworking this plan and this section in particular.

Responsible Organizations/Individuals: County Emergency Services Director, others as funding is identified to act as support personnel.

Estimated Expenses: Employee time and possibly a consultant if the requirements of the funding source require more time than county personnel have available.

Timeframe: 12 months upon identification of funding source

Funding Sources: County budget, state and / or federal grant(s)

STAPLEE Score: 42

Prioritization: 14

7. **Increase level of effort and proactively utilize county right to object in issuance of building permits by the state.**

Hazards:

Wildfire	Earthquake
Severe Weather	Tornado
Flood	Extreme Heat
Drought	Hazardous Materials
Dam Failure	

Comments: The county administration can work with the commission to formulate an approach and expense management of a more proactive review process as part of the state's building permit system for unincorporated parts of the county.

How this Action Contributes to the Mitigation Strategy: By utilizing its right to review pending state building permits and proactively injects itself to stop proposed projects that prove detrimental to the ability of existing and proposed communities to respond and recover quickly to natural and manmade emergencies, the county can utilize existing systems to impact future building in a cost effective manner.

Responsible Organizations/Individuals: Local emergency manager, LEPC members, county commissioners, county administration

Estimated Expenses: Employee Time

Funding Sources: Local planning grants and state funds

Timeframe: Immediately, through the 60-month action period

STAPLEE Score: 42

Prioritization: 15 (not ranked)

8. **Communications – Establish and prioritize needed improvements of key pre-disaster communications systems and critical response equipment.**

Hazards:

Wildfire	Earthquake
Severe Weather	Tornado
Flood	Extreme Heat
Drought	Hazardous Materials
Dam Failure	

Comments: County response personnel all need to use the same equipment to respond effectively to a disaster.

How this Action Contributes to the Mitigation Strategy: A more effective response leads to less damage and increases safety, both important goals of mitigation.

Responsible Organizations/Individuals: Local emergency manager, LEPC members, and other county emergency response agencies.

Estimated Expenses: Materials (new communications equipment) and Time (development of strategy on coordination of use of the older and newer equipment inter-operably).

Timeframe: 6 months to 2 years for securing necessary funding (through competitive grants), then within a year of award (action is contingent on grant award), then 1 to 2 years to achieve demonstrable improvements (through response use or through simulations - exercises).

Funding Sources: County and state budgets, state grants, and FEMA grants.

9. **Develop public service announcements about specific threats for disseminations via the media.**

Hazard: All hazards.

Comments: These announcements can be developed and kept on file to update and disseminate to the public as warranted. Such announcements can be made via television and radio, pamphlets, training sessions, and demonstrated activities. If the threat is an ongoing risk, the message can be relayed throughout the year to the county. Special populations such as non-English speaking populations and the homebound can be identified for specific messages. Topics covered that relate to many hazards would include evacuation and sheltering-in-place.

How this Action Contributes to the Mitigation Strategy: Adequate warning for certain hazards can mean life or death for individuals living and/or working in certain areas. The goal of mitigation is to reduce the effects of the hazard on life and property. Armed with knowledge of how

to safely and correctly respond to a hazard, people can make educated and informed choices during a disaster.

Responsible Organizations/Individuals: Local emergency manager and media outlets.

Estimated Expenses: Time and Materials plus expense of airing PSA's on local media.

Funding Sources: County or state budget, FEMA grants

Timeframe: As soon as materials can be developed and throughout the 60-month action period.

10. **Conduct public meetings to raise awareness of threats and how citizens can mitigate the impact of disasters.**

Hazard:

Wildfire	Earthquake
Severe Weather	Tornado
Flood	Extreme Heat
Drought	Hazardous Materials
Dam Failure	

Comments: This action can include a series of public meetings with local and visiting subject matter experts to educate the public on how to decrease their risk during a given disaster by understanding the hazard in question and the potential devastation it can create. The county can also team with home improvement stores to give classes to educate citizens on measures they can take to protect their own homes against certain disasters.

How this Action Contributes to the Mitigation Strategy: The public can be armed with information about certain types of disasters and the measures that they can take on their own personal property to lessen the effect on both life and property and, in turn, on the county.

Responsible Organizations/Individuals: MPG members, local emergency managers, Local Emergency Planning Committee (LEPC) members, county commissioners, other county agencies, the New Mexico DHSEM, and other state agencies with roles in emergency management.

Estimated Expenses: Time and materials

Funding Sources: County or state budget, FEMA grants

Timeframe: Starting as soon as desired and progressing throughout the HMP's 60-month action cycle.

11. Ensure that routine planned maintenance occurs on right-of-ways.

Hazards: High Wind, Thunderstorms, Wildfire

Wildfire Severe Weather

Comments: The MPG can meet with Power New Mexico (PNM) to strengthen tree management planning. Together, they can review and update plans and decide on a routine schedule for maintaining rights-of-way.

How this Action Contributes to the Mitigation Strategy: Strengthening planning can assist the county in maintaining areas that are in most need and can thereby reduce the amount of economic impact if a disaster occurs.

Responsible Organizations/Individuals: MPG, local emergency manager, PNM, other stakeholders (BLM, sovereign tribal nations, etc.)

Estimated Expenses: Initially, time and materials for meeting and plan refinement, later projects will include both participating agency personnel and equipment as well as contractor support.

Funding Sources: County budget, participating organizational budgets

Timeframe: Ongoing activity – one to have increasing participation by the necessary parties – 6 months to revise / produce maintenance plan(s). 6 months to 60 months (life of this plan) to implement, collect lessons learned and improve the management plan(s).

STAPLEE Score: 37

Prioritization: 4

12. Develop alternative public service announcements ahead of time to bring to wildfire public outreach.

Hazard:

Wildfire

Comments: These announcements can be developed and kept on file to update and disseminate to the public as warranted. Such announcements

can be made via television and radio, pamphlets, training sessions, and demonstrated activities. Special populations such as non-English speaking populations and the homebound can be identified for specific messages. Topics covered could include personal property mitigation and evacuation procedures.

How this Action Contributes to the Mitigation Strategy: The public can be armed with information about certain types of disasters and the measures that they can take on their own personal property to lessen the effect on both life and property and, in turn, on the county. Adequate warning for wildfires can mean life or death for individuals living and/or working in certain areas. Armed with knowledge of how to safely and correctly respond to a wildfire incident, citizens can make educated and informed choices during a disaster.

Responsible Organizations/Individuals: MPG members, local emergency manager, media outlets

Estimated Expenses: Time and materials (mainly government employees) but air time on local media (or donation of time by these media)

Funding Sources: County or state budget, FEMA grants

Timeframe: 12 months to formulate alternatives PSA. 3 additional months to pilot and revise PSAs. Available as needed after that and with additional time, reformulating into other topics/content.

STAPLEE Score: 42

Prioritization: 6

13. Low water crossing and bridge improvements

Hazards: Floods, but also the flood-related hazards of thunderstorms, tropical storms, etc.

Flood Severe Weather

Comments: Review and eliminate low water crossings based on prioritization that is driven from emergency response impediment. Scope and eliminate repetitive washout for bridges and improvements that can be made to these areas.

How this Action Contributes to the Mitigation Strategy: Addressing the critical low water crossing and bridges subject to inundation will

improve community evacuation and emergency response, both mitigative to the effects of the hazards.

Responsible Organizations/Individuals: Municipal, County and State highway/roads departments, County and Municipal emergency management, potentially sovereign nations, other stakeholders (such as emergency services and USFS).

Estimated Expenses: Initially time and materials but ultimately (as funding is found), contractor support to plan action, study impact of proposed action and ultimately support in execution of projects.

Timeframe: Next 12 months: study issue to identify potential projects (specific crossing or bridges, or groupings of these). 12 – 36 months after HMP approval: Seek funding for projects – grant dependent. 36 or more months after HMP approval – only after identification of funding: initiate planning/impact study and action.

Funding Sources: County and state budgets, state grants, and FEMA grants.

STAPLEE Score: 42

Prioritization: 2

14. Repetitive loss roads and highway improvement.

Hazards:

Flood Severe Weather

Comments: Review, scope and improve roads that pass through or along flood prone areas.

How this Action Contributes to the Mitigation Strategy: Addressing repetitive loss roads and highways will improve community evacuation and emergency response, both mitigative to the effects of the hazards.

Responsible Organizations/Individuals: Municipal, County and State highway/roads departments, County and Municipal emergency management, potentially sovereign nations, other stakeholders (such as emergency services and USFS).

Estimated Expenses: Initially time and materials but ultimately (as funding is found), contractor support to plan action, study impact of proposed action and ultimately support in execution of projects.

Timeframe: Next 12 months: study issue to identify potential projects (specific crossing or bridges, or groupings of these). 12 – 36 months after HMP approval: Seek funding for projects – grant dependent. 36 or more months after HMP approval – only after identification of funding: initiate planning/impact study and action.

Funding Sources: County and state budgets, state grants, and FEMA grants.

STAPLEE Score: 42

Prioritization: 3

15. Water rescue capacity development / improvement

Hazards:

Flood

Comments: Develop capacity among local emergency responders for a water rescue team.

How this Action Contributes to the Mitigation Strategy: A more effective response leads to less damage and increases safety, both important goals of mitigation.

Responsible Organizations/Individuals: County Emergency Services Director, County and City Fire Departments, other agencies with applicable resources (boats, etc)

Estimated Expenses: Time (technician and instructor) and materials (training supplies, tech-level equipment, travel related expenses, if training is not local).

Timeframe: 12 months for development of curriculum (if intent is to institutionalize locally), less if existing content is utilized. Immediately actionable as soon as funding source(s) identified.

Funding Sources: County and state budgets, state grants, and FEMA grants.

STAPLEE Score: 40

Prioritization: 12

16. Clearing and widening of Rio Ruidoso between the confluence of Grindstone Canyon Creek and Rio Ruidoso (inside the Village of

Ruidoso) and through to the Village of Ruidoso Downs corporate limits, a distance of approximately 15 miles. This area includes the confluence of intermittent streams of Gavilan Canyon, Cedar Creek and Cherokee Bill Canyon.

Hazards:

Flood

Comments: This stretch of the Rio Ruidoso has been the focal point of flooding in the area as each of the named streams drain more than the immediate watershed and the area is historically (and currently) heavily populated and the river valley is heavily forested. Two of the county's critical facilities, the Foxworth Lumber Yard and the Ruidoso Downs Racetrack have felt the impact of recent floods and the potential use of Ruidoso Downs and its associated open space as a staging area for emergency response are hampered by the potential of rapidly occurring and significant (deep and wide area) flooding.

How this Action Contributes to the Mitigation Strategy: By increasing efficiency of flow through the pinch points identified and

Responsible Organizations/Individuals: County and community public works department, state and federal agencies (forestry and natural resources stakeholders).

Estimated Expenses: pre-grant: $5 to 10K. Project: $250K - $1M, depending on final length of river to be addressed and considerations for sustainable rehabilitation design.

Funding Sources: Grant Application: county or community government. Scoping of project may be a grant funded activity that can be supported by a contractor. Project planning and procurement (once grant funded) by grant funds. Contractor efforts: grant funded. Probably a 15 to 25% matching requirement by the jurisdictions where project will be executed.

Timeframe: Project scoping over the next 3 to 6 months; once grant awarded by FEMA, 6 months to one year for project planning and procurement of contractor's services; 6 months to one year for contractor activity. Total time (provided immediate action by FEMA): 24 to 36 months.

STAPLEE Score: 38

Prioritization: 15 (not ranked)

17. Rerouting of a section of water and/or sewer lines in the Village of Ruidoso.

Hazards:

Flood

Comments: Project description under development by the Village of Ruidoso however it involves removal of water and/or sewer lines from a crossing point of Rio Ruidoso to a route under Sudderth Avenue.

How this Action Contributes to the Mitigation Strategy: Protect utilities from service disruption during a flooding event.

Responsible Organizations/Individuals: The Village of Ruidoso.

Estimated Expenses: pre-grant: $5 to 10K for planning/scoping. Project: $250K - $1M, depending on whether design involves running lines deeper below Rio Ruidoso or rerouting around the area.

Funding Sources: Grant Application: county or community government. Scoping of project may be a grant funded activity that can be supported by a contractor. Project planning and procurement (once grant funded) by grant funds. Contractor efforts: grant funded. Probably a 15 to 25% matching requirement by the jurisdictions where project will be executed.

Timeframe: Project scoping over the next 3 to 6 months; once grant awarded by FEMA, 6 months to one year for project planning and procurement of contractor's services; 6 months to one year for contractor activity. Total time (provided immediate action by FEMA): 24 to 36 months.

STAPLEE Score: 47

Prioritization: 15 (not ranked)

18. Improve the warning system for Grindstone Dam.

Hazards: Dam Failure, Flood

Dam Failure Flood

Comments: Grindstone Dam is subject to overtopping and flooding areas downriver. The current warning system should be upgraded.

How this Action Contributes to the Mitigation Strategy: By improving the warning system, the County can lessen downriver damage. Increased

warning time can give the agencies responsible for taking action an increased response time to mitigate against possible flooding and other damages.

Responsible Organizations/Individual: Local emergency manager, and other county and local agencies and personnel

Estimated Expenses: Time and materials (planning stage), contractor support (design / build stage)

Timeframe: Next 12 months – plan and formulate need (preliminary cost estimate). 12 to 24 months – locate funding source. 24 to 36 months out – design build (install).

Funding Sources: County budgets and possible grant sources

STAPLEE Score: 43

Prioritization: 9

19. Explore how hazardous material transportation routing impacts public safety within communities.

Hazards:

Hazardous Materials

Comments: Explore nature of hazardous materials transported through the County and determine if special HazMat route designation is applicable.

How this Action Contributes to the Mitigation Strategy: Although clustering of population in narrow corridors associated with highways (railroads) will not change nor will the need for transportation of hazardous materials or waste through these corridors, review and strategy development can result in more thoughtful\ routing of hazardous materials/waste through the county, decreasing impact, if these hazardous materials were released in a transportation-related accident.

Responsible Organizations/Individuals: County and Local Transportation Agencies, State Transportation Agency, Local Emergency Manager, Other County and local agencies and personnel, and Local Emergency Planning Committee

Estimated Expenses: Time and materials (mainly county employees and voluntary members of the LEPC) but possibly a local or state contractor to conduct studies and develop a plan for hazardous materials routing.

Timeframe: Ongoing: 12 to 24 months to conduct a study (this is an activity under consideration on a state-wide basis). 6 - 12 months more (after study release) for county to formulate and/or approve proposed routes (time is needed to ascertain the impact upon the county and nearby communities with constraint of material supplies).

Funding Sources: County and state budgets, state grants, FEMA grants, DOT grants.

STAPLEE Score: 39

Prioritization: 5

20. Hazardous materials technician capacity development

Hazards:

Hazardous Materials

Comments: Continue development of tactical capacity for HazMat response with development of technicians with skills necessary.

How this Action Contributes to the Mitigation Strategy: A more effective response leads to less damage and increases safety, both important goals of mitigation.

Responsible Organizations/Individuals: County Emergency Services Director, County and City Fire Departments, other agencies with applicable resources.

Estimated Expenses: Time (technician and instructor) and materials (training supplies, tech-level equipment, travel related expenses, if training is not local).

Timeframe: 12 months for development of curriculum (if intent is to institutionalize locally), less if existing content is utilized. Immediately actionable as soon as funding source(s) identified.

Funding Sources: County and state budgets, state grants, and EPA grants.

STAPLEE Score: 40

Prioritization: 10

21. Establish and implement a process for activating cooling shelters in high risk communities during heat events.

Hazards:

Extreme Heat

Comments: A program will be developed to include a process for identification and assessment of appropriate facilities, adoption of appropriate authorities and/or agreements to use the facilities, and protocols to equip, activate, operate and demobilize facilities that can be used as cooling shelters during an extreme heat event.

How this Action Contributes to the Mitigation Strategy: Availability of cooling shelters will reduce the potential for at-risk individuals such as the homeless, elderly or those without access to air condition to succumb to an extreme heat or drought event.

Responsible Organizations/Individuals: MPG, local emergency manager, PNM, other stakeholders (BLM, sovereign tribal nations, etc.)

Estimated Expenses: Facility expenses, staffing and set up resources.

Funding Sources: County budget, participating organizational budgets

Timeframe: 12 – 24 months.

22. Develop and adopt a County Drought Management Plan that includes strategies for water supply augmentation and water demand reduction.

Hazards:

Drought

Comments: The County will, in coordination with the local water district, conduct a planning process to develop a County Drought Management Plan. The plan will be adopted by the County Commission. The Plan will then be implemented by the appropriate County Departments and the water district. The plan would be drafted with the intent to work in concert with existing water management/curtailment plans.

How this Action Contributes to the Mitigation Strategy: Planning will assist the community in effectively reducing the hardships and impacts associated with drought.

Responsible Organizations/Individuals: Local emergency manager, water district

Estimated Expenses: Planning costs, staffing.

Funding Sources: County budget, participating organizational budgets

Timeframe: 12 – 24 months.

Table 5-3 Lincoln County Mitigation Actions by Hazard

Mitigation Strategy	Hazard								
	Wildfire	Severe Weather	Flood	Drought	Dam Failure	Earthquake	Tornado	Extreme Heat	Hazardous Materials
1. Leverage hazard mitigation funding to improve mitigation processes.	X	X	X	X	X	X	X	X	X
2. Notification systems and siren improvement.	X	X	X		X	X	X		
3. Mescalero tribal emergency management – hazard mitigation coordination improvement.	X	X	X	X	X	X	X	X	X
4. Village of Ruidoso water department coordination improvement		X	X		X	X			
5. Response process optimization	X	X	X		X	X	X		X
6. Research funding opportunities for a vulnerability assessment to assist mitigation planning in the county.	X	X	X	X	X	X	X	X	X
7. Increase level of effort and proactively utilize county right to object in issuance of building permits by the state.									
8. Communications – Establish and prioritize needed improvements of key pre-disaster communications systems and critical response equipment.	X	X	X	X	X	X	X	X	X
9. Develop public service announcements about specific threats for disseminations via the media.	X	X	X	X	X	X	X	X	X

Table 5-3 Lincoln County Mitigation Actions by Hazard

Mitigation Strategy	Hazard								
	Wildfire	Severe Weather	Flood	Drought	Dam Failure	Earthquake	Tornado	Extreme Heat	Hazardous Materials
10. Conduct public meetings to raise awareness of threats and how citizens can mitigate the impact of disasters.	X	X	X	X	X	X	X	X	X
11. Ensure that routine planned maintenance occurs on right-of-ways.	X	X							
12. Develop alternative public service announcements ahead of time to bring to wildfire public outreach.			X						
13. Low water crossing and bridge improvements.		X	X						
14. Repetitive loss roads and highway improvement.		X	X						
15. Water rescue capacity development/improvement.			X						
16. Clearing and widening of Rio Ruidoso between the confluence of Grindstone Canyon Creek and Rio Ruidoso (inside the Village of Ruidoso) and through to the Village of Ruidoso Downs corporate limits, a distance of approximately 15 miles. This area includes the confluence of intermittent streams of Gavilan Canyon, Cedar Creek and Cherokee Bill Canyon.			X						
17. Rerouting of a section of water and/or sewer lines in the Village of Ruidoso.			X						

Table 5-3 Lincoln County Mitigation Actions by Hazard

Mitigation Strategy	Hazard								
	Wildfire	Severe Weather	Flood	Drought	Dam Failure	Earthquake	Tornado	Extreme Heat	Hazardous Materials
18. Improve the warning system for Grindstone Dam.			X		X				
19. Explore how hazardous material transportation routing impacts public safety within communities.									X
20. Hazardous materials technician capacity development.									X
21. Identify locations for cooling shelters in high risk communities.				X				X	
22. Develop plans for water supply augmentation and water demand reduction.				X					

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6 Plan Maintenance

Section 201.6(c)(4) of 44 CFR requires that the Lincoln County Hazard Mitigation Plan incorporates a plan maintenance process to ensure the relevancy and implementation of mitigation goals, objectives and strategies outlined in the plan. This section provides the methodology for plan monitoring, evaluation and updating to ensure that the plan is incorporated into existing planning mechanisms with continued public participation for future plan maintenance.

6.1 Plan Monitoring and Evaluation

Lincoln County has developed a method to ensure that regular review and update of the HMP occurs, a method that encompasses decision making, direction, and documentation: The Lincoln County Commissioners determine which projects/action items will be implemented and how and when they will be completed. Review and revision of the HMP will be directed by the Lincoln County Office of Emergency Services, and the MPG will be responsible for monitoring, evaluating, and documenting the plan's progress throughout the year. Although the members of the MPG may change from year to year, future MPGs will continue to execute the same job functions as the current MPG.

The Emergency Services Director is responsible for contacting MPG members and organizing meetings and will monitor progress on the mitigation action items. Monitoring is important for future eligibility for any mitigation funding that may be available. FEMA and the New Mexico DHSEM have the authority to evaluate the progress of existing mitigation plans to determine if the plan is fulfilling program requirements.

Review of the status of mitigation action items will be conducted by the Emergency Services Director annually in coordination with the Lincoln County Local Emergency Planning Committee. Review will include assessing the status of any completed or ongoing mitigation projects and setting project and funding priorities for the coming year. Results of this review will be reported to the Lincoln County Board of Commissioners.

6.2 Plan Update Process

The plan will be reviewed, revised, and updated every five years from the date of FEMA's approval. If a disaster occurs or as action items are met, the plan will be reviewed, revised, and updated sooner than the required five years.

The MPG will reconvene approximately one year before the five-year period is up and begin evaluating the plan. HMP review and update will comprise a review of each goal and action item to determine the relevance to changing situations in the county and/or changes to state or federal policy and to ensure that current and expected conditions are being addressed. Key topics and questions that will be addressed include the following:

- Identification of hazards. Are there new hazards that affect the community?
- Development of hazard profiles. Are additional maps or new hazard studies available? Have chances of future events changed? Have recent and future development in the community been assessed for their effect on hazard areas?
- Inventory of assets. Have inventories of existing structures in hazard areas been updated? Are there any new special high-risk populations? Is future land development accounted for in the inventories?
- Estimation of losses. Have losses been updated to account for recent changes?

If the response to any of the above questions is "yes," then the HMP will be updated accordingly.

The MPG also will review the risk assessment portion of the HMP and determine if this information should be updated or modified. Revisions to this plan may also be required for different situations, e.g., the identification of specific new mitigation action items, the completion of listed mitigation action items, or a change in mitigation plan requirements for funding programs. If no changes are necessary, the State Hazard Mitigation Officer will be given a written justification for this determination.

The Emergency Services Director is responsible for incorporating all changes into the HMP electronically after the MPG has met and decided on the changes. The Emergency Services Director will complete all necessary revisions at least three months prior to the end of the five-year period to allow the MPG time to review the update. During the revision process, the Emergency Services Director will send status reports to the County Commissioners. Any required revisions will be implemented within six months following the review process. This process will

be repeated for each five-year review of the plan. An updated/revised plan will be submitted to the State Hazard Mitigation Officer and FEMA.

6.3 Implementation through Existing Programs

HMP requirements shall be incorporated into other county plans, as appropriate, during the normal review and update of those plans.

Implementing the action items is the responsibility of the County Commissioners, and they will delegate the various tasks of each item. The Commissioners will coordinate with the County Emergency Services Director and Lead Manager of each mitigation item. The Lead Manager will follow any current procedures the county has while completing the action items.

The Lead Manager of each action item will write the corresponding project into the appropriate department's budget, which is then submitted to the Commissioners. Outlined within each department budget are projects the department would like to complete. The Commissioners will hold budget hearings to determine which projects in the budget will and can be funded. All other projects will be removed until the following year's budget hearings. The Commissioners then approve each department's final budget.

6.4 Continued Public Involvement

Lincoln County is dedicated to involving the public directly in reshaping and updating the HMP. Although the MPG represents the public to some extent during its review of the plan, the public will be able to comment directly on and provide feedback about the plan during the review period. A public meeting will be held after each MPG meeting. This meeting will provide a forum wherein the public can express concerns, opinions, or ideas about the plan. The Lincoln County Office of Emergency Services will publicize and host the meeting. The Lincoln County Emergency Services Director will be responsible for keeping track of public comments about the plan.

Copies of the plan will be catalogued and kept on hand at all of the county public libraries. The existence and location of these copies will be publicized in the *Lincoln County News.* The review and any changes that are made during the review will also be publicized in the *Lincoln County News.*

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