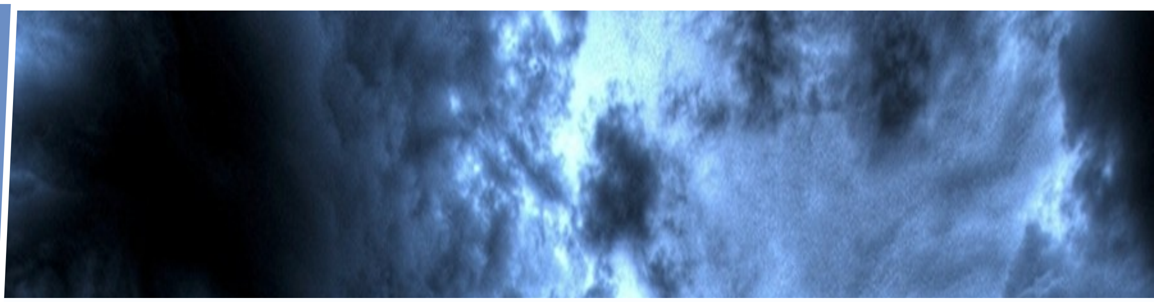

2021
Hazard Mitigation Plan

THE UNIVERSITY OF
NEW MEXICO

List of Figures and Tables

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Acronyms

Acronym	Term
ADA	Americans with Disabilities Act
APPM	Administrative Policies and Procedures Manual
CABQ	City of Albuquerque
CCERT	Campus Community Emergency Response Team
COC	Capital Outlay Committee
COOP	Continuity of Operations
CRS	Community Rating System
CWPP	Community Wildfire Protection Plans
DFIRMS	Digital Flood Insurance Rate Maps
DR	Disaster Recovery (Plans)
EAP	Emergency Action Plan
EDAC	Earth Data Analysis Center
EF	Enhanced Fujita (Scale)
FEMA	Federal Emergency Management Agency
FMAG	Fire Management Assistance Grants
HMGP	Hazard Mitigation Grant Program
HMP	Hazard Mitigation Plan
HSC	Health Science Center
ICS	Incident Command System
IFCI	International Fire Code Index
IT	Information Technologies
LTER	Long Term Ecological Research (Sevilleta)
mb	body wave magnitude
ML	Magnitude Level
MMI	Modified Mercalli Intensity
ms	surface wave magnitude
mw	moment magnitude
NCEI (formerly NCDC)	National Centers for environmental Information (National Climatic Data Center)
NFIP	National Flood Insurance Program
NMDHSEM	New Mexico Department of Homeland Security and Emergency Preparedness
NOAA	National Oceanic and Atmospheric Administration
NWR	National Wildlife Refuge (Sevilleta)
NWS	National Weather Service
OCP	Office of Capital Planning
OEM	Office of Emergency Management
OSE	Office of the State Engineer
PDC	Planning, Design and Construction
PDM	Pre-Disaster Mitigation
PDMAC	Pre-Disaster Mitigation Advisory Committee

PDSI	Palmer Drought Severity Index
PGA	Peak Ground Acceleration
PI	Principal Investigator
FM	Facilities Management Department
RPM	Reagents Policy Manual
SHELDUS	Spatial Hazard Events and Losses Database for the United States
SRMC	Sandoval Regional Medical Center
RS	Risk Services
STAPLEE	Social, Technical, Administrative, Political, Legal, Economic, Environmental
EHS	UNM Environmental Health and Safety
TORRO	Tornado and Storm Research Organization
UCAM	University Communication and Marketing Office
UHERT	UNM Healthcare Emergency Response Team
UNM	University of New Mexico
UNMH	University of New Mexico Hospital
USACE	United States Army Corps of Engineers
USGS	United States Geological Survey
WFU	Wildland Fire Use
WUI	Wildland-Urban Interface

Adoption of the University of New Mexico Hazard Mitigation Plan

The University of New Mexico recognizes the threat that natural hazards pose to people and property within the University community and has therefore prepared a multi-hazard mitigation plan. The University of New Mexico Hazard Mitigation Plan dated February 2021 was prepared in accordance with the Disaster Mitigation Act of 2000 and identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property in the University community from the impacts of future hazards and disasters.

The University of New Mexico hereby demonstrates their commitment to the hazard mitigation and achieving the goals outlined in the plan by its adoption.

The adoption of the University of New Mexico Hazard Mitigation Plan dated February 2021 shall be effective immediately upon its signing. This adoption supersedes and rescinds the previous Pre- Disaster Mitigation Plan dated August 2015 and shall remain in full force and effect until amended or rescinded by further promulgation.

Signatures:

James Holloway, PhD, Provost
Executive Vice President for Academic Affairs
DATE

Teresa Costantinidis, MBA
Senior Vice President for Finance & Administration
DATE

Douglas Ziedonis, MD, MPH
Executive Vice President of UNM Health Sciences
Chief Executive Officer of the UNM Health System
DATE

Garnett S. Stokes, PhD, President
The University of New Mexico
DATE

Chapter 1 Introduction

Vision and Purpose

The Federal Emergency Management Agency defines hazard mitigation as “Any sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards.” In other words, the investments made before a hazard event that will reduce disaster losses and break the cycle of disaster damage, reconstruction, and repeated damage. However, mitigation is most effective when it is based on a comprehensive, long-term plan that is developed before a disaster occurs. Mitigation planning identifies policies, actions, people and other resources that can assist over the long term to reduce risk and future losses from hazards. The hazard mitigation planning process is very important and creates a framework for risk-based decision making to reduce damages to lives, property, and the economy from future disasters.

The University of New Mexico (UNM) Hazard Mitigation Plan (HMP) identifies the hazards that can affect the university and branch campuses and describes mitigation strategies to reduce or eliminate the effects of those hazards. The plan provides guidance to university leadership and stakeholders by identifying potential natural hazards and prioritizing mitigation goals and objectives, proposing solutions to certain mitigation problems, and identifying possible funding sources for mitigation projects.

University of New Mexico Planning Area: History, Demographics, Economy, and Geography

University of New Mexico

The University of New Mexico, home of the Lobos, is New Mexico’s flagship institution of higher learning. Founded in 1889, UNM is a public university offering multiple bachelor, master, doctoral, and professional degree programs in all areas of the arts and humanities, sciences, health, and engineering. UNM’s mission is to serve as New Mexico’s flagship institution of higher learning through demonstrated and growing excellence in teaching, research, patient care, and community service. UNM has more than 159,000 active alumni, with Lobos in every state and more than 1,400 alumni outside the U.S. More than half of UNM’s alumni choose to remain in New Mexico.

The Main Campus in Albuquerque consists of the Central Campus, North Campus, and South Campus, and includes the UNM Health Sciences Center and UNM Hospital. UNM has four branch campuses across New Mexico located in Gallup/Zuni, Los Alamos, Taos, and Valencia County. Other UNM properties include UNM West, an extension campus in Rio Rancho, New Mexico and the Sevilleta LTER Field Station located in Socorro, New Mexico.

Figure 1: UNM Planning Area

**UNM Young Ranch was completely destroyed in the 2011 Los Conchas Fire. The property is now owned by the New Mexico State Land Office.*

UNM is led by a President, who is the Chief Executive Officer responsible for implementing university policies for all campuses and extensions. The UNM Board of Regents, composed of seven members who are appointed by the Governor of New Mexico, with the consent of the New Mexico State Senate, have fiduciary responsibility for the assets and programs of the University. The Regents establish goals and policies to guide the University and have oversight of the functioning of the University. The Board vests responsibility for the operation and management of the University in the President of the University.

UNM Main Campus

The Main Campus for UNM is located in Albuquerque, NM. With a grant from the Territory of New Mexico in 1889, the University started with 20 acres of land located in the southwest corner of the current day Central Campus. Today Main Campus boundaries are University Blvd. on the West, Central Avenue on the South, Girard Blvd. on the East and Indian School Road on the North, containing approximately 800 acres. Main Campus is divided into three geographical areas, Central Campus, North Campus, and South Campus, and includes all programs and departments that report to Academic Affairs and to the Health Sciences Center administrative areas. UNM's Main Campus offers 215 active degree and certificate programs. There are 94 baccalaureate, 71 masters, and 37 doctoral level degree programs. In addition, there are 5 doctoral professional practice programs—in law, medicine, nursing, pharmacy, and physical therapy.

UNM continues to undergo construction of new buildings as well as renovations to existing buildings. New major construction projects included the addition of the $65.7 million Physics and Astronomy Interdisciplinary Science Building (PAIS). The building houses upper division class labs, general classrooms and resource areas, offices for faculty, graduate students, and staff, and research spaces.

Ongoing major projects include the $35.5 million Johnson Center recreational and fitness expansion and renovation, the $16 million renovation of Clark Hall (chemistry) and the new $95 million UNM Hospital Patient Parking Structure.

Central Campus

The Central Campus is home to the main academic university. UNM Central Campus, the largest of all UNM campuses, boundaries University Blvd. on the west, Central Avenue on the South, Girard Blvd. on the East and Lomas Avenue on the North. UNM Central campus is noted for its unique Pueblo Revival architectural style, introduced when the university's third president, William G. Tight, plastered over the Victorian-style Hodgin Hall to create a monument to Pueblo Indian culture. John Gaw Meem, a famed Santa Fe architect, designed many university buildings in the pueblo style and is credited with imbuing the campus with its distinctive Southwestern feel. UNM Central Campus has 8 university buildings listed separately on the National Register of Historic Places.

UNM Central Campus is home to educational, research, and laboratory facilities, residence halls, UNM libraries, performance halls, museums and galleries, athletic spaces, and more.

North Campus

The North Campus is located north of Lomas Avenue and is home to the nationally recognized Health Sciences Center (HSC) and University of New Mexico Hospital (UNMH). The UNM North Campus is bordered on the west by Interstate 25 (I-25), on the east by Girard Boulevard, Lomas Boulevard on the south, and Indian School Avenue on the north, with a small portion located within the Medical Arts

Complex south of Lomas Boulevard. UNM HSC is the largest academic health complex in the state and includes the College of Nursing, College of Pharmacy, and School of Medicine. UNMH is New Mexico's only Level I Trauma Center, treating nearly 90,000 emergency patients and more than 450,000 outpatients annually. UNMH serves as the primary teaching hospital for the UNM School of Medicine and participates in hundreds of advanced clinical trials annually. It also is the home of the highly regarded UNM Children's Hospital.

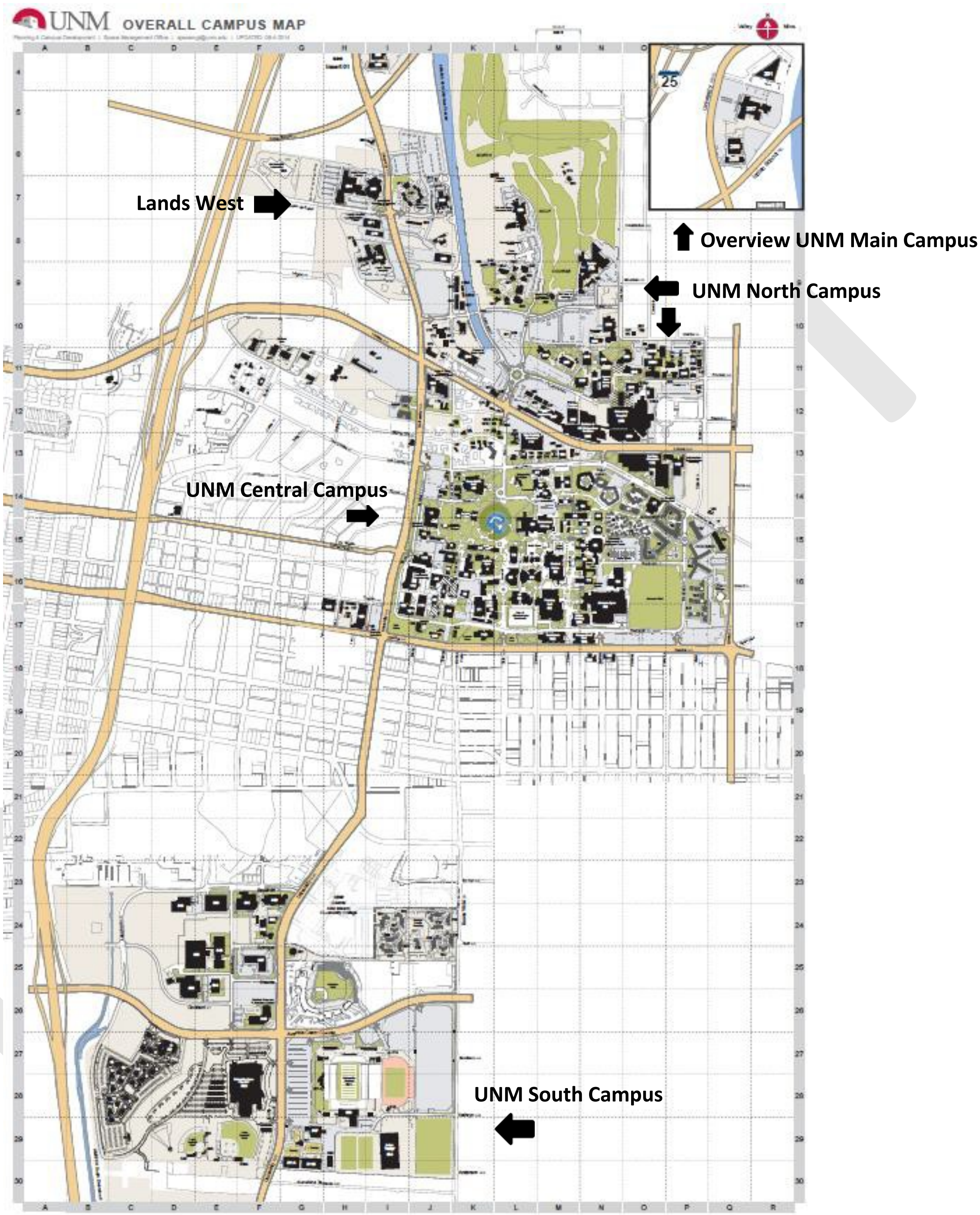
Additional facilities located on North Campus include the School of Law, the North Campus Golf Course, and Lands West. Lands West is home to the KNME-TV studios, UNM Carrie Tinley Hospital Outpatient Clinic, UNM Children's Campus, and the National Cancer Institute-designated UNM Cancer Center.

South Campus

The South campus is centered around the intersection of University Boulevard and Avenida César Chavez and is home to the Science and Technology Park, Student Support and Services Center and most of UNM's athletic facilities. The Athletics Complex includes: Branch Field at University Stadium, The Pit, Santa Ana Star (Baseball) Field, Lobo Softball field, McKinnon Family Tennis Stadium, Linda Estes Tennis Complex, the Soccer/Track Complex, Great Friends of UNM Track Stadium, UNM North Golf Course, The Championship Course at UNM, Armond H. Seidler Natatorium, Athletic Performance Center and Davalos Basketball Center. Additionally, the City of Albuquerque's AAA Baseball Team, the Isotopes, is also located in the Athletics Complex.

The Science and Technology Park is comprised of 163 acres, 41 of which were developed during Phase I. Phase II has begun with the development of an additional 42 acres. Phase II has commenced with the development of an additional 42 acres. Future phases will encompass approximately 80 acres. It is estimated that 70% of UNM's students park on South Campus, with approximately 1.7 million pickups/drop-offs yearly. University student shuttle services take students from South Campus to Main Campus on a Monday-through-Friday schedule, operating from 7:00 a.m. to 10:00 p.m.

Figure 2: Main Campus Map[1]



[1] https://css.unm.edu/campus-maps/index.html

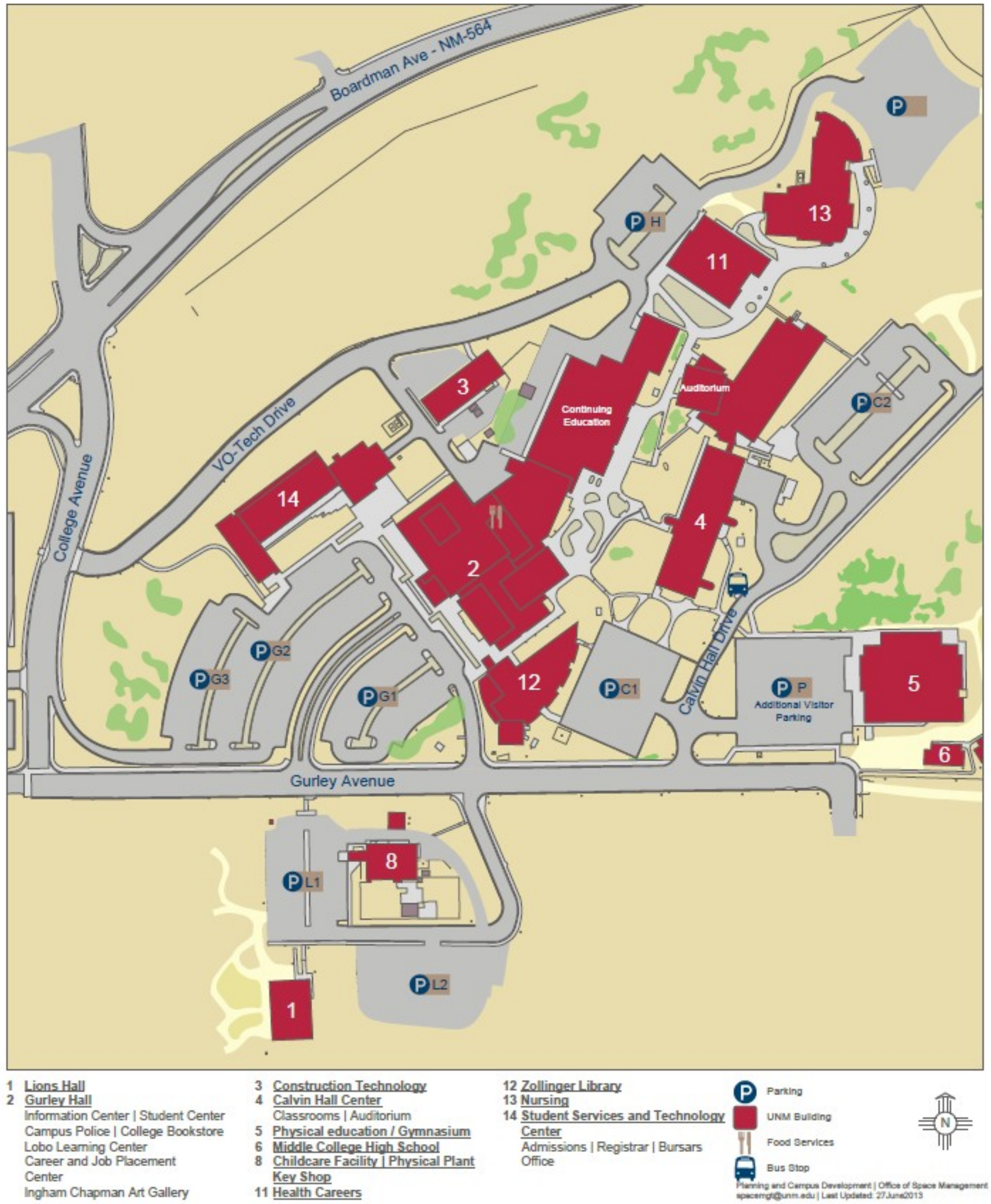
UNM Branch Campuses

The University established 2-year branch colleges to serve the citizens of New Mexico more fully and to provide the highest quality of education for students pursuing post-secondary education at different locations throughout the state. Branch colleges respond specifically to the unique needs and multicultural backgrounds of their respective communities by offering community education programs, career education, including certificate and associate degree programs, and transfer programs that prepare students for upper division entry into 4-year colleges and universities. Branch colleges utilize many resources in their service districts and therefore function as integral parts of their surrounding communities. They are thoroughly committed to assisting in the economic development of their service areas. In addition, they serve the needs of their respective communities in the manner of a comprehensive community college, offering a variety of academic, career, and community service programs. The University has branch campuses in Gallup/Zuni, Los Alamos, Taos and Valencia. Additionally, UNM has education centers located in Santa Fe, Farmington, and Kirtland Air Force Base and Extended Learning online.

UNM –Gallup Branch Campus

The Gallup Branch Campus (UNM-Gallup) spreads over 64 acres (.26 km²) in New Mexico's High Desert Country to include learning sites at Ramah, Navajo and Smith Lake. Founded in 1968, it serves approximately 75,000 residents of the region, which includes the City of Gallup and McKinley County, and is the largest of the four UNM branch campuses. UNM-Gallup includes the 25,000-square-foot Zuni South Campus and a 2500-square-foot facility on Gallup's North Side. The adobe-style facilities sit amongst some of the most beautiful red rock country in the Southwest. The Gallup population of approximately 21,000 may balloon to 100,000 and more on holidays and festival occasions because of easy accessibility to the reservations. UNM Gallup is home to over 3,000 students. Located near the Navajo, Zuni and Hopi Reservations, this campus has the largest Native American student body of any public college in the world, and receives close to $7,000,000 annually in tribal, federal and state grants as well as private, civic, and corporate grants and scholarships. The branch recently began to undertake repairs to older structures with funds from an $8 million general obligation bond, passed by local voters. They are also on course to complete the Technology Center and Classroom Building.

Figure 3: UNM Gallup Branch Campus Map

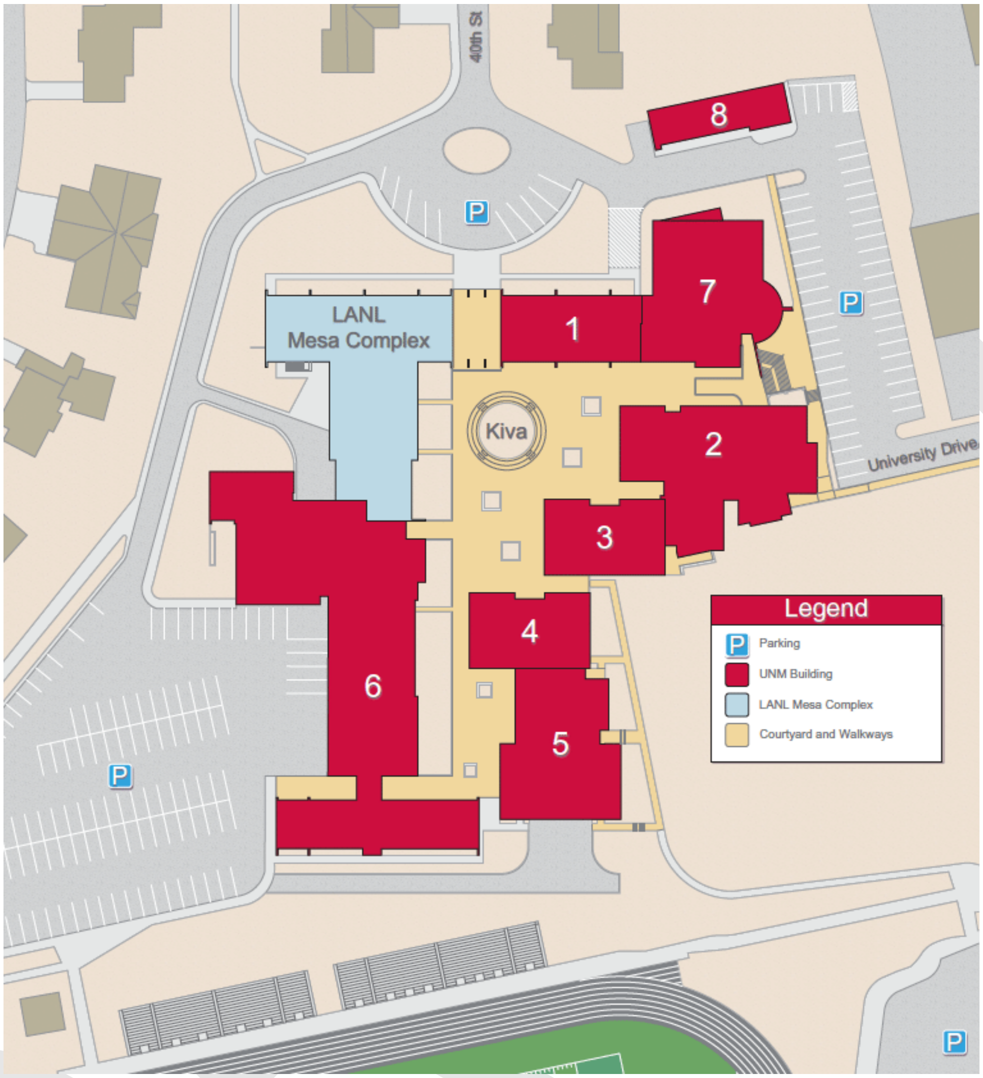


UNM – Los Alamos (UNM-LA) Branch Campus

The Los Alamos Branch Campus spreads over 184 acres (.75 km^2) in northern New Mexico. The UNM-LA campus consists of 8 buildings totaling 77,689 sq. ft. UNM-LA, in cooperation with Los Alamos National Laboratory and the Albuquerque and branch campuses of UNM, delivers instruction in traditional face-to-face teaching, as well as through a variety of technologies, including televised programming via satellite, video conferencing or the Internet. UNM-LA offers a number of outstanding programs and services including certificate programs and associate degree programs; community education and customized training courses; small business development seminars through our Small Business Development Centers (Los Alamos and Sandoval Counties); Adult Basic Education programs including General Education Development (GED) and English as a Second Language (ESL); and bachelor and graduate degree programs through UNM's Distance Education Program.

UNM began its presence in Los Alamos in 1956 with the establishment of the UNM–Los Alamos Center for Graduate Studies, which has been in continuous operation since that time. The University of New Mexico founded the UNM-LA campus officially on July 1st, 1980.

Figure 4: UNM Los Alamos Branch Campus Map[2]



UNM – Taos Branch Campus

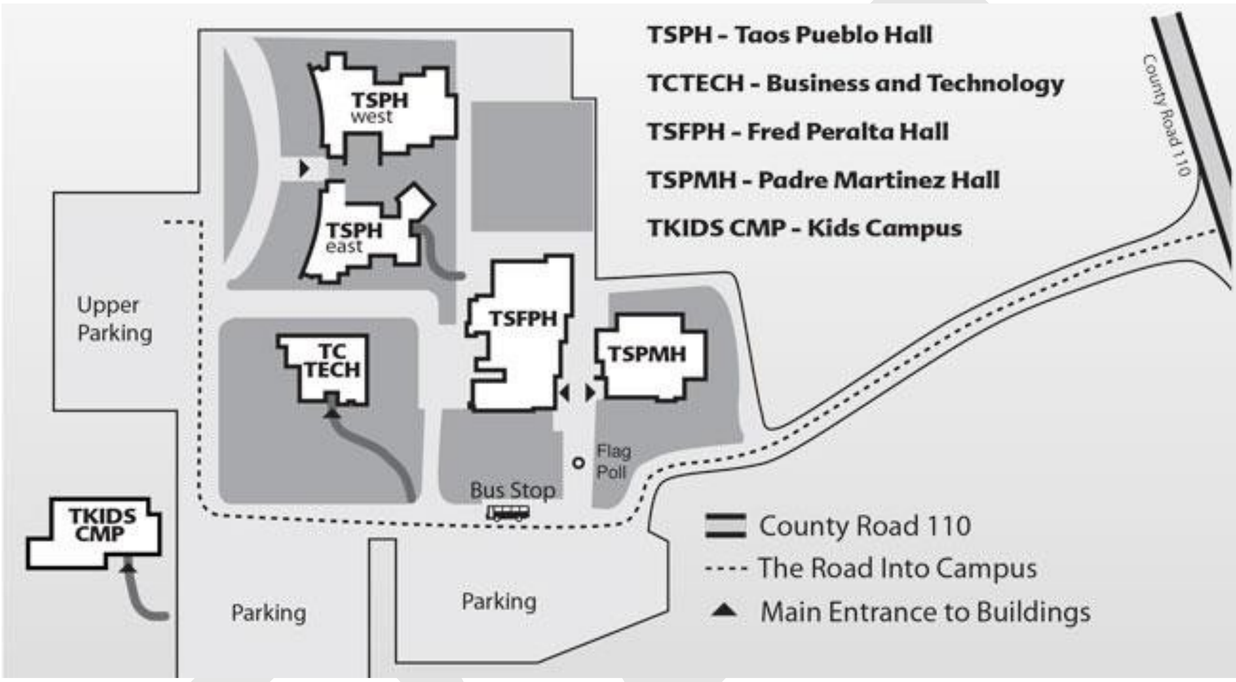
The UNM-Taos Branch Campus spreads over 45 acres (.18 km²). UNM-Taos is a two-year higher education college located in north central New Mexico, situated in a high mountain valley between the Rio Grande and the 1,000-year-old Taos Pueblo. The UNM-Taos service area is rural, remote, underserved, economically challenged, culturally diverse, and sparsely populated. Tourism and outdoor recreation, health care, government, construction and real estate, retail entrepreneurship and education are the primary sources of jobs and family income. UNM-Taos is a Hispanic Serving Institution and the only institution of higher learning within a 50-mile radius. The service area includes the 30,000 residents of Taos County living in the outlying villages within a 2,203 square mile service area, as well as the residents of two Native American Pueblos (Taos and Picuris).

[2] http://losalamos.unm.edu/about/campus-map/index.html

UNM-Taos has experienced remarkable growth and currently provides instructional opportunities to over 1,300 students. Degrees offered include Associate Degrees in Arts, Science, Applied Science, and Nursing plus a variety of certificates.

UNM-Taos became an affiliate of UNM in 1993 and attained official branch status in 2003.

Figure 5: UNM Taos Branch Campus Map[3]



UNM – Valencia Branch Campus

The Valencia Branch Campus spreads over 150 acres (.61 km²) of rural land overlooking the Rio Grande Valley to the west, the Manzano Mountains to the east, and historic Tome Hill to the north. UNM-Valencia Campus is located in Tome, New Mexico, halfway between Belen and Los Lunas, the two main population centers of Valencia County. The campus includes 9 buildings designed in a modern, southwestern style. UNM-Valencia received a prestigious award from the New Mexico Society of Architecture for its outstanding landscaping.

The UNM-Valencia Campus is an open-access, student-centered institution which offers a variety of associate degrees, certificate and credential programs. UNM-Valencia Campus has a five-part educational program that includes: Technical education programs; Certificates and/or Associate of Arts or Associate of Science degrees; Basic skills; The Community Education program; and the Small Business Development program.

[3] http://taos.unm.edu/about-unm-taos/campus-map.html

The University of New Mexico began serving the educational needs of Valencia County in August 1978 with the establishment of the UNM-Eastern Valencia County Satellite Center. A formal proposal to establish the branch was accepted by UNM in March 1981.

Figure 6: UNM Valencia Branch Campus Map[4]

UNM Other Site Locations

UNM Capillia Peak

Capillia Peak is an astronomical observatory owned and operated by UNM. It is located in the Manzano Mountains of central New Mexico, approximately 30 miles southeast of Albuquerque. The observatory contains a 24-inch Cassegrain optical telescope built by Boller and Chivens.

UNM DHL Ranch

The D.H. Lawrence Ranch, also known as the Kiowa Ranch, is located in San Cristobal, New Mexico, approximately 20 miles north of Taos. Situated on Lobo Mountain and comprising 160 acres, it is located at 8,500 feet. The ranch was entrusted to UNM for the purpose of creating a public memorial to the world-renowned writer D.H. Lawrence. According to the Taos tourist office, it is one of the most sought-after sites for visitors, second only to Taos Pueblo. The ranch was closed to visitors from 2008 until 2013. It reopened to visitors in 2014.

UNM – Sevilleta Long Term Ecological Research (LTER) Field Station

The Sevilleta LTER Field station is approximately 220,000 acres (890.7 km^2) in size, consisting of two mountain ranges and the Rio Grande valley in between. The Sevilleta LTER is bounded on the east by the Los Pinos Mountains ("Mountains of the Pines") and on the west by the Sierra Ladrones ("Thieves

[4] https://valencia.unm.edu/about/campus-map.html

Mountains," in reference to 17th, 18th and 19th century bandit groups that would use these rugged mountains as hideouts).

The Sevilleta LTER Field Station is operated by the University of New Mexico in collaboration with the U.S. Fish and Wildlife Service's Sevilleta National Wildlife Refuge. The Sevilleta LTER Field Station is located near the Headquarters of the U.S. Fish and Wildlife Service on the Sevilleta National Wildlife Refuge (NWR), Socorro, NM. The Sevilleta NWR is approximately 60 miles south of Albuquerque and is dissected by Interstate 25.

The Sevilleta LTER Field Station supports research and educational programs in biology, ecology, geology, and anthropology. The field station serves as a meeting facility for conferences, workshops, retreats and class field trips. Public access to the field station is permitted for scheduled activities; however, all field activities on the Sevilleta NWR (research projects or educational field trips) are required to have special use permits from the U.S. Fish and Wildlife Service.

The Sevilleta NWR was established in 1974 through a gift from the Campbell Family Foundation and The Nature Conservancy to the U.S. Fish and Wildlife Service. The Sevilleta NWR lies at the junction of several major biomes of the American Southwest; it is at the northern edge of the Chihuahuan Desert, the western edge of the Great Plains Short-grass Prairie, and the southeastern edge of the Colorado Plateau Shrub-Steppe. Along the Rio Grande are found gallery forests ("bosque") of cottonwood, Russian olive, and salt cedar. Above the riparian corridor are the grasslands/shrublands/deserts, while higher in the mountains are found the juniper savannas and piñon-juniper woodlands. Nearby mountain ranges (the Magdalena Mountains to the southwest, and the Manzano Mountains to the northeast) climb to nearly 10,800 feet elevation, and support old growth forests of ponderosa pine, limber pine, Douglas fir, Engleman spruce, and quaking aspen. As a result of the variety of ecosystems in the region, the biodiversity of the Sevilleta NWR is remarkably rich, supporting over 1,200 species of plants, 89 species of mammals, 353 species of birds, 58 species of reptiles, 15 species of amphibians, and thousands of species of arthropods.

Sevilleta provides logistical support for the many field research and educational activities being conducted in the Middle Rio Grande Valley. The station's research facilities include general laboratories, specimen processing and storage facilities, reference collections of plant and animal specimens, a computer center, a library, and a large conference room/classroom for group meetings. In addition, the station has a shop and equipment storage facility, a fleet of four-wheel drive field vehicles, cargo trailers, and a 4 x 4 ATV. The Field Station can provide housing for up to 82 people for periods ranging from a single night to multiple months. The station has a total of 11 completely furnished residence buildings.

UNM West

UNM West includes the UNM West Campus and Sandoval Regional Medical Center located in Rio Rancho, NM. UNM West Campus has been offering lower-division, upper-division, and graduate level courses at multiple sites on the “west side” of Albuquerque, since 1990. Sandoval Regional Medical Center UNM (SRMC), opened in July of 2012, is a community-based academic healthcare facility that is served by UNM Faculty Physicians and community-based independent physicians. SRMC houses 72 acute-care inpatient beds that service two medical/surgical units, an Intensive Care Unit, an inpatient Senior Behavioral Health unit, an Imaging department, and a 24-hour a day/7-days a week Emergency Department.

Main and Branch Campus Demographics

UNM represents a cross-section of cultures and backgrounds. UNM employs more than 20,000 people statewide, including the employees of University of New Mexico Hospital. In spring of 2020, 21,238 students attended the main campus with another 3,408 students at branch campuses.

Table 1: UNM Main Albuquerque Campus[5]

Spring Semesters					
As of Census Date, February 7, 2020					
Campus Location Headcount	**2016**	**2017**	**2018**	**2019**	**2020**
Main Albuquerque Campus	25,299	25,015	23,911	22,225	21,238
Branch Campus's					
Gallup Branch	1,975	1,715	1,760	1,813	1,326
Los Alamos Branch	658	711	644	701	530
Valencia Branch	1,831	1,839	1,759	1,678	1,026
Taos Branch	1,171	1,042	959	853	526
Branch Totals	5,635	5,307	5,122	5,045	3,408
Extended University Campus					
EW-UNM West in Rio Rancho	526	387	142	69	67
EA-UNM Online and ITV	8,331	8,867	9,673	9,496	9,425
EG-Gallup Bachelors/Graduate	19	4	2	4	0
ELA-Los Alamos Bachelors/Graduate	8	0	0	0	0
ET-Taos Bachelors/Graduate	51	0	0	0	0
EF-San Juan Bachelors/Graduate	40	25	9	6	0
**Headcount presented for Extended University Campuses are included in the Albuquerque Campus totals.*					

Populations on main campus and all branches are dynamic. Most employees and students are on the campus between the hours of 8:00 a.m. and 5:00 p.m. Daytime populations are spread out among all buildings. Night classes are held between 5:00 p.m. and 10:00 p.m. and have lower attendance than day classes. Faculty and staff are dispersed in various buildings around campus and generally have offices within their own departments. Senior administration staff (The President of UNM, the Regents, and

[5] Data provided by official enrollment report spring 2020, office of the registrar Enrollments statistics as of the census date February 7th, 2020 (https://oia.unm.edu/facts-and-figures/documents/Enrollment%20Reports/spring-2020-oer.pdf)

Provost, as well as many other top administrative positions) are located in Scholes Hall. Many other administrative staff are scattered across the campus to include branch campuses.

Most UNMH employees, patients, and visitors are in the hospital between the hours of 8:00 a.m. and 5:00 p.m. However, UNMH provides many patient services 24 hours/7 days a week.

Visitors come to tour the main and branch campuses, visit students, and attend various cultural, academic, and athletic activities. Athletic events such as football and basketball games often have a high attendance of students and visitors. On average, the Main University Campus population can swell to well over 150K during large sporting events, including current university daily population. (Athletic and special events on campus are covered in detail in the Athletics section.)

Only 14% of UNM's student population resides on campus in university housing. Student housing facilities are located on UNM's main and south campuses. Housing facilities consist of 37 free-standing buildings which encompass nearly one million square feet of building space. On-campus living options vary and students and guests can choose to stay in traditional halls, suites, or apartment style buildings. Lodging and dining facilities include 10 residence halls and one dining facility. The total building replacement costs for all Student Housing facilities combined is estimated to be $87M.

Residence Life and Student Housing provides lodging, community center and food service facilities to approximately 3,000 UNM student residents during each academic year. There are 8 university-managed resident halls/apartments for students, as well as 2 leased housing options. The La Posada dining facility occupancy varies in size, but peaks at traditional mealtimes. During the academic year, La Posada averages 380 for breakfast, 750 for lunch, and 850 residents for dinner. Peak occupancy period for both lodging and food service occurs during the academic school year. In the summer months, housing and dining facilities remain open to accommodate a smaller amount of conference guests and summer school residents. An estimated 200 administrators, staff, and students work in Student Housing and in the dining facilities year-round.

Academic and Research Programs

UNM offers more than 215 degree and certificate programs, 94 bachelor's degrees, 71 master's degrees, and 37 doctoral programs. All UNM graduate and undergraduate academic programs are fully accredited by the Higher Learning Commission of the North Central Association of Colleges and Universities. Many programs also have additional accreditation through specialized accrediting agencies.

UNM is the state's flagship research institution, and its research activities inject hundreds of millions ofdollars into New Mexico's economy, fund new advancements in healthcare, and augment teaching – giving students' valuable hands-on training in state-of-the-art laboratories. UNM's Carnegie Basic Classification is "Research University with Very High Research Activity." As a Hispanic-Serving Institution[6], the University represents a cross-section of cultures and backgrounds.

[6] The Hispanic Association of Colleges & Universities (HACU) defines HSIs "as colleges, universities, or systems/districts where total Hispanic enrollment constitutes a minimum of 25% of the total enrollment.

The Health Sciences Center is the state's largest integrated health care treatment, research and education organization. U.S. News and World Report's 2021 edition of "America's Best Graduate Schools" ranks the UNM School of Medicine 52nd in primary care and 81st in research. Additionally, in health disciplines, UNM's nursing/midwifery program is ranked 11th. Among the University's outstanding research units are the Center for Advanced Research Computing, Cancer Center, New Mexico Engineering Research Institute, Center for High Technology Materials, Design Planning Assistance Center, and the Mind Research Network.

Athletics

UNM's Athletics Complex, located on the South Campus, consists of several major athletic facilities, administration offices, practice fields and parking lots for students and athletic events. The athletic facilities include: Branch Field at University Stadium, The Pit, Santa Ana Star (Baseball) Field, Lobo Softball field, McKinnon Family Tennis Stadium, Linda Estes Tennis Complex, the Soccer/Track Complex, Great Friends of UNM Track Stadium, UNM North Golf Course, The Championship Course at UNM, Armond H. Seidler Natatorium, Athletic Performance Center and Davalos Basketball Center.

The Pit is home to UNM's men's and women's basketball programs, as well as host to regional and NCAA championships. It is the largest arena in the State of New Mexico with a capacity of 18,018 and hosts an average of 40 men's and women's basketball games each year. It also hosts various events ranging from state basketball tournaments, concerts, UNM and highschool graduations, and more. The University of New Mexico ticket office also is housed in the Pit. All ticket sales, including online service, operate from the southeast section of the building. The mid-ramp section of the Pit houses a primary phone/internet room for the campuses.

The Pit underwent a massive upgrade and expansion that was completed in time for the 2010-11 season that included $60 million of improvements. Among the improvements were the U.S. Bank club/suites level seating, upgraded lower bowl seating, two end wall video boards, ribbon boards, a unique graphics package showcasing the history of Lobo basketball and UNM athletics, upgraded concessions area, the new Lobo Den Store, and a remodeled concourse. NBA locker rooms were added for both the men's and women's teams along with a player's lounge.

Branch Field at University Stadium is home to the Lobo Athletics' football program. It includes the press box and the L.F. "Tow" Diehm training complex. The press box stands approximately 70 feet above street level, with five levels of seating, sky suites, press area and coaches' boxes. The building also houses one of two telecommunication hubs on the South Campus. Much of the internet and phone lines for South Campusrun through the press level of this facility.

Enrollment includes fulltime and part-time students, by campus, at the undergraduate or graduate level (including professional schools) of the institution, or both (i.e., headcount of for-credit students).

Campus Economy

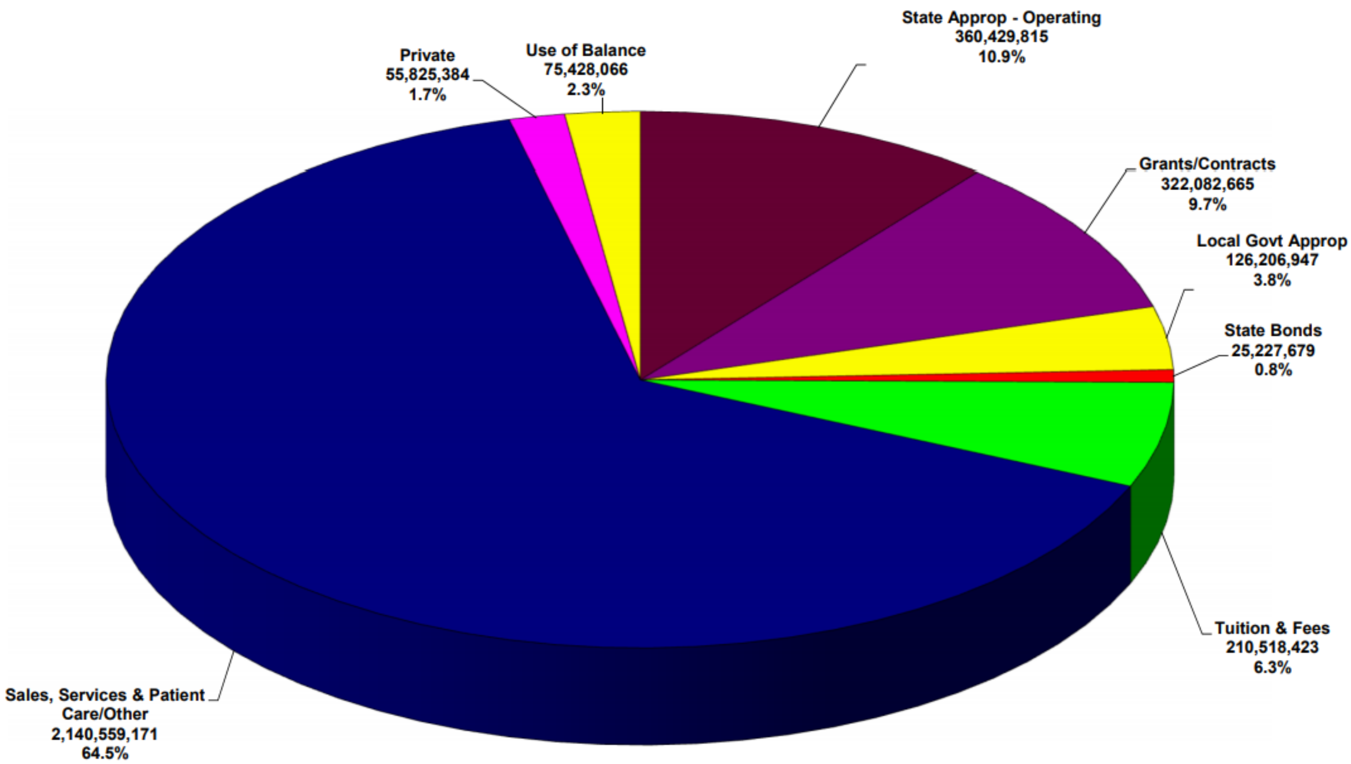
UNM is a major contributor to New Mexico's economy and has a significant impact resulting from its ability to attract hundreds of millions in out-of-state funds. For fiscal year 2019, federal and state agencies, industry, foundations, and national laboratories awarded $285.4 million in contract and grant awards to UNM for sponsored projects ranging from engineering to medicine and education to the humanities[7]. UNM's Budgeted consolidated revenue for fiscal year 2020 is $3.3 billion[8]. SeeTable 2.
In addition to providing compensated healthcare services to many New Mexico residents, UNM HSC provided services to patients who are either uninsured or under-insured and who do not meet the criteria for financial assistance. Provision expenses recorded for fiscal years 2019, 2018, and 2017 were $121.8 million, $116.2 million, and $142.1 million, respectively. UNM HSC incurs costs associated with providing charity care and other services for which payment is not received. As of June 30, 2019, the estimated cost of care for providing these services was $101.3 million compared to $94.5 million in FY18 and $110.0 million in FY17[9].

Table 2: 2020-2021 UNM Consolidated Revenue (in millions)[10]

Description	Total		Percent
State Appropriations (Operating)	$	360.4	10.9%
Grants/Contracts	$	322.1	9.7%
Local Government Appropriations	$	126.2	3.8%
State Bonds	$	25.2	0.8%
Tuition and Fees	$	210.5	6.3%
Sales and Services	$	2,140.6	64.5%
Private (Gifts and Contracts/Grants)	$	55.8	1.7%
Use of Balance	$	75.4	2.3%
Total Revenue	$	3,316.2	100.0%

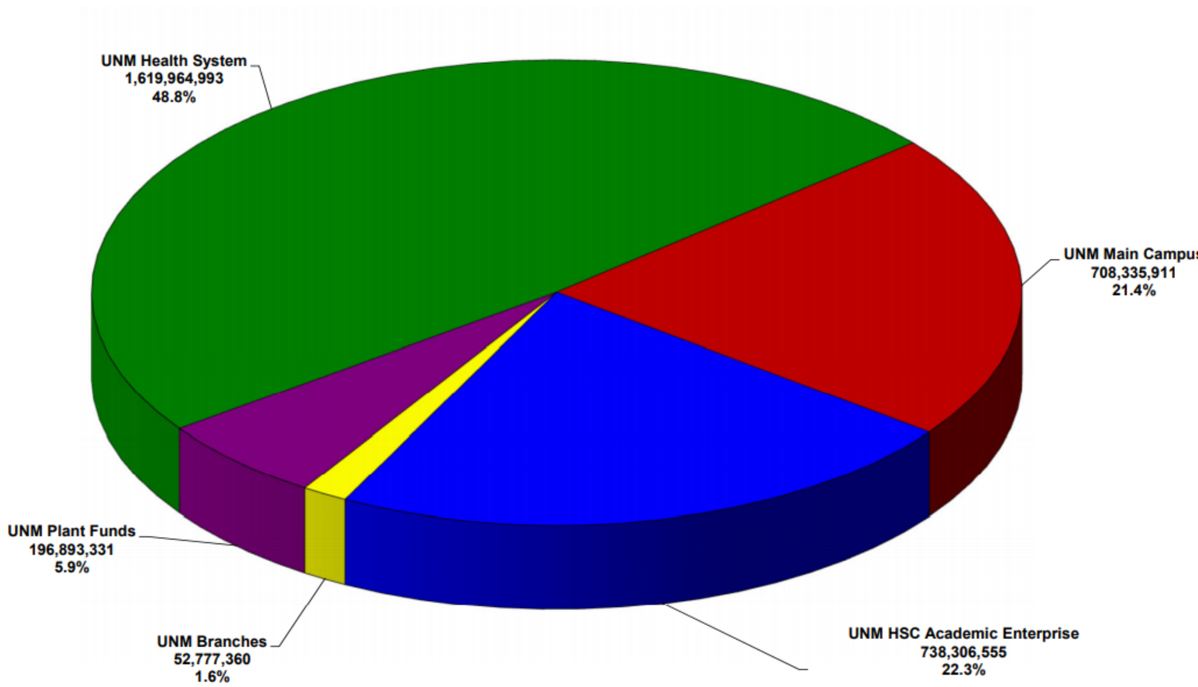
[7] Retrieved from http://fsd.unm.edu/resources/audrep19.pdf
[8] Retrieved from http://budgetoffice.unm.edu/assets/documents/budget/operatingcapitalbudgetplans/2020-21_operatingcapitalbudgetplansbook.pdf
[9] Retrieved from Financial Services Division Annual Reports http://fsd.unm.edu/resources/audrep19.pdf
[10] Retrieved from http://budgetoffice.unm.edu/assets/documents/budget/operatingcapitalbudgetplans/2020-21_operatingcapitalbudgetplansbook.pdf

Figure 7: UNM Consolidated Revenues 2020-21 Budget



Total Revenues $3,316,278,150

Figure 8: UNM Consolidated Expenditures 2020-21 Budget



Total Expenditures $3,316,278,150

UNM's fiscal year 2020-21 (July 1, 2020-July 30, 2021) Operating Budget includes Operating Budgets for the Main Campus; Health Sciences Center Academic Enterprise and Hospitals; the Gallup/Zuni, Valencia, Los Alamos, and Taos Branch Campuses; as well as the Capital Budget for the entire University.This provides the planned expenditure levels for the various programs and activities of the University. The Board of Regents is required to determine budget category limits prior to approval of the budget plan by the Higher Education Department and the State of New Mexico Department of Finance and Administration Budget Division.

UNM Utilities and Infrastructure

The Facilities Management Department (FM) is responsible for the care and upkeep of the physical campus environment. This includes the indoor and outdoor environment of the north, main and south campuses. Additionally, the department maintains the University's district energy system providing electricity, steam, chilled water for cooling, compressed air, and domestic water through its own distribution systems while maintaining over 300 buildings and 640 acres of campus. Electricity is distributed underground from two electrical substations, while other utilities are primarily generated atfour locations across campus. The Ford Utilities Center has the ability to generate 216,000 pounds per hour of steam, 4,000 tons of chilled water, 13 MW of electricity, and enough compressed air for the campus. The center also operates two remote chilled water plants—the Lomas Chilled Water Plant and the HSC Chilled Water Plant. These facilities have a combined chilled water capacity of 10,600 tons.

The fourth location, the Campus Utility Plant, has the ability to generate 24,000 pounds per hour of steam, and 500 tons of chilled water. The electrical generation is supplemented by solar photovoltaic (PV) systems. The on-campus PV systems can generate up to 660 kW on campus, with another 1,012 kW of PV at south campus, outlying facilities, and Valencia Campus. The UNM water system can provide up to 2.5 million gallons per day (MGD) of domestic water supplied by a UNM-owned well and includes a 1.25-million-gallon reservoir.

Climate

Mean annual temperatures in New Mexico range from 64°F in the extreme southeast to 40°F or lower in high mountains and valleys of the north. During the summer months, individual daytime temperatures quite often exceed 100°F at elevations below 5,000 feet; but the average monthly maximum temperatures during July, the warmest month, range from the low 90's at lower elevations to the upper 70's at high elevations. In January, the coldest month, average daytime temperatures range from the middle 50s in the southern and central valleys to the low 20's in the higher elevations of the north. Minimum temperatures below freezing are common in all sections of the State during the winter, but subzero temperatures are rare except in the mountains. The highest temperature recorded in New Mexico is 122°F on June 27, 1994 at the Waste Isolation Pilot Plant (WIPP) site. The lowest temperature recorded was -50 °F, on February 1, 1951 at Gavilan.

Average annual precipitation ranges from less than 10 inches over much of the southern desert and the Rio Grande and San Juan Valleys to more than 40 inches at higher elevations in the State. Summer rains fall almost entirely during brief, but frequently intense thunderstorms. July and August are the rainiest months over most of the State, with from 30 to 40 percent of the year's total moisture falling at that time. During the warmest 6 months of the year, May through October, total precipitation averages from 60 percent of the annual total in the Northwestern Plateau to 80 percent of the annual total in the eastern plains. Much of the winter precipitation falls as snow in the mountain areas, but it may occur as either rain or snow in the valleys. Average annual snowfall ranges from about 3 inches at the Southern Desert and Southeastern Plains stations to well over 100 inches at Northern Mountain stations. It may exceed 300 inches in the highest mountains of the north.

The average number of hours of annual sunshine ranges from near 3,700 in the southwest to 2,800 in the north-central portions.

Relative humidity ranges from an average of near 65 percent about sunrise to near 30 percent in mid-afternoon; however, afternoon humidity in warmer months is often less than 20 percent and occasionally may go as low as 4 percent. The low relative humidity during periods of extreme temperatures eases the effect of summer and winter temperatures. These low humidity levels contribute to decreased winter temperatures, since the atmosphere is unable to retain heat in the evenings.

Scope of the Hazard Mitigation Plan

The plan update process included seven major areas that were completed over the course of approximately 18 months starting in December 2019. These areas included:

1. Planning and meetings
2. Outreach
3. Capabilities assessment
4. Risk assessment including hazard identification and analysis
5. Mitigation strategy
6. Plan monitoring, evaluation, and updating
7. Plan adoption

The completion of each of these contributed to the overall HMP. The overall purpose of mitigation planning is to identify and document local policies and actions that can be implemented over the long term to reduce risk and future losses from hazards. The HMP helps UNM establish both short-term and long-term goals.

In developing this HMP, UNM followed the most up-to-date FEMA guidance available, the March 2013 Local Mitigation Planning Handbook, as well as the State of New Mexico Natural Hazards Mitigation Plan (September 2018), and the Bernalillo County/City of Albuquerque/ Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFCA)/Village of Los Ranchos de Albuquerque/Village of Tijeras Hazard Mitigation Plan (July 2015) (hereafter referred to as the 'local jurisdiction plan').

Authority

UNM is the authorizing jurisdiction for the HMP. Per 44 CFR Part 201.2, UNM is defined as a "local government". The key responsibilities of local governments are to:

1. Prepare and adopt a jurisdiction-wide natural hazard mitigation plan as a condition of receiving project grant funds under the HMGP, in accordance with §201.6.
2. At a minimum, review and update the local mitigation plan every 5 years from date of plan approval of the previous plan in order to continue program eligibility.

This HMP has been developed in accordance with current state and federal rules and regulations governing local hazard mitigation plans:

1. Section 322, Mitigation Planning, of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as enacted by Section 104 of the Disaster Mitigation Act of 2000 (P.L. 106-390)
2. Current Local Mitigation Planning requirements found in 44 CFR Part 201 – Mitigation Planning

This HMP shall be routinely monitored and revised to maintain compliance with the above provisions, rules and legislation.

Chapter 2 – Planning and Update Process

The Planning and Update Process chapter describes how the plan was prepared for by the University of New Mexico and includes the activities that make up the plan's update, as well as the people that were involved in the update process.

This section consists of the following subsections:

- UNM Administrative Team
- Pre-Disaster Mitigation Advisory Committee (PDMAC)
- UNM Natural Hazards Pre-Disaster Mitigation Website
- Meetings
- Public Involvement and Outreach
- State and Local Hazard Mitigation Plans
- Agency and Organization Coordination
- Future Development Trends

UNM Administrative Team

A UNM Administrative Team led the planning and update process of the HMP Plan. The UNM Administrative Team included Dr. Laura Banks, Director of the UNM Center for Disaster Medicine and Assistant Professor for the UNM Department of Emergency Medicine, and Byron Piatt, Emergency Manager for the University of New Mexico. Both have experience with mitigation planning, critical infrastructure, risk assessment, and project management. Together they shared the responsibilities for plan preparation, outreach and public meetings, and other administrative requirements deemed necessary for plan development.

During the update process, the Administrative Team:

1. Collected data for the plan update
2. Developed outreach strategy
3. Launched and maintained the public PDM website
4. Met with the State Mitigation Officer
5. Organized PDMAC meetings
6. Reviewed the 2015 HMP document
7. Reviewed the most up to date hazard information
8. Reviewed the Mitigation Workbook and Checklist
9. Updated the 2021 HMP document

The UNM HMP Administrative Team followed the hazard mitigation planning steps, activities and process outlined in 44 CFR Part 201.6 and FEMA's Local Mitigation Planning Handbook to develop this Plan. The completed Local Mitigation Plan Review Tool in Appendix A provides the location of where each requirement is met within the Plan.

Pre-Disaster Planning Advisory Committee

In the fall of 2019, the UNM Administrative Team reconvened the Pre-Disaster Mitigation Advisory Committee (PDMAC). PDMAC consists of key stakeholders from multiple departments across UNM and the surrounding jurisdiction, voluntarily advising the UNM Administrative Team in the update of the HMP. These individuals are uniquely qualified to assist, have institutional knowledge, along with the specific program experience of their current job positions. The 2021 PDMAC includes several who participated in the creation of the 2015 plan as well as many new members. Individuals were invited to participate in the PDMAC through email and telephone correspondence and meetings were largely held "virtually" due to COVID-19.

PDMAC Meetings

Much of the work of the PDMAC was conducted off-line due to Covid restrictions, or through the use of other groups on campus including the Emergency Management Committee. Regular meetings of the PDMAC were held bi-weekly on Fridays from March 2021 through June 2021. These meetings were conducted via Zoom as Covid restrictions remained in place. Meetings were scheduled in advance and posted onthe PDM website. Meetings were open to the public. Additional "Technical Support" meetings were also conducted to assist with the on-line nature of data retrieval and information sharing.

The PDMAC consists of the following members from a wide range of departments and agencies:

Table 3: UNM Pre-Disaster Mitigation Advisory Committee

Name	Department	Title
Abra Altman	UNM Office of the President	Strategic Support Manager
Al Sena	UNM Facilities Management Department	Director
Amanda Butrum	UNM Accessibility Resource Center	Director
Amanda Gerard	UNM Business Operations and Campus Dining Services	Operations Manager
Ben Begaye	UNM Student Union Building Facilities	Facilities Services Manager
Brian Pietrewicz	UNM Information Technologies	Deputy CIO
Byron Piatt	UNM Emergency Management	University Emergency Manager
Cinnamon Blair	UNM Communication and Marketing	Director, University Communication
Damian Wasson	UNM University Libraries	Facilities Coordinator
Dennis-Ray Armijo	UNM Student Union Building Facilities	Operations Manager
Florencio Olguin	UNM Art Museums	Collections Manager
Greg Trejo	UNM Office of the Vice President for Research	Strategic Support Manager
James Madrid	UNM Police Department	Commander

James Shaw	UNM Facilities Management Department	Interim Assoc. Director/Utilities Division
Jeff Gassaway	UNM Information Technologies	University Information Security Officer
Joanne Kuestner	UNM Museum of Southwestern Biology	Museum Administrator
Kathy Agnew	UNM Human Resources Client Services	Human Resources Consultant
Laura Banks	UNM Dept. of Emergency Medicine, Center for Disaster Medicine	Principle Investigator, Director
Liz Metzger	UNM Financial Services	University Controller
Mark Reynolds	UNM Information Technologies	Associate Director
Matt McKernan	UNM Athletics	Manager, Sports Facilities and Events
Megan Chibanga	UNM Residence Life Student Housing	Director
Michael Archuleta	City of Albuquerque, Office of Emergency Management	Emergency Operations Coordinator
Michael McCord	UNM Facilities Management Department	Environmental Services Manager
Michael Tuttle	UNM Risk Services	Associate Director
Miranda Harrison-Marmaras	UNM Information Technologies	Technical Analysist
Nick Zubel	City of Albuquerque, Office of Emergency Management	Senior Planner
Pamala Garcia-Ramirez	UNM Office of the Provost	Executive Asst: VP Research, Econ Dvlp, General Admin
Robert Perry	University of New Mexico Hospital	Hospital Emergency Manager
Rodger Ebner	City of Albuquerque, Office of Emergency Management	Director
Ruth Stoddard	UNM Resident Life Student Housing	Operations Manager
Scott Dotson	UNM Residence Life Student Housing	Facilities Services Manager
Shawn Penman	UNM Earth Data Analysis Center	GIS Specialist/Programmer
Thomas Walmsley	Bernalillo County Office of Emergency Management	Deputy Emergency Manager
Tim Gutierrez	UNM Office of Student Services	Associate Vice President
Tim Muller	UNM HSC Office of Research	University Biosafety Officer
Vincent Chavez	UNM Facilities Management Department	Manager, Facilities Maintenance
Zachary Peterson	Environmental Health and Safety	Interim Manager

UNM Natural Hazards Pre-Disaster Mitigation Website

The PDM website was developed as a way to disseminate information on the HMP to PDMAC members as well as UNM staff, faculty, and students, neighboring community associations, and other community stakeholders. Included on the website are meeting dates, meeting agendas, meeting notes, Planning

Team contact list, Advisory Committee members, and draft mitigation strategies. Draft versions of the campus HMP are included so stakeholders can download the document for review purposes. Reference materials such as relevant FEMA documents and county disaster plans are also available on this website. The UNM Department of Emergency Medicine maintains the PDM website. Additionally, a Microsoft OneDrive was used as an information sharing tool for the PDMAC members to facilitate their online interactions.

Public Involvement and Outreach

The HMP Administrative Team used multiple methods to notify the UNM community of opportunities available to participate in the HMP update. UNM staff, faculty, and students as well as local neighborhood associations were sent email correspondence inviting them to attend PDMAC meetings. UNM faculty and staff were notified via email correspondence. A formal letter was sent to all departments across UNM to be emailed to their respective staff and faculty. UNM students were notified via a similar letter that was sent out via email. Neighborhood associations were contacted via email. All letters were similar, described the purpose of mitigation as well as the plan, the updating process, and explained why their participation as a stakeholder was important. The general public was invited via email to attend the meetings of the PDMAC and review the material available on-line. These letters and invitations are included in Appendix C.

Public outreach brought new members to the PDMAC from the University community, including UNM staff and students. These individuals became members of the PDMAC and attended meetings when possible. A meeting agenda was sent to all members of the PDMAC prior to the meetings for their review. During meetings, all members of the PDMAC were encouraged to comment and give feedback. Comments were also sent via email to the HMP administrative team from members of the PDMAC throughout the updating process. Feedback from the PDMAC was incorporated into the entire update process. As feedback was given, it was reviewed by the PDMAC and HMP administrative team, and using group consensus, added into the plan or not. Multiple invitations were sent out to neighborhood associations, however there was no feedback from this group.

Once a draft of the HMP was complete, the plan was posted on the website for general public to review and comment, and the nearby neighborhood associations were again invited via email to review the document and attend a meeting of the PDMAC.

The UNM community will be made aware of future opportunities for participation in HMP maintenance. The PDM website will continue to be utilized to communicate opportunities with the public even after the plan is approved and adopted. An up-to-date point of contact will be listed on the website for those with questions or comments regarding the HMP.

State and Local Hazard Mitigation Plans and Programs

In order to maintain consistency with local and State information, both the State of New Mexico and Bernalillo County/City of Albuquerque hazard mitigation plans were utilized as resources for valuable information on natural hazards. The State of New Mexico's Hazard Mitigation Plan was last updated in September of 2018, and the combined local jurisdiction plan is in final draft form as of March 2021.

February 2021

Integration of plans is extremely important for efficiency, effectiveness and to avoid potential adverse interactions during a response. Plans are reviewed during development and implementation to avoid such conflict, and then again during updates. During the 2018 update, the HMP took into consideration the hazard and risk stratification analysis of the local jurisdictional plans. They were then complied and ranked by local preparedness area for assistance to local jurisdictions when completing the next round of updates.

The State Plan divides New Mexico into 6 preparedness areas. UNM campuses and facilities are located in 3 of these preparedness areas.

Preparedness Area #3

- UNM-Los Alamos Branch
- UNM-Taos Branch

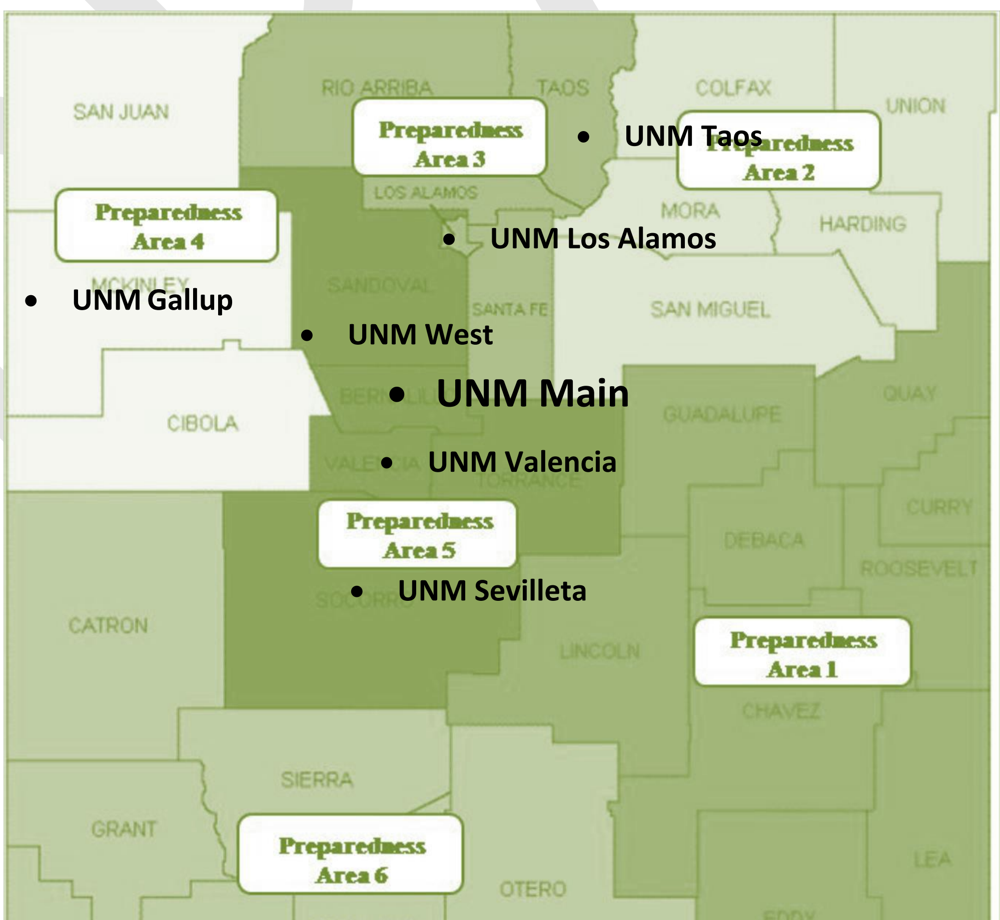
Preparedness Area #4

- UNM-Gallup/Zuni Campus

Preparedness Area #5

- University of New Mexico Main Campus
- UNM Sevilleta LTER Field Station
- UNM West
- UNM-Valencia Branch

Figure 9: NMDHSEM 6 Preparedness Areas



UNM has closely aligned its mitigation goals with the State of New Mexico's goals. The State and local jurisdiction plans were referenced for hazard information, mitigation action best practices, and types of mitigation actions appropriate for the University. The State, Bernalillo County, and the City of Albuquerque have been valuable partners of the University and provided technical assistance during the development of this Plan.

Agency and Organization Development

UNM used single jurisdiction coordination for the update of the HMP. This best suited the University's needs as UNM is an educational institution with sole discretion in the mitigation planning process. However, UNM actively coordinated with the New Mexico Department of Homeland Security and Emergency Management's State Mitigation Officer and Emergency Management Officials from the City of Albuquerque and Bernalillo County for technical assistance, hazard identification, and risk reduction activities.

Future Development Trends

The PDMAC investigated UNM's 2020 Capital Outlay 5 Year Plan to identify future large, non-recurring expenditures such as the construction of a building, acquisition, repairs and campus improvements. The Capital Outlay Plan was developed by Planning and Campus Development to conjoin strategic facilities plans, feasibility studies and needs assessments with the UNM Master Plan.

Table 4: Planned building and infrastructure additions from the 2020 Five Year Capital Outlay Plan[11]

Project Title	Description	Completion Date	Cost
College of Fine Arts Facilities Renewal	Renew Mesa del Sol & Center for the Arts	2023	$5.3 million
Modernization of Essential Research Facilities	Upgrades to critical research space infrastructure	2023	$2.0 million
Fire Safety Improvements	Replacement of fire alarm and fire suppression systems in buildings at greatest risk per State Fire Marshall and Facilities Condition Assessment	2025	$2.5 million
Hibben Center	Smoke Control Upgrade	2022	$0.4 million
Business Center	Replace roofing over lower portions east and west side	2022	$0.3 million

[11] Retrieved from https://pdc.unm.edu/strategic-leadership/capital-planning/5-year-capital-list1.pdf

Future goals from the UNM Consolidated Master Plan (adopted 2011):

- Add a new adult acute care wing of the hospital located near I-25 and Lomas. Build new clinics along University Boulevard.
- Develop a dedicated transit line linking new healthcare facilities west of University Blvd. with existing UNM Hospital
- Add research and academic facilities on the east side of the campus.
- Place emphasis on pedestrian improvements, including the Healing Garden, Tucker Road, and major street crossings.
- Expand the number of student beds by 2,000.
- Redevelop outdated dormitories and provide a wider range of housing options.
- Develop a student-centered recreation center.
- Increase allowable building heights to five stories.
- Reinforce existing pedestrian malls and strengthen east-west pedestrian routes to better connect the residential side of the campus with the academic area on the west.
- Limit auto access to portions of Redondo Drive and prioritize transit and bike.
- Expand and renovate the primary athletic venues: The Pit and University Stadium.
- Develop retail and other commercial uses along Cesar Chavez and University.
- Develop a new housing village west of the Pit for upperclassmen.
- Strengthen the campus character of the Science and Technology Park. Add structured parking and usable open space.
- Develop better pedestrian, bike, and transit connections to the Central and North Campuses.
- UNM IT data center planning
- Fiber connectivity build out for the State of New Mexico

In summary, the update process for the UNM HMP was open and comprehensive, and included input from a wide variety of stakeholders, as well as the most current hazard and vulnerability data available to the team.

Chapter 3 - Community Capabilities

The PDMAC conducted a thorough review of all capabilities and resources available to accomplish mitigation and reduce long term vulnerability. This capability and resource assessment section identifies and examines the existing capabilities of the University of New Mexico that currently reduce disaster losses or could be used to reduce losses in the future, as well as capabilities that inadvertently increase risks in the community. State and Federal resources are also identified. PDMAC collected and reviewed information and divided the capabilities and resources into four categories:

- Planning and Regulatory
- Administrative and technical
- Financial
- Educational and Outreach

Planning and Regulatory Capabilities

Planning and regulatory capabilities are plans, policies, and programs that relate to guiding and managing the operations, growth and development of the University of New Mexico. These capabilities can be used for mitigation planning and to implement specific mitigation actions. The planning and regulatory capabilities documented below may enable or impede mitigation activities, which has been taken into account in the creation of mitigation goals.

Table 5: List of current UNM Plans as of February 2021

Department	Title	Last Modified
UNM	Consolidated Master Plan	2015
UNM	5-Year Capital List	2020
UNM	College of University Libraries and Learning Sciences Emergency Plan	2015
UNM	Museum of Southwest Biology Pre-Disaster Mitigation Plan	2008
UNM	Information Technologies Strategic Plan	2017
UNM	IT Organization Chart	October 2020
UNM	IT Standards (http://cio.unm.edu/standards/)	various
UNM	Emergency Communication Plan	January 2020
UNM	Communication and Marketing Department (UCAM) Emergency Plan	November 2020
UNM	Health Sciences Library and Informatics Center Area Emergency Plan	May 2020
UNM	Center on Alcoholism, Substance Abuse, and Addictions (CASAA) Environmental Plan	March 2006
UNM	Department of Electrical & Computer Engineering Building Emergency Response Plan	November 2008
UNM	Art Museum and ITS Jonson Gallery Emergency/Disaster Response and Preparedness Plan	2008
UNM	Libraries' Emergency Recovery Plan	November 2020
UNM	Animal Resource Facility Incident Response Plan	December 2020
UNM	Facilities Management 5 Year Strategic Plan 2012-2017	2/24/15
UNM Hospital	Communications Equipment Failure Plan	12/08/14
UNM Hospital	Emergency Operations Plan 2021	1/30/2021
UNM Hospital	Hazardous Materials and Waste Management Plan	6/12/2019
UNM Hospital	Life Safety Management Plan	6/12/2019
UNM Hospital	Safety Management Plan	6/12/2019
UNM Hospital	Utility System Management Plan	6/12/2019

Department	Title	Last Modified
UNM-Gallup	UNM-Gallup Strategic Plan Plan Refresh 2019 – 2024	2019
UNM-Taos	UNM-Taos Strategic Plan 2014-2019	August 2014
UNM-Valencia	UNM-Valencia Strategic Plan for 2017 – 2021	2017

Table 6: List of UNM Policies as of February 2021

Policy	Description	Effect
APPM-2100: Sustainability	Policy to maintain healthy relationships throughout the network of interactions that satisfy the basic needs of health, shelter, food, and transportation.	UNM encourages harmony between sustainable goals of environmental protection and economic opportunity within the context of its mission; could ease the way for a wide range of mitigation activities
APPM-2500: Acceptable Computer Use Policy	Outlines proper and improper behaviors, defines misuse and incidental use, explains rights and responsibilities, and briefly reviews the repercussions of violating these codes of conduct.	UNM encourages, supports, and protects freedom of expression as well as an open environment to pursue scholarly inquiry and to share information; could ease the way for improvements to IT infrastructure.
APPM-2520 Computer Security Controls and Access to Sensitive Information	Describes additional requirements and responsibilities applicable to faculty, staff, students, vendors and volunteers who are in IT-related positions or are in positions that have access to sensitive and protected information.	UNM must safeguard the rights and responsibilities provided for in Policy 2500 while also ensuring system and data availability, reliability, and integrity; could ease the way improvements to IT infrastructure as well as policy changes.
APPM-2550: Information Security	Policy and procedures for the basic components of the UNM Information Security Program which applies to employees, contractors, vendors, volunteers, and all other individuals who work with UNM data and information.	UNM is committed to protecting and safeguarding all data and information that it creates, collects, generates, stores, and/or shares; could ease the way for improvements to IT infrastructure.
APPM-2560 Information Technology Governance	Describes the IT Governance framework and defines the roles and responsibilities of individuals and groups involved with IT governance to ensure effective input and decision-making pertaining to IT policies, standards, guidelines, processes, and procedures.	UNM information technology (IT) resources, applications, and manpower must be managed in a manner that enables the University to apply new technologies and adopt new processes effectively while enhancing and encouraging the innovation required for the University to excel in all aspects of its mission; could ease the way for improvements to IT infrastructure.
APPM-3250: Employee Orientation	Defines responsibilities and describes the process to ensure consistency	UNM is committed to giving new employees information

	throughout the stages of orientation.	they need to become productive members of the campus community; could ease the way for updated safety and security education and training.
APPM -3290: Professional Development and Training	Policy and Procedures for providing employees with opportunities to develop and advance skills and abilities for performance within their current position and career advancement within the University.	UNM is committed to providing employees with opportunities to develop and advance skills and training; could ease the way for updated safety and security training for current employees.
APPM-5150: University Wayfinding System and Sign Standards	Describes the requirements and procedures necessary to ensure a successful and cost effective Wayfinding System.	UNM is committed to providing a consistent and cohesive visual identity through signage and other mechanisms to guide individuals in finding their way to various destinations throughout UNM; could ease the way for additional mechanisms to enhance accessibility and public safety.
APPM-5310 Information Technology for Facilities	Defines the policies and procedures necessary to ensure that IT needs are adequately, and cost effectively provided for in the University's facilities and utilities planning, design, and construction processes.	UNM recognizes the importance and cost of IT in the educational, administrative, research, and public service roles of the University; could ease the way for improvements to IT infrastructure.
APPM-6100: Risk Management	Defines responsibilities and describes the Policy and Procedures for UNM's safety training and loss control program.	UNM is committed to protect the health and safety of the campus community and the public from hazards and to protect the reputation and physical resources of the University against loss or damage; could ease the way for a wide range of mitigation activities.
APPM-6110: Safety & Risk Services	Describes UNM's safety and loss control program administered by the University's Safety & Risk Services Department (described more fully in APPM-6100). Describes the responsibilities of UNM's Safety & Risk Services Department.	UNM is committed to providing a safe and healthful work, educational, and living environment, to having a positive impact on the natural environment, and to protecting the University's physical resources and financial assets; could ease the way for a wide

		range of mitigation activities
APPM-6130: Emergency Control	Describes the responsibilities of staff, faculty, and students at University entities in the city of Albuquerque during an incident.	UNM is obligated to conduct its education, business, clinical, and support activities on a regular basis unless conditions exist which may endanger the University community or impact the ability to operate; could ease the way for Continuity of Operations activities.
APPM-6150: Casualty and Liability Insurance and Claims	Describes procedures for reporting personal or property losses and provides general information on the University's insurance coverage.	Could assist with linking future claims from natural disasters with future mitigation planning. Could change and improve future plans and regulations.
APPM-6410: Museums and Collections	Policy and procedures for all UNM Museums and Collections to ensure proper preservation and accessibility for current and future generations.	Evidence that UNM Museums and Collections are essential to UNM's mission-material objects represent a tangible and irreplaceable source of information for teaching, research, and public appreciation; could ease the way for mitigation activities related to museums and collections.
RPM-Section 2.10.1: Historic Preservation	All buildings, landscapes and places or objects of historic significance will be preserved and protected. Removal of or major alteration to any buildings designated by the University Historic Preservation Committee to be of historic significance must be approved by the Board of Regents.	UNM believes these unique historic resources provide a connection to the past and are essential to alumni development, student recruitment, and the public image of the University; may inhibit mitigation activities that modify a buildings pueblo revival architectural style, especially those on the National Registry of Historical Places.
RPM-Section 2.10: Architectural Style of Campus Buildings and Campus Master Plan	All buildings constructed on the central campus continue to be designed in the Pueblo Revival style and that buildings on the north and south campuses reflect the general character of this style to the extent possible given the special needs for facilities in these areas.	UNM believes the pueblo revival architectural style is a unique feature of the central campus worth preservation and enhancement; may inhibit mitigation activities that modify a buildings pueblo revival architectural style, especially those on the National Registry

		of Historical Places.
UNMH Information Technology Security Policy	Sets forth the UNM Hospitals' information security organizational structure that serves to preserve the confidentiality, integrity, and availability of UNM Hospitals' information.	Evidence that UNMH believes protecting the integrity, confidentiality and availability of UNM Hospitals' IT Systems and Information is important; could ease the way for improvements to IT infrastructure.

Table 7: List of State Policies, Regulations and Statutes

Policy/Statute	Description	Effect
Disaster Location Act (NMSA, 2005) 12-11-23 Policy and Purpose; 12-11-24 Provisional appropriation; and 12-11-25 Expenditure of funds	Provides state funds to be expended fordisaster relief for any disaster declared by the Governor that is beyond local control.	State funds may also be used as a match for federal disaster relief grants.
All Hazard Emergency Management Act (NMSA, 2007) 12-10-2 Purpose; 12-10-3 Emergency planning and coordination; 12-10-4 All hazard emergency management…; 12-10-5 Local emergency management	Establishes the basic structure of Emergency Management as a state agency and defines the role of localgovernment in emergency preparedness.	Supports local jurisdictions efforts to organize emergency management functions within their territorial limits
3-18-7: Additional county and municipal powers; flood and mudslide hazard areas; flood plain permits; land use control; jurisdiction; agreement (NMSA, 2009)	The state requires communities to designate special flood hazard areas and mudslide hazards. The homeland security and emergency management department is designated as the state coordinating agency for the national flood insurance program and may assistcounties or municipalities when requested by a county or municipality to provide technical advice and assistance.	Evidence that the State Legislature believes floodplain regulation to be important
3-17-7, 4-37-9.1 Water conservation and drought management (NMSA, 2003); 72-14-3.2 Water conservation plans; municipalities, counties and water suppliers (NMSA, 2003); 6-21-23 Prohibited actions (NMSA, 2003); and 72-4A-7 Conditions for grants and loans (NMSA, 2011)	All relate to the requirement for applicants for financial assistance fromthe New Mexico Finance Authority to submit water conservation plans with funding application. Water conservation plans help to mitigate drought.	Serves to protect water users in time of drought and to clarify the need for drought contingency planning. The fact that the finance authority and water trust boards have issued tens of Millions of dollars in loans shows that many jurisdictions are creating these plans.

Policy/Statute	Description	Effect
72-4A-2 Findings and purpose (NMSA, 2003) through72-4A-7 Conditions for grants and loans (NMSA, 2011)	Allows Water Trust Board funds to be used for water conservation and water re-use activities. This serves to mitigate drought.	Serves to allow state funds from the water trust board to be used for water conservation and re-use activities, which had previously been prohibited. It will promote water conservation in drought prone areas.
72-14-3.1 State Water Plan: purpose; contents (NMSA, 2003)	Directs the Interstate Stream Commission to prepare a comprehensive state water plan. This plan helps mitigate drought.	Requires a state plan to allocate the state's water resources and plan for future needs. It is beneficial to the entire state, which is facing drought conditions.
68-2-34 Fire planning task force; duties (NMSA, 2003)	Creates the Fire Planning Task Force and outlines its duties.	This statute is beneficial in that the Fire Planning Task Force must identify areas of unusually high fire hazard and propose mitigation measures.
International Building Code	All new buildings in the state are required to meet or exceed the standards in the International Building Code or the International Residential building code. This code requires a certain level of protection be installed in new buildings, to protect against wind, snow loads, fires, earthquakes and other natural hazards.	UNM is responsible for monitoring its own development and submits Capital Project requests. The State permits new construction through the NM Construction Industries Division and all buildings are inspected following the State adopted IBC. UNM is not self-regulating and therefore, is required to follow the Governor's mandate to build all new buildings at a minimum of LEED Silver.

Table 8: Additional State Planning and Regulatory Capabilities

Type of Capability	Listing of Capabilities
Regulations	• Uniform Administrative Code Ordinance (O-17-40, April, 2017),CABQ • Adoption of 2009 IFC by Bernalillo County and the Los Ranchos Fire Department • Bernalillo County Planning and Development Services, County Planning Commission, County Development Review Authority, and Zoning Administrator • City of Albuquerque Planning Department, Albuquerque Development Commission and Development Review Board • Los Alamos County Planning and Zoning Commission • Taos County Planning Department, Planning Commission, and Board of Commissioners • Town of Taos Planning and Zoning Department • Valencia County Planning and Zoning • Village of Los Lunas Municipal Planning Commission
Programs	• NFIP ordinances for Bernalillo, Los Alamos, McKinley, Sandoval, and Valencia counties. • Statewide Community Rating System (CRS) Program • Albuquerque Metropolitan Arroyo Flood Control Authority – AMAFCA • Middle Rio Grande Conservancy • NMFlood.org helps support FEMA's Risk Mapping, Assessment, and Planning (Risk MAP) program. Risk MAP builds on flood hazard data and maps produced during the Flood Map Modernization (Map Mod) program • Water 2120: Securing Our Water Future, ABCWUA.org, 2015 • Ciudad Soil and Water Conservation District (encompasses most of Bernalillo County, including the City of Albuquerque and part of southern Sandoval County) • Valencia Soil and Water Conservation District encompasses the parts of Bernalillo County not part of Ciudad (far western and southern parts of the County) • Mid-Region Councils of Government
Plans	• 2014 Bernalillo County Capital Improvement Plan • 2021 McKinley County Multi-Jurisdictional Natural Hazard Mitigation Plan • 2020-2026 CABQ Six-Year Capital Improvement Plan • 2020 Bernalillo County / City of Albuquerque Comprehensive Plan • 2010 Bernalillo County Emergency Operations Plan • 2010-2020 City of Albuquerque and Bernalillo County Facility Plan • 2002 Bernalillo County Wildland Urban Interface Area Inventory Assessment • 2019 Taos County Hazard Mitigation Plan • Various Sector and Neighborhood Development Plans

Table 9: Federal Planning and Regulatory Capabilities

Type of Capability	Listing of Capabilities
Regulations	• Section 322, Mitigation Planning, of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as enacted by Section 104 of the Disaster Mitigation Act of 2000 (P.L. 106-390) • Local Mitigation Planning requirements found in 44 CFR Part 201.6
Programs	• National Flood Insurance Program, administered by FEMA, is aimed at reducing the impact of flooding on private and public structures. This is achieved by providing affordable insurance for property owners and by encouraging communities to adopt and enforce floodplain management regulations. These efforts help mitigate the effects of flooding on new and improved structures. • FEMA'S Hazard Mitigation Assistance Grant Programs provide funding for eligible mitigation activities that reduce disaster losses and protect life and property from future disaster damages. Currently, FEMA administers the Hazard Mitigation Grant Program (HMGP), the Flood Mitigation Assistance (FMA) Program, and the Pre-Disaster Mitigation (PDM) Program.

Administrative and Technical Capabilities

Administrative and Technical capabilities refer to University of New Mexico staff, faculty, and students, as well as state and federal partners, and their skills and tools that can be used for mitigation planning and to implement specific mitigation actions.

Table 10: List of UNM Administrative and Technical Capabilities

Department Name	Skills
UNM Art Museums	Technical expertise on the collections of UNM
UNM Capital Outlay Committee (COC)	Administers the process and identifies potential capital outlay projects/targets for the following year
UNM Center for Disaster Medicine/Dept. of Emergency Medicine	Project management, mitigation planning, and emergency management
UNM Earth Data Analysis Center (EDAC)	Technical expertise, GEOSPATIAL SUPPORT, engineering, and building knowledge
UNM Emergency Manager	Oversees and coordinates all emergency planning and management operations for the University, to include University-wide emergency preparedness programs and initiatives.
UNM Facilities Management Department (FM)	Knowledge and technical expertise on the physical campus (including all campuses and support for branch campuses)
UNM Risk Services	Knowledge and technical expertise on risk management, mitigation, prevention and avoidance.
UNM Environmental Health and Safety	Knowledge and technical expertise on environmental affairs, health, safety and more.

Table 11: State Administrative and Technical Capabilities

Agency Name	Skills
Bernalillo County	Emergency response capacity includes 25 first responders and 6 fire rescue trucks
Bernalillo County Fire Districts (12)	Response capacity includes a daily minimum on-duty staffing level of 57 firefighters, paramedics, lieutenants, captains and battalion commanders.
Bernalillo County Office of Homeland Security and Emergency Management	Technical assistance, planning, and emergency management
Bernalillo County Sheriff's Department	Largest sheriff department in the state
City of Albuquerque Office of Emergency Management	Technical assistance, planning, and emergency management
New Mexico Department of Homeland Security and Emergency Management (NMDHSEM)	State funded mitigation personnel, technical assistance, planning, and emergency management
Statewide Floodplain Managers	Manage floodplain resources and flood mitigation
Statewide Police and Fire Departments	Technical assistance, planning, and emergency management and response

Table 12: Federal Administrative and Technical Capabilities

Agency Name	Skill
US Army Corps of Engineers (USACE)	Technical and planning assistance needed to support effective floodplain management and the preparation of comprehensive plans for the development.
US Federal Emergency Management Agency (FEMA)	Funding and technical assistance, training in disaster mitigation, preparedness, and planning, NFIP, flood mapping, and more.
US National Earthquake Hazards Reduction Program	Training, planning and technical assistance under grants to States or local jurisdictions
National Science Foundation	National Earthquake Hazard Reduction Program (NEHRP) in Earth Sciences, Hazard Reduction Program
New Mexico Department of Homeland Security and Emergency Management (NMDHSEM)	State funded mitigation personnel, technical assistance, planning, and emergency management
US United States Geological Survey (USGS)	Expertise in mapping for use in floods and other hazards

Financial Capabilities

Financial capabilities are the resources UNM has access to or is eligible to use to fund mitigation actions. The following grant programs are mostly federal in origin and directly or indirectly relate to mitigation. Some are for specific hazards, while others can be applied to any hazard that UNM needs to address.

Table 13: Federal and State Funding Sources

Name of Program	Primary Purpose
FEMA Public Assistance 406 Mitigation	For damaged public structures in a Presidential disaster declaration area that are otherwise eligible to receive Public Assistance funds, mitigation measures to reduce future risk can be considered. See http://www.fema.gov/public-assistance-local-state-tribal-and-non-profit/hazard-mitigation-funding-under-section-406-0 for more information.
FEMA Hazard Mitigation Grant Program (HMGP)	Following a Presidential disaster declaration, this program funds mitigation projects and actions that are projected to reduce future losses in excess of the projects' costs. See http://www.fema.gov/hazard-mitigation-grant-program for more information.
FEMA Pre-Disaster Mitigation Program (PDM)	From an annual Congressional appropriation, this program funds mitigation projects and actions that are projected to reduce future losses in excess of the projects' costs. See http://www.fema.gov/pre-disaster-mitigation-grant-program for more information.
National Flood Insurance Program	Formula grants to States to assist communities to comply with NFIP floodplain management requirements (Community Assistance Program) flood insurance rate maps and flood plain management maps for NFIP communities. UNM does not participate in the NFIP however, the communities that UNM is located within do.
USACE Section 205 Authority	Provides authority to the Corps of Engineers to plan and construct small flood damage reduction projects (structural and nonstructural) that have not already been specifically authorized by Congress.
USACE Section 219 of the Water Resources Development Act of 1992 (WRDA92), Environmental Infrastructure, as amended	Provides assistance to non-federal interests for carrying out water-related environmental infrastructure and resource protection and development projects, including wastewater treatment and related facilities, water supply, storage, treatment, and distribution facilities. Such assistance may be in the form of technical, planning, and design assistance as well as construction assistance for defined projects and locations with specific amounts authorized for each location. A non-federal cost share of not less than 25% is required for all assistance under Section 219.
USFS Collaborative Forest Restoration Program (CFRP)	Assists public or private forest owners with an opportunity to reduce wildfire dangers that threaten the community as a whole. 80% Federally funded.

Name of Program	Primary Purpose
USGS Earthquake Hazards Program	Annual Program announcement through http://www.grants.gov/ for competitive proposals for grants and cooperative agreements to support research in earthquake hazards, the physics of earthquakes, earthquake occurrence, and earthquake safety policy.
New Mexico Community Foundation (NMCF)	NMCF is a statewide endowment-building and grant-making organization that serves and invests in New Mexico's people, communities and environment. With partners in every county, NMCF promotes philanthropy as a tool for building community assets, relationships and self-reliance. NMCF provides grants in several areas related to hazard mitigation and forest stewardship. See www.nmcf.org for more information.

UNM Mitigation Resources

UNM relies exclusively upon federal mitigation grant programs available through the NMDHSEM and FEMA to fund mitigation projects. There is currently no university funding sources identified for mitigation projects. UNM may pursue outside funding sources as identified by the State of New Mexico.

State Mitigation Resources

The State of New Mexico does not have any pre- or post-disaster mitigation grant programs or funding of its own. The State acts as the grantee for federal mitigation grant programs, evaluates and recommends projects to FEMA for funding, and passes federal grant funds through to the sub-grantees. The non-federal share is usually borne by the applicant, although on rare occasions the state may contribute to the non-federal share. Applicants may meet their match by cash, in-kind services, or a combination of the two. Future funding of all federal grants depends upon continued funding by Congress. Apart from meeting the requirements of federal programs and technical assistance, the State and UNM have limited mitigation funding.

Insurance

UNM is insured by the State of New Mexico Property Certificate of Coverage. UNM is not insured by the National Flood Insurance Program. The policy of insurance is "all risk", subject to exclusions. "Flood" is not an exclusion. Some property is excluded, but primary buildings and property are not. Coverage includes money and securities, valuable papers, and vehicles, now existing or hereafter acquired, owned by the Governmental Entity, in the care, custody and control of the Governmental Entity for which the Governmental Entity is legally liable, or for which the Governmental Entity has assumed liability prior to loss wherever situated, not otherwise excluded. The Public Property Reserve Fund covers against all risks of direct physical loss or damage not otherwise excluded occurring during the period of the Certificate to covered property, including the expense of removal of debris of covered property damaged by a covered peril.

Educational and Outreach Capabilities

Educational and Outreach capabilities refer to programs and methods already in place that can be used to implement mitigation activities and communicate hazard-related information.

Table 14: Education and Outreach Capabilities

Program	Description
Albuquerque-UNM Medical Reserve Corps (MRC)	Organizes and trains volunteers willing to respond to disasters and emergencies, public health issues and education. Volunteers participate in local non-emergency public health activities.
Center for Domestic Preparedness training	Preparedness, response, and operations training in the areas of agriculture, hospital facilities, emergency medical services, public health, and nuclear facilities that focuses on the application of the principles of ICS, or Hospital Incident Command System to address an all-hazards incident.
FEMA Emergency Management/ Mitigation Training	Training in disaster mitigation, preparedness, Incident Command System (ICS), Hospital ICS, planning, and more.
Local Emergency Planning Committees (LEPC)	A voluntary organization for chemical emergency response planning and implementation in a community. Located in each county across New Mexico.
National Weather Service's Storm Ready	A nationwide community preparedness program that uses a grassroots approach to help communities develop plans to handle all types of severe weather. Many UNM/UNMH employees have participated in Storm Ready training taught by the local NOAA office.
New Mexico Medical Reserve Corps (MRC) Serves	NM MRC Serves is part of a national network of local groups of volunteers committed to improving the health, safety, and resiliency of their communities and schools. There are 13 MRC units located in New Mexico. NM MRC Serves manages a database of New Mexico's statewide registry of pre-credentialed, volunteer healthcare professionals.
PDMAC	Representatives from multiple departments across UNM with institutional knowledge along with the pre-disaster mitigation program experience.
University of New Mexico C-Community Emergency Response Team (CERT)	Educates UNM staff, faculty, and students about disaster preparedness for hazards that may impact NM and trains them in basic disaster response skills. UNM C-CERT members can assist others following an event when professional responders are not immediately available to help.
UNM Communication and Marketing	Public information and communications office providing social media, media relations, web communications, and marketing services for UNM.
UNM Emergency Communication	Multi-faceted, campus notification system: • LoboAlerts is the University's emergency text messaging system used to provide safety and weather alerts, and notification of events which have the potential to threaten the University's ability to

Program	Description
	conduct regular activities. The system also includes a warning siren, email alerts, web page updates, LoboAlerts Twitter, and LoboAlerts Facebook. • UNM Community Communications is a free of charge service provided to the community at large that provides information to the surrounding campus community regarding important events. UNM Emergency Alert Sirens are sounded in the event of an emergency that makes it dangerous to be outdoors, such as a severe lightning storm, an environmental hazard or a threat from an armed individual. During an alert, people who are not on campus and hear the siren should not come on campus. People who are on campus should seek shelter in the nearest building. The system is tested at the beginning each semester to help familiarize the campus community with the sounds. Tests are broadly announced in advance through the UNM Webpage, email messages and local notices.
UNM Healthcare Emergency Response Team (UHERT)	UHERT is a state-wide medical response team of volunteers primarily affiliated with UNMH and UNM. The team provides qualified medical personnel to the state in the event of an emergency.

National Flood Insurance Program

The National Flood Insurance Program (NFIP) is aimed at reducing the impact of flooding on private and public structures. This is achieved by providing affordable insurance for property owners and by encouraging communities to adopt and enforce floodplain management regulations. These efforts help mitigate the effects of flooding on new and improved structures. Overall, the program reduces the socio-economic impact of disasters by promoting the purchase and retention of Risk Insurance in general, and National Flood Insurance in particular. UNM is currently not participating in the NFIP. UNM is insured by the State of New Mexico Property Certificate of Coverage.

The NFIP does have free resources available to UNM for mitigation planning purposes. One very important resource available to all communities are digital maps created for floodplain management and insurance purposes called Digital Flood Insurance Rate Maps (DFIRMs). A DFIRM will generally show a community's base flood elevations, flood zones, and floodplain boundaries. For property owners/renters, these maps are a reliable indication of flood zones. However, maps are constantly being updated due to changes in geography, construction and mitigation activities, and meteorological events. Therefore, for a truly accurate determination, the insurance agent or company, or community floodplain manager should be contacted. There are currently 21 New Mexico Counties with DFIRMs, 2 counties with DFIRMs pending, and 10 counties without DFIRMs.

Chapter 4 – Risk Assessment

Introduction

The risk assessment chapter reviews the 10 identified natural hazards and the impacts they have on the UNM community, economy, and the natural and built environment. UNM followed the four recommended steps in the Local Mitigation Planning Handbook for conducting a risk assessment. The four steps are:

1. Describe natural hazards
2. Identify UNM critical assets
3. Analyze the risks
4. Summarize the impact to UNM

The risks assessment process utilizes the history of hazard events, an examination of the geographic exposure to hazards, previous occurrences, and a disaster scenario.

Hazard Identification

The University of New Mexico planning area spreads across six counties of the state, including 3 separate preparedness areas as defined by NMDHSEM. It is important for UNM to document natural hazards that may affect the main campus, branch campuses, or other UNM properties, which are located across the State.

In 2018, the NMDHSEM updated its State Hazard Mitigation Plan and identified 14 natural hazards which had the greatest impact on the state.

Table 15: Hazards Identified in the State of New Mexico Plan

Hazard Category	Hazard Type
Atmospheric	Extreme Heat High Wind Thunderstorm (including Lightning and Hail) Tornado Severe Winter Storms
Hydrologic	Drought Flood/Flash Floods
Geologic	Earthquakes Expansive Soils Land Subsidence Volcano Landslide
Other	Wildland/Urban Interface Fire Dam Failure

Based on the information within the State Plan, the four most significant hazards for the state of New Mexico are:

1. Wildland/Urban Interface Fire
2. Flood
3. Thunderstorm (including Lightning and Hail)
4. Drought

Four hazards listed in the State Hazard Mitigation Plan were excluded from additional consideration as they present little to no risk to UNM. Hazards that were dropped from further evaluation are summarized as follows:

Volcano - The 2018 State Plan states that there are no estimates of future occurrence of volcanic activity in New Mexico in the near future. New Mexico's numerous volcanoes are considered dormant, but not extinct. The State Plan reports an extremely low probability of a volcano in the next 10 years (.01%) and therefore the probability of volcanic eruption is considered "Highly Unlikely". Given the very low probability of occurring and the lack of previous occurrences, this hazard was not deemed a significant threat to UNM and is not addressed further in the Plan.

Expansive Soils - There are no previous occurrences and expansive soils pose no risk to the University, faculty, staff, or students. Due the low frequency of this hazard and its minor potential impact, the risk is considered negligible, and the hazard is addressed in the rest of the Plan.

Land Subsidence - Due to the low frequency of this hazard and its minor potential impact, it is considered a nuisance and is not addressed in the rest of the Plan. Land subsidence is an issue for parts of the state (Carlsbad) but not any location in close proximity to UNM campuses or properties.

Dam Failure – The HMP Administrative team conducted research on the New Mexico Rio Grande dams to determine the risk of inundation from dam failure. Utilizing the NFHL Flood Data Application for dam and flood data[12], it was determined that UNM has no structures or properties at risk of inundation from dam failure. The dam structures near UNM campuses and properties are arroyo/storm water/diversion structures. The closest Rio Grande Dam is 38 miles north of UNM Main Campus. The closest dam structure to UNM Main Campus is located 4.5 miles away from UNM Main Campus. The inundation risk from these dam structures is negligible for all UNM Campuses and properties. Flooding is profiled and mitigated in this plan separately from inundation.

Data Collection

Hazard information is referenced directly from the State Hazard Mitigation Plan. Because the State Plan was last updated in 2018, revised and UNM specific information was added to this Plan when available. Historical data was collected from multiple online resources for each New Mexico County with a UNM property. Sites used for historical data included the National Centers for Environmental Information

[12] National Flood Hazard Layer Data Application, http://nmflood.org/MAPS/NFHL/ (October 26, 2015)

(NCEI – formerly the National Climatic Data Center (NCDC)) and Spatial Hazard Events and Losses Database for the United States (SHELDUS). In some cases, the State's

Preparedness Area data was used when nothing more specific was available. Source information is cited throughout this Plan.

In an effort to provide the most up to date information for each hazard, UNM updated the history for each hazard through 2020. Calculating mathematical probability of future occurrence of hazards for small geographic areas such as the UNM campuses, with a limited history of hazard events, does not produce actionable results. Therefore, the UNM Hazard Mitigation Plan will adopt the probabilities calculated by the NMDHSEM for the 3 Preparedness Areas in which UNM campuses are located. The probability or chance of occurrence was calculated based on historical data provided by local authorities or databases. Probability was determined by dividing the number of events observed by the number of years and multiplying by 100..

NCEI (NCDC)

NOAA's National Centers for Environmental Information (formerly Climatic Data Center) maintains a Storm Events Database which contains the recordsused to create the official NOAA Storm Data publication, documenting:

- The occurrence of storms and other significant weather phenomena having sufficient intensity to cause loss of life, injuries, significant property damage, and/or disruption to commerce;
- Rare, unusual, weather phenomena that generate media attention, such as snow flurries in South Florida or the San Diego coastal area; and
- Other significant meteorological events, such as record maximum or minimum temperatures or precipitation that occur in connection with another event.

The database currently contains data from January 1950 to February 2021, as entered by NOAA's NationalWeather Service (NWS). Due to changes in the data collection and processing procedures over time, there are unique periods of record available depending on the event type. NCEI (NCDC) has performed data reformatting and standardization of event types but has not changed any data values for locations, fatalities, injuries, damage, narratives and any other event specific information. Please refer to the Database Details page for more information.

SHELDUS

The University of South Carolina's Spatial Hazard Events and Losses Database for the United States is a county-level hazard loss data set for the U.S. for 18 different natural hazard events types such thunderstorms, hurricanes, floods, wildfires, and tornados. For each event the database includes the beginning date, location (county and state), property losses, crop losses, injuries, and fatalities that affected each county. The data set does not include Puerto Rico, Guam, or other U.S. territories.

SHELDUS data equally distributes loss information across affected counties. Therefore, fatalities andinjuries may be listed as a percentage rather than a whole number.

SHELDUS originally contained only those events that generated more than $50,000 in damage or at least one death. SHELDUS is currently in the process of removing these thresholds and is adding every loss causing (monetary and human) event as reported in the data sources.

Disaster History

FEMA Disaster Declarations

The Robert T. Stafford Disaster Relief and Emergency Assistance Act requires that: "All requests for a declaration by the President that a major disaster exists shall be made by the Governor of the affected State." Based on the Governor's request, the President may declare that a major disaster or emergency exists, thus activating an array of Federal programs to assist in the response and recovery effort.

New Mexico has experienced numerous major Federal disaster and emergency declarations. Tables 16-18 identify the major Federal disaster declarations in the state since 1950 as of July 2015. These tables include the following information: FEMA Disaster Number, the date the disaster was declared, the location of the disaster (UNM planning area locations are highlighted if the information was available), and the incident description.

Table 16: New Mexico Major Disaster Declarations

Number	Date	Location	Incident Description
4352	12/20/2017	Pueblo of Acoma	Severe Storms, Flooding
4199	10/29/2014	Guadalupe, Lincoln, Otero, Rio Arriba, San Miguel and **Sandoval**, and the Pueblo of Acoma and Santa Clara Pueblo	Severe Storms and Flooding
4197	10/06/2014	Guadalupe, Lincoln, Otero, Rio Arriba, San Miguel and **Sandoval**, and the Pueblo of Acoma and Santa Clara Pueblo.	Severe Storms and Flooding
4152	10/29/2013	Catron, Chaves, Cibola, Colfax, Eddy, Guadalupe, **Los Alamos**, **McKinley**, Mora, **Sandoval**, San Miguel, Santa Fe, Sierra, **Socorro**, and Torrance	Severe Storms, Flooding, and Mudslides
4148	09/30/2013	**Bernalillo**, Colfax, Luna, **Sandoval**, and Socorro counties as well as the Cochiti, Kewa (Santa Domingo), San Felipe, and Sandia Pueblos	Severe Storms and Flooding
4047	11/23/2011	Cibola, **Los Alamos**, **Sandoval** counties as well as Acoma, Cochiti, and Santa Clara Pueblos.	Flooding
1962	03/24/2011	Lincoln, Otero, Rio Arriba, Sierra, **Socorro** and **Taos** counties and Santa Ana, Taos and, Santa Clara Pueblos, and the Mescalero Apache Tribe	Severe Winter Storm and Extreme Cold Temperatures

1659	08/30/2006	Rio Arriba and **Taos** Counties	Severe Storms & Flooding
1329	05/13/2000	**Bernalillo**, Chaves, Cibola, DeBaca, Dona	New Mexico Wildfire

Number	Date	Location	Incident Description
		Ana, Eddy, Guadalupe, Lincoln, **Los Alamos**, **McKinley**, Mora, Otero, Rio Arriba, **Sandoval**, San Juan, San Miguel, Santa Fe, Sierra, **Socorro**, **Taos** and Torrance counties	
1301	09/22/1999	Dona Ana, Luna, Mora, Rio Arriba, San Juan, **Sandoval**, Sierra and the Mescalero Indian Reservation	Severe Storms and Flooding
1202	01/29/1998	New Mexico	Severe Winter Storms
992	06/07/1993	New Mexico	Flooding, Severe Storm
945	06/18/1992	New Mexico	Flooding, Hail, Thunderstorms
731	01/18/1985	New Mexico	SEVERE STORMS, FLOODING
722	09/06/1984	New Mexico	SEVERE STORMS, FLOODING
692	10/24/1983	New Mexico	SEVERE STORMS, FLOODING
589	06/23/1979	New Mexico	Severe Storms, Snowmelt, Flooding
571	01/29/1979	New Mexico	FLOODING
380	05/11/1973	New Mexico	SEVERE STORMS, SNOW MELT, FLOODING
361	11/20/1972	New Mexico	Heavy Rains, Flooding
353	09/20/1972	New Mexico	Heavy Rains, Flooding
346	08/01/1972	New Mexico	SEVERE STORMS, FLOODING
202	07/01/1965	New Mexico	SEVERE STORMS, FLOODING
38	08/15/1955	New Mexico	FLOOD
27	10/13/1954	New Mexico	FLOOD

Table 17: New Mexico Emergency Declarations

Number	Date	Location	Incident Description
3229	09/07/2005	New Mexico	Hurricane Katrina Evacuation
3154	05/10/2000	New Mexico	New Mexico Fire
3128	07/02/1998	New Mexico	Extreme Fire Hazard
3034	03/02/1977	New Mexico	Drought

Table 18: New Mexico Fire Management Assistance Declarations

Number	Date	Location	Incident Descriptions
5240	6/8/2018	New Mexico	Soldier Canyon Fire
5239	6/1/2018	New Mexico	Ute Park Fire
5184	6/15/2017	New Mexico	El Cajete Fire
5134	7/14/2016	New Mexico	Timberon Fire
5127	6/16/2016	New Mexico	Dog Head Fire
5026	6/5/2013	New Mexico	Tres Lagunas Fire
2982	6/20/2012	New Mexico	Romero Fire
2981	6/18/2012	New Mexico	Blanco (CR 4901) Fire
2979	6/9/2012	New Mexico	Little Bear Fire

2978	5/26/2012	New Mexico	Whitewater-Baldy Fire Complex
2935	6/30/2011	New Mexico	Donaldson Fire
2934	6/29/2011	New Mexico	Little Lewis Fire
2933	6/26/2011	New Mexico	Las Conchas Fire

Number	Date	Location	Incident Descriptions
2918	6/12/2011	New Mexico	Track Fire
2917	6/10/2011	New Mexico	Wallow Fire
2897	4/17/2011	New Mexico	Tire Fire
2880	4/3/2011	New Mexico	White Fire
2866	3/8/2011	New Mexico	Quail Ridge Fire
2843	6/2/2010	New Mexico	Rio Fire
2842	5/24/2010	New Mexico	Cabazon Fire
2818	5/7/2009	New Mexico	Buckwood Fire
2777	6/25/2008	New Mexico	Big Springs Fire
2762	4/21/2008	New Mexico	Trigo Fire
2741	11/21/2007	New Mexico	Ojo Peak Fire
2682	2/24/2007	New Mexico	Belen Fire
2647	6/21/2006	New Mexico	Rivera Mesa Fire
2644	6/16/2006	New Mexico	Malpais Fire
2636	4/12/2006	New Mexico	Ojo Feliz Fire
2631	3/1/2006	New Mexico	Casa Fire
2600	1/2/2006	New Mexico	Southeast New Mexico Fire
2522	6/18/2004	New Mexico	Bernardo Fire
2518	5/25/2004	New Mexico	Peppin Fire
2472	6/25/2003	New Mexico	Atrisco Fire (Formerly Bosque Fire)
2467	5/10/2003	New Mexico	Walker Fire
2459	8/26/2002	New Mexico	Lakes Fire Complex
2424	6/13/2002	New Mexico	Roybal Fire Complex
2416	6/6/2002	New Mexico	Ponil Fire
2414	6/4/2002	New Mexico	Turkey Fire
2415	6/4/2002	New Mexico	Cerro Pelado Fire
2408	5/23/2002	New Mexico	Borrego Fire
2404	5/7/2002	New Mexico	Dalton Fire
2402	5/1/2002	New Mexico	Penasco Fire
2398	3/23/2002	New Mexico	Kokopelli Fire Complex
2364	6/3/2001	New Mexico	Trap and Skeet Fire
2310	6/15/2000	New Mexico	La Cueva Fire
2304	5/30/2000	New Mexico	Viveash Fire
2297	5/14/2000	New Mexico	Scott-Able Fire
2296	5/8/2000	New Mexico	Cree Fire
2295	4/20/2000	New Mexico	Rio Grande Fire Complex
2213	6/26/1998	New Mexico	Osha Canyon Complex
2177	5/5/1996	New Mexico	Hondo Fire
2025	6/18/1977	New Mexico	Barker Fire
2015	5/21/1974	New Mexico	Guadalupita Fire

UNM Disaster History

Recent natural disasters and associated costs for UNM Main Campus and Sevilleta LTER Field Station are shown in Table 19. Note: No data is available for the UNM Branch Campuses (Gallup, Los Alamos, Taos and Valencia) on past natural hazard disasters exist. This is the most up to date information as of August 1, 2014.

UNM does not report any losses under $1,000 to insurance as a claim. Many of the losses fall in this category. Maintenance issues identified above are not reported as an insurance claim based on standard insurance language.

Table 19: UNM Disaster History (June 30, 2010 – February 1, 2021)

Date of Loss	TMA Project #	Project Name	SRS#	Actual Cost	BLDG NAME/#	DISASTER TYPE
06/30/10	100630 ANTHRO FLD	Anthropology Flood - Bldg. 11	11-101	$12,830.66	011-Anthropology/ Maxwell Museum	Rain/Flood
07/26/10	100726 BIOLOGY FLD	Biology Flood	11-112	$6,150.45	021-Castetter Hall/Biology	Rain/Flood
07/26/10	100726 CARLISL GYM	Carlisle Gym Flood	11-111	$12,004.05	004-Carlisle Gym	Rain/Flood
08/08/10	100808 LOGAN FLOOD	Logan Hall Flood	11-117	$204,927.95	034-Logan Hall/ Psychology	Rain/Flood
09/01/10	100901 ANTHRO ANNX	Anthropology Annex Flood - Bldg. 12	11-129	$40,644.68	012-Anthropology Annex	Rain/Flood
01/01/11	110101 ATHL FLOOD	Athletic Building Flood	11-188	$106.30	307-Athletic Building	Freeze/ Flood
01/01/11	110101 EECE FLOOD	EECE Flood	11-188	$0.00	046-EECE-Engineering & Sci Lib	Freeze/ Flood
01/01/11	110101 SOC SCI AHU	Social Sciences Bldg. AHU	11-188	$24,955.88	078-Social Sciences	Freeze/ Flood
01/11/11	110111 SUB CW COIL	Student Union Bldg. - Chilled Water Coil	11-188	$49,010.60	060-Student Union (SUB)	Freeze/ Flood
02/02/11	110202 CGF FLOOD	Crystal Growth Facility Flood	11-202	$263.91	331-Crystal Growth Facility	Freeze/ Flood
02/02/11	110202 JNSN GYM	Johnson Gym Flood	11-202	$9,945.23	059-Johnson Center	Freeze/ Flood
02/02/11	110202	Mesa Vista Flood	11-202	$1,514.28	056-Mesa Vista	Freeze/

Date of Loss	TMA Project #	Project Name	SRS#	Actual Cost	BLDG NAME/#	DISASTER TYPE
	MV FLOOD				Hall	Flood
02/03/11	110203 ATHL FLOOD	Athletic Building Flood	11-202	$1,133.32	Athletics	Freeze/ Flood
02/03/11	110203 BIOLOGY FLD	Biology Flood	11-202	$3,589.94	021-Castetter Hall/Biology	Freeze/ Flood
02/03/11	110203 CANCER FLD	Cancer Center Flood	11-202	$0.00	284-UNM Cancer Center	Freeze/ Flood
02/03/11	110203 CHEM FLOOD	Chemistry Flood	11-202	$74,438.45	022-Clark Hall (Chemistry)	Freeze/ Flood
02/03/11	110203 EECE FLOOD	EECE Flood	11-202	$43,512.68	046-EECE-Engineering & Sci Lib	Freeze/ Flood
02/03/11	110203 HUMANI TIES	Humanities Flood	11-202	$5,669.59	081-Humanities	Freeze/ Flood
02/03/11	110203 N&P ELEV	Nursing & Pharmacy Elevator Controls	11-202	$11,748.60	228-Nursing & Pharmacy	Freeze/ Flood
02/03/11	110203 SUB COILS	Student Union Bldg. AHU Coils	11-202	$18,098.00	060-Student Union (SUB)	Freeze/ Flood
02/03/11	110203 TAMARN D FLD	Tamarind Flood	11-202	$969.80	162-Tamarind	Freeze/ Flood
02/04/11	110204 1705 MV FLD	1700 Mesa Vista Flood	11-202	$984.73	178-UNM Res Theatre (Triplock)	Freeze/ Flood
02/04/11	110204 CHTM FLOOD	Center for High Tech Materials Flood	11-202	$1,518.83	338-Center for High Tech Materials	Freeze/Flo od
02/04/11	110204 REGENER FLD	Regener Hall Pipe Freeze - XX	11-202	$0.00	035-Regener Hall/Physics	Freeze/ Flood
02/04/11	110204 STADIUM RR	Stadium SW Restroom Flood	11-202	$8,005.65	301-South Campus Substation	Freeze/ Flood
02/05/11	110205 ZIM LIB FLD	Zimmerman Library Flood	11-202	$2,664.45	053-Zimmerman Library	Freeze/ Flood
02/06/11	110206 ELKS FLOOD	Elks Lodge Frozen Coil - XX	11-202	$0.00	267-ELKS Lodge	Freeze/ Flood
02/07/11	110207 STADIUM	Football Stadium Press Box Flood	11-202	$40,009.58	Football Stadium	Freeze/ Flood

February 2021

Date of Loss	TMA Project #	Project Name	SRS#	Actual Cost	BLDG NAME/#	DISASTER TYPE
	FLD					
02/10/11	110210 N&P FLOOD	Nursing & Pharmacy Flood	11-202	$2,048.06	228-Nursing & Pharmacy	Freeze/ Flood
02/12/11	110212 MIND FLOOD	MIND Backflow Flood	11-202	$0.00	260-Domenici Hall	Freeze/ Flood
02/17/11	110217 BMSB FLOOD	Basic Medical Sciences Building Acid Waste	11-213	$212.85	211-Reginald Heber Fitz Hall	Freeze/ Flood
02/18/11	110218 PEARL FLOOD	Pearl Hall Flood	11-202	$74.63	195-Pearl Hall	Freeze/ Flood
06/27/11	110627 YOUNG FIRE	Young Ranch Fire	11-270	$2,552.31	401-Young Ranch - Dixon	Fire
08/29/11	110829 PIT FLOOD	PIT Flood - HVAC Louvers - NW Corner	12-132	$4,492.60	302-WisePies Arena aka The Pit	Rain/Flood
10/08/11	111008 N&P PLAZA	Nursing & Pharmacy Roof Plaza Deck Flood	12-152	$2,658.26	Nursing & Pharmacy	Rain/Flood
05/05/12	120505 EECE FLOOD	EECE Basement Flood	12-249		EECE	Rain/Flood
07/26/13	130726 STORM DMG	Campus-Wide Storm Damage			Campus Wide Storm Damage	Rain/Flood
09/15/13	130915 RAIN DAMAGE	Campus-Wide Torrential Rain Damage			Campus Wide Storm Damage	Rain/Flood
07/27/14	140727 RAIN DAMAGE	Torrential Rain Damage			Campus Wide Storm Damage	Rain/Flood
08/01/14	140801 RAIN DAMAGE	Torrential Rain Damage		$1,000,000.00	Over $1.2 million paid/still paying contractors. Campus Wide.	Rain/Flood
	INS - CONDEN SORS	Hailstorm Damage 06-14-02		$79,969.76		
TOTAL				**$1,666,706.08**		

Critical Assets

UNM and UNM Hospital resources include assets such as facilities, services, and infrastructure necessary for the university to conduct operations and provide services. Resources can be housed on campus or in the community. The essential services performed by the University and hospital which are supported by mitigation planning and actions include:

1. Medical and basic science research and development
2. Provision of clinical care
3. Post-secondary education and library services
4. Administration and finance
5. Housing and food services
6. Providing venues for community arts, entertainment, and sports
7. Preservation of historical structures and archival collections
8. Public safety and occupational health
9. Public broadcast via television and radio

For the purpose of this document 'critical asset' means: UNM and UNM Hospital people, functions, and structures which are vital to maintain the health, safety, and well-being of university employees, students, visitors, and patients, and the university's economic sustainability, history, and educational functions during time of natural disaster.

University assets were categorized into three types: people, infrastructure and facilities. Each participating PDMAC member was asked to review the current list of UNM buildings and infrastructure components related to their area of responsibility and to the university as a whole, and to add assets that had been created or expanded during the previous five-year period. The 5-Year Capital Improvement Plan for the university was reviewed to determine if significant improvements or replacements are being planned for the critical facilities on the list, and for new facilities that might be deemed critical. In addition, the UNM Consolidated Master Plan (adopted in 2011) was analyzed to determine the potential risk associated with future land use and development. Table 20 shows the categories of assets addressed in the UNM HMP planning process, including people, infrastructure, and facilities.

Table 20: University Assets

People
Undergraduate, graduate, and non-degree seeking students
Residential students
Patients and their families
Employees including temporary and permanent staff and faculty
Individuals with accessibility and functional needs, including children
Campus visitors for entertainment, sports, teaching, research, and business
Neighboring community members
Infrastructure
Communications and security technology
Utilities and power
Transportation and roadways

Educational, administrative, and medical data maintenance
Natural environment
Critical Facilities
Research
Administration
Clinical
Housing and food services
Venues
Museums and collections
Historical buildings and structures
Public safety
Utilities
Transmission and broadcast

A database of the monetary values of critical facilities and infrastructures used to support the essential functions of the university is maintained by the State of New Mexico General Services Department Risk Management Division. This database will be used on an on-going basis to update the value of critical facilities for mitigation planning.

A final, updated list of critical physical facilities and infrastructure was created, reviewed and accepted by the PDMAC. The actual list of facilities and infrastructure - including their physical location, critical nature, function, and economic valuation – can be requested by contacting the UNM OEM at: MSC11 6025, 1 University of New Mexico, Albuquerque, NM 87131 or the UNM Emergency Manager at bpiatt@salud.unm.edu. Distribution of the list will be at the discretion of UNM OEM.

UNM contains many historic resources of significance. These resources provide a connection to the past for students, faculty, staff, alumni, and the general public. They are considered essential to alumni development, student recruitment, the public image of the University, and create a sense of place. The Campus Heritage Preservation Survey details these historic resources and can be viewed on the UNM website (http://iss.unm.edu/PCD/docs/Getty_Report/GettyProject_Vol1_All.pdf).

The list of essential services and the list of critical infrastructure and facilities were utilized to conduct a risk analysis and to develop or update the general and specific mitigation strategies included in the HMP.

Changes in Development

Since 2015, UNM has experienced tremendous growth and expansion. Based on the evaluation conducted by the PDMAC (as described under the Critical Assets section), significant changes in development have been documented. Only those changes in development relevant to the HMP are described here.

UNM HSC expansion since 2015 has been both operational and geographical, with new construction and renovation of pre-existing facilities. Relevant examples include:

- Physics & Astronomy Interdisciplinary Science Building (PAIS)
- Johnson Center expansion and remodel
- Smith Plaza Renovation
- McKinnon Center for Management (MCM)
- Lobo Rainforest
- La Posada Renovation
- Farris Engineering Center Renovation
- New Hospital Tower and Parking Garage

The PDMAC determined that new facilities have no increased or decreased vulnerability to hazards. New development has been similar in purpose and placement and therefore is deemed just as vulnerable to hazards as pre-existing facilities.

Risk Analysis

The risk analysis takes information relating to both UNM and the State of New Mexico as a whole. The following hazard profiles describe different hazard characteristics. In some cases, hazards affect specific geographic areas (i.e., Floods and Landslides). When this is the case, the hazard profile includes a map identifying areas of the state where the hazard could occur. For hazards that could occur anywhere, such as tornadoes and winter storms, the hazard profile identifies which portions of the state may be more vulnerable to the hazard.

The remainder of this section presents hazard profiles and risk assessment information for the eleven hazards applicable to UNM listed in Table 15. It includes a description of each hazard and historical reviews of hazard occurrences in the State of New Mexico. The order in which the hazards are presented does not reflect the relative levels of risk they pose to the state.

Drought

Hazard Characteristics

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 by 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 there is inadequate soil moisture to meet the needs of 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 dryland agricultural operations.
- Hydrological drought refers to deficiencies in surface and subsurface water supplies. It is measured as stream flow, snowpack, 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.
- Socio-economic drought occurs when physical water shortages start to affect the health, wellbeing, and quality of life of the people, or when the drought starts to affect the supply and demand of an economic product.

Drought increases the probability and severity of wildfire. Drought also increases the severity of flash flooding due to soils becoming hydrophobic, repelling or incapable of dissolving in water, resulting in increased runoff and erosion. Economically, prolonged drought can have devastating effects on agriculture and food supply. 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.

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 of 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 with 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.

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) (Figure 10) 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. PDSI is used by the U.S. Department of Agriculture (USDA) to determine allocations of grant funds for emergency drought assistance

Figure 10: Palmer Drought Severity Index[13]

Drought Severity	Return Period (years)	Description of Possible Impacts	Drought Monitoring Indices		
			Standardized Precipitation Index (SPI)	NDMC* Drought Category	Palmer Drought Index
Minor Drought	3 to 4	Going into drought; short-term dryness slowing growth of crops or pastures; fire risk above average. Coming out of drought; some lingering water deficits; pastures or crops not fully recovered.	-0.5 to -0.7	D0	-1.0 to -1.9
Moderate Drought	5 to 9	Some damage to crops or pastures; fire risk high; streams, reservoirs, or wells low, some water shortages developing or imminent, voluntary water use restrictions requested.	-0.8 to -1.2	D1	-2.0 to -2.9
Severe Drought	10 to 17	Crop or pasture losses likely; fire risk very high; water shortages common; water restrictions imposed.	-1.3 to -1.5	D2	-3.0 to -3.9
Extreme Drought	18 to 43	Major crop and pasture losses; extreme fire danger; widespread water shortages or restrictions.	-1.6 to -1.9	D3	-4.0 to -4.9
Exceptional Drought	44 +	Exceptional and widespread crop and pasture losses; exceptional fire risk; shortages of water in reservoirs, streams, and wells creating water emergencies.	less than -2	D4	-5.0 or less

*NDMC - National Drought Mitigation Center

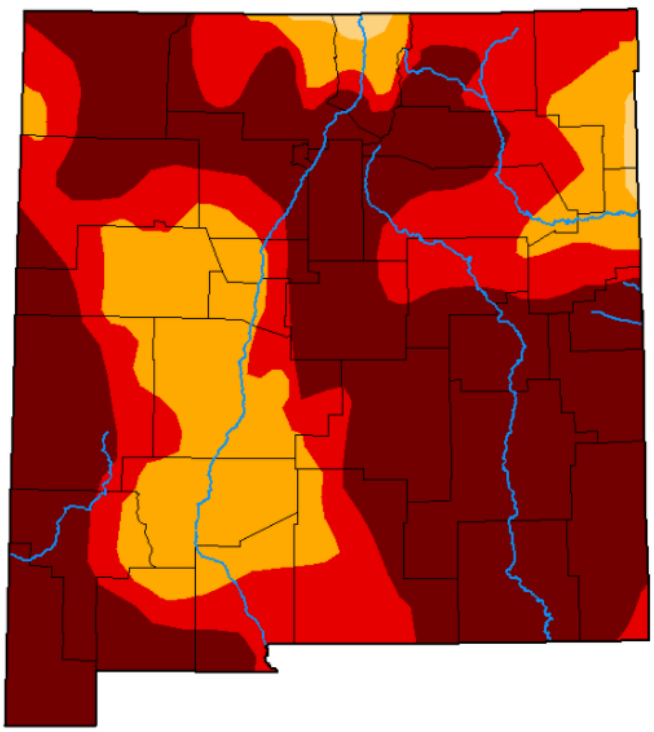
13 Source: http://www.drought.noaa.gov/

According to the National Drought Information Service, almost the entire state is suffering from severe drought, and those numbers increase to 79.9% in extreme and 53.3% in exceptional.[14] Historically, drought in the state of New Mexico ranges from abnormally dry to exceptionally dry, with a majority of the state hovering in a severe to extreme status. (Figure 11).

Figure 11: US Drought Monitor – New Mexico as of March 30, 2021[15]

U.S. Drought Monitor

New Mexico



March 30, 2021

(Released Thursday, Apr. 1, 2021)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.00	100.00	100.00	99.35	79.88	53.28
Last Week 03-23-2021	0.00	100.00	100.00	99.68	80.21	53.38
3 Months Ago 12-29-2020	0.00	100.00	99.97	99.59	82.26	53.20
Start of Calendar Year 12-29-2020	0.00	100.00	99.97	99.59	82.26	53.20
Start of Water Year 09-29-2020	0.00	100.00	99.92	73.65	39.88	2.90
One Year Ago 03-31-2020	55.74	44.26	26.25	11.40	0.00	0.00

Intensity:

- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to https://droughtmonitor.unl.edu/About.aspx

Author:
Brad Pugh
CPC/NOAA

USDA

droughtmonitor.unl.edu

Water Use at UNM

UNM Main Campus is a designated “large water system” by the New Mexico Environment Department. Over 40,000 people using UNM’s water consistently. Because UNM is a “large water system,” it is bound by the same regulations as the City of Albuquerque with regard to purity, cleanliness, testing and licensure. UNM’s FM is responsible for ensuring the water is clean and usable and is also committed to reducing water waste on campus.

[14] National Drought Information Service, https://www.drought.gov/states/new-mexico (retrieved on April 7, 2021).
[15] University of Nebraska-Lincoln https://droughtmonitor.unl.edu/Maps/MapArchive.aspx (retrieved on April 7, 2021)

Water usage annually:

- UNM pumps about 276 million gallons of water are pumped from UNM's wells
- Approximately 16 million gallons are used in the dorms
- 5 million gallons are used at La Posada
- 3 million gallons are used at the Student Union Building
- An estimated 40 million gallons are used in the medical buildings primarily located on the North Campus.
- Water is also used by utilities, landscaping and remaining campus buildings.

Accomplishments to reduce UNM's water usage:

- Installation of low-flow toilets and urinals
- 40,000 square feet of turf has removal for a more sustainable landscape
- Electricity saving efforts in unoccupied buildings (holidays and weekends)

Precipitation and Reservoir Storage

According to the NWS, precipitation has been near 30% below normal across nearly all of New Mexico, and is predicted to be so until November 2021 at least (January-November 2021)[16]. Snowpack was about 77% of average, down from 89% in 2019. This is comparable to the 2011-12 trends, according to Scott Overpeck, Meteorologist with the National Weather Service in Albuquerque.[17] Reservoir storage is less than 75% statewide, with some as low as 3%, according to the US Geological Service Current Water Data for New Mexico (USGS Current Water Data for New Mexico)

Previous Occurrences

According to the New Mexico Drought Plan, the state has experienced droughts since prehistoric times. During the more recent historical period, drought has had particularly acute impacts during the years 1900-1910, 1932-1937, 1945-1956, 1974-1977, 2002-2004, and 2011-2013. The most recent Drought Executive Order was signed by Governor Martinez on July 11, 2018 (Executive Order 2018-031). This ordered the Drought Task Force to review and revise the drought plan with a focus on drought planning, mitigation and response. This order also indicated that New Mexico had received less than half of the average precipitation for the water year, resulting in record low snowpack and spring runoff. Drought impacts were described as being beyond the response capability of local communities

All Preparedness Areas in New Mexico have experienced drought conditions over the last 9 years. The online NCDC database was used to investigate past events from January 1, 2012 – April 1, 2021, as entered by NOAA's NWS.[18] Referencing this online database, NCDC currently does not have data on drought losses.

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16 https://www.cpc.ncep.noaa.gov/products/predictions//multi_season/13_seasonal_outlooks/color/churchill.php

17 https://www.kob.com/new-mexico-news/new-mexico-dealing-with-below-normal-snowpack/6044454/

Table 21 highlights significant past droughts by Preparedness Area. Only past occurrences in preparedness areas with UNM properties are listed.

Table 21: Significant Past Occurrences-Drought[19]

Date	Location	Significant Event
Summer 2008	Northern New Mexico (Preparedness Area 2 and 3)	In the summer of 2008, the agriculture community was in a panic as the state was dealing with the endangered silvery minnow. Farmers were faced with a low snowpack that feeds irrigation reservoirs in northern New Mexico and low rainfall with forecasted continuing dry conditions cut irrigation supplies dramatically. Compounding issues more, legal issues were being considered ordering farmers to share the river supply to save the silvery minnow. This impacts financial capabilities in the agricultural community and decreases agricultural supply.

Emergency Management Agency Declared Disasters from Drought

NMDHSEM reports one State-declared disaster for drought between 2003 and 2013 which had State reimbursement funds available. This number is based on how many Executive Orders were signed by the Governor for drought which resulted in local government or tribal reimbursement. According to NMDHSEM records, the total cost for the 2006 State declared drought event was $500,000 (Table 22). Research into locations for each disaster would need to be completed prior to breaking-out the figures by Preparedness Area. There were no federal disaster declarations for drought from 2003 through 2017.

Table 22: State Disaster Event Information 2003 through 2017

Event Type	State Executive Order	Dollar Loss
Drought	2018-031	Not Available
Drought	2012-006	$500,000.00
Total	**1**	**$500,000.00**

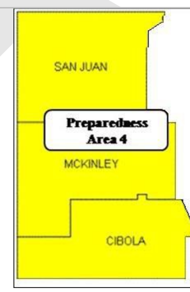
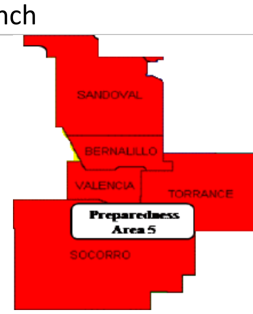
[18] Due to the large amount of data (thousands of records) the dates were scaled down to the most recent 2 years. The NCDC database only shows 500 records per query.
[19] Information is provided by the Drought Task Force Report at http://www.nmdrought.state.nm.us/

Current Drought Conditions

Each NMDHSEM zoned Preparedness Area has experienced the effects of drought. The U.S. Drought Monitor started in 2000. Since 2000, the longest duration of drought (D1–D4, Moderate to Exceptional) in New Mexico lasted 329 weeks beginning on May 1, 2001, and ending on August 14, 2007. The most intense period of drought occurred the week of January 19, 2021, where D4 affected 54.27% of New Mexico land.[20]

Table 23 provides an overview of the drought conditions of Preparedness Area's with UNM campuses and properties that exists as of May 18, 2021.

Table 23: Current Drought Conditions as of June 16, 2015 for Preparedness Areas 1-6[21]

Preparedness Area 3 UNM-Los Alamos Branch and UNM-Taos Branch	
Moderate Dry/ Exceptional Drought	
Preparedness Area 4 UNM-Gallup Branch	
Severe Drought/ Exceptional Drought	
Preparedness Area 5 UNM Main Campus, UNM Sevilleta Long Term Ecological Research (LTER) Field Station, UNM West, and UNM-Valencia Branch	
Severe Drought/Exceptional Drought	

[20] https://www.drought.gov/states/new-mexico, Accessed May 25, 2021

[21] Source: US Drought Monitor (May 18, 2021)

Frequency

Drought is a regular event in all areas of New Mexico that visits the state in recurring cycles. Experts predict that drought conditions are likely to continue for the foreseeable future. Periods of recent extreme meteorological drought, as defined by a Palmer drought index of -4.0 or lower, have been noted in the mid-1930's in the Northeastern Plains and Central Highlands, in 1947 in the Central Highlands, in the 1950's throughout the State, in 1963-64 in the Northern Mountains, in 1964 in the Southeastern Plains, and in 1967 in the Northern Mountains. Drought again started in 2000 and continued till 2004. The longest general drought since 1930 was in the 1950's.[22]

Probability of Future Occurrence

According to the NOAA Climate Prediction Center, the Seasonal Drought Outlook indicates drought conditions will persist for the remainder of 2021.[23]

Risk Assessment

While drought conditions in the state are improving, the history of drought in New Mexico demonstrates that drought occurs in cycles. Long-term solutions for coping with drought conditions and a limited water supply will require increased cooperation between urban users and agricultural use. UNM facilities in rural parts of the state may need to increase or diversify their sources of water. UNM Main Campus has its own water supply, therefore it is less susceptible to the effects of drought. However, UNM Main Campus should continue to take measures to reduce water use on campus.

A prolonged drought also increases the probability of other hazards. Forests become more susceptible to wildfires and native vegetation dies, leaving exposed soils susceptible to erosion, flash flooding, and dust storms. UNM branch campuses are located in rural areas of the state that are susceptible to these hazards that are worsened by drought conditions. Table 24 identifies potential impacts from a drought.

Table 24: Potential Impacts from Drought

Subject	Potential Impacts
HEALTH and SAFETY of the PUBLIC	Increased number of wildfires; Health problems related to low water flows and poor water quality; Health problems related to dust
HEALTH and SAFETY of RESPONDERS	Increased wildfire risk coupled with limited water supply makes it more challenging for responders to fight fires and puts responders at greater risk
CONTINUITY OF OPERATIONS	Impacts expected for operations that are dependent on water (Hydro power)
DELIVERY of SERVICES	Impacts expected for operations that are dependent on water
PROPERTY, FACILITIES, INFRASTRUCTURE	Potential impacts due to increase in dust and land subsidence, especially branch campus

[22] http://nmcc.nmsu.edu/en/climate-new-mexico/
[23] https://www.cpc.ncep.noaa.gov/, accessed May 25, 2021

Subject	Potential Impacts
	locations.
ENVIRONMENT	Animal habitat and food supply can dwindle causing species die-off; poor soil quality; loss of wetlands; increased soil erosion; migration of wildlife
ECONOMIC CONDITION	Decreased tourism; Crop loss; Decreased land prices; Unemployment from drought-related declines in production; Increased importation of food; Rural population loss
PUBLIC CONFIDENCE	Reduced incomes; Fewer recreational activities; Increase in food costs due to loss of crops and livestock; Loss of aesthetic values; Loss of cultural sites

Data Limitations

Given that drought is a slow-moving hazard without an event to mark its arrival, a one-time drought can be difficult to define. In most cases, the dry weather conditions that cause droughts will need to persist for a while before it becomes clear that drought conditions exist. There are also data limitations in determining the available quantity and quality of groundwater. The costs associated with drought are difficult to quantify and are not available on the NCDC.

Summary of Impact to UNM

All UNM campuses are equally vulnerable to drought conditions. Drought measurements are not very precise, and often they are directed toward particular segments of the state. For example, there are drought measurements based upon agricultural conditions; there are measurements of stream flow and water storage in reservoirs; there are measurements of groundwater and effects upon drinking water systems; and there are strictly meteorological and climatic measurements. Some drought indicators might point toward an abatement of drought conditions for the agricultural sector, while the drought continues for drinking water in the same area. Because of the limited agricultural activity, UNM Main and Branch Campuses vulnerability to drought is determined low.

Earthquakes

Hazard Characteristics

Earthquakes hazards principally arise from ground motions due to seismic waves (elastic waves traveling through the earth). Such ground motions can be generated by explosions, or by other phenomena that apply forces to the surface or interior of the earth. However, earthquakes are most commonly due to rapid slip along a zone of weakness (a fault). This process releases internal stress and converts a small portion (a few percent) of the associated strain energy into seismic waves that can propagate for great distances. Earthquakes occur most frequently near the boundaries between tectonic plates, which segment earth's crust and shallow mantle. However, damaging earthquakes can also occur within plate interiors in regions where strain accumulates, or where the frictional properties of faults are perturbed, due to volcanic, tectonic, or anthropogenic processes (e.g., fluid withdrawal or injection). Although earthquakes in the United States during the past few decades have caused less economic loss annually than other hazards, they have the potential to cause great and sudden losses. Within one to two minutes, an earthquake can devastate a city through ground shaking, surface-fault ruptures, and ground subsidence. Earthquakes furthermore often trigger other devastating hazards, such as landslides, fires, and damage to dams and levees.

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 widespread 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 record 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 (the geographic location and depth of the earthquake source). Earthquakes generate elastic waves, both in 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 2000 to 9000 miles/hour). P waves typically produce predominantly vertical forces on buildings. S (secondary) waves, also known as shear waves, have a transverse (side-to-side relative to their propagation direction) motion and travel more slowly (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, which structures 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 (the extensive damage to Mexico City in 1985 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 one in earthquake magnitude indicates an approximately 32-fold increase in energy). Intensity, in contrast, varies spatially and with local geology, and describes the strength 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 in use by the scientific and hazard community, based on different observable characteristics of seismic waves. The oft-noted Richter Scale is the original magnitude scale, but it is technically applicable only to southern California and is scientifically obsolete. The three extensively quoted scales are the body wave magnitude, mb the surface wave magnitude, ms, and the moment magnitude, mw. Body and surface wave magnitudes vary because they are based on the amplitudes of observed body and surface waves, respectively. These components of the seismic wavefield 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 larger departures only commonly occurring for very large earthquakes (magnitudes in excess of 7.5).

The commonly used Modified Mercalli Intensity (MMI) Scale is expressed in Roman numerals. It is based on the amount of shaking and specific kinds of damage to man-made objects or structures. This scale has twelve 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.

Table 25 illustrates the comparison for scales of magnitude and intensity.

Table 25: Different Magnitudes of Earthquakes

PGA (% G)	Magnitude (Richter)	Intensity (MMI)	Description
<0.17	1.0-3.0	I	I. Not felt except by a very few under especially favorably conditions.
0.17-1.4	3.0-3.9	II-III	II. Felt only by a few persons at rest, especially on upper floors of buildings. III. Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motorcars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
1.4-9.2	4.0-4.9	IV-V	IV. Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motorcars rocked noticeably. V. Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
9.2-34	5.0-5.9	VI-VII	VI. Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight. VII. Damaged negligible in buildings of good design and construction; slight to moderate in well-build ordinary structures; considerable damage in poorly built or badly designed structures; chimneys broken.
34-124	6.0-6.9	VIII-IX	VIII. Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments and walls. Heavy furniture overturned. IX. Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
>124	7.0 and higher	X or higher	X. Some well-built wooden structures destroyed; most masonry and frame structures destroyed and foundations. Rails bent. XI. Few, if any (masonry), structures remain standing. Bridges destroyed. Rails bent greatly. XII. Damage total. Lines of sight and level are distorted. Objects thrown in the air.

Historic and Prehistoric Earthquakes in New Mexico

The Rio Grande rift is a major tectonic feature of western North America (Wilson et al., 2005), and is expressed on the surface of the earth as a series of elongate north-south trending basins that run from central Colorado, through the central parts of New Mexico, into northern Mexico where it blends with the greater Basin and Range Province. Because the rift guides the path of the Rio Grande in New Mexico, it is the most highly populous sector of the state. Much of New Mexico's historical seismicity has been concentrated in the Rio Grande Valley between Socorro and Albuquerque, with about half of the earthquakes of intensity VI or greater (MMI) that occurred in the state between 1868 and 1973 being centered in this region. Los Alamos lies near several major boundary faults of the Rio Grande rift in north-central New Mexico. The margin of the Rio Grande rift in the Los Alamos area is locally defined by the Rio Grande rift-related Pajarito fault system.

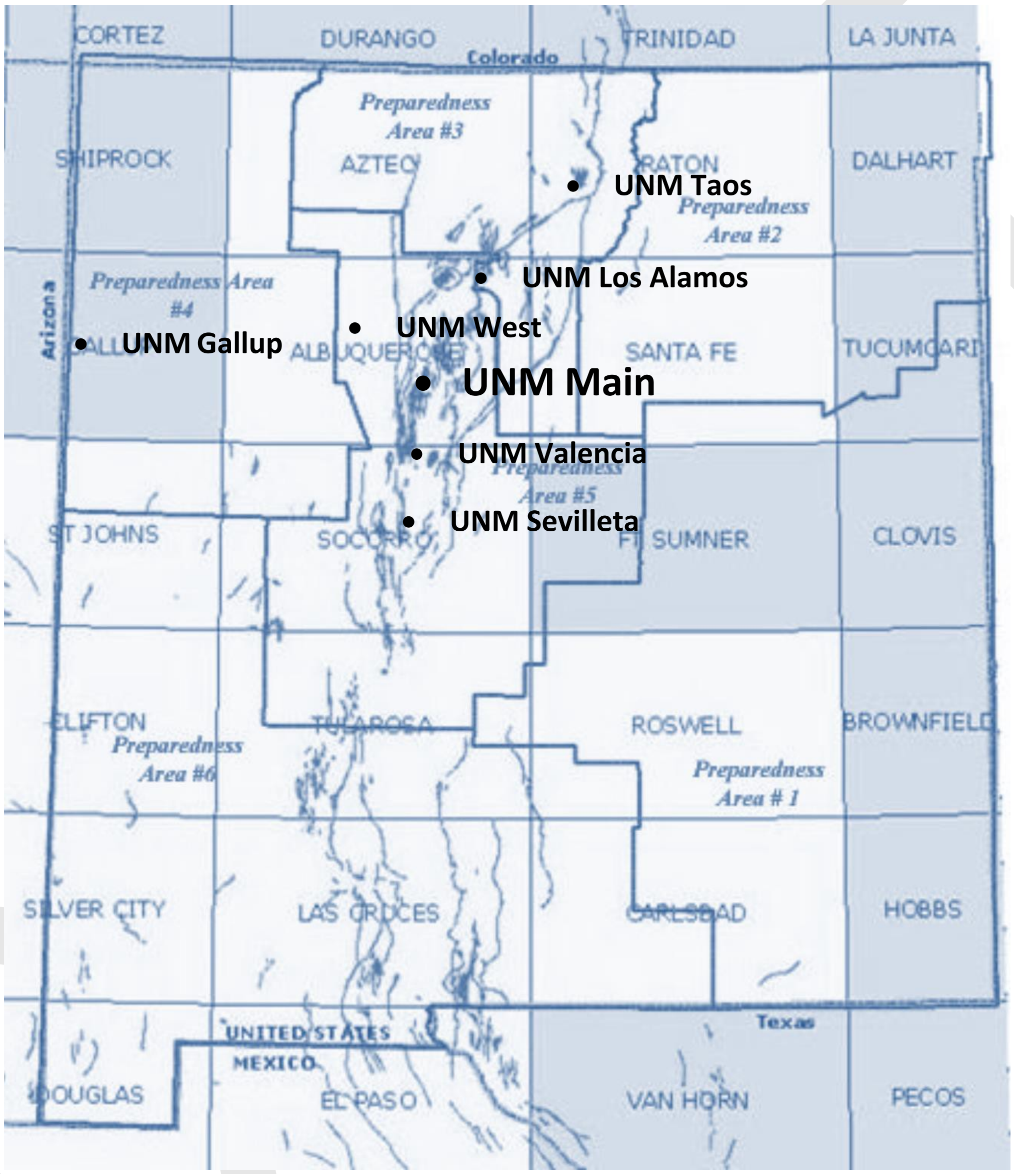
Historic earthquakes in the southwestern U.S. and northern Mexico region include a magnitude ~7.2 earthquake in northern Mexico in 1887 (which is perhaps a good analogue for a large Rio Grande rift earthquake in New Mexico), numerous magnitude 4 to 6 earthquakes in the Socorro areas throughout the 20th century (most notably two earthquakes near magnitude 6 in 1906), and magnitude 4 to 5+ events in Cerrillos and Dulce in 1918 and 1966, respectively. The net earthquake threat to the state is considered moderate in a national perspective. There have been at least eight earthquakes felt by the residents of Los Alamos since its creation during World War II. The largest of these registered a magnitude 4 that occurred in 1952 and a magnitude 3.3 in 1971; both earthquakes had reported MMIs of V in Los Alamos. More recently, Los Alamos experienced very small magnitude (<2) earthquakes (1991 and 1998) that produced unusually high MMIs (up to V). Recent paleoseismic studies on the Pajarito fault systems indicated that a large earthquake of approximately magnitude 7 occurred in recent prehistoric times. An October 17, 2011 magnitude 3.8 earthquake generated MMI levels of III-IV in the Espanola Basin/Pojoaque/Santa Fe region.

Thousands of recorded earthquakes have been measured in New Mexico and analyzed in recent decades by the New Mexico Institute of Mining and Technology and/or the U.S. Geological Survey. The Socorro area has been the most active earthquake region of the state during at least the past 150 years. During the past 45 years, approximately 50% of the seismic energy generated by earthquakes in New Mexico has been released in a region centered near Socorro, encompassing only about 2% of the state's total land area. This relatively high rate of earthquake activity in the Socorro region is due to a slowly inflating (~2 mm/year) sill of molten rock (magma) that is roughly 1300 square miles in area and sits approximately 12 miles beneath the surface of the fault-bounded Rio Grande rift.

Some small earthquakes in New Mexico have also been triggered by human activity. Earthquake-like ground shaking may be related to oil and gas production and fluid reinjection.

Figure 12 shows the identified faults located in the state of New Mexico.[24] Faults and associated folds are included that are believed to be the source of earthquakes with a magnitude greater than 6 during the Quaternary Period (the past 1,600,000 years).[25]

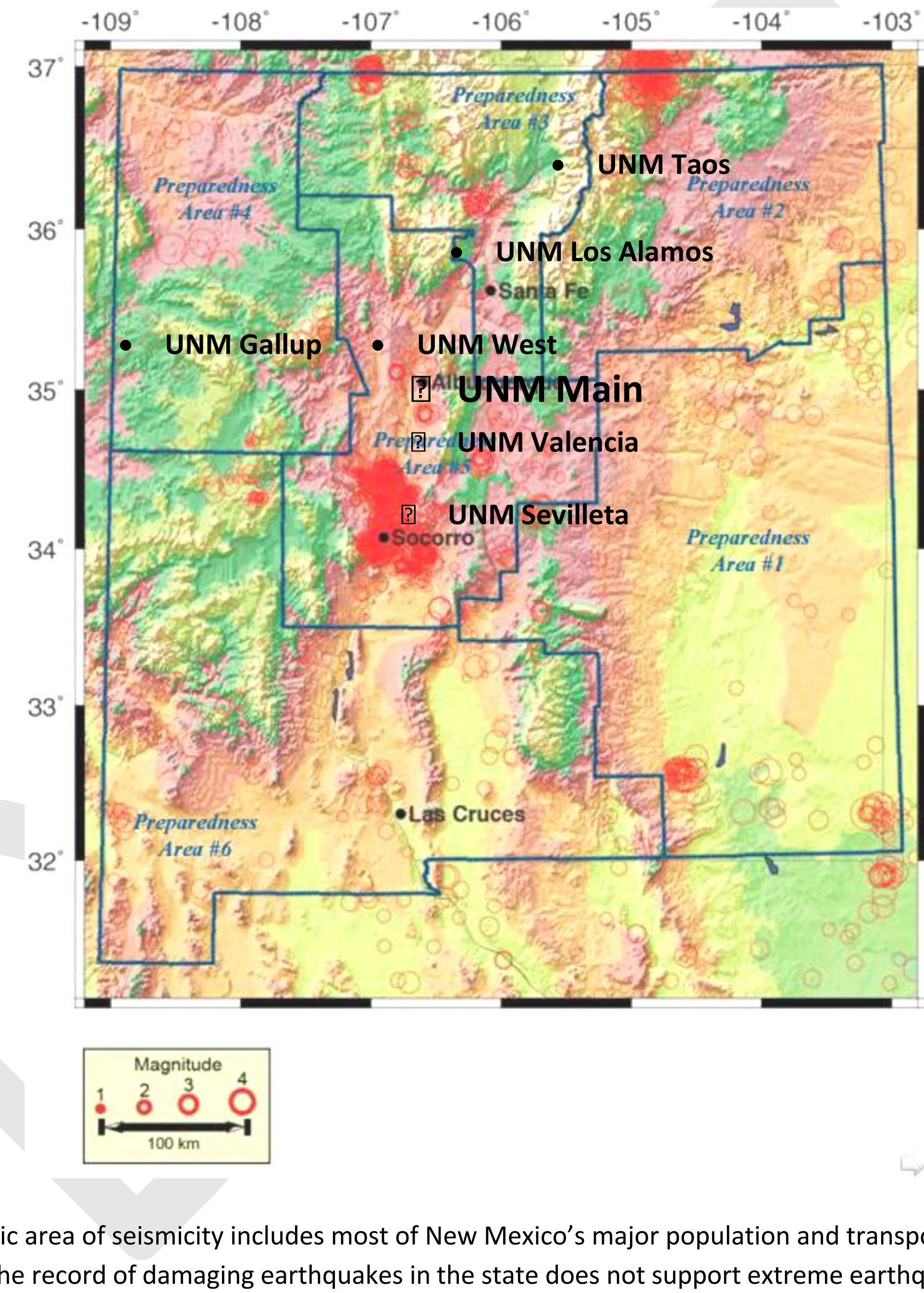
Figure 12: Preparedness Areas and Fault Lines in New Mexico



[24] Source: http://earthquake.usgs.gov/regional/qfaults/nm/
[25] Maps of each geologic structure: http://earthquake.usgs.gov/hazards/qfaults/

Figure 13 illustrates the earthquake hazard areas in the state of New Mexico. There has been a clustering of earthquake activity around the cities of Socorro and Albuquerque (both located in Preparedness Area 5). Additionally, significant amounts of high-magnitude seismic activity have beenrecorded in the northeast area of the state in Preparedness Areas 2 and 3.

Figure 13: Earthquakes in New Mexico, 1962 - 2012[26]



The historic area of seismicity includes most of New Mexico's major population and transportation centers. The record of damaging earthquakes in the state does not support extreme earthquake

[26] Aster, R., Bilek, S., Stankova, J., Morton, E., Earthquakes in the central Rio Grande rift and the Socorro magma body, Proc. Volcanism in the American Southwest, USGS Open File Report, Flagstaff, AZ, 2012.

mitigation measures, as are common in states like California or nations like Japan. However, the lack of serious earthquake damage in the past should not be interpreted as evidence that such damage will not occur in the future.

Previous Occurrences

The City of Socorro (Preparedness Area 5) is the earthquake capital of New Mexico. Socorro is 78 miles south of Albuquerque. A 5,000 km2 (1,931 mi2) area, less than 2% of New Mexico, surrounding the town has produced nearly 50% of the 30 natural earthquakes of magnitude 4.5 or greater in the state since 1869. Three of these shocks occurred during a very strong swarm from 2 July 1906 through early 1907 and were the strongest within the state from 1869 through 2012. Information on these shocks comes from newspaper accounts and notably from a published paper by the noted seismologist H. F. Reid. His paper on the 1906–1907 swarm in the first issue of the Bulletin of the Seismological Society of America and presents Rossi-Forel earthquake intensity observations out to distances of several hundred kilometers for the three strong earthquakes of the swarm.[27]

Earthquake swarms, defined as a series of earthquakes recurring for days in nearly the same location within minutes of each other, are very common in this region. Historical accounts of these swarms date back to the 1860s, and they have been recorded on local seismic instruments since the early 1960s. The majority of the earthquakes in these swarms are shallow (3-8 miles beneath the surface), and relatively small (M < 1.0). These small earthquakes are not damaging; however, based on historic seismicity and geologic evidence, there is a chance for a larger, possibly damaging event in the future (Wong, 2009). According to the US Geological Survey, there is an 18% chance of a large earthquake (M > 6.0) in the Socorro region in the next 100 years.

Twelve strong felt earthquakes with estimated magnitudes of 4.5 or greater occurred in the Socorro area from 1869 through 1961. Unlike the instrumental data from 1962 through 2004, nearly all of these strong shocks appear to have had epicenters near Socorro rather than north of San Acacia. Also, the statistics for earthquakes with magnitudes of 4.5 or greater from 1869 to the present indicated the Socorro-area seismic activity before the 1930s was significantly higher primarily because of prolonged earthquake swam that commenced in July 1906 a few months following the San Francisco earthquake in April of that year. Earthquakes were felt as early as July 2, 1906 and continued almost on a daily basis well into 1907. Three shocks in the swarm had magnitudes of 5.5 to 6.1, strong enough to significantly damage some adobe and masonry structures. The most unusual characteristic noted of the swarm was the exceptionally large number of felt earthquakes over a six-month period. It is suspected that weak shocks probably related to the swarm continuing into 1909.

The largest earthquakes of record in this region occurred during an ongoing earthquake swarm in 1906, and the magnitudes of the two largest events were approximately 6.0. For comparison, the largest felt and heard event from the most recent swarm in this region (August 2009) was M 2.6. This earthquake

[27] Source: Reid, H.G. Remarkable earthquakes in central New Mexico in 1906 and 1907, Bulletin of the Seismological Society of America, 1, 10-16, 1911. Sanford, A.R., 2008, New Estimates of the magnitudes and locations for the strongest earthquakes in 1906-07 Socorro, New Mexico, earthquake swarm: New Mexico Geology, 30, 107-112.

increased the property damage already sustained at Socorro from previous earthquakes. Four rebuilt chimneys were shaken off the Socorro County Courthouse, and two others were cracked severely. Plaster fell at the courthouse, and a cornice on the northwest corner of the two-story adobe Masonic Temple was thrown onto its first floor. Several bricks fell from the front gable on one house. Plaster was shaken from walls in Santa Fe, about 139 miles from the epicenter. Felt over most of New Mexico and in parts of Arizona and Texas.[28]

Table 26 lists the locations and dates of the strongest earthquakes that have occurred in New Mexico since 1869. The have been no earthquakes reported in the State larger than 4.5 since 2005.

Table 26: Earthquakes 4.5 and Greater in New Mexico (1869 - 2015)[29]

Table 26 below identifies the number of 4.5 or greater magnitude earthquakes in the State of New Mexico.

Date	Time	Depth	Mag	Mag Type	RMS	Location
8/10/2005	22:08:22	5	5	mw	0.68	Raton, NM
1/2/1992	45:35.6	5	4.6	mb	0.8	Eunice, NM
1/29/1990	16:10.7	12	4.5	mb		Bosque, NM
11/29/1989	54:38.5	13	4.6	mb		Bosque, NM
9/20/1982	55:17.2	11.3	5	mb		San Antonio, NM
3/5/1977	00:54.7	22	4.6	mb		Crownpoint, NM
1/5/1976	23:32.9	25	5	mb		Crownpoint, NM
3/17/1973	07:43:05	6	4.5	mb		Hernandez, NM

Table 27 outlines earthquakes where additional information was available regarding damage reports or unique conditions.

Table 27: Significant Past Occurrence - Earthquake 1918 – 2010

Date	Location	Significant Event
September 1, 2009	Socorro, NM (Socorro County) Preparedness Area 5	Earthquake Swarm Seismicity within the Socorro region has been very active in recent days. A felt earthquake of magnitude (ML) 2.3 occurred approximately 3 km NE of Socorro near Escondida. Small events continued to occur during this time with activity beginning near the Lemitar area on August 24, 2009. These events have been numerous and fairly shallow depth of 5.5-6 km. The largest event was ML=2.5 on August 29, 2009 at 18:31:01 MDT (August 30, 2009 at 01:31:01 UTC) and was felt by many residents of Lemitar and Socorro. We have preliminary locations on the

[28] Source: http://earthquake.usgs.gov/regional/states/events/1906_11_15.php; Reid, 1911
[29] "USGS: Earthquake Archives", http://earthquake.usgs.gov/earthquakes/search/ (July 27, 2015)

Date	Location	Significant Event
		largest 53 events (ML range of 0.5 to 2.5); however, over 400 smaller events have also occurred since August 19, 2009. The locations of 53 of the largest earthquakes are very similar, suggesting that this is an earthquake swarm. Earthquake swarms are usually caused in response to tectonic or hydrological pressure changes in the crust. Minor felt earthquakes in this region are not uncommon and have been documented by Dr. Allan Sanford in the past (figure below, blue squares). However, this was a swarm with unusually frequent, large earthquakes (14 earthquakes with ML > 1.4). For a size comparison, felt reports were noted for 4 events with ML 1.9 and greater.
January 4, 1971	City of Albuquerque (Bernalillo County) Preparedness Area 5	Maximum Intensity VI earthquake felt within 600 square miles of the City of Albuquerque. Minor damage in the west and northwest of the City with reports of cracked walls/ plaster, broken windows and damage to fallen objects. Most damage reported at University of Albuquerque (now the location of St. Pius X High School) and West Mesa High School, both located on the west side of the City.
November 3, 1954	Albuquerque, NM (Bernalillo County) Preparedness Area 5	Plaster cracks, broken windows, and cracked fireplaces have been reported from past earthquakes. Minor structural damage occurred to a bank in Albuquerque from an intensity V earthquake. Barns have collapsed and rooftop air-conditioners shaken loose.
May 28, 1918	Village of Cerrillos (Santa Fe, County) Preparedness Area 3	An earthquake with strong local effects in Santa Fe County, where people in the village of Cerrillos were thrown off their feet and fallen plaster was reported (intensity VII - VIII).
November 15, 1906	Socorro, NM (Socorro County) Preparedness Area 5 Santa Fe, NM (Santa Fe, County) Preparedness Area 3	The largest historic earthquake in New Mexico: (Mercalli Intensity: VII): This earthquake, which was the culmination of a sustained earthquake swarm between 1904 through 1907, increased the property damage already sustained at Socorro from previous earthquakes. Four rebuilt chimneys were shaken off the Socorro County Courthouse, and two others were cracked severely. Plaster fell at the courthouse, and a cornice on the northwest corner of the two-story adobe Masonic Temple was thrown onto its first floor. Several bricks fell from the front gable on one house. Plaster was shaken from walls in Santa Fe about 200 kilometers from

Date	Location	Significant Event
		the epicenter. Felt over most of New Mexico and in parts of Arizona and Texas.[30]

Frequency

Based on state-wide date related to past seismic event, the frequency of magnitude 4.5 or larger earthquakes in the State of New Mexico has been determined as low to medium. Historically, based on available data related to previous earthquake events in New Mexico, every year there is a .22 chance of a 4.5+ earthquake occurring in New Mexico.

Probability of Future Occurrence

Significant earthquakes (larger than 6.5 magnitude with more than $1 million in damage) with epicenters in the State of New Mexico have not been felt in recent history, but the area has numerous faults with the potential for a large magnitude earthquake. The potential for such a disaster is low. The greatest threat is along the Rio Grande Rift and the Jemez Lineament that runs North-east to South-west near Los Alamos.

Figures 14-17 provide a visual representation of the maximum probable earthquake epicenter and potential peak ground acceleration (PGA) values for individual towns and cities across the state. The location and magnitude for the epicenters were recommended by Subject Matter Experts for each Preparedness Area.

Risk Assessment

Significant earthquakes (larger than 6.5 magnitude with more than $1 million in damage) with epicenters in the State of New Mexico have not been felt in recent history. However, the state contains numerous faults with potential for large magnitude earthquakes. The potential for such a disaster is low. The greatest threat is along the Rio Grande Rift and the Jemez Lineament that runs northeast to Southwest near Los Alamos. This area includes UNM Main Campus, UNM Valencia Branch, UNM West, UNM Los-Alamos Branch, and the Sevilleta LTER Field station. According to Arup Maji (Professor Civil and Structural Engineering, University of New Mexico) the likely consequence to New Mexico is partial collapse of unreinforced masonry and old adobe buildings. Roads and bridges are unlikely to suffer damage that would render them unusable.

According to Rick Aster (Chair of the Department of Earth and Environmental Science, New Mexico Institute of Mining and Technology), if a major basin and range earthquake similar to the 1887 Sonoran Earthquake were to occur in New Mexico, the state would suffer high levels of damage, with general losses ranging from 10s to 100s of millions of dollars depending on the location of the event. Furthermore, the area most subject to seismic activity, based on historic occurrence, is the Socorro-to-Albuquerque segment of the Rio Grande valley. This area is densely populated and rapidly developing. Present building codes require construction of certain occupancies (schools, hospitals, public buildings) to high earthquake resistance standards, although seismic mitigating construction is not required for residential buildings.

[30] Source: http://earthquake.usgs.gov/regional/states/events/1906_11_15.php; Reid, 1911

NMDHSEM was able to contract with the Earth Data Analysis Center of University of New Mexico to conduct Hazus modeling in each of the six Preparedness Areas. Hazus runs were done based on the highest magnitude most probable earthquake (listed in Table 28). Based on input from Subject Matter Experts Dave Love (Principal Senior Environmental Geologist, New Mexico Institute of Mining and Technology) and Richard Aster, the following maximum probable magnitude earthquakes were modeled for each Preparedness Area. Only preparedness areas with UNM properties are listed.

Table 28: Hazus Model Maximum Probable Magnitude for each Preparedness Area

Preparedness Area	Location	Maximum Probable Magnitude
3	Los Alamos	7.5
4	Farmington	5.5
5	Albuquerque	7.5

The following maps (Figures 14-17) depict the maximum probable earthquake epicenter and peak ground acceleration (PGA) calculations for each Preparedness Area. PGA quantifies what is experienced by a particle on the ground during the event of an earthquake. It is recorded by taking the largest increase in velocity recorded by a particular seismic station during an earthquake.

Figure 14: Maximum Probable Earthquake Epicenter and Potential Peak Ground Acceleration

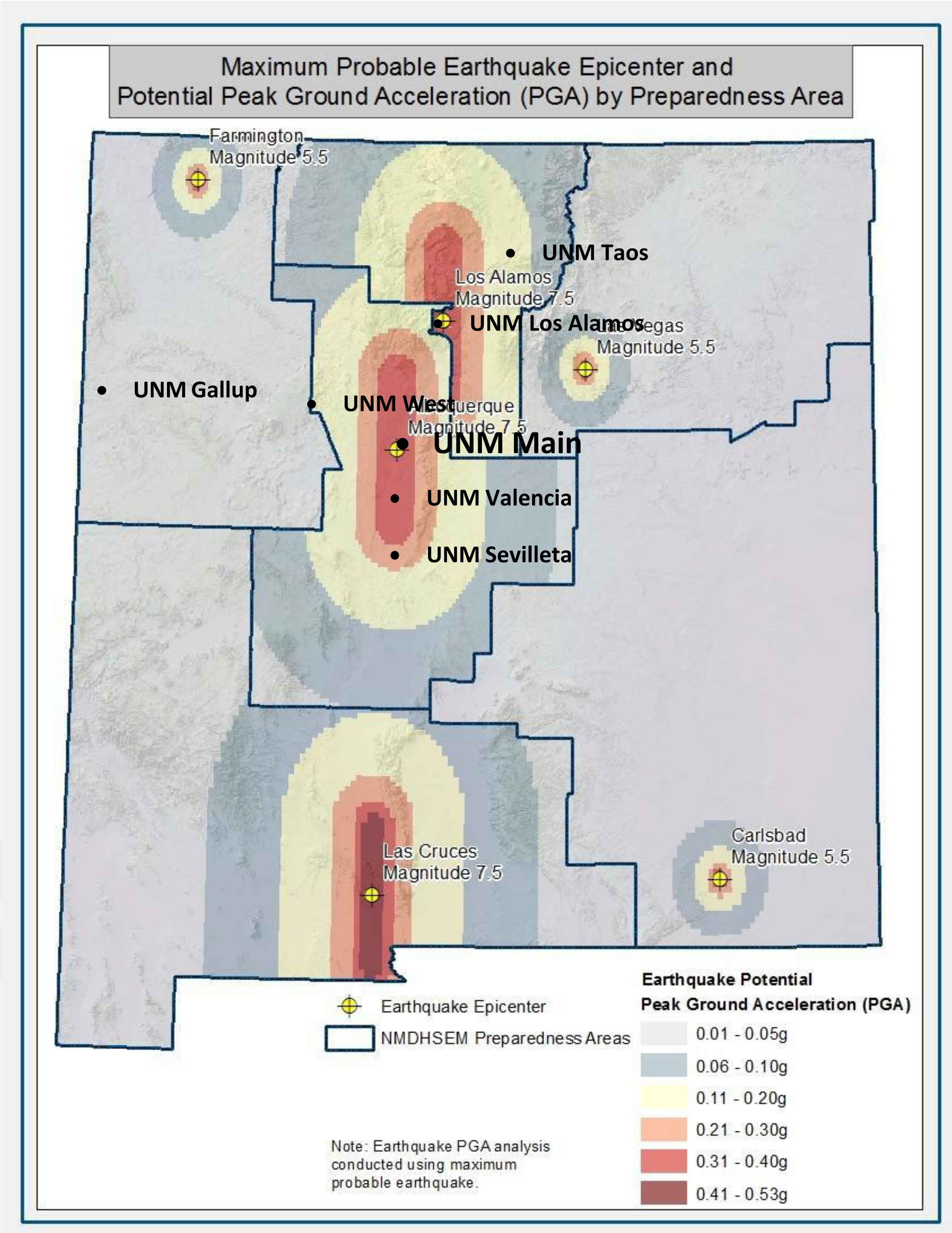


Figure 15: Maximum Probable Earthquake Epicenter and Potential Peak Ground Acceleration, Preparedness Area 3

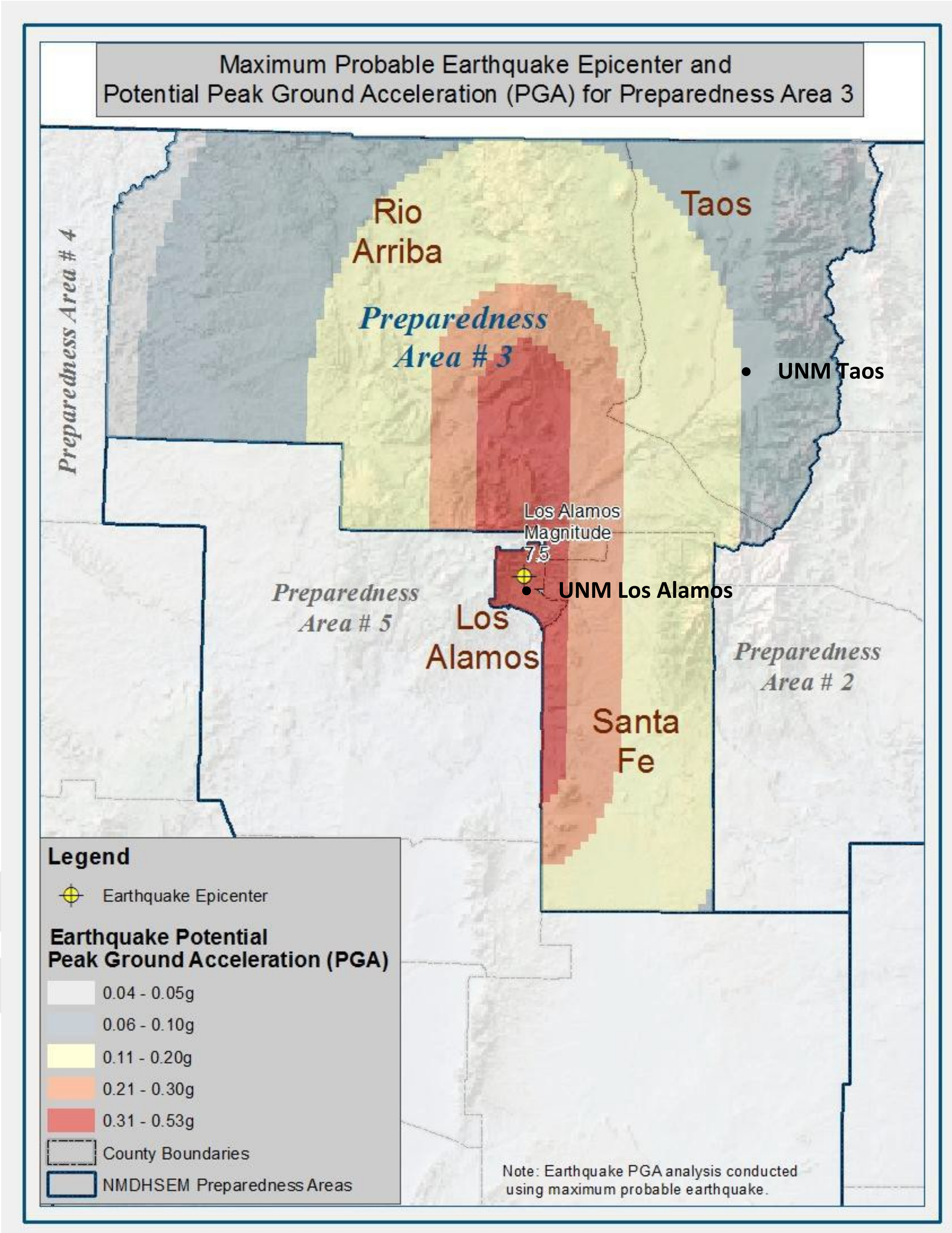


Figure 16: Maximum Probable Earthquake Epicenter and Potential Peak Ground Acceleration, Preparedness Area 4

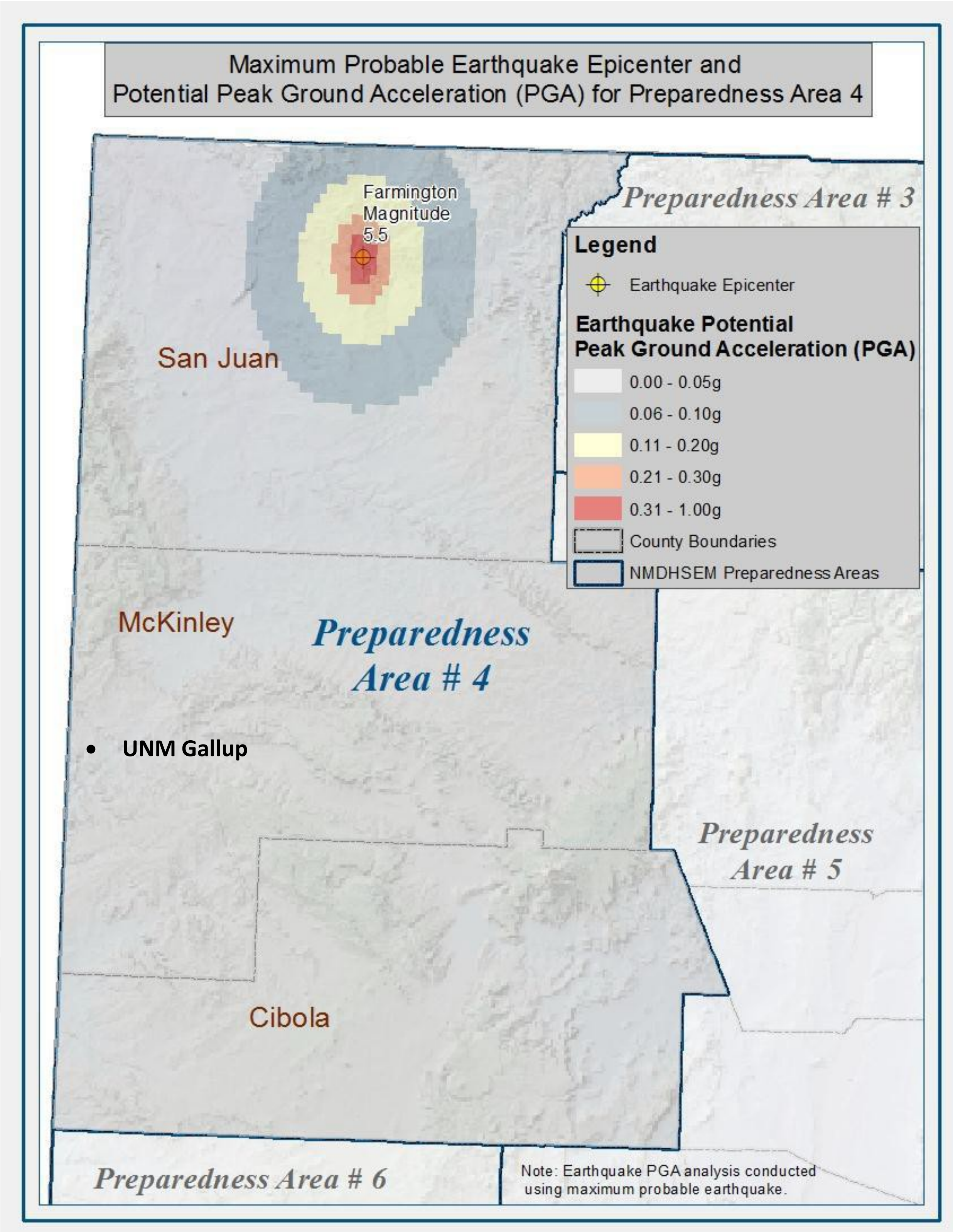


Figure 17: Maximum Probable Earthquake Epicenter and Potential Peak Ground Acceleration, Preparedness Area 5

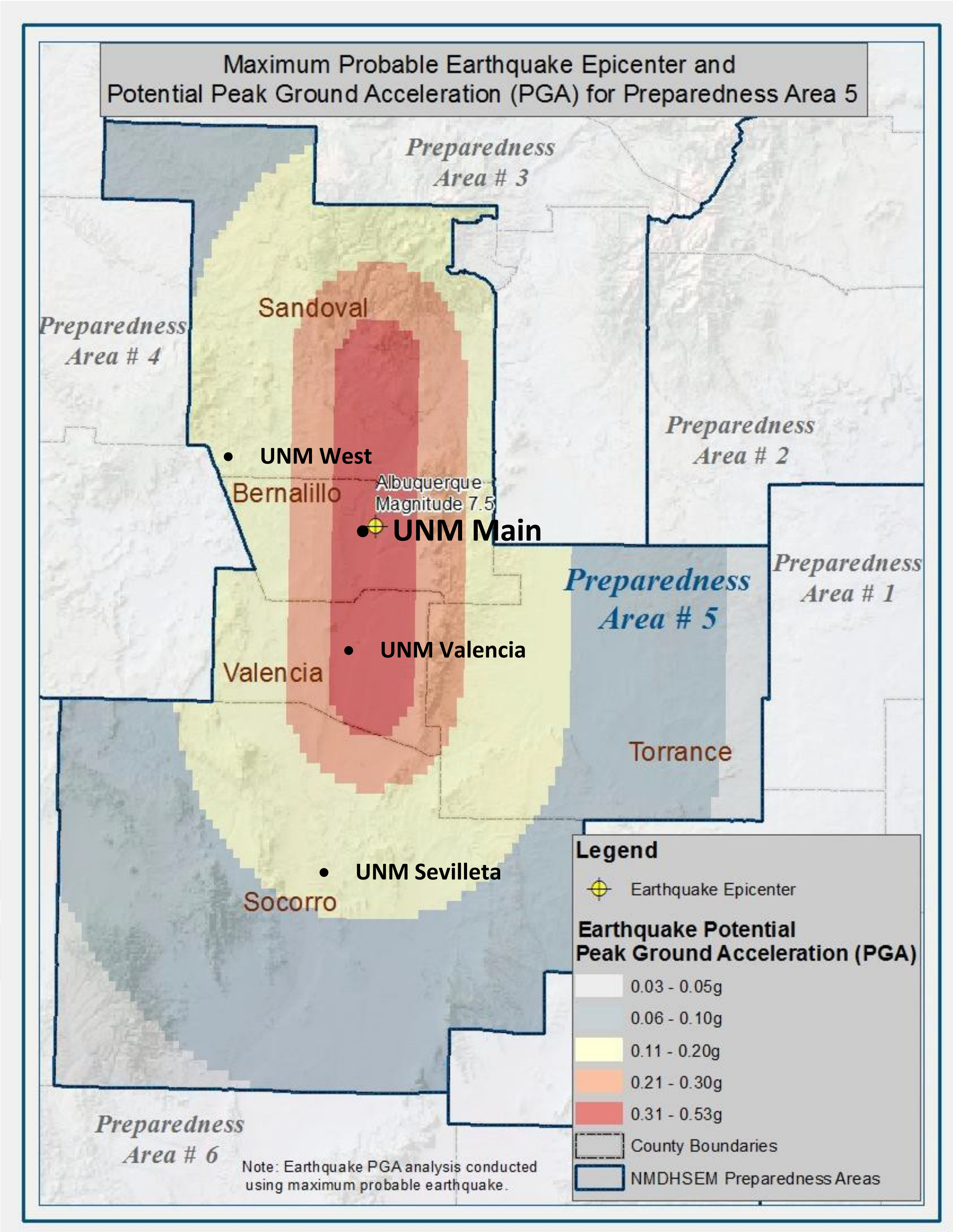


Table 29 identifies potential impacts from an earthquake.

Table 29: Potential Impacts from Earthquakes

Subject	Potential Impacts
Health and Safety of the PUBLIC	The public may be injured or killed by falling materials. Broken glass can cause injuries.
Health and Safety of RESPONDERS	Responders face the same impacts as the public
CONTINUITY OF OPERATIONS	Those operations that are in or near the impact area may be shut down or even destroyed.
DELIVERY of SERVICES	Service delays are anticipated to operations within or near the damaged areas.
PROPERTY, FACILITIES, INFRASTRUCTURE	Earthquakes can cause widespread damages to buildings and infrastructure. Some buildings or bridges can be condemned. Water and gas lines as well as dams may rupture. Earthquake building codes have not been implemented consistently throughout the state, and this could be a serious problem.
ENVIRONMENT	The cascading effects such as landslides are the main environmental issue.
ECONOMIC CONDITION	A strong earthquake may cause severe damages within a community.
PUBLIC CONFIDENCE	No impacted by the event itself, but may be damaged if the response to an event is poor.

Data Limitations

Present seismic monitoring in New Mexico is conducted by the New Mexico Institute of Mining and Technology and the U.S. Geological Survey National Earthquake Information Center in Golden, CO. Levels of instrumentation and staffing are presently sufficient to generally characterize events anywhere within the state to magnitude levels of approximately 3.0 (and significantly smaller in better instrumented areas, such as the vicinity of the WIPP/Carlsbad area and the Socorro region. Unusual sequences of exceptional societal or scientific interest can be additionally studied with temporary deployments of portable seismographs through the IRIS PASSCAL Instrument Center at the New Mexico Institute of Mining and Technology and/or using USGS national resources. Los Alamos National Laboratory also operates a regional seismographic network focused on the Pajarito fault zone and Valles Caldera region.

Summary of Impact to UNM

Much of the UNM's infrastructure, especially older construction, has not been designed with earthquake resistance in mind. An earthquake of even moderate scale in the right place could cause extensive damage. Based on peak acceleration values, it is apparent that the region roughly along the Rio Grande from southern Socorro County north into Rio Arriba County is where seismic activity would be expected. UNM Main Campus, UNM West, Los Alamos Branch Campus, Taos Branch Campus, Valencia County Branch and Sevilleta LTER Field Station are located within Rio Grande fault line and are vulnerable to earthquake damage. The Gallup Branch Campus data is not available and further studies will be required to determine those vulnerabilities.

There are no credible seismic damage estimates for UNM Main, Gallup, Los Alamos, Taos, Valencia branch campuses, UNM West, and Sevilleta LTER Field Station. More information is needed on the types of structures —their age, condition, and construction type—in order to rate their relative vulnerability. For example, unreinforced masonry structures built before current building codes are more susceptible to damage than others built to seismic-resistant codes. UNM Main Campus buildings range in age from 1889 to present day. Older buildings within the infrastructure are more susceptible to natural hazards than newer constructed or reconstructed structures and become a challenge when determining the best approach to implement a mitigation strategy. Facilities at the Branch locations are newer in design and have fewer infrastructure concerns, based on past incidents. As buildings are being considered for renovation or new facilities constructed, UNM Planning and Campus Development should consider building design based on mandatory construction laws and regulations as well as best practices and lessons learned from past natural hazard events.

Extreme Heat

Hazard Characteristics

Extreme heat is defined as temperatures that hover 10 degrees or more above the average high temperature for the region and last for several weeks. In an average year, extreme heat kills 175 people.[31] Young children, the elderly, outdoor laborers, and sick people are the most likely to suffer the effects of extreme heat. The heat index measures the severity of hot weather by estimating the apparent temperature: how hot it feels (Table 30). Skin resistance to heat and moisture transfer is directly related to skin temperature, therefore the ambient temperature can be quantified by examining the relation between relative humidity versus skin temperature. If the relative humidity is higher/lower than the base value, the apparent temperature is higher/lower than the ambient temperature.

Table 30 also outlines the heat disorders during extreme temperatures. In New Mexico at elevations below 5,000 feet, individual day-time temperatures often exceed 100°F during the summer months. However, during July, the warmest month, temperatures range from slightly above 90°F in the lower elevations to 70°F in the higher elevations.[32]

Table 30: Heat Index/Heat Disorders[33]

Heat Index/Heat Disorders		
Danger Category	**Heat Disorders**	**Apparent Temperature (°F)**
I Caution	Fatigue possible with prolonged exposure and physical activity	80-90
II Extreme Caution	Sunstroke, heat cramps and heat exhaustion possible with prolonged exposure and physical activity	90-105
III Danger	Sunstroke, heat cramps and heat exhaustion likely; heatstroke possible with prolonged exposure and physical activity	105-130
IV Extreme Danger	Heatstroke or sunstroke imminent	>130

Extreme heat, or heat wave, is defined by the NWS as a temperature of ten degrees 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 existswhen the body's core temperature rises above 105° F as a result of environmental temperatures. Patients may be delirious, in a stupor or comatose. The death-to-care ratio in reported cases in the U.S. averages about 15%.

[31] *FEMA Extreme Heat Backgrounder*
[32] Source: *Western Region Climate Center* www.wrcc.dri.edu/narratives/NEWMEXICO.htm
[33] Information provided by NOAA: http://www.nws.noaa.gov/os/heat/index.shtml#heatindex

- 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 physical activity. The symptoms include 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° to 5° F. Populations of elderly, disabled, and debilitated people could face a significant medical emergency during an extended period of excessive heat. The highest temperature on record for Albuquerque is 107°F on June 6th, 1994. Los Lunas, NM sees an average of 6 days in a year over 100 degrees. UNM locations in higher elevations, such as Los Alamos and Taos don't see temperatures rise over 100 degrees.

New Mexico is partially an arid desert state, and summer temperatures often exceed the 100-degree mark 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, anywhere in 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 due to a lack of air conditioning. In general, it is safe to say that there is no area of the state that is immune from the hazard of heat wave.

A unique aspect to 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 percent. This means that approximately 20 percent 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.

In 1979, meteorologist R.G. Steadman developed a heat index (Figure 18) to illustrate the risks associated with extreme summer heat. NOAA's heat alert procedures are based mainly on Heat Index Values. The Heat Index, sometimes referred to as the “apparent temperature” is given in degrees Fahrenheit. The Heat Index is a measure of how hot it really feels when relative humidity is factored with the actual air temperature.

Figure 18: Heat Index as of June 2015[34]

National Weather Service
Heat Index Chart

Temperature (°F)

Relative Humidity (%)	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	128	136					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127										
100	87	95	103	112	121	132										

Likelihood of Heat Disorders with Prolonged Exposure and/or Strenuous Activity

Caution — Extreme Caution — Danger — Extreme Danger

According to the Office of the Medical Investigator, there are two recorded events of extreme heat causing death or injury within the state of New Mexico. Those deaths were due to negligence of parents leaving children in the car for a long period of time. Periods of excessive heat usually result in high electrical consumption for air conditioning, which can cause power outages and brownouts.

While 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.

[34] Source: http://www.weather.gov/media/unr/heatindex.pdfb

Previous Occurrences

The State of New Mexico experiences extreme heat events annually. Table 31 highlights past occurrences recorded by NMDHSEM. Referencing the NCDC online database, there are three occurrences entered for past events. The events on August 6, 2012 and July 14, 2010 left two fatalities.

Table 31: Significant Past Occurrences - Extreme Heat (January 1, 2006 - December 1, 2012)

Date	Location	Significant Event
June 10, 2013	Albuquerque, NM Preparedness Area 5	A seven-month-old boy was in critical condition after being left inside a hot car for more than two hours during the afternoon of Monday, June 10th. Temperatures around the city at the time of the incident were in the upper 90s to low 100s. The ASOS at the Albuquerque Sunport recorded a maximum temperature of 99 degrees Fahrenheit, which tied the record maximum temperature for the date last observed in 1981.
August 6, 2012	Albuquerque, NM Preparedness Area 5	A toddler died after being left inside a parked vehicle for over eight hours. Ambient air temperatures were in the lower to mid-90s. An Albuquerque toddler died Monday afternoon after being left inside a car for at least 8 hours. The boy was found Monday afternoon inside the car and was pronounced dead later at the hospital. High temperature recorded at the Albuquerque International Sunport was 93F.
July 14, 2010	Albuquerque, NM Preparedness Area 5	A 2-year-old died after being left in a hot car for almost four hours at Southwestern Indian Polytechnic Institute. By noon MST, the outside air temperature was 93 degrees which may have resulted in temperatures exceeding 135 degrees in the vehicle.
July 2003	State of New Mexico All Preparedness Areas	Hottest month ever recorded in New Mexico. There were 14 days of highs of 100° or more, and no cooling at night. A new all-time high low temperature of 78° is set. 21 days do not go below 70°. Average temperature of 84.6° for the entire month shatters 1980 record of 82.7°.
May 24. 2000	State of New Mexico All Preparedness Areas	New daily high temperature records were set across the state as temperatures soared into the high 90s and 100s all across the east and south. Record highs in the mid and upper 80s were also set in the higher elevation communities of both the south central, central and northern mountains.
June 1998	State of New Mexico All Preparedness Areas	Conditions were unusually warm and dry throughout the month of June, but the heat intensified beginning on the 20th with daily high temperatures climbing well above 100 degrees,

Date	Location	Significant Event
		except in mountain communities at elevations above 7500 feet. Readings in the southeast section of the state peaked at 108 to 113 degrees as these locations exceeded 10 consecutive days with daily highs above 100 degrees. New records for duration of 100 plus degree-days were set from Carlsbad north to Clovis and Tucumcari. The heat broke records that had lasted 60 to 70 years. By the end of the month a number of locations in the east had observed 16 to 20 days with a daily high over 100 degrees.
June 27, 1994	Albuquerque, NM Preparedness Area 5	Albuquerque area hits 107°, the highest temperature ever recorded in Albuquerque (the 104° on June 26 tied the previous record).
Summer (June through August) 1980	Albuquerque, NM Preparedness Area 5	Record heat with 25 days of 100 or more in the Albuquerque metro area (prior record was 12 days). July average daytime high is 99.1°.

Table 32 outlines previously recorded extreme heat events as reported by SHELDUS.

Table 32: SHELDUS Previously Recorded Extreme Heat Events (1994-2014)[35]

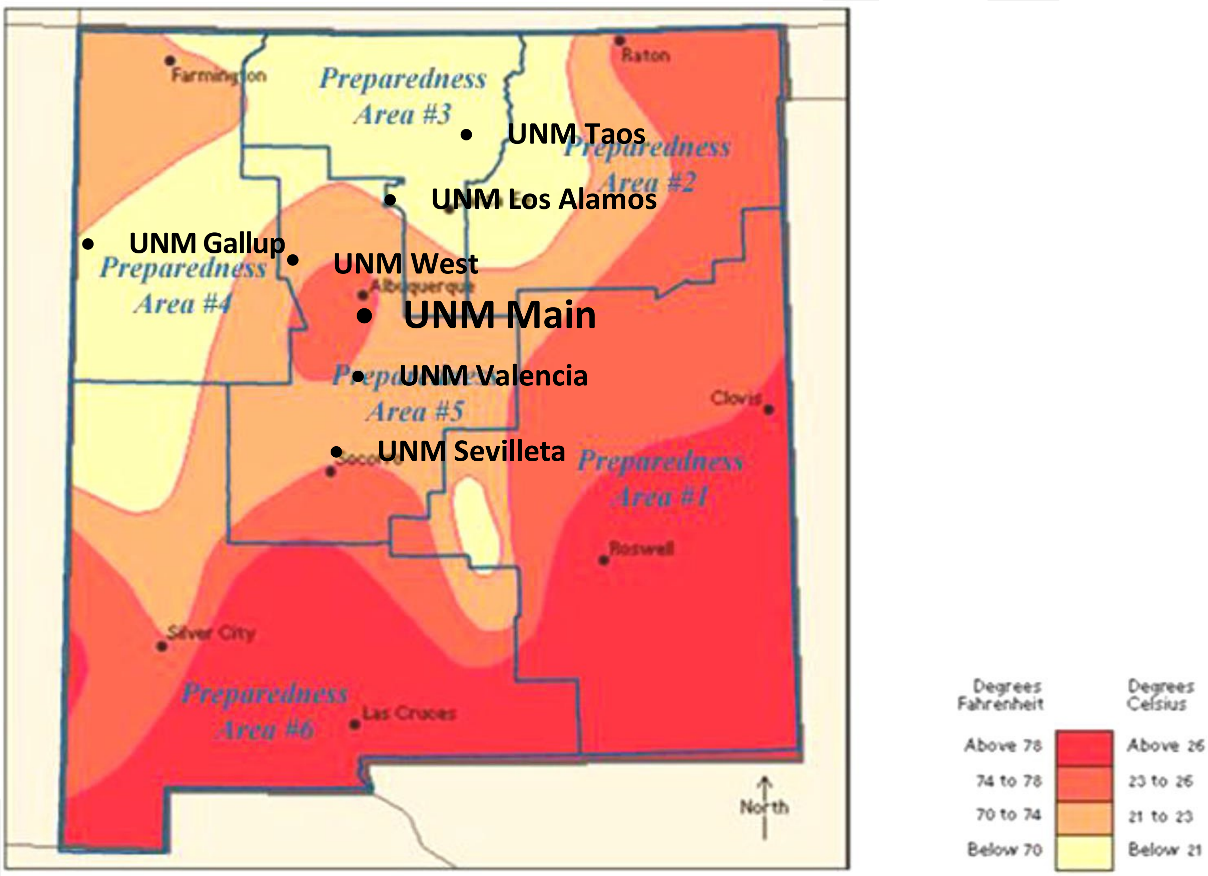
County Name	Year	Month	Property Damage	Injuries	Fatalities	Records
Bernalillo	2013	6	0	1	0	1
Bernalillo	2012	8	0	0	1	1
Bernalillo	2010	7	0	0	1	1

[35] SHELDUS, http://hvri.geog.sc.edu/SHELDUS/ (July 27, 2015

Frequency

Patterns, frequency, and degree of severity of extreme heat events are difficult to predict. Referencing the map in Figure 19, the state can experience average summer temperatures from 70 to well over 78 degrees with temperatures in the summer reaching up to 100 degrees plus. In temperatures exceeding 90°F, young children, the elderly, outdoor laborers, and sick people are the most likely to suffer from sunstroke, heat cramps, heat exhaustion, and possibly heatstroke.

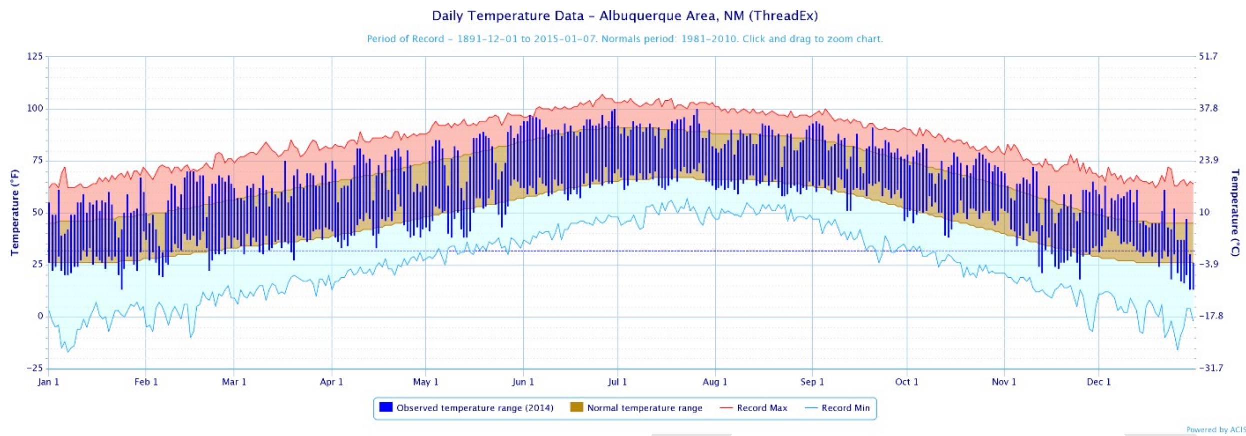
Figure 19: Average Temperature and Preparedness Area Map of New Mexico[36]



The National Weather Service Albuquerque reported above average monthly temperatures in New Mexico for 2014. The average temperature in 2014 was 58.7°F. This was 1.5 degrees above the 30-year normal (1981-2010) of 57.2°F. The long term annual normal (1893 to current) temperature is 56.4°F. 2014 was the 7th warmest year on record at the Albuquerque Sunport, going back to 1892. 2012 was the warmest year on record with an average temperature of 59.9°F.

[36] Source: 2010 NM State Hazard Mitigation Plan

Figure 20: Daily Temperature Data - Albuquerque Area, NM[37]



Probability of Future Occurrence

To determine the probability of each Preparedness Area experiencing future extreme heat occurrences, the probability or chance of occurrence was calculated based on historical data identified in Table 33. Table 33 identifies the probability of each Preparedness Area experiencing some type of extreme heat event annually. Probability was determined by dividing the number of events observed by the number of years and multiplying by 100. This gives the percent chance of the event happening in any given year.

It should be noted that general inconsistencies in local event reporting to the NCDC would make this probability seem low as extreme heat events are an annual occurrence.

Table 33: Probability of Future Occurrence - Extreme Heat

Probability of Future Occurrence	
Preparedness Area	**Extreme Heat**
Preparedness Area 3	1.2%
Preparedness Area 4	3.6%
Preparedness Area 5	1.2%

Risk Assessment

New Mexico experiences some form of extreme heat activity annually, based on seasonal meteorological patterns and local topographical conditions. All UNM locations are susceptible to extreme heat conditions, although local topography, such as elevation and land contours, plays a significant part in how this extreme heat affects a particular area. The effects of extreme temperatures generally affect at risk sectors of the population: the elderly, the young, the sick/infirmed, those living below the poverty level and outdoor laborers.

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[37] "National Weather Service: 2014 Weather Highlights", http://www.srh.noaa.gov/abq/?n=climonhigh2014annual-tempprecipabq (July 20, 2015)

Table 34 outlines impacts from extreme heat events for each Preparedness Area to consider when planning for these types of events.

Table 34: Extreme Heat Impacts

Subject	Impacts
Health and Safety of The Public	Injuries and death have resulted from extreme heat events. Individuals caught outdoors can suffer dehydration and death from high temperatures; Increased wildfire risk
Health and Safety of Responders	Responders face the same impacts as the public.
Continuity of Operations	Airport closures and local/regional power failures
Delivery of Services	Airport closures and local/regional power failures
Property, Facilities, Infrastructure	None anticipated
Environment	Increased drought conditions (see Drought section for a list of associated environmental impacts)
Economic Condition	Increased utility costs due to the extreme temperatures are anticipated; Loss of tourism; Decreased agricultural yields
Public Confidence	No impacts anticipated

Data Limitations

Quantifying vulnerability of individual structures to damage from extreme heat hazards is difficult. The NCDC and SHELDUS have limited information on extreme heat incidents that have occurred in New Mexico.

Summary of Impact to UNM

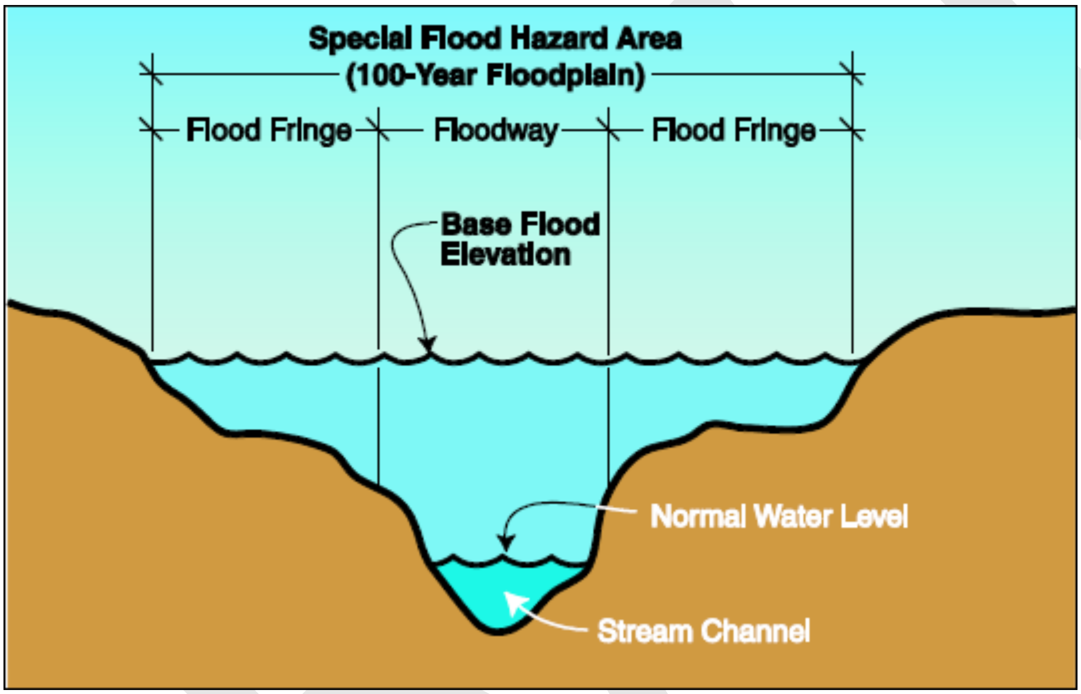
Extreme heat can equally affect all UNM campuses, facilities, housing, high value research and art, and some equipment, but it is generally a health risk, not a structural hazard. In temperatures exceeding 90°F, young children, the elderly, outdoor laborers, and people with pre-existing health conditions are more likely to suffer from sunstroke, heat cramps, heat exhaustion, and possibly heatstroke. Extreme heat is a concern for UNM because of the number of facilities which house many different specimens for research. In an extreme heat condition, the loss of air conditioning can cause catastrophic loss to experiments and specimens that requires a controlled environment. These losses of experiments are of such significance they are considered irreplaceable due to the years of research in the process. Vulnerability is viewed as low based on discussions with campus administration. Backup alternatives are in place in the event of the loss of power (generators) but recognize these type alternatives can fail as well. Students housed in UNM housing facilities could also be affected if there is a brownout. Loss of power, and therefore loss of air conditioning, could force students to be temporarily moved out of UNM dormitory facilitates due to high temperatures. UNM dormitories do not have generators but they do have emergency power for lighting.

Flood/Flash Floods

Hazard Characteristics

Flooding is one of the most common hazards in all 50 states and U.S. territories. Most injuries and deaths from flooding happen when people are swept away by flood currents, and most property damage results from inundation by sediment-filled water. The majority of flood events in the United States involve inundation of floodplains. Figure 21 shows inundation of floodplains during a large-scale weather system with prolonged rainfall from storms or snowmelt.

Figure 21: Flood Definition[38]



This type of flooding typically results from large-scale weather systems generating prolonged rainfall from locally intense storms or snowmelt. For the purposes of this report, this type of flooding is referred to as riverine flooding and is characterized by a gradual and predictable rise in a river or stream due to persistent precipitation. After the stream or river overflows its banks, the surrounding area often remains under water for an extended period of time.

[38] Source: FEMA's "Understanding Your Risks – FEMA Publication 386-2, page 2-12.

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 probability of occurrence, shown in Table 35, is expressed as the percentage chance that a flood of a specific extent will occur in any given year. Flash floods are usually the result of excessive precipitation or rapid snowmelt and can occur suddenly. Although the State of New Mexico experiences riverine flooding, flash flooding is a more common and a more damaging type of flooding.

Table 35: Flood Probability Terms[39]

Flood Recurrence Intervals	Chance of occurrence in any given year
10-year	10%
50-year	2%
100-year	1%
500-year	0.2%

Flash floods are aptly named: they occur suddenly after a brief but intense downpour; they move quickly and end abruptly. Although the duration of these events is usually brief, the damages can be quite severe. People are often surprised at how quickly a normally dry arroyo can become a raging torrent. Flash floods are the primary weather-related killer with around 140 deaths recorded in the United States each year. Flash floods are common and frequent in New Mexico, and as a result, New Mexico has the tenth highest flash flood fatality rate in the nation. Flash floods cannot be predicted.

Flash flooding is the second greatest weather hazard in New Mexico. New Mexico ranks 10th in the nation in flash flood deaths per capita, using statistics based on storm data for 2006 - 2012. The flash flooding problem stems from a number of factors. During the summer (June through August period), 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. Table 36 lists the major causes of riverine flooding vs. flash flooding.

Table 36: Flooding vs. Flash Floods – Cause[40]

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

[39] Source: USGS Water Science School: http://ga.water.usgs.gov/edu/100yearflood.html (December 2012)
[40] Source: http://www.weatherexplained.com/Vol-1/Floods-Flash-Floods.html

Alluvial Fans

Alluvial fans and alluvial fan flood hazards exist in the state. Alluvial fan flood hazard characteristics include heavy sediment/debris loads and high velocity flows. According to FEMA, "an alluvial fan is a sedimentary deposit located at a topographic break such as the base of a mountain front, escarpment, or valley side, that is composed of stream flow and/or debris flow/sediments and has the shape of a fan, either fully or partially extended."[41] New Mexico has more alluvial plains than alluvial fans due to the natural apex, according to Paul Dugie, NM Floodplain Managers Association. Though the intense rainstorms which produce fan floods occur randomly, they nevertheless can develop very rapidly at any time and can recur with frequency.[42] The California Alluvial Fan Task Force states, "When alluvial fan flooding occurs, it is flashy and unpredictable and variable in magnitude. This type of flooding does not necessarily occur as the result of large amounts of rain. Often, it is triggered by intense rainfall over short periods of time. The natural flooding process that drives alluvial fan sedimentation tends to produce thick deposits of sand and gravel, particularly near the apex of the fan, with relatively minor proportions of fine-grained particles." According to Dr. David Love, New Mexico Bureau of Geology and Mining Resources, in the State of New Mexico, there have been no confirmed studies specific to alluvial fan flooding risk.

According to multiple studies, alluvial fan flood risk can cause high velocity flow (as high as 15-30 feet per second) producing significant hydrodynamic forces, erosion/scour to depths of several feet, deposition of sediment and debris (to depths of several feet), deposition of sediment and debris (depths of 15 – 20 feet have been observed), debris flows/impact forces, mudflows, inundation, producing hydrostatic/buoyant forces (pressure against buildings caused by standing water), flash flooding with little, if any, warning times.

Alluvial fans are often an overlooked as hazards and there is a tendency to underestimate both the potential and severity of alluvial fan flood events. The infrequent rainfall, gently sloping terrain, and often long time spans between successive floods contribute to a sense of complacency regarding the existence of possible flood hazards. [43]

Stormwater Runoff

When heavy precipitation falls, stormwater runoff is possible. Stormwater runoff occurs when heavy precipitation flows over the ground. Urban areas with water-resistant surfaces like driveways, sidewalks, and streets can prevent the stormwater from naturally soaking into the ground. These surfaces should direct water into the drainage systems for discharge. However, drainage systems may be overwhelmed or at capacity causing excess water to seep into basements and through building walls and floors causing flooding.

Flooding and Debris Flow Post-fire

Freshly burned landscapes are at risk of damage from post-wildfire erosion hazards such as those caused by flash flooding and debris flows. Burn scar areas have a tremendous impact on flood and debris flow

[41] Source: FEMA, MT-2 Procedures Manual, May 2009, p.30
[42] FEMA, Alluvial Fans: Hazards and Management, 1989, p. 3
[43] FEMA, MT-2 Procedures Manual, May 2009

following short duration high intensity rainfall. These high-volume low frequency floods result from typical monsoon summer rains and occur in and downstream of the burn scar areas. Dramatic changes in runoff, erosion, and deposition have been documented in watersheds affected by wildfire. These post-fire changes have led to loss of life, damage to property, and significant impacts on infrastructure.

Extreme soil damage occurs within watersheds that experience a wildfire. Soil damage usually occurs where burn intensities are severe to moderate. The loss of the organic components in the soil greatly decreases the ability of rain to infiltrate. Within these burned areas, large floods result from average monsoonal rainstorms. In combination with the damaged soil, the destruction of vegetation by wildfires and in particular the forest canopy has created high potential for floods. In general, coniferous trees intercept more rainfall than deciduous trees in full leaf. New Mexico forests are predominantly Coniferous and the risk for flooding is increased when these forest types and others are drastically reduced and destroyed by wildfires.

Increased long term risk of flooding will continue for years after a watershed has experienced a burn. Ongoing concerns are the increased potential for flooding and debris flow plus large amounts of sediment being transported from the burn scar areas. Additionally, debris flows could create temporary dams or sediment plugs along drainage courses that could fill and breach, sending flood waves downstream creating life safety issues. Life safety concerns are higher in those communities located downstream of burned watersheds.

Debris flows are destructive, fast-moving slurries of water and sediment that can originate from rainfall on recently burned, rugged areas and can have an enormous destructive power. The location, extent, and severity of wildfire and the subsequent rainfall intensity and duration cannot be known in advance; however, it is possible to determine likely locations and sizes of post-wildfire debris flows using available geospatial data and mathematical models. Debris flow hazards can also be assessed for areas that have not burned but are at high risk of wildfire.

The USGS, in cooperation with the U.S. Forest Service and NOAA, has conducted debris-flow analyses for the Las Conchas fire, the Track fire, and the Little Bear Fire.[44] Studies of these areas report high volume floods downstream of burn scar areas. The models showed that for a 28-millimeter rain in 30 minutes (equivalent to a 10-year recurrence interval), the debris flow probability increased by more than 80% for 67% of the basins burned by the Las Conchas Fire.

The models also showed that for a 38-millimeter rain in 30 minutes (equivalent to a 10-year recurrence interval), the debris flow probability increased by more than 80% for Railroad Canyon and Lake Maloya basins burned by the Track Fire (range of debris flow probability was from 2 to 97%). Lake Maloya is the main water supply for the City of Raton. Maps shown in the USGS Post-wildfire Debris Flow Assessment

[44] Tillery, A.C., Matherne, A.M., and Verdin K.L., 2012, Estimated probability of post wildfire debris flows in the 2012 Whitewater–Baldy Fire burn area, southwestern New Mexico: U.S. Geological Survey Open-File Report 2012–1188, 11 p., 3 pls: http://pubs.usgs.gov/of/2012/1188/

for the Area Burned by the Track Fire can be used for prioritization of erosion mitigation or protective measures.[45]

Basins with the highest probability of the highest debris flows include the upper Santa Clara Canyon (in the northern burn scar area) and Peralta, Colle, Bland, Cochiti, Capulin, Alamo and Frijoles Canyons (in the southern burn scar area). In the future, flood frequency predictions and debris flow hazard assessments could help land managers plan for and mitigate the effects of post-fire flooding and debris flows.

NFIP

UNM does not participate in the NFIP. However, the NFIP and FEMA supply many useful resources to assist communities with planning for their flood risk. FEMA conducts a Flood Insurance Study that includes statistical data for river flow, storm tides, hydrologic/hydraulic analyses, and rainfall and topographic surveys. FEMA uses this data to create the flood hazard maps that outline a community's different flood risk areas. These flood maps are useful tools for identifying where flood-prone areas are and how frequently a floodplain will be inundated with water. This information contributes to the development of strategies that may decrease or eliminate the potential impacts from a flooding event. Maps that delineate special hazard areas and the risk premium zones applicable to the community are termed Flood Insurance Rate Maps (FIRM) or Digital Flood Insurance Rate Maps (DFIRM).

New Mexico's counties are in various stages of FEMA Flood Mapping programs. Current mapping status can be retrieved by visiting NMFlood.org. All UNM campuses and properties are located within counties with DFIRMs available.

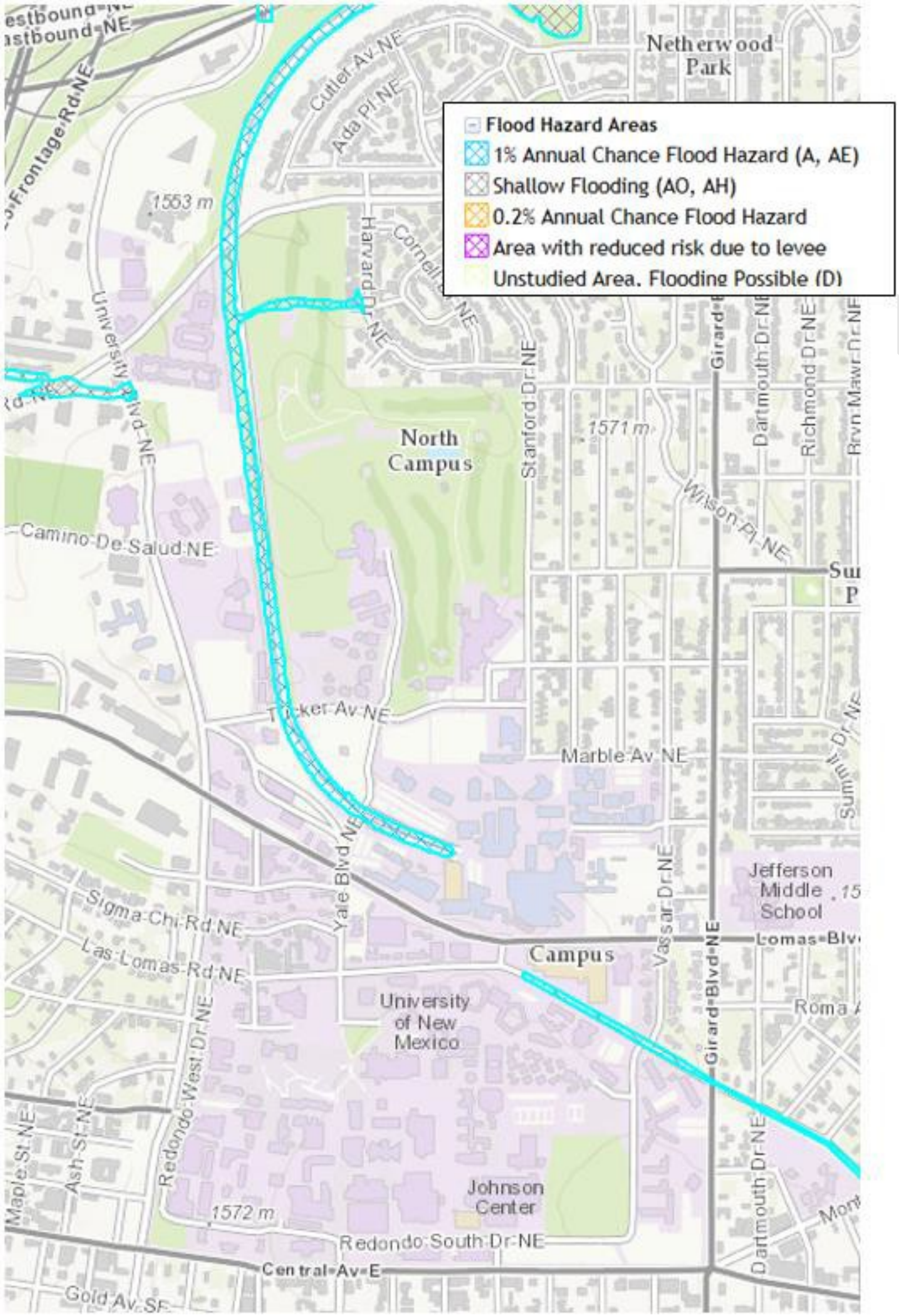
Figures 22-25 show maps for all UNM campus and property locations that are within FEMA designated flood zones. Current FEMA designated flood zones identified for New Mexico that apply to UNM areas are described below[46].

- **Zone A**: Areas with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. Because detailed analyses are not performed for such areas; no depths or base flood elevations are shown within these zones.
- **Zone AE and A1-A30**: Areas with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. In most instances, base flood elevations derived from detailed analyses are shown at selected intervals within these zones.

[45] Source: Tillery, A.C., Darr, M.J., Cannon, S.H., and Michael, J.A., 2011, Post wildfire debris flow hazard assessment for the area burned by the 2011 Track Fire, northeastern New Mexico and Southern Colorado: U.S. Geological Survey Open-File Report 2011-1257. http://pubs.usgs.gov/of/2011/1257

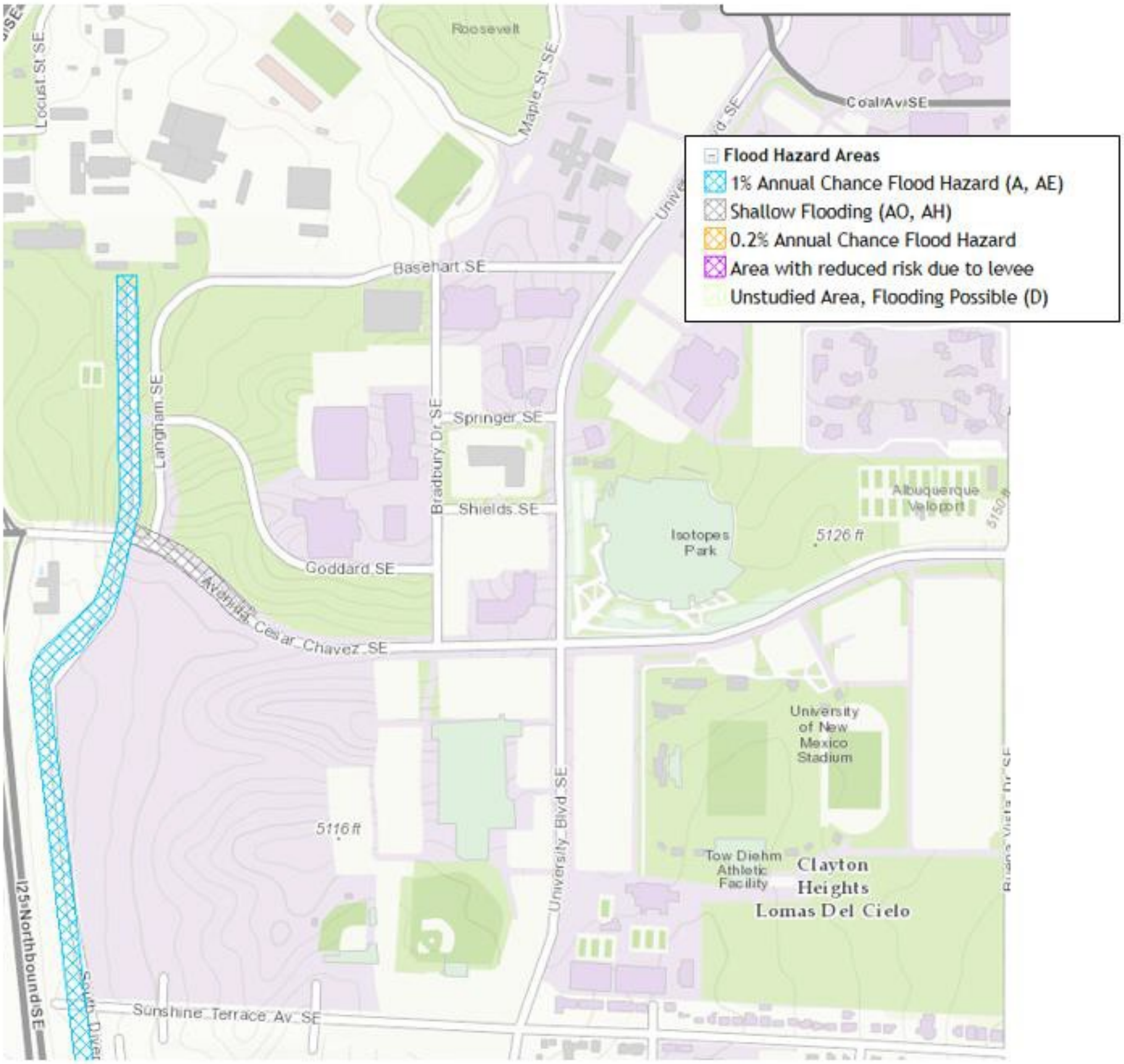
[46] Source: http://www.fema.gov/library/viewRecord.do?id=2324

Figure 22: UNM Central and North Campuses FEMA National Flood Hazard Layer (Data as of 9/27/13)[47]



47 National Flood Hazard Layer Data Application, http://nmflood.org/MAPS/NFHL/ (July 23, 2015)

Figure 23: UNM South Campus FEMA National Flood Hazard Layer (Data as of 9/27/13)[48]



48 National Flood Hazard Layer Data Application, http://nmflood.org/MAPS/NFHL/ (July 23, 2015)

Figure 24: UNM Valencia Branch Campus National Flood Hazard Layer (Data as of 9/27/13)[49]

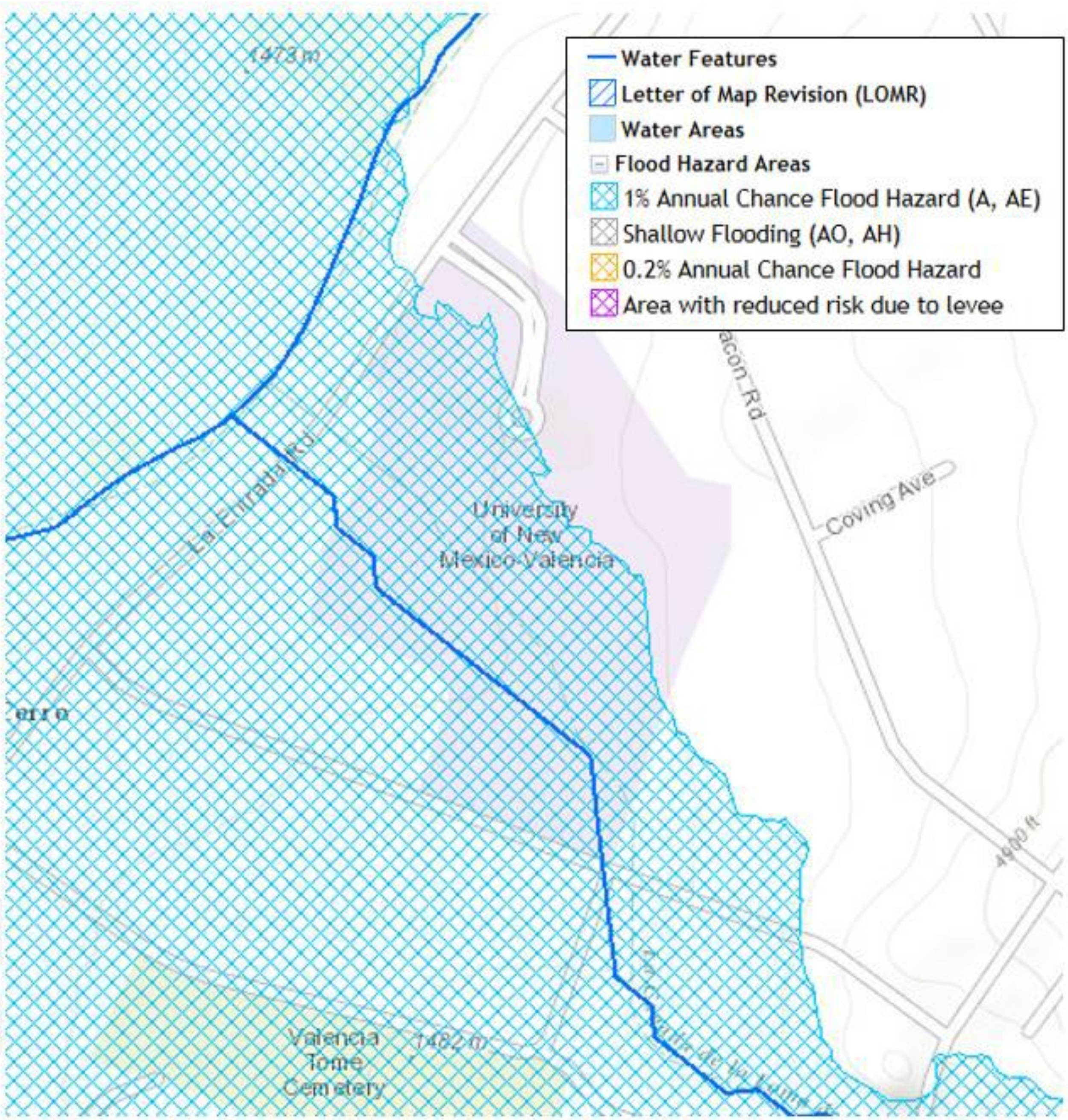
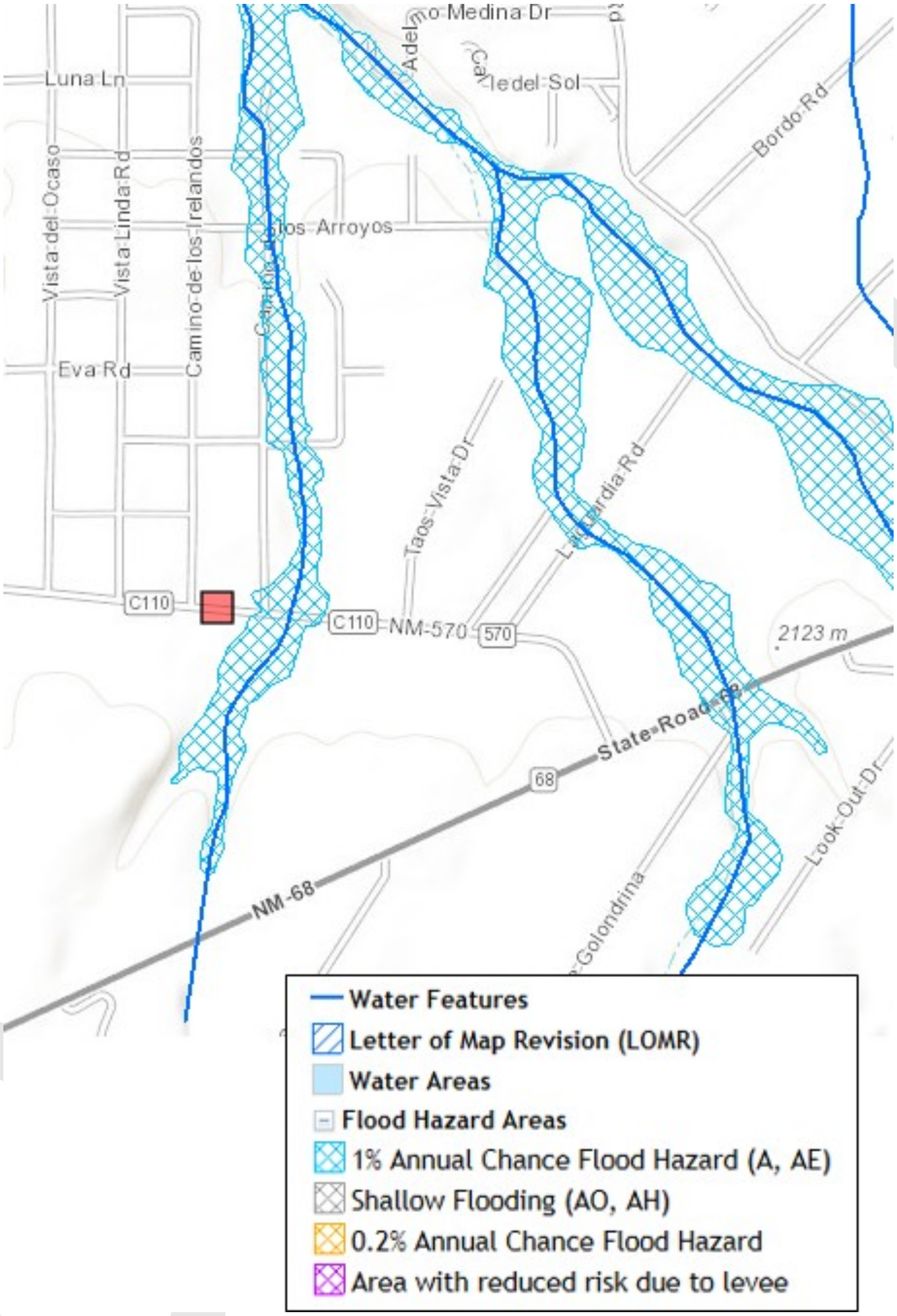


Figure 25: UNM Taos Branch Campus National Flood Hazard Layer (Data as of 9/27/13)[50]

[49] National Flood Hazard Layer Data Application, http://nmflood.org/MAPS/NFHL/ (July 23, 2015)



Repetitive Loss Properties

UNM does not have any NFIP designated Repetitive Loss Properties.

[50] National Flood Hazard Layer Data Application, http://nmflood.org/MAPS/NFHL/ (July 23, 2015)

Previous Occurrences

On June 26, 2011, the Los Conchas Fire moved along the mesas at the top of Cochiti Canyon where the former John Young Ranch was located. The four buildings on the property in northern New Mexico were damaged by the fire. The most serious damage was done to the main house where the UNM Department of Anthropology conducted field schools for students. The fire left the structures within a burn scar and vulnerable to erosion from the heavy rains during monsoon season. The NM State Land Office and UNM took measures to protect the property from potential flooding due to the burn scar. On August 3, 2011, significant rains at the top of the canyon caused partial flooding of the buildings. Then heavy rains on August 14, 15 and 16 carried soil, ash, trees and boulders downstream, jumping the banks of the creek and floating the debris downstream. This debris smashed into the walls of the bunk house filling it with 4 feet of water, mud and debris completely destroying the property. The property is now owned by the New Mexico State Land Office.

New Mexico has experienced numerous flood/flash flooding events in each county. The current online NCDC database contains data from 1996 to 2014, as entered by NOAA's NWS. Referencing this online database, NCDC reports a total of 226 flood/flash flood events with 9 deaths and $30.21 million in property damage for those counties with UNM campuses and properties.[51]

Table 37: Significant Past Occurrences of Flood/Flash Flood (as of 2012)

Date	Location	Significant Event
August 1, 2014	Albuquerque Bernalillo County Preparedness Area 5	Storms developed by mid to late afternoon on the 1st over northern New Mexico then pushed very slowly south through the evening and predawn hours on the 2nd. Storms developed over the Albuquerque Metro Area during the late evening and produced flash flood emergency-level flooding within the area from UNM campus into downtown on a busy Friday night. Numerous water rescues were reported. Several businesses reported water inside with just about the entire area of Central Avenue closed. Mud and rockslides created numerous lane closures around area roadways. An overnight deluge washed out ballasts along a portion of the Rail Runner tracks within Waldo Canyon, resulting in suspended service for the entire day Sunday. A large sink hole developed at the intersection of MLK Jr. and Broadway. The entire intersection was destroyed. Property damages were $1 million.
September 10, 2013	La Joya Socorro County Preparedness Areas 5	The initial round of intense rainfall on the 10th and 11th flooded numerous roadways and homes then subsequent heavy rainfall through the 15th created extreme flooding. Socorro

[51] "NOAA, NCDC: Storm Events Database", https://www.ncdc.noaa.gov/stormevents/EXICO (July 23, 2015)

Date	Location	Significant Event
		County emergency management indicated a total of at least 16 roads were washed out and damaged severely across the county, including NM 408 and CR 91 between Escondida and Lemitar, and NM 1 between San Antonio and Luis Lopez. The Rio Puerco and Rio Grande rivers both flooded into nearby low-lying areas and threatened nearby communities. A breach in a levee on the Rio Puerco flooded several homes and the community of San Francisco was evacuated. The US 380 bridge east of San Antonio was overtopped. US 60 was closed at mile marker 166. Property damages were $ 1.2 million.
August 24, 2012	Los Alamos Preparedness Area 3 Sandoval County Preparedness Area 5	FEMA-DR- 4079 was declared on August 24, 2012 for emergency work and repair/replacement of facilities damaged by the flooding in Lincoln County, Sandoval County and the Pueblo of Santa Clara. The flooding occurred during the period of June 22 to July 12, 2012. Los Alamos County and Mescalero Apache were added to the declaration at a later date. Source; http://www.fema.gov/pdf/news/pda/4047.pdf Early monsoon rains provided an initial moisture surge impacting parts of the state June 20 through 22, 2012. Moisture spread into western New Mexico on June 21, giving the Albuquerque to Belen corridor (Preparedness Area 5) around one half to three quarters of an inch of rain. Additionally, heavy rain and flash flooding impacted the Little Bear and Whitewater Baldy burn scars on June 22 (Preparedness Area 6). A much more significant and sustained monsoon burst developed on July 2, 2012 and peaked July 5 and 6, 2012 before weakening July 11, 2012. Source; National Weather Service Albuquerque, 2012 Monsoon Season Summary
November 23, 2011	Thoreau, NM Preparedness Area 4	A backdoor cold front pushed across the state from the northeast corner through the gaps of the central mountain chain and continued westward to the Arizona border. This front in combination with rich low-level Gulf of Mexico

Date	Location	Significant Event
		moisture and mid- level monsoon moisture created a very unstable atmosphere. Precipitable water values were nearly 150% of normal across much of the state. Slow storm movement and repeated development of storms over the same general areas led to flash flooding in western New Mexico. Flooding was reported into Thoreau Baptist Church, Giant Gas Station, Thoreau Chapter House as well as multiple other businesses and 6 homes. Several bridges and roads were also washed over with debris, including state roads 118, 371 and 612 and county roads 61, 27, 51, and Castle Rock.
August 21, 2011	Sandoval County Los Alamos, NM Preparedness Area 3	The first day of flash flooding over the Las Conchas burn scar was widespread. Early in the afternoon, showers and thunderstorms developed over the central and northern portions of the burn scar. Later in the afternoon and early evening, stronger and very slow-moving storms developed across the southern portions of the burn scar. Radar estimated 3 to 4 inches of rain across a widespread area. Flash flooding was reported with each of these storms. 1 to 1.5 inches of rain fell on the northern portion of the Las Conchas burn scar, flash flooding was reported in Santa Clara Canyon. Four people that were working in the canyon had to be rescued by helicopter. Flows were reported to be 8 to 10 feet high when they reached Dixon's Apple Orchard. The flood waters damaged the owner’s personal residence, inundated the main storage facility with 10 feet of mud and debris, moved a semi-truck approximately 200 yards and destroyed approximately 10 percent of the apple orchard. The water also wiped out a 50 yard long 4 foot by 4-foot rock retaining wall that was built in 1942. Total reported property damage was $12 million.
August 14, 2008	Taos County Preparedness Area 3 McKinley County Preparedness Area 4	Severe storms and flooding between July 26 and Sept. 18, 2006 lead to disaster declaration FEMA 1659. In what was determined to be a 500-yr event, strong thunderstorms developed over the southern Sacramento Mountains and along the eastern heights of Alamogordo. One storm in particular dropped about an inch and

Date	Location	Significant Event
	Sandoval and Valencia Counties Preparedness Area 5	a half of rain in 40 minutes over Marble Canyon, which drains into eastern Alamogordo. Roads along the eastern heights turned into raging torrents, which flowed westward into the center of town. The entire city of Hatch was flooded, and mud flowed into numerous houses and apartments, when an arroyo overflowed. The entire apartment complex was condemned and 150+ families were evacuated. The Rio Grande River reached a stage of 9.3 feet, the highest in 50 years. The Navajo Nation (where two deaths occurred) and 19 counties were declared eligible for public assistance funds including: Cibola, Doña Ana, Grant, Guadalupe, Harding, Hidalgo, Lincoln, Luna, McKinley, Mora, Otero, Rio Arriba, Sandoval, San Miguel, Sierra, Socorro, Taos, Torrance and Valencia. Doña Ana and Otero counties were declared for Individual Assistance. Federal funding for this disaster exceeds $20 Million Source: New Mexico Storms and Flooding– FEMA-1783- DR. http://www.fema.gov/pdf/news/pda/1783.pdf. Federal Emergency Management Agency, 14 Aug. 2008. Web. 13 May 2010. http://www.fema.gov/pdf/news/pda/1783.pdf
May 23, 2007	San Juan County Preparedness Area 4 Las Alamos County Preparedness Area 3 Sandoval County Preparedness Area 5	Federal disaster funds were authorized for this event (FEMA- 1301) in September 1999 to help communities recover from the floods in Luna, Sierra, Doña Ana, San Juan, Rio Arriba, Los Alamos, Sandoval, and Mora Counties.
July 26 through September 18, 2006	19 Counties Preparedness Areas 1, 2, 3, 4, 5, and 6	Disaster declaration FEMA 1659. In what was determined to be a 500-yr event, strong thunderstorms developed over the southern Sacramento Mountains and along the eastern heights of Alamogordo. One storm in particular dropped about an inch and a half of rain in 40 minutes over Marble Canyon, which drains into eastern Alamogordo. Roads along the eastern heights turned into raging torrents, which flowed westward into the center of town. The entire city of Hatch was flooded and mud flowed into numerous houses and apartments,

Date	Location	Significant Event
		when an arroyo overflowed. The entire apartment complex was condemned and 150+ families were evacuated. The Rio Grande River reached a stage of 9.3 feet, the highest in 50 years. The Navajo Nation (where two deaths occurred) and 19 counties were declared eligible for public assistance funds including: Cibola, Doña Ana, Grant, Guadalupe, Harding, Hidalgo, Lincoln, Luna, McKinley, Mora, Otero, Rio Arriba, Sandoval, San Miguel, Sierra, Socorro, Taos, Torrance and Valencia. Doña Ana and Otero counties were declared for Individual Assistance. Federal funding exceeded $20 million. Source: *http://www.fema.gov/pdf/news/pda/1783.pdf*
April 2004	Bernalillo County Preparedness Area 5	Heavy thunderstorms caused flash flooding in several areas of the state. This flooding lead to federal disaster (FEMA- 1514) funds being authorized for four counties (Bernalillo, Eddy, Mora, and San Miguel). Damage cost for this event was approximately $5.8 million.
July 2, 2001	Los Alamos County Preparedness Area 3	A storm with heavy rain of 1 to 2 inches in an hour developed over Pueblo Canyon on the west edge of Los Alamos. Storm runoff from the burned forest was brief, but intense with water and mudflows estimated at 1,500 cubic feet per second, which overwhelmed the inlet structure west of North Road and then breached the street 60 feet above. A 150-yard section of road surface was destroyed and one of the city's main sewer lines was undercut and then broken. Debris filled the basements of at least five homes along Alabama Avenue. The total damage estimate for this event was $3.5 million.
July 29, 1999	Rio Rancho, NM Sandoval County Preparedness Area 5	A flash flood event from heavy rain of 2 inches in about 2 hours caused road and soil erosion in northern Rio Rancho. No injuries were reported, but residents in some of the newer or remote subdivisions on the far north edge of the city were stranded after numerous dirt roads and low water arroyo crossings were washed out. Some roads became gullies 4 feet deep and 14 feet wide. The area around the city landfill, along with Wastewater Treatment

Date	Location	Significant Event
		Plant #2, suffered heavily, with 2 miles of roads isolated by at least five deep cuts. Damage costs were estimated at $1 million.
June 16, 1999	Albuquerque, NM Bernalillo County Preparedness Area 5	Heavy rains up to 2 inches in a 45-minute period flooded streets and dry arroyos across northern Albuquerque. Over 100 new automobiles on a dealer lot were flooded by rapidly rising water. Poor or clogged drainage was partially to blame for these losses. The total losses were estimated at $1.2 million.

Declared Disasters from Flood/Flash Flooding

DHSEM reports 40 State Declared Disasters for flooding between 2003 and 2013. This number is based on how many Executive Orders were signed by the Governor for flooding or flood threat. According to DHSEM records, the total cost for State declared flood events from 2003 through 2012 was $31,866,315. The total does not reflect all costs for federal disasters 4047 and 4079 which are still being tallied.

Six of the 40 State flood disasters were also federally declared disasters. The total Public Assistance dollar losses from federal, State and local government entities and all tribal entities was $113,382,188. The State contributed between 12.5% and 18.74% of the total cost for the disasters. The percentage of State contribution varied with each disaster.

Table 38 is a tally of flood damage as reported by SHELDUS broken out by county from 1994 through 2014.

Table 38: SHELDUS History of Flood/Flash Flood Events (1994 -2014)

County Name	Year	Month	Property Damage	Property Damage (ADJ 2014)	Injuries	Fatalities	Records
Bernalillo	1996	7	$35,000.00	$52,809.18	0	0	1
Bernalillo	1997	7	$100,000.00	$147,499.07	0	0	1
Bernalillo	1998	7	$30,000.00	$43,571.04	0	0	1
Bernalillo	1999	6	$1,200,000.00	$1,705,181.27	0	0	1
Bernalillo	2006	7	$100,000.00	$117,428.57	0	0	1
Bernalillo	2007	7	$4,000.00	$4,567.06	0	0	1
Bernalillo	2008	7	$22,500.00	$24,739.83	0	0	3
Bernalillo	2008	8	$351,500.00	$386,491.14	0	0	4
Bernalillo	2009	7	$2,000.00	$2,206.95	0	0	1
Bernalillo	2009	9	$1,000.00	$1,103.47	0	1	1
Bernalillo	2010	7	$11,000.00	$11,942.33	0	0	4
Bernalillo	2010	9	$0.00	$0.00	0	1	1
Bernalillo	2012	7	$2,000.00	$2,062.21	0	0	1

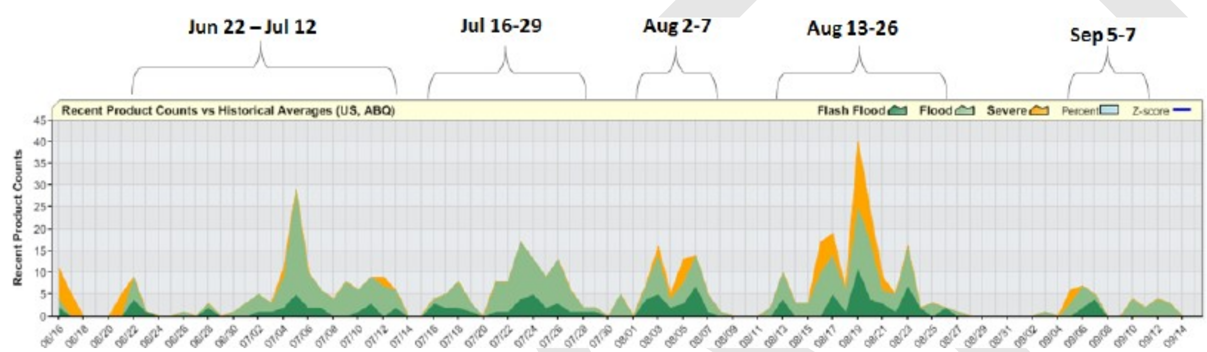
County Name	Year	Month	Property Damage	Property Damage (ADJ 2014)	Injuries	Fatalities	Records
Bernalillo	2013	7	$146,000.00	$148,368.39	0	0	7
Bernalillo	2013	9	$65,000.00	$66,054.42	0	0	2
Bernalillo	2014	7	$212,000.00	$212,000.00	0	0	3
Bernalillo	2014	8	$1,090,000.00	$1,090,000.00	0	0	5
Los Alamos	2001	7	3,500,000.00	4,678,577.07	0	0	1
Los Alamos	2001	8	100,000.00	133,673.63	0	0	1
Los Alamos	2008	8	10,000.00	10,995.48	0	0	1
Los Alamos	2011	8	6,000,000.00	6,314,671.98	0	0	1
Los Alamos	2012	7	50,000.00	51,555.35	0	0	1
Los Alamos	2001	7	3,500,000.00	4,678,577.07	0	0	1
McKinley	1997	9	$0.00	$0.00	1	2	2
McKinley	2002	7	$100,000.00	$131,593.11	0	0	1
McKinley	2005	5	$3,750.00	$4,545.62	0	0	1
McKinley	2005	6	$5,000.00	$6,060.83	0	0	1
McKinley	2006	8	$0.00	$0.00	0	2	1
McKinley	2007	8	$28,000.00	$31,969.44	0	0	2
McKinley	2008	7	$0.00	$0.00	0	3	1
McKinley	2008	8	$5,500.00	$6,047.51	0	0	2
McKinley	2009	9	$35,000.00	$38,621.59	0	0	3
McKinley	2010	7	$190,000.00	$206,276.55	0	0	3
McKinley	2010	8	$325,000.00	$352,841.47	0	0	6
McKinley	2011	8	$5,000.00	$5,262.23	0	0	1
McKinley	2012	8	$150,000.00	$154,666.06	0	0	1
McKinley	2013	8	$100,000.00	$101,622.18	0	0	2
McKinley	2013	9	$155,000.00	$157,514.39	0	0	3
McKinley	2014	8	$100,000.00	$100,000.00	0	0	1
Sandoval	1997	8	$5,000.00	$7,374.95	0	0	1
Sandoval	1999	7	$1,000,000.00	$1,420,984.39	0	0	1
Sandoval	1999	8	$600,000.00	$852,590.64	0	0	1
Sandoval	2000	8	$20,000.00	$27,495.47	0	0	1
Sandoval	2006	7	$800,000.00	$939,428.57	0	0	2
Sandoval	2007	7	$5,000.00	$5,708.83	0	0	1
Sandoval	2007	8	$500.00	$570.88	0	0	1
Sandoval	2008	2	$40,000.00	$43,981.92	0	0	1
Sandoval	2008	8	$29,000.00	$31,886.89	0	0	6
Sandoval	2008	10	$40,000.00	$43,981.92	0	0	1
Sandoval	2010	7	$1,000.00	$1,085.67	0	0	1
Sandoval	2010	8	$32,000.00	$34,741.31	0	0	3
Sandoval	2011	8	$6,750,000.00	$7,104,005.97	0	0	2

County Name	Year	Month	Property Damage	Property Damage (ADJ 2014)	Injuries	Fatalities	Records
Sandoval	2012	7	$10,000.00	$10,311.07	0	0	1
Sandoval	2012	8	$25,000.00	$25,777.68	0	0	2
Sandoval	2013	7	$852,000.00	$865,821.04	0	0	4
Sandoval	2013	9	$1,465,000.00	$1,488,765.06	0	0	9
Sandoval	2014	7	$290,000.00	$290,000.00	0	0	8
Sandoval	2014	8	$250,000.00	$250,000.00	0	0	1
Socorro	1998	7	$65,000.00	$94,403.92	0	0	3
Socorro	1999	7	$150,000.00	$213,147.66	0	0	1
Socorro	2006	7	$40,000.00	$46,971.43	0	0	1
Socorro	2009	6	$30,000.00	$33,104.22	0	0	1
Socorro	2010	7	$15,000.00	$16,284.99	0	0	2
Socorro	2012	7	$10,000.00	$10,311.07	0	0	1
Socorro	2012	8	$5,000.00	$5,155.54	0	0	1
Socorro	2013	7	$1,200,000.00	$1,219,466.24	0	0	2
Socorro	2013	9	$1,300,000.00	$1,321,088.44	0	0	4
Socorro	2014	9	$5,000.00	$5,000.00	0	0	1
Taos	1999	4	$2,857.14	$4,059.95	0	0	1
Taos	2005	5	$3,750.00	$4,545.62	0	1	1
Taos	2013	9	$50,000.00	$50,811.09	0	0	1
Taos	2014	7	$2,000.00	$2,000.00	0	0	1

Frequency

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 (Preparedness Area 4) in early September. In mid to late summer, the pacific winds bring humid subtropical air into the state. Solar heating trigger afternoon thunderstorms that can be devastating. July and August 2012 brought intense flooding with burn scar areas producing up to 400% greater flows than the calculated 1% chance storm event. Figure 26 shows the monsoon burst periods that caused numerous flood events. Information provided by the National Weather Service in Albuquerque, 2012 Monsoon Season Summary.

Figure 26: 2012 Monsoon Burst Periods



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 streambed) and can involve a rapid rise in water level, high velocity, and large amounts of debris, which can lead to significant damage that includes the uprooting of trees, undermining of 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 due to 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 snowpack. Excessive runoff allows the combined release of the water in the snowpack 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 1 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 the remaining winter snowpack 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.

Late summer floods can occur due to hurricane remnants and tropical storms that move over the state from both the Gulf of Mexico and the Pacific Ocean. By the time these remnants reach New Mexico, however, usually the only feature remaining is an abundance of moisture. Hurricane-force winds have long since dissipated. Flash floods frequently occur on alluvial fans with devastating results. The combination of rapidly rising floodwater, high velocities and heavy sediment/debris loads.

Probability of Future Occurrence

Each Preparedness Area has several conditions that may contribute to flash floods and exacerbate the associated impacts:

- Steep Slopes: have moderate to steep sloping terrain that can contribute to flash flooding, since runoff reaches the receiving arroyos and rivers more rapidly over steeper terrain
- Obstructions: During floods, obstructions can block flood flow and trap debris, damming floodwaters and potentially causing increased flooding uphill from the obstructions
- Soils: Soils throughout much of the state are derived from underlying parent materials rich in carbonate as well as mixed clays. As a result, soils are typically fine grained, and have low infiltration rates and high runoff potential. Vegetative cover is either mixed shrubs or mixed grasses. Sparse vegetative cover combines with high runoff soil potential to result in significant flooding hazards in ephemeral washes and adjacent areas

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 probability of occurrence is expressed as the percentage chance that a flood of a specific magnitude will occur in any given year.

To determine the probability of New Mexico experiencing flood/flash flood event, the probability or chance of occurrence was calculated based on historical data identified the NCDC database from a period of January 2006 to December 2012 (84 months). Probability was determined by dividing the number of events observed by the number of months and multiplying by 100. This gives the percent chance of the event happening in any given year. In applying this formula, Preparedness Areas probabilities to the following hazards are identified in Table 39.

Table 39: Probability of Future Occurrence - Flood/Flash Flood

Probability of Future Occurrence		
Preparedness Area	**Flood**	**Flash Flooding**
Preparedness Area 3	1.2%	29%
Preparedness Area 4	0%	42%
Preparedness Area 5	0%	46%

Risk Assessment

New Mexico is affected by the North American Monsoon System every summer, and the "Monsoon Season" is designated as the period lasting from June 15th through September 30th. With the onset of the Monsoon, New Mexico is typically impacted by a variety of weather hazards that can often put the population at risk for serious injury or death Thunderstorm frequency increases during this period, while exceptionally hot days are common as well. Impacts from Floods/Flash Flooding to New Mexico are identified in Table 40.

Table 40: Potential Impacts from Flood/Flash Flood Events

Subject	Potential Impacts
Health and Safety of the Public	Flooding in the state has been known to sweep people away and be drowned
Health and Safety of Responders	Same impact as the public
Continuity of Operations	While the flooding in New Mexico is generally short lives the long-term impacts such as in the Village of Hatch can shut down an entire community for weeks.
Delivery of Services	Delivery of services may be impossible for weeks.
Property, Facilities, Infrastructure	Facilities in the flooded areas will sustain damages, up to and including total loss. Utilities such as water and sewage may be completely unusable
Environment	Long term severe impacts are possible due to the severe contamination often found in flood waters. Fortunately for us, flash flooding passes quickly, and dose not linger. However, the strong forces of the water can cause massive amounts of erosion and can divert natural waterways.
Economic Condition	As we saw in 2006, communities can have severe economic losses in the form of damages, and business shutdowns.
Public Confidence	If a community is impacted by flooding, the public may very well be angry for allowing development to occur in hazardous areas, or for allowing adverse impacts downstream form development.

Data Limitations

In order to address the data deficiency, a team of subject matter experts (NM Floodplain Managers Association, local research scientists in geomorphology or geology) would study the probability, extent, vulnerability and impact of post-fire flooding and alluvial fan flood hazards.

Summary of Impact to UNM

Virtually every jurisdiction in the state is subject to flooding, given the right conditions. Historically, flooding on UNM Main Campus has occurred due to heavy precipitation and stormwater runoff in properties located underground or at ground level. Based on the locations of all the UNM campuses, the only campus that lies within a flood zone and is vulnerable to a flooding event is the Valencia Branch Campus. UNM Main Campus (Central, North, and South campuses) and UNM Taos Branch Campus are located adjacent to areas designated as flood zones. UNM Main Campus has an arroyo running adjacent to and through the campus. UNM Taos has a water body adjacent to the campus. The Sevilleta LTER Field Station is relatively close to the Rio Grande but is situated west of the river located on much higher terrain. No official data is available for the Sevilleta location. UNM West, UNM Gallup, and UNM Los Alamos are not located in or near FEMA designated flood zones. All campuses could potentially experience flooding due to stormwater runoff.

UNM Taos and UNM Los Alamos Branch Campuses are located in areas at risk for wildfires. Therefore, these campuses are also at risk for flooding and debris flow post wildfire. Infrastructure near or in a burn scars can suffer catastrophic damage from heavy precipitation as was seen with the John Young Ranch following the Las Conchas Fire.

High Wind

Hazard Characteristics

Wind is defined as the motion of air relative to the earth's surface, and the hazard of high wind is commonly associated with severe thunderstorm winds (exceeding 58 mph) as well as tornadoes, hurricanes, tropical storms and nor'easters. High winds can also occur in the absence of other definable hazard conditions, events often referred to as simply "windstorms." High wind events might occur over large, widespread areas or in a very limited, localized area. They can occur suddenly without warning, at any time of the day or night.

Typically, high winds occur when large air masses of varying temperatures meet. Rapidly rising warm moist air serves as the "engine" for severe thunderstorms, tornadoes and other windstorm events. These storms can occur singularly, in lines or in clusters. They can move through an area very quickly or linger for several hours. While scales exist to measure the effects of wind, they can be conflicting or leave gaps in the information. For the purposes of this plan, we use the Beaufort Wind Scale (Figure 27) because it is specifically adapted to wind effects on land.

Figure 27: Beaufort Scale, December 2012[52]

Beaufort Wind 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 rise. 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.

[52] Source: http://www.spc.noaa.gov/faq/tornado/beaufort.html

All areas of the state can experience all 12 Beaufort categories. As used in this section, windstorms are 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.

Figure 28 illustrates various wind zones throughout the country based on design wind speeds established by the American Society of Civil Engineers. It divides the country into four wind zones, geographically representing the frequency and magnitude of potential high wind events including severe thunderstorms, tornadoes and hurricanes. The figure shows that New Mexico is located Zone I, II and III wind speeds for shelters of up to 160 mph.

Figure 28: Wind Zones in the United States

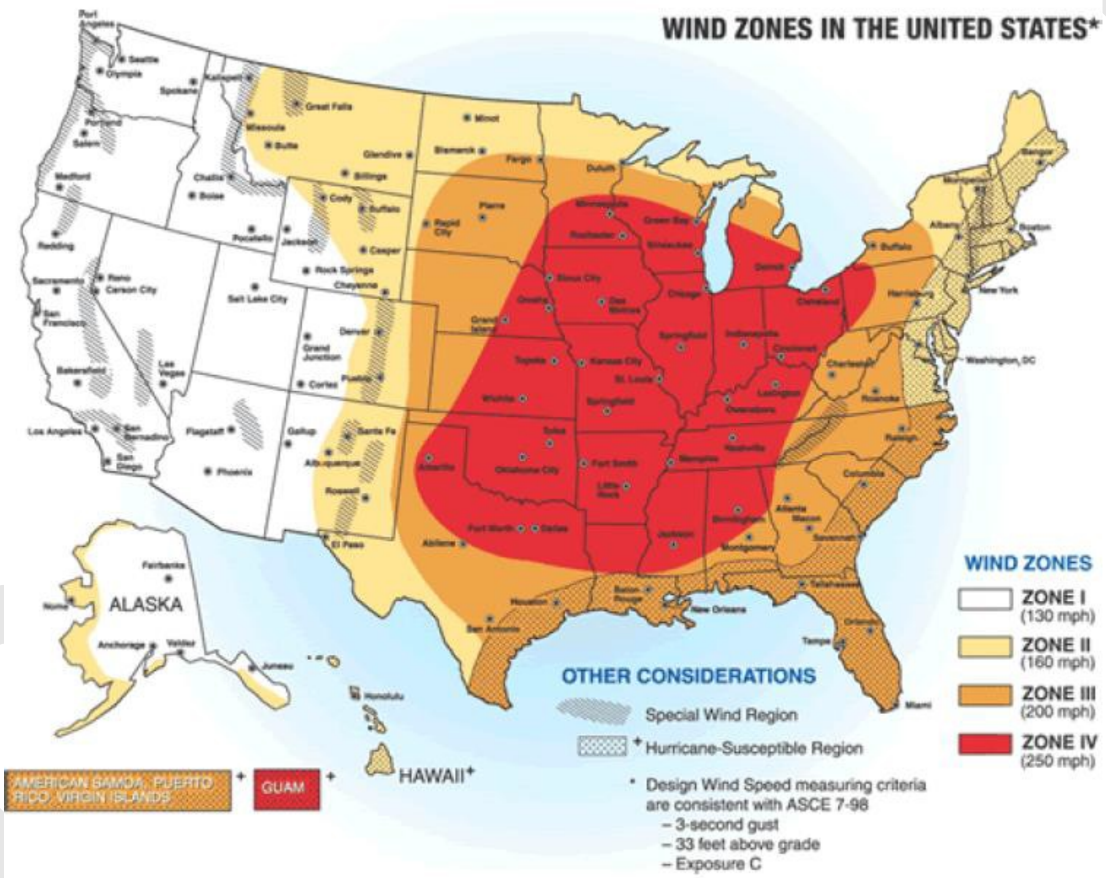


Table 41 correlates the New Mexico Preparedness Areas with UNM properties to the wind zones identified on the map.

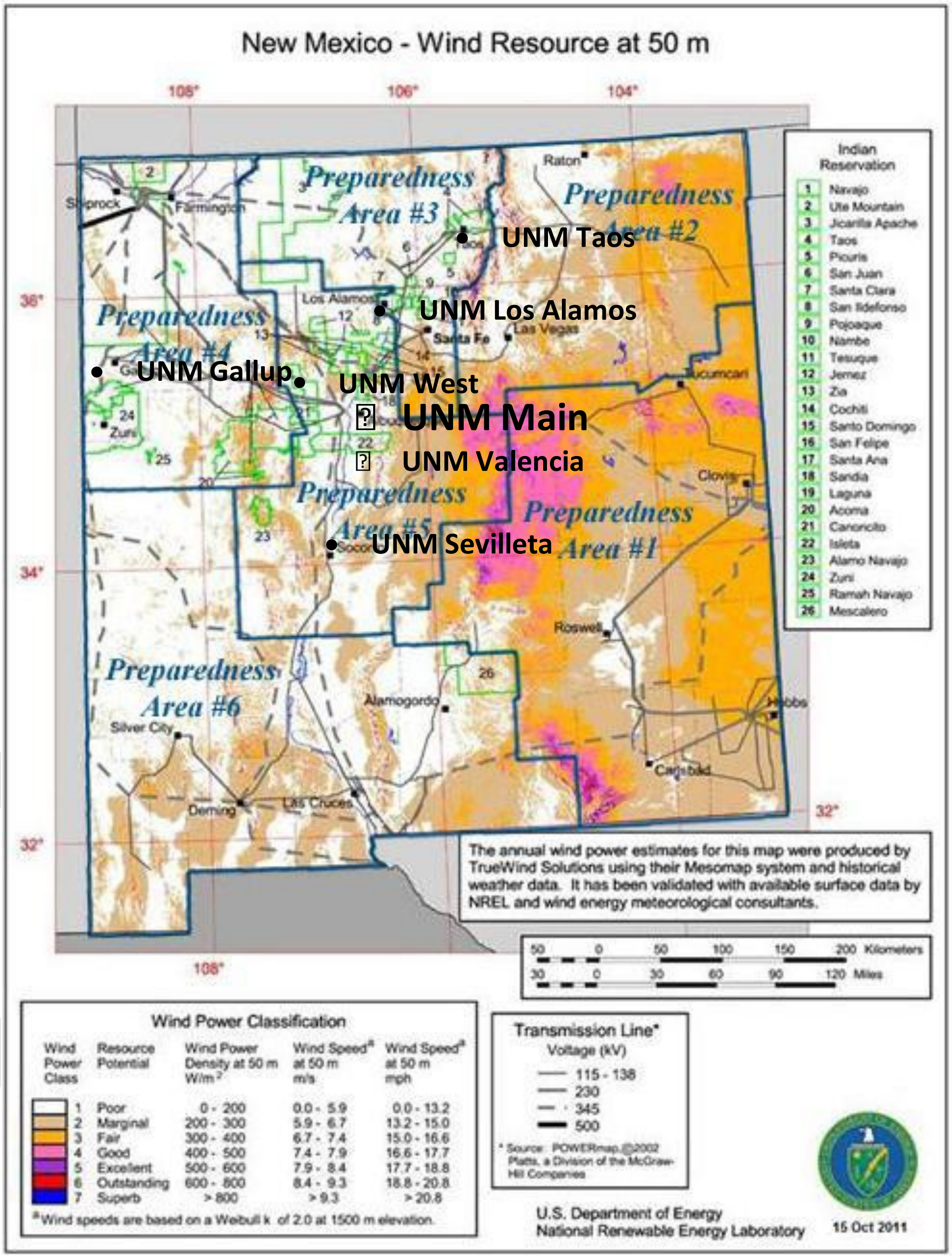
Table 41: Wind Speed Experienced by New Mexico Preparedness Areas[53]

Location	Wind Speed Zone
Preparedness Area 3	Zone I and II (Winds from 130 up to 160 mph
Preparedness Area 4	Zone I (winds up to 130 mph)
Preparedness Area 5	Zone I and II (Winds from 130 up to 160 mph

[53] Source: http://www.fema.gov/safe-rooms/wind-zones-united-states

The entire State of New Mexico is subject to high wind conditions, but areas most vulnerable where the population is concentrated, and buildings are of older design. Figure 29 shows average wind speeds in New Mexico as provided by the U.S. Department of Energy's (Energy Department's) Wind Program and the National Renewable Energy Laboratory.[54] This resource map shows estimates of wind power density at 50 m above the ground. This map indicates that New Mexico has wind resources consistent with community-scale production.

Figure 29: Average Wind Speeds in by NM Preparedness Area – October 15, 2011



[54] Source: U.S. Department of Energy http://www.windpoweringamerica.gov/maps_template.asp?stateab=nm

Previous Occurrences

The current online NCDC database contains data from January 12, 1950 – July 27, 2015, as entered by NOAA's National Weather Service (NWS). Referencing this online database, NCDC reports a total 426 high wind events with four injuries and $9.075 million in property damage.[55] Table 42 describes significant events that have occurred in New Mexico in counties/preparedness areas with UNM properties.

Table 42: Significant Past Occurrence - High Wind

Date	Location	Significant Event
July 26, 2013	Bernalillo County	A large complex of strong thunderstorms organized over north central New Mexico then slowly pushed south along the entire Rio Grande Valley. As this storm complex pushed into the Albuquerque Metro Area, a severe downburst wind measuring a historical 89mph at the Sunport surged out ahead of the storm and produced extensive damage and flash flooding to many areas along and south of Interstate 40. Several outdoor events were severely impacted, including an Albuquerque Isotopes baseball game, Summer Fest at the BioPark Zoo, and a concert at the Isleta Amphitheater. Downed tree branches and uprooted trees created extensive power outages leaving more than 25,000 customers without power. Interstate 25 was closed between the Big I and Rio Bravo Boulevard for nearly 12 hours as downed power lines and power poles were repaired along several access ramps. Flash flooding with these thunderstorms stranded several motorists in several feet of water across downtown Albuquerque and in many other areas of town. The property damage cost from this thunderstorm wind event was $ 1 million.

[55] The search query conducted on the NCDC database included: high winds, strong winds, thunderstorm wind, dust storm, and dust devil events.

Date	Location	Significant Event
December 1, 2011	Bernalillo/Valencia Counties (Preparedness Area 5)	A powerful cold front produced wind gusts between 60 and 90 mph and caused widespread damage to roofs and power lines around Albuquerque, Socorro and even Grants. Sustained winds between 40 and 55 mph and gusts between 60 and 90 mph were common across the Albuquerque Metro Area with numerous reports of roof damage, downed power lines, evaporative coolers blown off roofs, tree limbs snapped, and trees toppled over. Over 2500 damage claims were filed in and around the Albuquerque Metro area with damage estimated to be $ 4.5 million. The winds also took on the University of New Mexico football practice facility, with damage noted to the south walls and roof. Also, the Valencia High School roof in Los Lunas was partially damaged from high winds.
December 2009	Socorro County (Preparedness Area 5)	As reported by the Mountain Mail, after a weekend of wintry weather, high winds were a cause of concern for many county residents, especially those traveling on Highway 60, which had to be shut down near Magdalena for over an hour. The closure was the result of diesel fuel leaking from the tank of a wrecked semi-tractor trailer. According to the Magdalena Marshal, two semis were blown off the road; one at mile marker 126, and the other at mile marker 119. The semi at 119 leaked 240 gallons of diesel fuel causing the highway had to be closed until the hazmat operation had been completed. The truck driver from Boise, Idaho, said he was on his way to Tucson when he experienced the estimated 100 mph gusts on Highway 60. Higher winds were recorded at other stations in the county. Magdalena Ridge Observatory sustained wind speeds at the 10,600-foot facility averaged about 100 mph over a seven-hour period with gusts up to 128 mph.
September 9, 2003	Albuquerque Bernalillo County (Preparedness Area 5)	Thunderstorms with gusty winds of 45-50 mph moved across Albuquerque. A large and leafy tree limb fell at the New Mexico State Fair causing minor injuries to 4 people. Two men were transported to hospital and then released.

Date	Location	Significant Event
May 24, 1999	Socorro County/Valencia County (Preparedness Area 5)	Over $1.2 million in damages were caused by a severe storm which began near Alamo in northwest Socorro County swept northeast across central Valencia County with high winds and large hail. Heavy wind damage from sustained winds estimated near 80 mph overturned and destroyed about 15 mobile homes and caused damage to about 150 other homes with many small outbuildings and sheds blown down in the area from Los Chavez to Tome Hill between Los Lunas and Belen. Large hail also knocked out numerous windows and broke windshields. Only two relatively minor injuries were reported in the hardest hit area. Residents had 40-60 minutes advanced warning and school officials successfully evacuated numerous portable classroom buildings without incident or injury to students before high winds struck.
March – April 1993	Albuquerque, NM (Preparedness Area 5)	Windstorms/Dust storms. Numerous days with high winds and blowing dust. Albuquerque Airport recorded a peak gust of 80 MPH in March, Sandia Peak a gust of 106 MPH.
December 1977	Albuquerque, NM (Bernalillo County) Preparedness Area 5	The central Rio Grande valley is occasionally subject to mountain wave-induced winds, which can become exceptionally strong. One such wave-induced windstorm occurred when surface winds with gusts between 50 and 70 mph were reported at the airport in Albuquerque. Wind reports from around the Albuquerque metro area included a peak wind of 71 mph at the airport, 97 mph at the base of the Sandia Tramway and gusts between 80 and 90 mph at Coronado Airport.

Table 43 provides a cumulative overview of significant high wind events that have occurred in counties in which UNM campuses and properties are located. Table 43 is a tally of high wind events as reported by SHELDUS broken out by County. Data is reported by event and is aggregated by county.

Table 43: SHELDUS History of High Wind Events (1994-2014)

County Name	Hazard	Year	Month	Property Damage	Property Damage (ADJ 2014)	Injuries	Fatalities	Records
Bernalillo	Wind	1994	1	$2,500.00	$3,993.52	0	0	1
Bernalillo	Wind	1994	10	$0.00	$0.00	1	0	1
Bernalillo	Wind	1995	3	$2,142.86	$3,328.69	0	0	1
Bernalillo	Wind	1995	4	$1,666.67	$2,588.98	0	0	1
Bernalillo	Wind	1995	9	$500.00	$776.70	0	0	1

County Name	Hazard	Year	Month	Property Damage	Property Damage (ADJ 2014)	Injuries	Fatalities	Records
Bernalillo	Wind	1996	1	$6,333.33	$9,555.94	0	0	1
Bernalillo	Wind	1996	3	$11,666.66	$17,603.05	0	0	2
Bernalillo	Wind	1996	12	$4,285.71	$6,466.42	0	0	1
Bernalillo	Wind	1997	4	$28,750.00	$42,405.98	0	0	2
Bernalillo	Wind	1997	10	$4,545.45	$6,704.50	0	0	1
Bernalillo	Wind	1998	2	$11,538.46	$16,758.09	0	0	1
Bernalillo	Wind	1998	3	$0.00	$0.00	1	0	1
Bernalillo	Wind	1998	4	$5,300.00	$7,697.55	0	0	2
Bernalillo	Wind	1999	2	$1,176.47	$1,671.75	0	0	1
Bernalillo	Wind	1999	4	$10,000.00	$14,209.84	0	0	1
Bernalillo	Wind	2000	4	$8,888.89	$12,220.21	0	0	1
Bernalillo	Wind	2000	9	$15,000.00	$20,621.60	0	0	1
Bernalillo	Wind	2000	12	$4,166.67	$5,728.23	0	0	1
Bernalillo	Wind	2001	6	$428.57	$572.89	0	0	1
Bernalillo	Wind	2001	7	$15,000.00	$20,051.05	0	0	1
Bernalillo	Wind	2003	9	$0.00	$0.00	2	0	1
Bernalillo	Wind	2004	6	$1,500.00	$1,879.85	0	0	1
Bernalillo	Wind	2007	6	$277.78	$317.16	0	0	1
Bernalillo	Wind	2007	12	$769.23	$878.28	0	0	1
Bernalillo	Wind	2008	2	$2,500.00	$2,748.87	0	0	1
Bernalillo	Wind	2008	5	$4,000.00	$4,398.20	0	0	2
Bernalillo	Wind	2008	10	$2,500.00	$2,748.87	0	0	1
Bernalillo	Wind	2009	2	$1,000.00	$1,103.47	0	0	1
Bernalillo	Wind	2009	4	$7,044.45	$7,773.37	0	0	3
Bernalillo	Wind	2009	6	$2,800.00	$3,089.73	0	0	1
Bernalillo	Wind	2009	7	$750.00	$827.61	0	0	1
Bernalillo	Wind	2009	12	$34,366.67	$37,922.73	0	0	1
Bernalillo	Wind	2010	3	$66.67	$72.38	0	0	1
Bernalillo	Wind	2010	4	$1,666.67	$1,809.45	0	0	1
Bernalillo	Wind	2010	6	$136,666.66	$148,374.35	0	0	2
Bernalillo	Wind	2011	3	$3,333.33	$3,508.15	0	0	1
Bernalillo	Wind	2011	4	$4,333.34	$4,560.60	0	0	3
Bernalillo	Wind	2011	6	$416.67	$438.52	0	0	1
Bernalillo	Wind	2012	3	$13,500.00	$13,919.94	0	0	2
Bernalillo	Wind	2012	4	$22,166.67	$22,856.20	0	0	3
Bernalillo	Wind	2012	12	$166.67	$171.85	0	0	1
Bernalillo	Wind	2013	3	$666.67	$677.48	0	0	1
Bernalillo	Wind	2013	6	$15,166.67	$15,412.70	0	0	4
Bernalillo	Wind	2013	7	$579,000.00	$588,392.46	0	0	6

County Name	Hazard	Year	Month	Property Damage	Property Damage (ADJ 2014)	Injuries	Fatalities	Records
Bernalillo	Wind	2013	10	$8,000.00	$8,129.77	0	0	1
Bernalillo	Wind	2014	2	$600.00	$600.00	0	0	1
Bernalillo	Wind	2014	4	$2,285.72	$2,285.72	0	0	4
Bernalillo	Wind	2014	6	$33,500.00	$33,500.00	0	0	3
Bernalillo	Wind	2014	7	$857.14	$857.14	0	0	2
Bernalillo	Wind	2014	9	$60,000.00	$60,000.00	0	0	2
Bernalillo	Wind	2014	10	$500.00	$500.00	0	0	1
Los Alamos	Wind	1995	11	$2,000.00	$3,106.77	0	0	1
Los Alamos	Wind	1998	4	$2,300.00	$3,340.45	0	0	1
Los Alamos	Wind	1999	4	$6,666.67	$9,473.23	0	0	1
Los Alamos	Wind	2000	7	$10,000.00	$13,747.74	0	0	1
Los Alamos	Wind	2007	6	$277.78	$317.16	0	0	1
Los Alamos	Wind	2009	3	$1,875.00	$2,069.01	0	0	1
Los Alamos	Wind	2009	4	$100.00	$110.35	0	0	1
Los Alamos	Wind	2010	10	$1,000.00	$1,085.67	0	0	1
Los Alamos	Wind	2013	5	$30,000.00	$30,486.66	0	0	1
McKinley	Wind	1995	3	$2,142.86	$3,328.69	0	0	1
McKinley	Wind	1995	11	$2,000.00	$3,106.77	0	0	1
McKinley	Wind	1996	3	$8,333.33	$12,573.61	0	0	1
McKinley	Wind	1996	12	$4,285.71	$6,466.42	0	0	1
McKinley	Wind	1997	4	$8,750.00	$12,906.17	0	0	1
McKinley	Wind	1998	4	$2,300.00	$3,340.45	0	0	1
McKinley	Wind	1998	6	$1,000.00	$1,452.37	0	0	1
McKinley	Wind	1998	7	$25,000.00	$36,309.20	0	0	1
McKinley	Wind	1999	2	$1,176.47	$1,671.75	0	0	1
McKinley	Wind	1999	4	$31,666.67	$44,997.84	0	0	3
McKinley	Wind	2000	4	$8,888.89	$12,220.21	0	0	1
McKinley	Wind	2000	7	$15,000.00	$20,621.60	0	0	1
McKinley	Wind	2001	6	$428.57	$572.89	0	0	1
McKinley	Wind	2002	3	$0.00	$0.00	2	0	1
McKinley	Wind	2003	7	$7,500.00	$9,649.57	0	0	1
McKinley	Wind	2005	4	$2,187.50	$2,651.61	0	0	1
McKinley	Wind	2007	6	$277.78	$317.16	0	0	1
McKinley	Wind	2009	1	$0.00	$0.00	0	0.25	1
McKinley	Wind	2009	3	$1,875.00	$2,069.01	0	0	1
McKinley	Wind	2009	4	$2,600.00	$2,869.03	0	0	2
McKinley	Wind	2011	1	$0.00	$0.00	0	0.5	2
McKinley	Wind	2011	2	$0.00	$0.00	0	0.165	1
McKinley	Wind	2011	4	$2,833.33	$2,981.92	0	0	2

County Name	Hazard	Year	Month	Property Damage	Property Damage (ADJ 2014)	Injuries	Fatalities	Records
McKinley	Wind	2011	6	$416.67	$438.52	0	0	1
McKinley	Wind	2013	10	$8,000.00	$8,129.77	0	0	1
McKinley	Wind	2014	3	$5,000.00	$5,000.00	0	0	2
Sandoval	Wind	1995	3	$2,142.86	$3,328.69	0	0	1
Sandoval	Wind	1995	4	$1,666.67	$2,588.98	0	0	1
Sandoval	Wind	1995	11	$2,000.00	$3,106.77	0	0	1
Sandoval	Wind	1996	1	$6,333.33	$9,555.94	0	0	1
Sandoval	Wind	1996	3	$8,333.33	$12,573.61	0	0	1
Sandoval	Wind	1996	6	$20,000.00	$30,176.67	0	0	1
Sandoval	Wind	1996	12	$4,285.71	$6,466.42	0	0	1
Sandoval	Wind	1997	4	$8,750.00	$12,906.17	0	0	1
Sandoval	Wind	1997	10	$4,545.45	$6,704.50	0	0	1
Sandoval	Wind	1998	2	$11,538.46	$16,758.09	0	0	1
Sandoval	Wind	1998	4	$2,300.00	$3,340.45	0	0	1
Sandoval	Wind	1999	2	$1,176.47	$1,671.75	0	0	1
Sandoval	Wind	1999	4	$6,666.67	$9,473.23	0	0	1
Sandoval	Wind	1999	6	$7,500.00	$10,657.39	0	0	1
Sandoval	Wind	2000	4	$8,888.89	$12,220.21	0	0	1
Sandoval	Wind	2000	12	$4,166.67	$5,728.23	0	0	1
Sandoval	Wind	2001	6	$428.57	$572.89	0	0	1
Sandoval	Wind	2001	7	$10,000.00	$13,367.37	0	0	1
Sandoval	Wind	2001	12	$10,000.00	$13,367.36	0	0	1
Sandoval	Wind	2002	8	$0.00	$0.00	1	0	1
Sandoval	Wind	2002	9	$2,500.00	$3,289.83	0	0	1
Sandoval	Wind	2005	4	$2,187.50	$2,651.61	0	0	1
Sandoval	Wind	2007	6	$277.78	$317.16	0	0	1
Sandoval	Wind	2007	12	$50,769.23	$57,966.57	0	0	2
Sandoval	Wind	2008	3	$500.00	$549.77	0	0	1
Sandoval	Wind	2009	2	$1,000.00	$1,103.47	0	0	1
Sandoval	Wind	2009	3	$1,875.00	$2,069.01	0	0	1
Sandoval	Wind	2009	4	$7,044.45	$7,773.37	0	0	3
Sandoval	Wind	2009	6	$2,800.00	$3,089.73	0	0	1
Sandoval	Wind	2009	12	$34,366.67	$37,922.73	0	0	1
Sandoval	Wind	2010	3	$66.67	$72.38	0	0	1
Sandoval	Wind	2010	4	$2,666.67	$2,895.12	0	0	3
Sandoval	Wind	2010	5	$1,000.00	$1,085.67	0	0	1
Sandoval	Wind	2010	6	$137,666.66	$149,460.02	0	0	3
Sandoval	Wind	2010	8	$50.00	$54.28	0	0	1
Sandoval	Wind	2010	10	$1,500.00	$1,628.51	0	0	2

County Name	Hazard	Year	Month	Property Damage	Property Damage (ADJ 2014)	Injuries	Fatalities	Records
Sandoval	Wind	2011	3	$3,333.33	$3,508.15	0	0	1
Sandoval	Wind	2011	4	$19,333.34	$20,347.28	0	0	4
Sandoval	Wind	2011	6	$416.67	$438.52	0	0	1
Sandoval	Wind	2012	3	$16,000.00	$16,497.71	0	0	3
Sandoval	Wind	2012	4	$22,166.67	$22,856.20	0	0	3
Sandoval	Wind	2012	12	$166.67	$171.85	0	0	1
Sandoval	Wind	2013	3	$666.67	$677.48	0	0	1
Sandoval	Wind	2013	6	$5,166.67	$5,250.48	0	0	3
Sandoval	Wind	2013	10	$8,000.00	$8,129.77	0	0	1
Sandoval	Wind	2014	2	$600.00	$600.00	0	0	1
Sandoval	Wind	2014	4	$2,285.72	$2,285.72	0	0	4
Sandoval	Wind	2014	7	$857.14	$857.14	0	0	2
Socorro	Wind	1995	3	$2,142.86	$3,328.69	0	0	1
Socorro	Wind	1995	4	$1,666.67	$2,588.98	0	0	1
Socorro	Wind	1996	1	$6,333.33	$9,555.94	0	0	1
Socorro	Wind	1996	3	$8,333.33	$12,573.61	0	0	1
Socorro	Wind	1996	5	$3,750.00	$5,658.13	0	0	1
Socorro	Wind	1996	12	$20,952.38	$31,613.65	0	0	2
Socorro	Wind	1997	4	$8,750.00	$12,906.17	0	0	1
Socorro	Wind	1997	7	$30,000.00	$44,249.72	0	0	1
Socorro	Wind	1997	10	$4,545.45	$6,704.50	0	0	1
Socorro	Wind	1998	2	$11,538.46	$16,758.09	0	0	1
Socorro	Wind	1999	2	$1,176.47	$1,671.75	0	0	1
Socorro	Wind	2000	4	$8,888.89	$12,220.21	0	0	1
Socorro	Wind	2000	12	$4,166.67	$5,728.23	0	0	1
Socorro	Wind	2001	4	$3,571.43	$4,774.06	0	0	1
Socorro	Wind	2001	6	$428.57	$572.89	0	0	1
Socorro	Wind	2001	7	$0.00	$0.00	4	0	1
Socorro	Wind	2005	4	$2,187.50	$2,651.61	0	0	1
Socorro	Wind	2007	6	$277.78	$317.16	0	0	1
Socorro	Wind	2007	12	$769.23	$878.28	0	0	1
Socorro	Wind	2008	3	$500.00	$549.77	0	0	1
Socorro	Wind	2009	4	$7,044.45	$7,773.37	0	0	3
Socorro	Wind	2009	6	$2,800.00	$3,089.73	0	0	1
Socorro	Wind	2009	12	$34,366.67	$37,922.73	0	0	1
Socorro	Wind	2010	4	$15,000.00	$16,284.99	0	0	2
Socorro	Wind	2010	7	$1,500.00	$1,628.50	0	0	1
Socorro	Wind	2011	4	$22,500.00	$23,680.02	0	0	2
Socorro	Wind	2011	6	$416.67	$438.52	0	0	1

County Name	Hazard	Year	Month	Property Damage	Property Damage (ADJ 2014)	Injuries	Fatalities	Records
Socorro	Wind	2013	7	$10,000.00	$10,162.22	0	0	1
Socorro	Wind	2013	10	$8,500.00	$8,637.88	0	0	2
Socorro	Wind	2014	4	$1,000.00	$1,000.00	0	0	2
Taos	Wind	1995	11	$2,000.00	$3,106.77	0	0	1
Taos	Wind	1996	12	$16,666.67	$25,147.23	0	0	1
Taos	Wind	1997	7	$30,000.00	$44,249.72	0	0	1
Taos	Wind	1998	2	$11,538.46	$16,758.09	0	0	1
Taos	Wind	1999	2	$1,176.47	$1,671.75	0	0	1
Taos	Wind	2007	6	$277.78	$317.16	0	0	1
Taos	Wind	2008	5	$10,000.00	$10,995.48	0	0	1
Taos	Wind	2009	4	$6,944.45	$7,663.02	0	0	2
Taos	Wind	2013	4	$125.00	$127.03	0	0	1
Taos	Wind	2013	12	$8,333.34	$8,468.52	0	0	1

Frequency

The State of New Mexico experiences high wind events annually, based on seasonal meteorological patterns and local topographical conditions. 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 the Sandia and Manzano Mountain ranges and spill over to the west, typically down slope toward the Albuquerque metropolitan area (Preparedness Area 5).

Wind speeds over the State are usually moderate, although relatively strong winds often accompany occasional frontal activity during late winter and spring months and sometimes occur just in advance of thunderstorms. Frontal winds may exceed 30 mph for several hours and reach peak speeds of more than 50 mph. Spring is the windy season in New Mexico. Blowing dust and serious soil erosion of unprotected fields may be a problem during dry spells. Winds are generally stronger in the eastern plains than in other parts of the State. Winds generally predominate from the southeast in summer and from the west in winter, but local surface wind directions will vary greatly because of local topography and mountain and valley breezes.

A study was conducted by the National Weather Service – Albuquerque titled, "A Climatology of High Wind Warning Events for Northern and Central New Mexico: 1976-2005." The study conducted an assessment of climatological wind data across northern and central New Mexico in an effort to provide forecasters with supplemental knowledge of the synoptic regimes and frequency of high wind events.

The climatological record of high wind events was built for eight observational sites across New Mexico utilizing a 30-year period of record from 1976 to 2005. Locations included Albuquerque – Preparedness Area 1, Clayton – Preparedness Area 2, Farmington – Preparedness Area 4, Gallup – Preparedness Area 4, Los Vegas – Preparedness Area 2, Roswell – Preparedness Area 1, Santa Fe – Preparedness Area 3 and Tucumcari – Preparedness Area 1. NWS staff conducted hourly, monthly, seasonal, and yearly intervals and interim surface observations from these eight sites to determine the frequency of high wind events. The observations provided the NWS with information that with continued future work will hopefully include the construction of a database that will allow improved methods for inter-site comparisons of events on an individual and collective basis.[56]

Probability of Future Occurrence

High winds are difficult to predict precisely in pattern, frequency, and degree of severity. The windiest time of the year is during the spring months of April and May, with March and June often times not far behind. The graphs below depict mean monthly wind speeds at seven locations across the state – the spring wind maximum is evident at all sites.

To determine the probability of New Mexico experiencing future high wind occurrences, the probability or chance of occurrence was calculated based on historical data identified the NCDC database from a period of January 1, 2006 – December 1, 2012 (84 months) and from local emergency management officials. Probability was determined by dividing the number of events observed by the number of months and multiplying by 100. This gives the percent chance of the event happening in any given year.

Table 44 provides the probability of future occurrence in each Preparedness Area based on the probability formula.

Table 44: Probability of Future Occurrence (annually) - High Wind

Probability of Future Occurrence			
Preparedness Area	**High Wind**	**Strong Wind**	**Dust Storm**
Preparedness Area 1	100%	4.8%	0%
Preparedness Area 2	8.3%	2.3%	0%
Preparedness Area 3	2.3%	6.0%	0%
Preparedness Area 4	4.8%	2.3%	0%
Preparedness Area 5	30%	3.6%	1.2%
Preparedness Area 6	11%	0%	1.2%

[56] Source: http://www.srh.noaa.gov/media/abq/LocalStudies/hww_studyBTS2010.pdf

Risk Assessment

No areas of New Mexico are immune from damaging high winds. High wind is a fact of life for state residents, especially in the spring. 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.

Strong winds can damage buildings and uproot trees but can also produce areas of blowing dust that can reduce visibilities making road travel hazardous. The NWS Albuquerque issues high wind warnings when winds are expected to have sustained speeds of 40 mph or greater and/or instantaneous gusts of 58 mph or higher. A study was recently completed to determine the frequency of high wind events across New Mexico, and to evaluate the synoptic regime associated with these events. This study showed that high wind events are also most common in the spring.

High wind events often have a westerly component. During the spring months two factors work in tandem to create strong winds. By March or April, the polar jet stream has started migrating northward but can still often influence the southwest U.S., such that wind speeds increase dramatically with height. Meanwhile, the sun angle is getting higher in the sky and creating greater heating near the surface of the earth. The heated surface air rises to a greater depth of the atmosphere during these spring months, often to a height between 7,500 and 10,000 feet above the surface. The rising air mixes with stronger winds aloft, resulting in stronger and turbulent winds mixing down to the surface. Strong surface pressure gradients can enhance surface winds. High wind events across New Mexico can also occur with strong surface fronts, especially those that race through the eastern plains.[57]

Table 45 identifies the impacts related to high wind events.

Table 45: Probability of Future Occurrence - Flood/Flash Flood

Subject	Impacts
Health and Safety of the Public	The public can face severe injuries and even death because of high wind events.
Health and Safety of Responders	Responders face the same risks as the public.
Continuity of Operations	Little to no impacts anticipated, except for facilities that may be damaged or during an event.
Delivery of Services	Little to no impacts anticipated, except for facilities that may be damaged or during an event.
Property, Facilities, Infrastructure	High wind can cause anywhere from minor damage to total destruction of facilities and infrastructure depending on the size of the event. Extensive damages are anticipated.

[57] Source: http://www.srh.noaa.gov/abq/?n=features_highwind

Environment	Wind can cause widespread extensive damage to the environment in the form of damaged or downed trees and crops, and debris or contamination dispersal.
Economic Condition	A small community can be heavily damaged and by wind. The economic base (businesses) and individuals can lose everything, and recovery may require substantial investment.
Public Confidence	Not impacted by the event itself, but may be damaged if the response to an event is poor.

Data Limitations

UNM events that take place outdoors such as sporting events, are susceptible to high wind events. In the past, downed power lines, roof damage, trees being blown down, and collapse of outdoor structures has occurred. These incidents can result in injuries and possible death. Structures that are not adequately anchored such as portable buildings are also vulnerable for damage from high wind events. The amount of business lost due to high wind events has not been calculated due to the difficulty of attaining this information.

Summary of Impact to UNM

All UNM campuses can be affected by high windstorm events. UNM campuses could experience high wind events between 0 and 63 mph. UNM main campus identifies high winds as being medium based on past occurrence recorded. UNM Branch Campuses and the Sevilleta LTER identified winds as being a low risk.

Landslide

Hazard Characteristics

Landslides are the downward and outward movement of loose material on slopes. Landslides include a wide range of ground movement, such as rock falls, deep failure of slopes, and shallow debris flows. Although gravity acting on and over steepened slopes is the primary reason for a landslide, landslides are often prompted by the occurrence of other disasters such as seismic activity of heavy rain fall. Other contributing factors include the following:

- Erosion by rivers, glaciers, or waves creating over-steepened slopes;
- Rock and soil slopes weakened through saturation by snowmelt or heavy rains;
- Earthquakes creating stresses that make weak slopes fail;
- Volcanic eruptions producing loose ash deposits, heavy rain, and debris flows;
- Excess weight from accumulation of rain or snow, stockpiling of rock or ore, from waste piles, or from manmade structures stressing weak slopes;
- Floods or long duration precipitation events creating saturated, unstable soils that are more susceptible to failure;
- Addition of water from irrigation ditches crossing steep slopes and saturating the substrate; and
- Moist clay on slopes deform, slide, and flow easily.

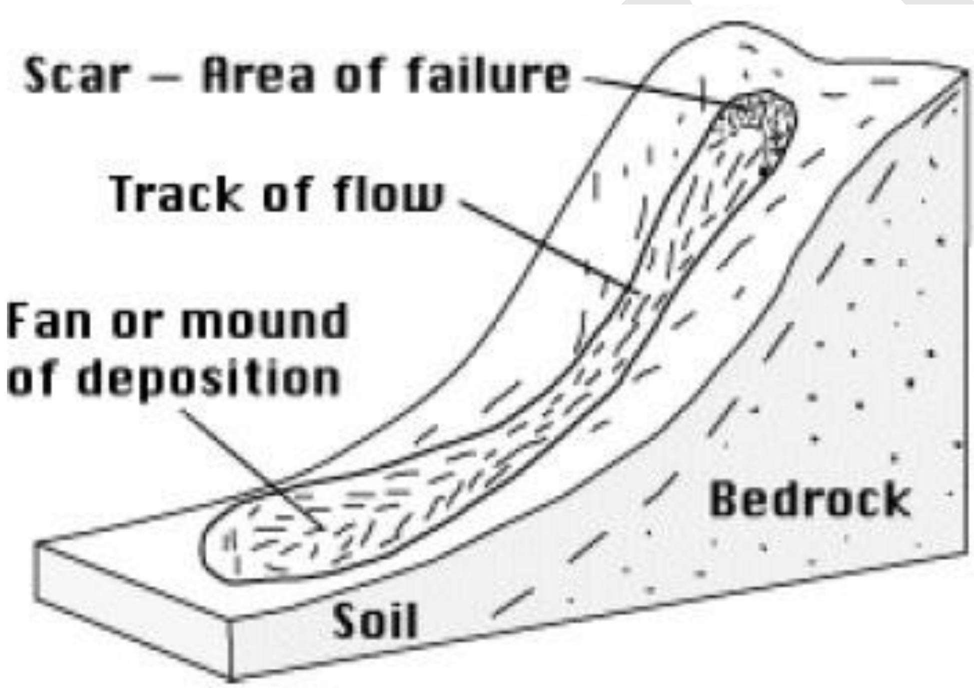
Slope material often becomes saturated with water and may develop a debris or mudflow. If the ground is saturated, the water weakens the soil and rock by reducing cohesion and friction between particles. Cohesion, which is the tendency of soil particles to "stick" to each other, and friction affect the strength of the material in the slope and contribute to a slope's ability to resist down slope movement. Moist clays on slopes are plastic, deforming and sliding under slight loads and also prevent water from percolating downward. Saturation also increases the weight of the slope materials and, like the addition of material on the upper portion of a slope, increases the gravitational force on the slope. Undercutting of a slope reduces the slope's resistance to the force of gravity by removing much-needed support at the base of the slope. Alternating cycles of freeze and thaw can result in a slow, virtually imperceptible loosening of rock, thereby weakening the rock and making it susceptible to slope failure. The resulting slurry of rock and mud can pick up trees, houses, and cars, and block bridges and tributaries, causing flooding along its path. Additionally, removal of vegetation can leave a slope much more susceptible to superficial landslides because of the loss of the stabilizing root systems.

Geologists identify active landslides and areas subject to slope instability so that they may be avoided or mitigated. Together, geologists and civil engineers develop and implement measures to improve the stability of slopes, repair existing landslides, and prevent damage from future landslides. Slope stability can be improved by removing material from the top of the slope, adding material or retaining structures to the base of the slope, and reducing the degree of saturation by improving drainage within the slope.

Landslide Types

Debris Flows – a mixture of rock fragments, soil, vegetation, water and, in some cases, entrained air that flows downhill as a fluid. Debris flows can range in consistency from that of freshly mixed concrete to running water. Debris flows can be further classified as mudflows and earth flows depending on the ratio of water to soil and rock debris. Lahars are a special form of debris flow caused by volcanic eruptions (Figure 30).

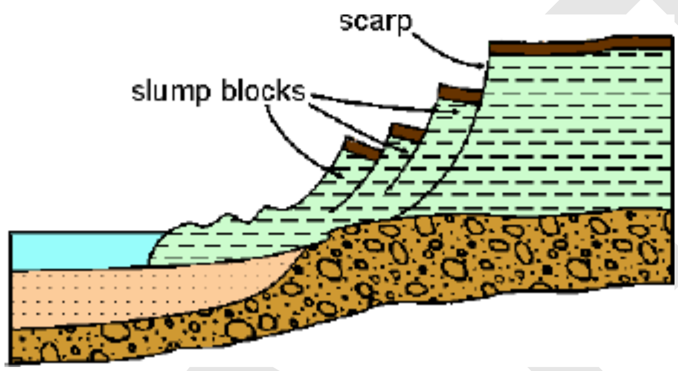
Figure 30: Landslide – Debris Flow[58]



[58] USGS, http://pubs.usgs.gov/fs/2004/3072/fs-2004-3072.html (December 2012)

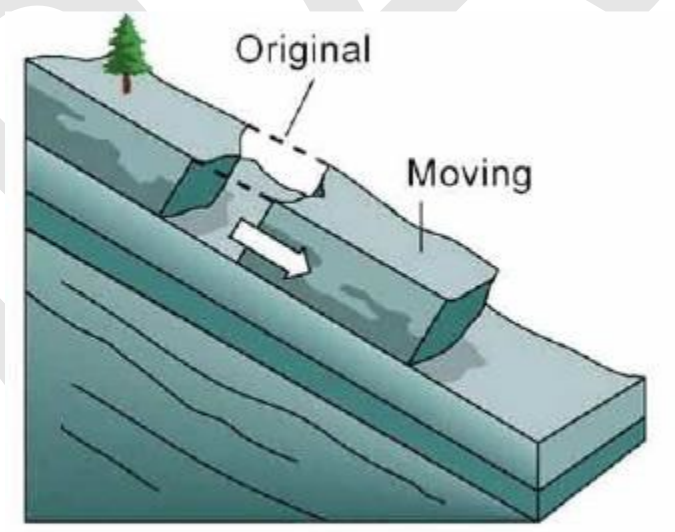
Slump – a landslide consisting of a mass of material moving down slope as a unit, usually along a curved plane of failure. The removed mass of soil and rock leave an abrupt drop-off at the top of the landslide known as a scarp. Repeated slumping can often result in terracing, or series of scarps, as secondary failures occur within the landslide mass (Figure 31).

Figure 31: Landslide – Slump[59]



Slide – the rapid movement of a large mass of rock along a plane of weakness, such as a bedding plane or joint. In general, rockslides occur on steep mountain faces, but have been known to occur on slopes as low as 15 degrees (Figure 32).

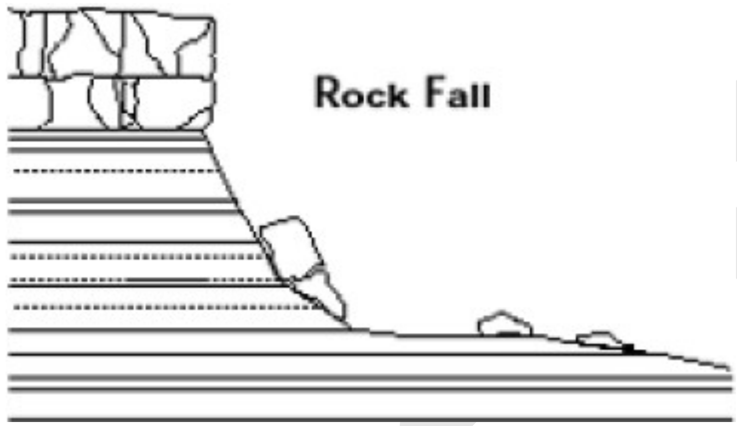
Figure 32: Landslide – Rock Slide[60]



Rock Fall – the freefall of rock from a cliff. Rock falls are often the result of physical weathering such as ice wedging. The rock typically accumulates at the base of the cliff in the form of talus (loose rock). Rock falls are often triggered by earthquakes (Figure 33).[61]

[59] USGS, http://pubs.usgs.gov/fs/2004/3072/fs-2004-3072.html (December 2012).
[60] USGS http://pubs.usgs.gov/fs/2004/3072/fs-2004-3072.html (December 2012)

Figure 33: Landslide – Rock Fall[62]



Landslides can be classified by using the Alexander Scale (Table 46). The Alexander Scale provides descriptions of landslide damage and the different levels and type of damage.

Table 46: Alexander Scale for Landslide Damage[63]

Level	Damage	Description
0	None	Building is intact.
1	Negligible	Hairline cracks in walls or structural members; no distortion of structure or detachment of external architectural details.
2	Light	Buildings continue to be habitable; repair not urgent. Settlement of foundations, distortion of structure, and inclination of walls are not sufficient to compromise overall stability.
3	Moderate	Walls out of perpendicular by one or two degrees, or there has been substantial cracking in structural members, or the foundations have settled during differential subsidence of at least 15 cm; building requires evacuation and rapid attention to ensure its continued life.
4	Serious	Walls out of perpendicular by several degrees; open cracks in walls; fracture of structural members; fragmentation of masonry; differential settlement of at least 25 cm compromising foundations; floors may be inclined by one or two degrees or ruined by heave. Internal partition walls will need to be replaced; door and window frames are too distorted to use; occupants must be evacuated, and major repairs carried out.

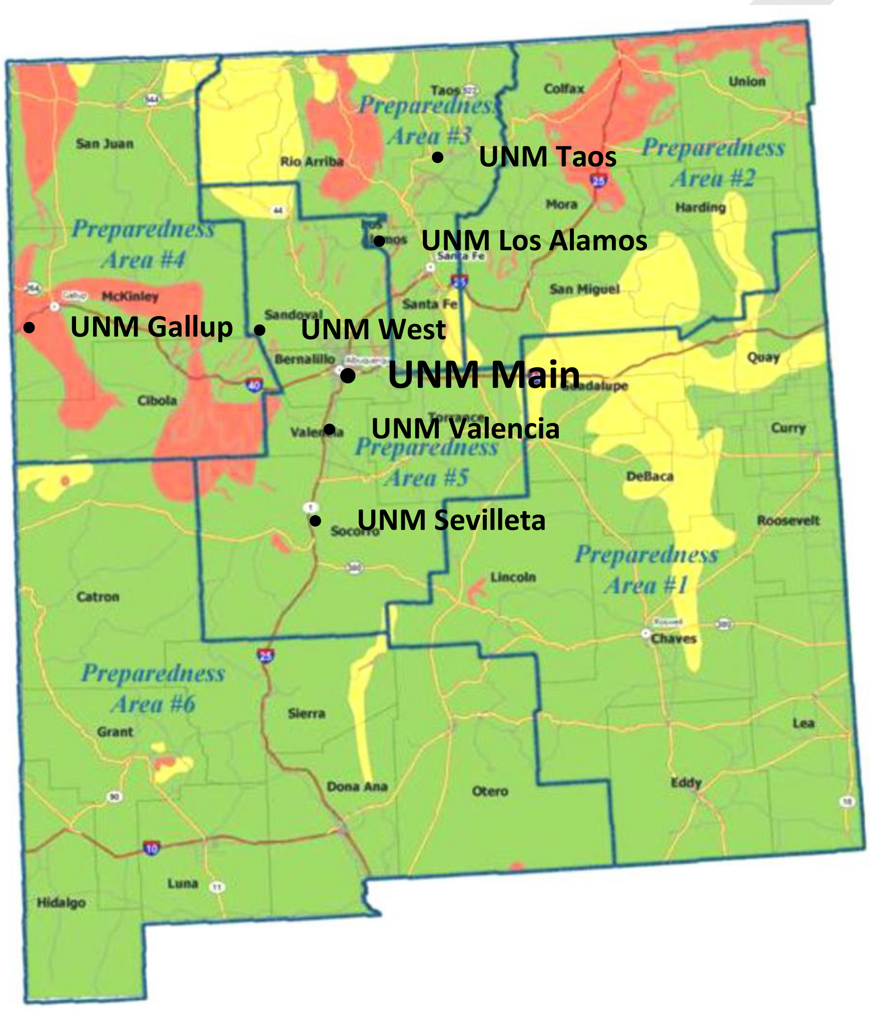
[61] http://pubs.usgs.gov/fs/2004/3072/fs-2004-3072.html (December 2012)
[62] Schematic of rock fall. Image courtesy of USGS
[63] Source: Risk Frontiers, Natural Hazards Research Center http://www.riskfrontiers.com/damage_scales13.htm (December 2012)

5	Very Serious	Walls out of plumb by five or six degrees; structure grossly distorted; differential settlement has seriously cracked floors and walls or caused major rotation or slewing of the building [wooden buildings are detached completely from their foundations]. Partition walls and brick infill will have at least partly collapsed; roofs may have partially collapsed; outhouses, porches, and patios may have been damaged more seriously than the principal structure itself. Occupants will need to be re-housed on a long-term basis, and rehabilitation of the building will probably not be feasible.
6	Partial Collapse	Requires immediate evacuation of the occupants and cordoning of the site to prevent accidents with falling masonry.
7	Total Collapse	Requires clearance of the site.

Landslides occur in every state and U.S. territory. Although frequently associated with areas of high rainfall, landslides are a potential hazard in arid or semi-arid states like New Mexico. Landslides in New Mexico range from large, slow-moving, deep-seated masses, which can destroy structures by gradual movement, to shallow, fast-moving debris flows that threaten life and property. The USGS National Landslide Hazards Program has mapped the landslide risk for the entire conterminous U.S.

Figure 34 provides a view of landslide susceptible areas in New Mexico along with the six Preparedness Area boundaries.[64] Most of New Mexico is mapped in the lowest risk zone where there is a low landslide incidence that involves less than 1.5% of the land area.

Figure 34: Landslide Susceptible Preparedness Areas in New Mexico



Low:	≤ 1.5% of land area
Moderate:	1.5% -15% of land area
High:	≥ 15% of land area.

The areas shown in yellow include the northern edge of Rio Arriba County (Preparedness Area 3), Sandoval (Preparedness Area 5) and San Juan County (Preparedness Area 4), and portions of Socorro (Preparedness Area 5) represent areas of moderate susceptibility and involve 1.5% to 15% of the land area. This can be based on steep slopes in the area, natural or artificial cutting, or high precipitation in the area. Although these areas have a moderate susceptibility to landslides, they also have a low

[64] Source: http://landslides.usgs.gov/html_files/landslides/nationalmap/

occurrence. The red areas include an area around Magdalena Mountains in Socorro County and portions of McKinley and Socorro Counties indicate a high susceptibility and low incidence of past landslides that involves more than 15% of the land area.

Previous Occurrences

There is little information capturing previous landslide events in New Mexico, specifically at the Preparedness Area level. Data that has been captured is identified in Table 47 and briefly explains those significant events that have occurred. Information provided by local jurisdictions and NMDHSEM.

Table 47: Significant Past Occurrence – Landslide

Date	Location	Significant Event
January 15, 2013	Guadalupe Mesa (Sandoval County) Preparedness Area 5	Thousands of tons of rock (12,000-13,000 cubic yards) fell down the east face of Guadalupe Mesa leaving boulders displaced and a dust slope. A 30-foot thick and 150-foot-high slab of rock broke loose. Some residents were awakened by the avalanche and there was a blanket of dust covering everything. No damage was reported in the article. Source: Jemez Thunder, Volume 19, No. 418, February 1, 2013
July 23, 2010	Magdalena Mountains (Socorro County) Preparedness Area 5	Heavy rain unleashed a mudslide in the Magdalena Mountains blocking a road and isolating researchers at a key New Mexico science facility. The landslide isolated the Langmuir Laboratory for Atmospheric Research located high on 10,700-foot South Baldy Peak. Five New Mexico Institute of Mining and Technology scientists and two technicians were working at the facility whose primary mission is to study thunderstorms. It wasn't long after the storm started that dirt and large boulders tumbled down the mountain sprawling over the only access road. Five members of the lab crew abandoned their vehicles and were picked up by a four-wheel-drive vehicle that took them to safety. The other two walked down part of the mountain to a four-wheel-drive vehicle that also took them to safety. No one was hurt in the landslide.
July 15, 2008	Gallup, NM Preparedness Area 4	A rockslide crushed 3 people in a homeless camp outside of Gallup, NM. One female and two male bodies were recovered after they were found trapped under a roughly 12-foot-wide boulder. Heavy rain had hampered recovery efforts. Gallup police Lt. Rick White says the rockslide might have happened during a rainstorm.

Date	Location	Significant Event
September 1998	Taos, NM (Taos County) Preparedness Area 3	A falling boulder (270,000 kg) struck a bus, killed five people, and injured 14, along HWY 68. The boulder left a 5x5x14 meter crater in the highway. The highway was closed for 19 hours and clean-up costs were approximately $75,000.
June 1977	Taos, NM (Taos County) Preparedness Area 3	A landslide event caused $50,000 in property damage.

Declared Disasters from Landslide

DHSEM reports one State Declared Disaster for landslide between 2003 and 2013 (Table 48). According to DHSEM records, the total cost for the 2007 landslide disaster was $291,137. All associated damages were within San Juan County which (in Preparedness Area 4). There were no federal disaster declarations for landslide from 2003 through 2012.

Table 48: New Mexico Landslide Disaster Declarations (2003 – 2012)

Event Type	State Executive Order	Dollar Loss
Landslide	07-021	$291,137.00
Total	**1**	**$291,137.00**

Frequency

The frequency of landslides in New Mexico is low based on previous occurrences. An issue for consideration is landslide events that do occur that are not reported and unpopulated land area where landslides go un-noticed.

Probability of Future Occurrence

Landslides can result in serious structural damage to roads, buildings, irrigation channels, utilities and pipelines. To determine the probability of each Preparedness Area experiencing future landslide occurrences, the probability or chance of occurrence was calculated based on historical data provided by local authorities. Probability was determined by dividing the number of events observed by the number of years and multiplying by 100. This gives the percent chance of the event happening in any given year.

Table 49 provides the probability of each Preparedness Area experiencing a landslide event.

Table 49: Probability of Annual Occurrence of Landslide

Probability of Future Occurrence	
Preparedness Area	**Landslide**
Preparedness Area 3	7%
Preparedness Area 4	7%
Preparedness Area 5	3%

One concern that is under review is landslides following a wildfire. In June 2011, the Track Fire burned 113 square kilometers in Colfax County, northeastern New Mexico, and Las Animas County, southeastern Colorado, including the upper watersheds of Chicorica and Raton Creeks. The burned landscape is now at risk of damage from post wildfire erosion, such as that caused by debris flows and flash floods. Small debris flows may affect structures at or downstream from basin outlets and increase the threat of flooding downstream by damaging or blocking flood mitigation structures.

Risk Assessment

Landslides have occurred in New Mexico, specifically in Preparedness Areas 1, 3 and 4. Though data for landslides previous occurrences and minimal, based on previous occurrence, Taos County (Preparedness Area 3) would be considered of having a high risk to a landslide occurrence. Table 50 identifies potential impacts from a volcanic eruption.

Table 50: Potential Landslide Impacts

Subject	Potential Impacts
Health and Safety of the Public	Anyone within the path of a land or rockslide at the time of occurrence, could be injured or killed
Health and Safety of Responders	Same as the public
Continuity of Operations	Any operation in the area of a slide may be unable to continue operations for a time perhaps even permanently depending on the damages.
Delivery of Services	Supply chains could be negatively affected if highways and roads are impacted. Otherwise, minor impacts are anticipated.
Property, Facilities, Infrastructure	Buildings and almost all infrastructure would be severely damaged or destroyed in the event of a landslide occurring nearby.
Environment	Long-term severe impacts are very unlikely.
Economic Condition	The small impact area of landslides leads to minor economic impacts.
Public Confidence	Not likely to be impacted.

Data Limitations

USGS produced landslide maps approximately 20 years ago based on aerial photographs of steep regions throughout the State. There are archives paper copies at 1:100,000 and mylars of a compilation at 1:500,000 scale. It would be helpful to produce state-wide landslide maps in digital format based on the mapping done 20 years ago. Also, the mapping the debris flow run-out zones would be helpful in understanding the potential impact of landslides.

Summary of Impact to UNM

Landslide events are not of concern at the UNM Main, UNM West, UNM-Valencia Branch and Sevilleta LTER Field Station. Gallup Branch Campus is in McKinley County which is in an area of high landslide susceptibility. Los Alamos Branch Campus and Taos Branch Campuses may be at risk to landslides post wildfire. However, no data exists regarding landslide events at any of UNM's locations.

Severe Winter Storms

Hazard Characteristics

Winter storms have significant snowfall, ice, and/or freezing rain, with the quantity of precipitation variable by elevation. According to the NWS, heavy snowfall is four inches or more in a 12-hour period, or six or more inches in a 24-hour period in non-mountainous areas; and 12 inches or more in a 12-hour period or 18 inches or more in a 24- hour period in mountainous areas. Winter storms vary in size and strength and include heavy snowfalls, blizzards, freezing rain, sleet, ice storms, blowing and drifting snow conditions, and extreme cold.

A variety of weather phenomena and conditions can occur during winter storms. For clarification, 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 32F 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

A blizzard is a winter storm with considerable falling and/or blowing snow combined with sustained winds or frequent gusts of 35 mph or greater that frequently reduces visibility to less than one-quarter mile. Extremely cold temperatures accompanied by strong winds can result in wind chills that cause bodily injury such as frostbite and death. Winter storm occurrences tend to be very disruptive to transportation and commerce. Trees, cars, roads, and other surfaces develop a coating or glaze of ice, making even small accumulations of ice extremely hazardous to motorists and pedestrians. The most prevalent impacts of heavy accumulations of ice are slippery roads and walkways that lead to vehicle and pedestrian accidents, collapsed roofs from fallen trees and limbs, heavy ice and snow loads, and downed telephone poles and lines, electrical wires, and communication towers. Such storms can also cause exceptionally high rainfall that persists for days, resulting in heavy flooding.

A severe winter storm for New Mexico as defined by the National Weather Service:

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

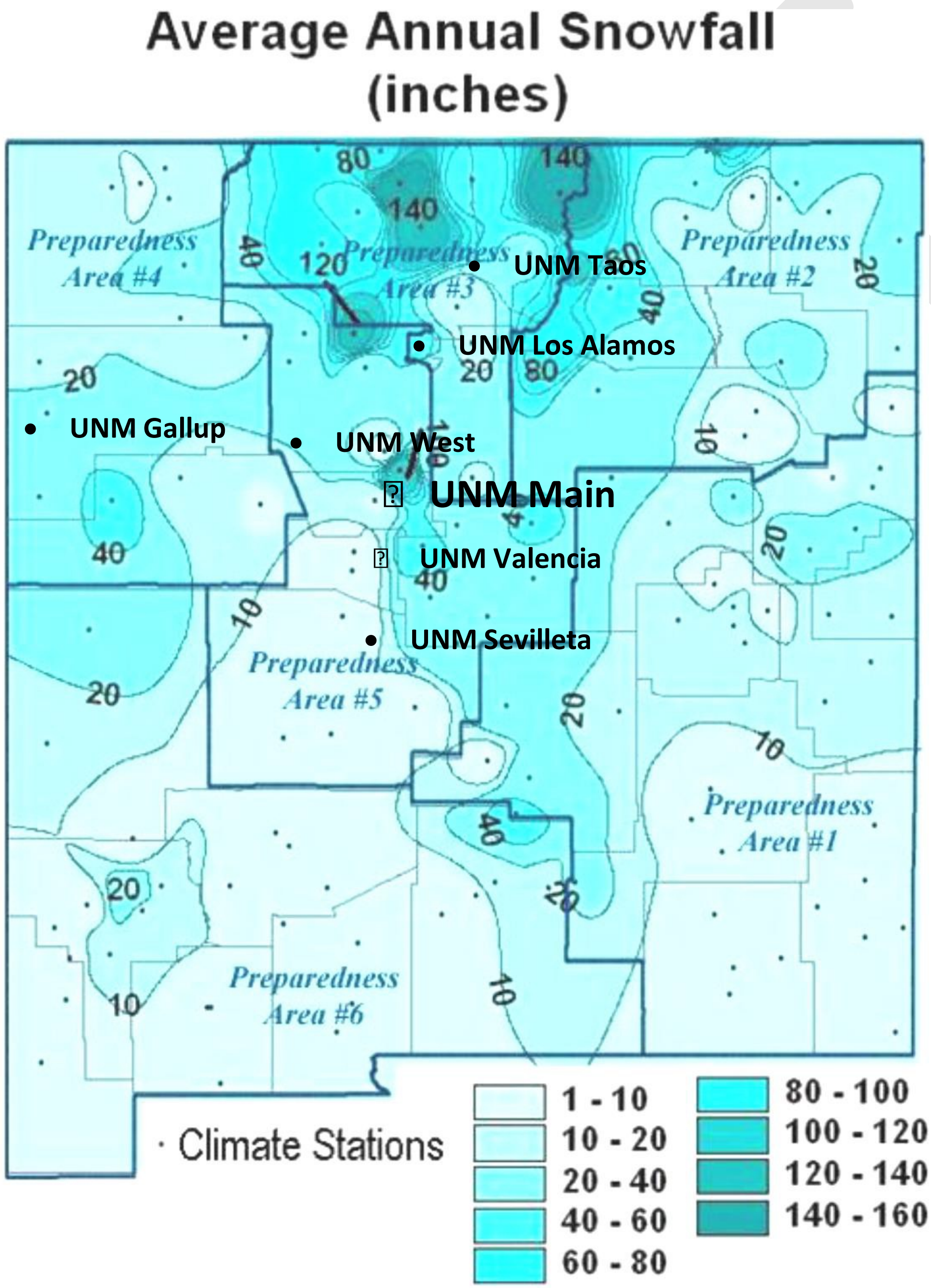
Most winter precipitation in New Mexico is associated with Pacific Ocean storms as they move across the state from west to east. As the storms move inland, moisture falls on the coastal and inland mountain ranges of California, Nevada, Arizona, and Utah. If conditions are right, the remaining moisture 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 over 100 inches in the northern mountains. 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.[65]

[65] Source: http://www.wrcc.dri.edu/narratives/NEWMEXICO.htm

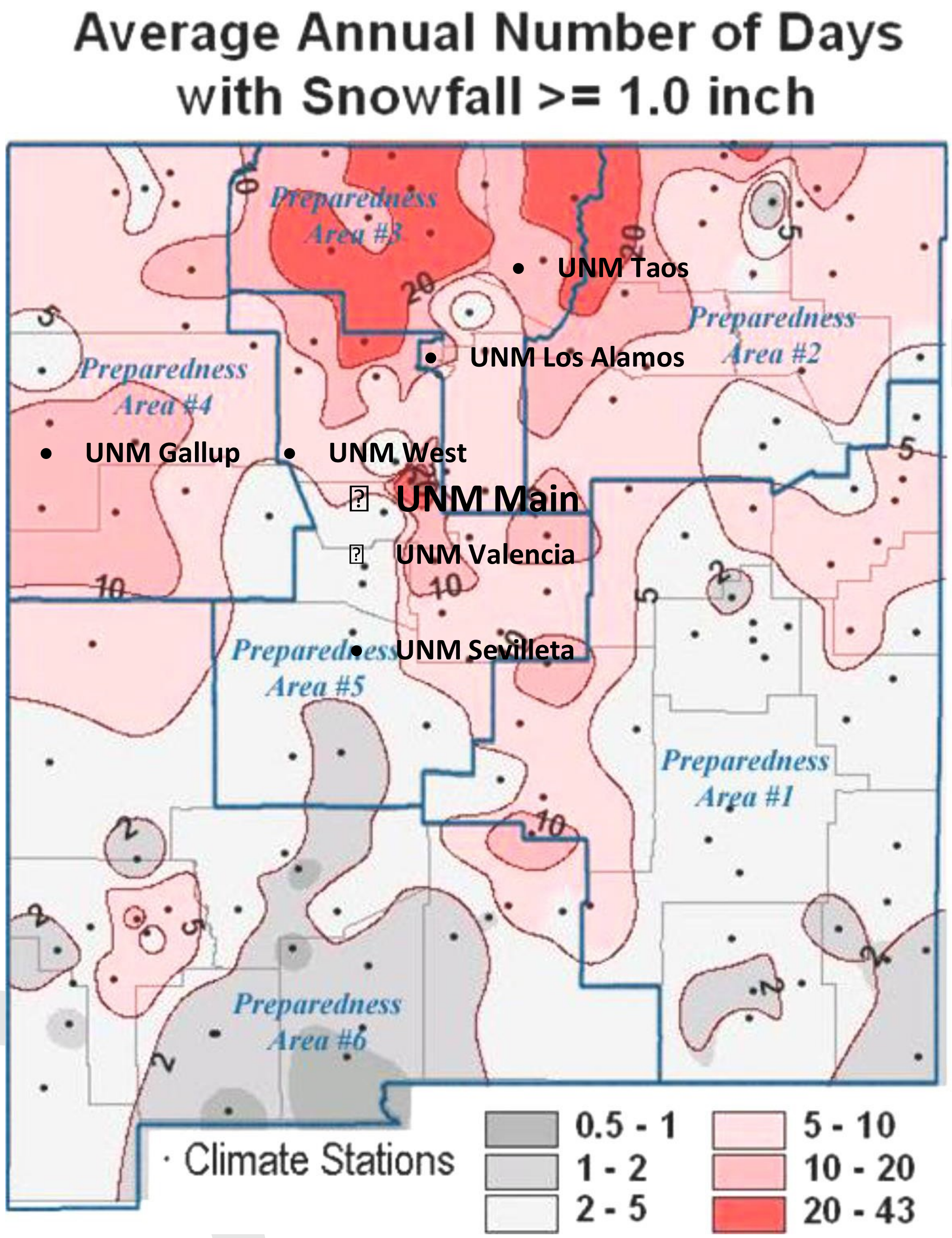
The following two maps (Figures 35-36) depict statewide snowfall distributions by average inches and average numbers of days with snowfall over 1 inch.

Figure 35: Statewide Snowfall Distributions by Preparedness Area as of January 2012[66]



[66] Source: http://www.srh.noaa.gov/abq/?n=prepwinterwxclimo

Figure 36: Statewide Average Annual Number of Days with Snowfall >= 1.0 Inch



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.

The Wind Chill is the temperature your body feels when the air temperature is combined with the wind speed. It is based on the rate of heat loss from exposed skin caused by the effects of wind and cold. As the speed of the wind increases, it can carry heat away from your body much more quickly, causing skin temperature to drop. The Wind Chill chart (Figure 37) shows the difference between actual air temperature and perceived temperature, and amount of time until frostbite occurs.

Figure 37: Wind Chill Chart - December 2012[67]

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

Extreme cold occurs when temperatures drop below normal and wind speeds increase, as this occurs, the body is cooled at a faster rate than normal, causing the skin temperature to drop, which can lead to frostbite (when body tissues freeze) and hypothermia (abnormally low body temperature, <95°F). Extreme cold is measured by the wind chill temperature index. The index is based on heat loss from exposed skin and includes a frostbite indicator.

In New Mexico, January is the coldest month. Day-time temperatures range from the mid-50s in the southern and central valleys to the mid-30s in the north's higher elevations. Minimum temperatures below freezing are common throughout the state; however, subzero temperatures are rare, even in the mountains.[68]

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.[69]

The entire state of New Mexico experiences some form severe winter storm event. Based on the topography of the state, such as elevation and land contours, this all plays a significant part in winter weather affects a particular area. The effects of severe winter storm events vary according to the type of hazard. Winter storms often have the effect of disrupting transportation and commerce. Injury to people and property result from heavy loads of snow and ice causing collapse of roofs of buildings,

[67] http://www.weather.com/outlook/recreation/ski/tools/windchill/
[68] Western Region Climate Center http://www.wrcc.dri.edu/narratives/NEWMEXICO.htm
[69] http://www.wrcc.dri.edu/narratives/NEWMEXICO.htm

falling trees and telephone poles, knocking down electrical lines, and creating slippery conditions for pedestrians and vehicles.

Previous Occurrences

The State of New Mexico experiences severe winter storm events annually. Referencing the NCDC, the six counties with UNM properties experienced a total of 32 winter storm events between April 1, 2000 and July 20, 2015.[70] For the same time period, 3 deaths and $50,000 in property damage were reported. Table 51 briefly explains those significant winter storm events that have occurred. Source information is from the NCDC and data provided by local authorities.

Table 51: Significant Past Occurrences - Severe Winter Storms

Date	Name/Location	Significant Event
December 24, 2011	Albuquerque, NM Preparedness Area 5	A major winter storm event moving through the Albuquerque Metro area caused the shutdown of I-25 / I-40 for over 18 hours stranding passengers.
December 15, 2008	Upper Rio Grande Valley Preparedness Area 5	A deep low-pressure area centered over California continued to pump moisture into Mew Mexico on the 15th and 16th. A strong short-wave trough ejected out of the low and helped bring widespread, heavy snow to much of the area near and north of Interstate 40. Eight to 12 inches of snow fell over much of the Upper Rio Grande Valley. Two deaths were reported from this storm event.
December 16, 2008	Upper Rio Grande Preparedness Area 3	8 – 10 inches of snow fell on “much of the Upper Rio Grande”. Two fatalities were reported.
December 25, 2006	Preparedness Area 2, 3 and 5	A storm spinning over New Mexico for nearly 36 hours dumped up to 36 inches of snow, stranding New Mexicans in their homes and forced the closure of roads across the state. Most highways including I-25 and I-40 were closed for extensive periods. The National Guard preformed training missions to airlift supplies to trapped residents and hay to stranded livestock for five days afterward. Eighteen counties reported storm related damages, as snow remained on the ground until January 12. The Governor issued a State Declaration of emergency. Estimated response costs are up to $5 million. The Governor made a request to FEMA for a Presidential Disaster Declaration.

[70] NCDC event type search included: Cold/Wind Chill, Extreme Cold/Wind Chill, Frost/Freeze, Winter Storm, and Winter Weather

Date	Name/Location	Significant Event
January 1, 2001	McKinley County Preparedness Area 4	A slow-moving winter storm howled into northern and central New Mexico with gusty winds and heavy snow, which closed state highways and many rural roads and contributed to two deaths from exposure. Tribal police found one body just north of Gallup and another near Bluewater. The storm produced 18 to 36 inches of heavy snow that engulfed snow removal and closed roads from the eastern Sangre de Cristo Mountains south over Las Vegas into the central highlands to Vaughn and Corona and westward over the Estancia Valley and the east slope communities of the Sandia and Manzano Mountains. Some residents remained trapped in their homes for 4-5 days before enough snow removal opened both the major and minor county roads. A state of emergency was declared in several counties including Mora, San Miguel and Torrance.
January 1997	Albuquerque, NM Preparedness Area 5	Winter storms produced widespread heavy snow and icy roads across much of New Mexico. Icy roads were the direct cause of numerous auto mishaps as road conditions deteriorated very quickly. At least two fatal accidents were directly related to the weather, with weather an indirect cause of a third fatal crash. A car spun while in snow south of Carrizozo and collided with a school bus killing a 27-year-old passenger. A passenger was also killed near Tucumcari when a van slid off the road in a snowstorm and overturned several times. A 30-year-old woman and her 3-year-old son were also killed when their automobile crashed into the rear a semi-truck stopped at the end of traffic tie-up about 15 miles west of Grants. In Rio Rancho, an elderly woman slipped and fell on ice in her driveway January 13; she could not get up and died of exposure before anyone found her. The interstate had been closed 3 miles away to clear other accidents. Roads were snow packed and icy. Snow totals in many areas averaged 7 inches with amounts of 10 to 19 inches reported on the Highlands between Edgewood and Santa Rosa and south to Carrizozo. Amounts of 14 inches were also recorded near Zuni and Pietown in west central sections of the state. Many rural roads remained snow clogged for several days and large sections of the interstate highways leading to Albuquerque in all directions were closed overnight until late on the 16th.

Declared Disasters from Severe Winter Storm, Snowstorm and Freeze

NMDHSEM reports 10 State Declared Disasters for severe winter storms between 2003 and 2013. This number is based on how many Executive Orders were signed by the Governor for severe winter storm, snowstorm and freeze. According to DHSEM records, the total cost for State declared flood events from 2003 - 2012 was $6,052,869 (Table 52). The total does not reflect all costs for Executive Order 09-048 which is still being tallied. The data is not broken out by County or Preparedness Area.

Table 52: State Disaster Event Information 2003 through 2012

Event Type	State Executive Order	Dollar Loss
Severe Winter Storm	04-031	$176,513
Snowstorm	05-012	$384,269
Snowstorm	05-016	$906,396
Snowstorm	06-070	$2,013,953
Snowstorm	08-005	$1,386,815
Snowstorm	09-001	$71,427
Snow/Windstorm	09-048**	$54,040
Snowstorm	10-005	$209,456
Severe Cold	11-014	$750,000
Navajo Freeze	13-004	$100,000
Total	**10**	**$6,052,869**

One of the 10 State severe winter storm disasters was also a federally declared disaster Table 53. The total Public Assistance dollar losses from federal, State and local government entities and all tribal entities was $2,393,376. The State contributed 12.5% of the total cost for this disaster. Data is not broken out by County or Preparedness Area. However, for this one disaster damage was calculated from Preparedness Areas 1, 3, 5 and 6.

Table 53: Federal Disaster Event Information 2003 through 2012

Event Type/Name	Event Number	Federal Share	State Share	Total Cost	State % of Total
Severe Winter Storm and Extreme Cold Temperatures	1962	$1,795,032	$299,172	$2,393,376	12.50%
Total	**1**	**$1,795,032**	**$299,172**	**$2,393,376**	

Another source of severe winter storm damage information is SHELDUS. Below is a tally of severe winter storm damage as reported by SHELDUS broken out by County (Table 54). Data is reported by event and is aggregated by county.

Table 54: SHELDUS History of Winter Weather Hazards (1995-2013)

County Name	Year	Month	Property Damage	Property Damage (ADJ 2014)	Injuries	Fatalities	Records
Bernalillo	1995	1	$0.00	$0.00	0.26	0	1
Bernalillo	1997	4	$65,217.39	$96,195.04	0	0	1
Bernalillo	1997	12	$131,578.95	$194,077.72	0	1	2
Bernalillo	1998	3	$2,500.00	$3,630.92	0	0	1
Bernalillo	1999	3	$8,333.33	$11,841.53	0	0	1
Bernalillo	1999	10	$16,666.67	$23,683.08	0	0	1
Bernalillo	2000	10	$8,333.33	$11,456.44	0	0	2
Bernalillo	2008	12	$0.00	$0.00	0	0.41	3
Bernalillo	2009	1	$0.00	$0.00	0	0.08	1
Bernalillo	2013	12	$0.00	$0.00	0	0.33	1
Los Alamos	1995	1	$0.00	$0.00	0.26	0	1
Los Alamos	1995	12	$0.00	$0.00	0.42	0	1
Los Alamos	1996	10	$0.00	$0.00	0	0.09	1
Los Alamos	1997	4	$65,217.39	$96,195.04	0	0	1
Los Alamos	1999	3	$8,333.33	$11,841.53	0	0	1
Los Alamos	2008	12	$0.00	$0.00	0	0.26	2
Los Alamos	2009	12	$1,538.46	$1,697.65	0	0	1
McKinley	1995	1	$0.00	$0.00	0.26	0	1
McKinley	1995	12	$0.00	$0.00	0.42	0	1
McKinley	1996	10	$0.00	$0.00	0	0.09	1
McKinley	1997	1	$0.00	$0.00	0	3	3
McKinley	1997	4	$65,217.39	$96,195.04	0	0	1
McKinley	1997	12	$0.00	$0.00	0	1	1
McKinley	1998	3	$2,500.00	$3,630.92	0	0	1
McKinley	1999	3	$8,333.33	$11,841.53	0	0	1
McKinley	2001	1	$0.00	$0.00	0	1	1
McKinley	2008	12	$0.00	$0.00	0	0.41	3
McKinley	2009	1	$0.00	$0.00	0	0.33	2
McKinley	2009	12	$1,538.46	$1,697.65	0	0	1
McKinley	2011	1	$0.00	$0.00	0	0.5	2
McKinley	2011	2	$0.00	$0.00	0	0.165	1
McKinley	2013	11	$12,500.00	$12,702.78	0.25	0.25	1
Sandoval	1995	1	$0.00	$0.00	0.26	0	1
Sandoval	1995	12	$0.00	$0.00	0.42	0	1

County Name	Year	Month	Property Damage	Property Damage (ADJ 2014)	Injuries	Fatalities	Records
Sandoval	1996	10	$0.00	$0.00	0	0.09	1
Sandoval	1997	4	$65,217.39	$96,195.04	0	0	1
Sandoval	1997	12	$131,578.95	$194,077.72	0	0	1
Sandoval	1998	3	$2,500.00	$3,630.92	0	0	1
Sandoval	1999	3	$8,333.33	$11,841.53	0	0	1
Sandoval	1999	10	$16,666.67	$23,683.08	0	0	1
Sandoval	2000	10	$8,333.33	$11,456.44	0	0	2
Sandoval	2008	12	$0.00	$0.00	0	0.41	3
Sandoval	2009	1	$0.00	$0.00	0	0.08	1
Sandoval	2009	12	$1,538.46	$1,697.65	0	0	1
Sandoval	2013	12	$0.00	$0.00	0	0.33	1
Socorro	1995	1	$0.00	$0.00	0.26	0	1
Socorro	1997	4	$65,217.39	$96,195.04	0	0	1
Socorro	1997	12	$131,578.95	$194,077.72	0	0	1
Socorro	1998	3	$2,500.00	$3,630.92	0	0	1
Socorro	1999	3	$8,333.33	$11,841.53	0	0	1
Socorro	1999	10	$16,666.67	$23,683.08	0	0	1
Socorro	2000	10	$8,333.33	$11,456.44	0	0	2
Socorro	2008	12	$0.00	$0.00	0	0.41	3
Socorro	2009	1	$0.00	$0.00	0	0.08	1
Socorro	2009	12	$1,538.46	$1,697.65	0	0	1
Taos	1995	1	$0.00	$0.00	0.26	0	1
Taos	1995	12	$0.00	$0.00	0.42	0	1
Taos	1996	10	$0.00	$0.00	0	0.09	1
Taos	1997	4	$65,217.39	$96,195.04	0	0	1
Taos	1997	12	$0.00	$0.00	0	1	1
Taos	1998	3	$2,500.00	$3,630.92	0	0	1
Taos	1999	3	$8,333.33	$11,841.53	0	0	1
Taos	1999	10	$16,666.67	$23,683.08	0	0	1
Taos	2008	12	$0.00	$0.00	0	0.26	2
Taos	2009	1	$0.00	$0.00	0	0.08	1
Taos	2009	12	$1,538.46	$1,697.65	0	0	1
Taos	2013	12	$8,333.34	$8,468.52	0	0	1

Frequency

No part of the state is immune from the severe winter storms, whether extreme cold, heavy snow, ice storm, or other cold weather condition. The mountainous areas of the state, which includes all

Preparedness Areas, are more likely to receive snow and cold than the plains and desert, and residents of high-altitude areas are more likely to be prepared for these conditions, even if they become extreme.

Probability of Future Occurrence

To determine the probability of New Mexico experiencing severe winter storms in the future, the probability or chance of occurrence was calculated based on historical data identified the NCDC database from a period of January 1, 2006 – December 1, 2012. Probability was determined by dividing the number of events observed for each of the four NCDC categories by the number of months and multiplying by 100. This gives the percent chance of the event happening in any given year. Table 60 provides the probability of future occurrence in each Preparedness Area based on the probability formula. In addition, the column to the far right of Table 55 shows the overall winter storm probability for all four categories for each Preparedness Area. Overall probability for winter storms was determined by the number of events for all four NCDC categories for each Preparedness Area divided by the number of months and multiplying by 100.

Table 55: Probability of Future Occurrence - Severe Winter Storms

Probability of Future Occurrence					
Preparedness Area	**Extreme Cold/Wind Chill**	**Freezing Fog**	**Heavy Snow**	**Winter Storm**	**Overall Winter Storm**
Preparedness Area 1	.01%	3.6%	42%	8.3%	55.4%
Preparedness Area 2	1.2%	0%	3.6%	0%	4.8%
Preparedness Area 3	1.2%	0%	1.2%	0%	2.4%
Preparedness Area 4	3.6%	0%	1.2%	0%	1.2%
Preparedness Area 5	1.2%	0%	11%	0%	12.0%
Preparedness Area 6	6.0%	0%	0%	0%	6.0%

Risk Assessment

Severe winter storms are difficult to predict precisely in pattern, frequency, and degree of severity. The impact from severe winter storm events (heavy snowfall, blizzard, ice storm, freezing drizzle/freezing rain, sleet, wind chill, and extreme temperatures) has been moderate with impact to widespread area of crops and livestock depending on the time of year when it occurs. Highly vulnerable populations include those in mobile home parks, recreational vehicles, and aged or dilapidated housing, but no area is safe.

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. This actually occurred on December 24, 2011 during a serve snowstorm when motorists traveling through Albuquerque, NM (Preparedness Area 5) interstate system were stranded for up to 18 hours. The plains and desert areas are more susceptible to high winds that contribute to the drifting of snow, and a snowstorm 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 cause a power failure, as would be likely with an ice storm, the effect could be very serious anywhere in the state. 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. Table 56 outlines Impacts from severe winter storm events for each Preparedness Area to consider when planning for these types of events.

Table 56: Severe Winter Storm Impacts

Subject	Impacts
Health and Safety of The Public	Injuries and death have resulted from winter storm events. Individuals caught outdoors can suffer frostbite, hypothermia, and death from low temperatures.
Health and Safety of Responders	Responders face the same impacts as the public.
Continuity of Operations	Travel to key facilities and places of employment may be impossible, and those entities may not be able to function.
Delivery of Services	Facilities that are unable to be reached or if supply lines are blocked, widespread denial of services may result.
Property, Facilities, Infrastructure	Winter storms can cause ice to form on roads and bridges rendering them impassible, can accumulate on power lines and cause them to break, can cause water pipes to burst, and heavy snows can collapse roofs
Environment	Winter storms can cause damages to trees and plants as well as to crops and animals.
Economic Condition	The negative effects to the economic condition are generally from the damages the hazard causes to infrastructure and agriculture. Individuals and businesses can suffer unanticipated expenses.
Public Confidence	Winter storms are an expected event in the state, but a slow response such as road clearing or restoration of utilities can cause an erosion of the public's confidence in the government.

Data Limitations

Accurate methods to quantify potential future damages are not readily available. The amount of business lost due to winter storms and road closures has not been calculated due to the difficulty of attaining this information.

Summary of Impact to UNM

Winter storms occur frequently on an annual basis and impact all UNM Campuses. As with State and County jurisdictions, all UNM campuses can be affected by winter storm events. The average snowfall UNM campuses could receive ranges from 1 to 40 inches of snow. UNM Campuses located in higher elevations (Los Alamos and Taos Campuses) could receive up to 60 inches in a given year.

The threat winter storm events pose is primarily to electric utilities when snow and ice-laden branches fall across power lines, breaking them and interrupting service. Additionally, due to the location of our rural Branch Campuses (Gallup, Los Alamos, Taos), access in and out can be limited due to roads becoming risky and or closed. The UNM Main Campus has maintained a list of past occurrences highlighting their vulnerabilities in damages caused by winter storms. The probability of a winter storm causing structure damage or risking life safety are considered low.

Thunderstorms (including Lightning and Hail)

Hazard Characteristics

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, the former “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.

All UNM Campuses and properties experience thunderstorms. According to NWS, the thunderstorm season in New Mexico begins over the high plains in the eastern part of the state in mid to late April, peaks in May and June, declines in July and August, and then drops sharply in September and October. In the western part of the state, thunderstorms are infrequent during April, May, and June, increase in early July and August, and then decrease rapidly in September. Over the central mountain chain, thunderstorms occur almost daily during July and August, especially over the northwest and north central mountains.

Thunderstorms tend to 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. Most of the storms in western New Mexico are associated with the southwest monsoons, which mainly produce flash floods.

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

Thunderstorm frequency is measured in terms of incidence of thunderstorm days or days on which thunderstorms are observed. Any county (or Preparedness Area) may experience 10 or more thunderstorm days per year. According to the NWS Publication, Storm Data, in the past 30 years New Mexico has experienced over 50 reported events 75 mph or higher associated with thunderstorms, with a single occurrence of 115 mph winds. This means that in New Mexico winds similar to a Category 1 Hurricane (Saffir-Simpson Scale) are experienced on average about 1 day every 1.5 years.

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 is the cause of extensive damage to buildings and structures, death or injury to people and livestock, the cause of wildfires, and the disruption of 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 (10,000-60,000°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. New Mexico ranks 22nd in lightning frequency overall.[71]

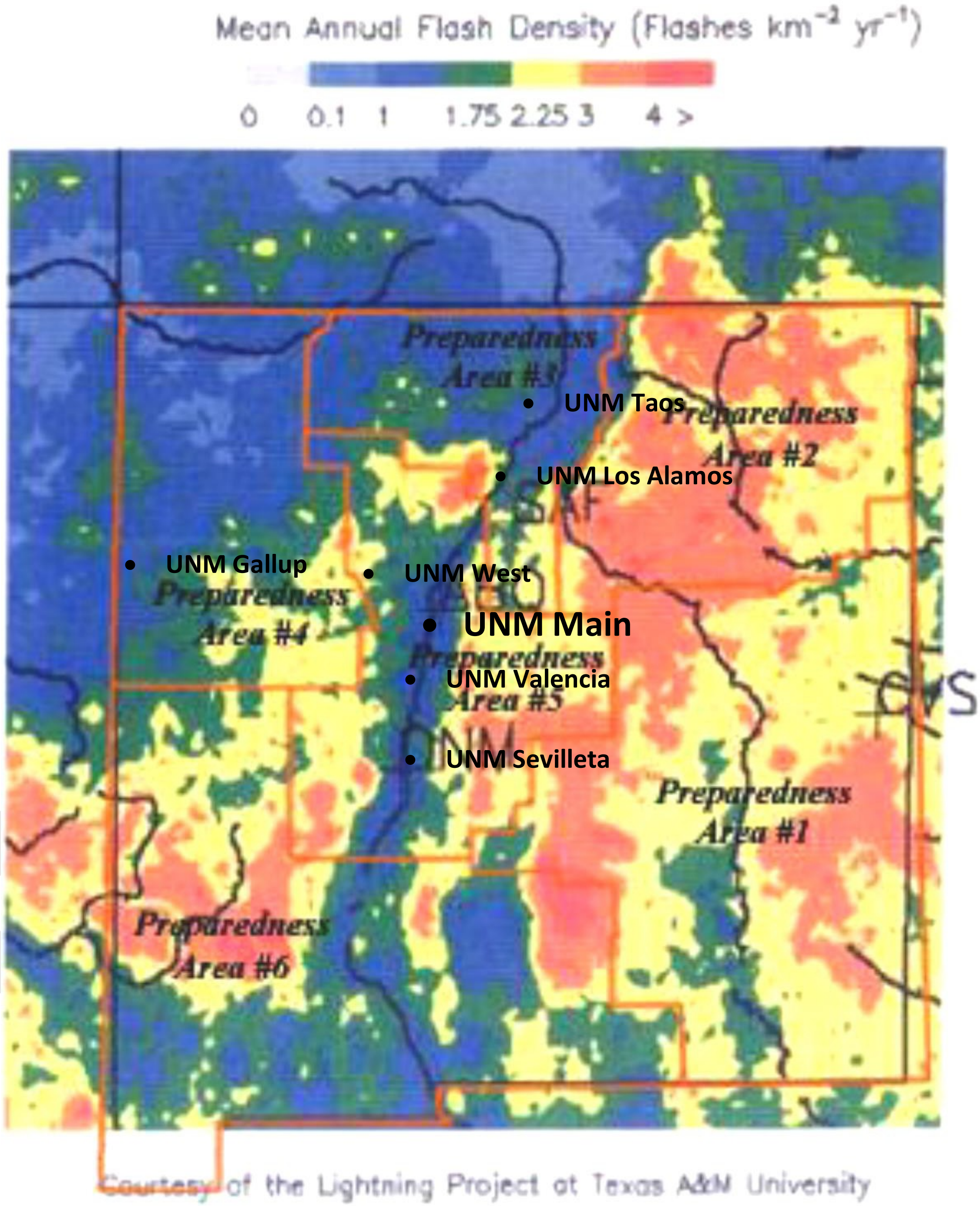
According to the National Weather Service, New Mexico suffered 90 lightning related fatalities between 1959 and 2011 (52 years). Overall New Mexico has a 100% probability of a lightning event every year and there is a 100% chance of a lightning fatality each year. According to NWS, New Mexico experienced 614,898 lightning flashes in 2011. Between 1997 and 2011 the average number of lightning flashes totaled 879,282 per year.[72]

Recent storms monitored by the New Mexico Institute of Mining and Technology produced between 65 and 1062 lightning flashes per minute. Additionally, lightning strikes the ground or objects on average once in every five to 10 cloud flashes. Based on New Mexico Institute of Mining and Technology studies, New Mexico routinely has thunderstorms that have between 13 and 106 lightning strikes per minute. While the entire state is at risk for lightning events, some areas of the state have higher concentrations of them.

[71] http://www.lightningsafety.com/nlsi_lls/fatalities_us.html
[72] http://www.lightningsafety.noaa.gov/stats/Table-Flashes_by_State_1997-2011.pdf

Figure 38 shows areas of lightning density in the state. Based on the maps in Figure 38, higher concentrations of lightning strikes occur in Preparedness Areas 1, 2, 5 and 6.

Figure 38: Lightning Density in New Mexico Preparedness Areas



The Lightning Activity Level is a scale from 1-6, which describes frequency and character of cloud-to ground (cg) lightning (Figure 39).

Figure 39: Lightning Activity Level

	Cloud and Storm Development	Areal Coverage	Counts cg / 5 min	Counts cg / 15 min	Average cg / min
1	No thunderstorms	None	-		--
2	Cumulus clouds are common but only a few reach the towering stage. A single thunderstorm must be confirmed in the rating area. Light rain will occasionally reach ground. Lightning is very infrequent.	<15%	1-5	1-8	<1
3	Cumulus clouds are common. Swelling and towering cumulus cover less than 2/10 of the sky. Thunderstorms are few, but 2 to 3 occur within the observation area. Light to moderate rain will reach the ground, and lightning is infrequent.	15% to 24%	6-10	9-15	1-2
4	Swelling cumulus and towering cumulus cover 2-3/10 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.	25% to 50%	11-15	16-25	2-3
5	Towering cumulus and thunderstorms are numerous. They cover more than 3/10 and occasionally obscure the sky. Rain is moderate to heavy, and lightning is frequent and intense.	>50%	>15	>25	>3
6	Dry lightning outbreak. (LAL of 3 or greater with majority of storms producing little or no rainfall.)	>15%	-	-	-

Based on the Lightning Activity scale, all Preparedness Areas consistently experiences storms of LAL5 or higher, specifically during the monsoon seasons. The North American Monsoon System is a large-scale shift in the atmospheric circulation that results in a summertime maximum of precipitation across portions of Mexico, Arizona and New Mexico. The monsoon season, broadly defined from mid- June to late September, is actually comprised of "bursts" and "breaks," or periods of rainy and dry weather. The average onset occurs around July 9 for the Middle Rio Grande valley (Preparedness Area 5) and around July 12 for the Four Corners region (Preparedness Area 4).

Hail is frozen water droplets formed inside a thunderstorm cloud. They are formed 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, and then 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 and can become 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. The costliest hailstorm in the United States was in Denver in July 1990 with damage of $625 million.

No part of the state is immune to hailstorms. 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 62 shows hail sizes and possible damages from hail events.

According to the NWS, oversized and severe hailstorms occur most frequently in May, followed by June, July, and April. Most counties across the eastern half of the state will see large hail ranging from golf ball to softball at least 6 to 8 times during the spring and also during the summer thunderstorm season. Smaller hail is much more frequent and common in all counties across the east. Counties in the central and western areas will see damaging hail at least twice each year. Hail the size of baseballs or softballs has been reported near Albuquerque, Santa Fe and Las Cruces within the past 3 to 6 years. The Socorro hailstorm in October 2004 caused nearly 40 million dollars in damage from baseball sized hail.[73]

[73] Source: http://www.srh.noaa.gov/abq/?n=prephazards

Table 57 combines the NOAA and TORRO hailstorm intensity scales as a way of describing the size of hail based on the intensity and diameter of the hail.[74]

Table 57: Combined NOAA/TORRO Hailstorm Intensity Scale

Combined NOAA/TORRO Hailstorm Intensity Scales					
Intensity Category		**Typical Hail Diameter (mm)***	**Probable Kinetic Energy, J-m_2**	**Description**	**Typical Damage Impacts**
H0	Hard Hail	5	0-20	Pea	No damage
H1	Potentially Damaging	5-15	>20	Mothball	Slight general damage to plants, crops
H2	Significant	10-20	>100	Marble, grape	Significant damage to fruit, crops, vegetation
H3	Severe	20-30	>300	Walnut	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored
H4	Severe	25-40	>500	Pigeon's Egg > Squash ball	Widespread glass damage, vehicle bodywork damage
H5	Destructive	30-50	>800	Golf ball > Pullet's egg	Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries
H6	Destructive	40-60		Hen's egg	Bodywork of grounded aircraft dented; brick walls pitted
H7	Destructive	50-75	>800	Tennis ball > cricket ball	Severe roof damage, risk of serious injuries
H8	Destructive	60-90	>800	Large orange > Softball	(Severest recorded in the British Isles) Severe damage to aircraft bodywork
H9	Super Hailstorms	75-100	>800	Grapefruit	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open
H10	Super Hailstorms	>100	>800	Melon	Extensive structural

Previous Occurrences

Thunderstorm activity in New Mexico is consistent due to seasonal meteorological patterns and local topographical conditions. The entire state is susceptible to a full range of weather conditions, including

74 Source: Tornado and Strom Research Organization http://www.torro.org.uk/site/hscale.php

thunderstorms, lightning and hail. All areas of state are susceptible to thunderstorm conditions, although local topography, such as elevation and land contours, plays a significant part in how weather affects a particular area. For the purpose of this report, all areas of the state are considered equally vulnerable to all types of thunderstorm activity.

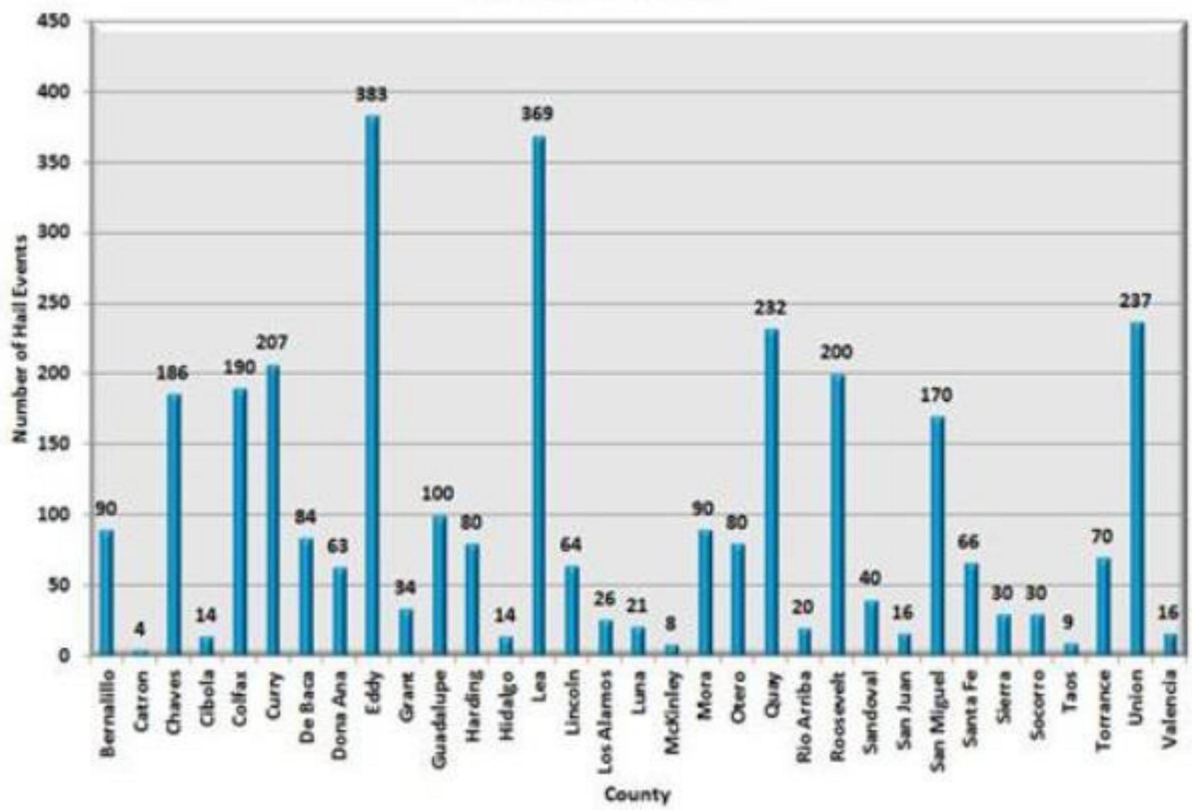
The impacts of thunderstorms vary according to the types of secondary hazards they produce. Thunderstorms can cause substantial rainfall leading to localized flash flooding. Additionally, thunderstorms can cause lightning strikes that have the potential to ignite wildfires and lead to injury and death. Hailstorms are another potential result of thunderstorms and they can sometimes damage agricultural crops and cause property damage.

Referencing the NCDC database, from January 2000 to July 30, 2015, 240 thunderstorm events (including lightening and hail) have caused 1 death, 15 injuries, and $54.170 million in property damage. New Mexico averages 25 thunderstorm events per year. Essentially New Mexico has a 100% probability of a thunderstorm, and .3% chance of a fatality from thunderstorms every year.

The following four Figures illustrate the number of hailstorms in the state of New Mexico by hail size, the number of hailstorms by month of occurrence, and the number of recorded hailstorms by county. This information offers insight into potential high-risk counties and particularly risky times of the year for hailstorms. Additionally, the data offers insight into the probability that the state will experience a high number of large hail-stone events.

Figure 40 shows the number of hailstorms by County between 1955 and 2012.

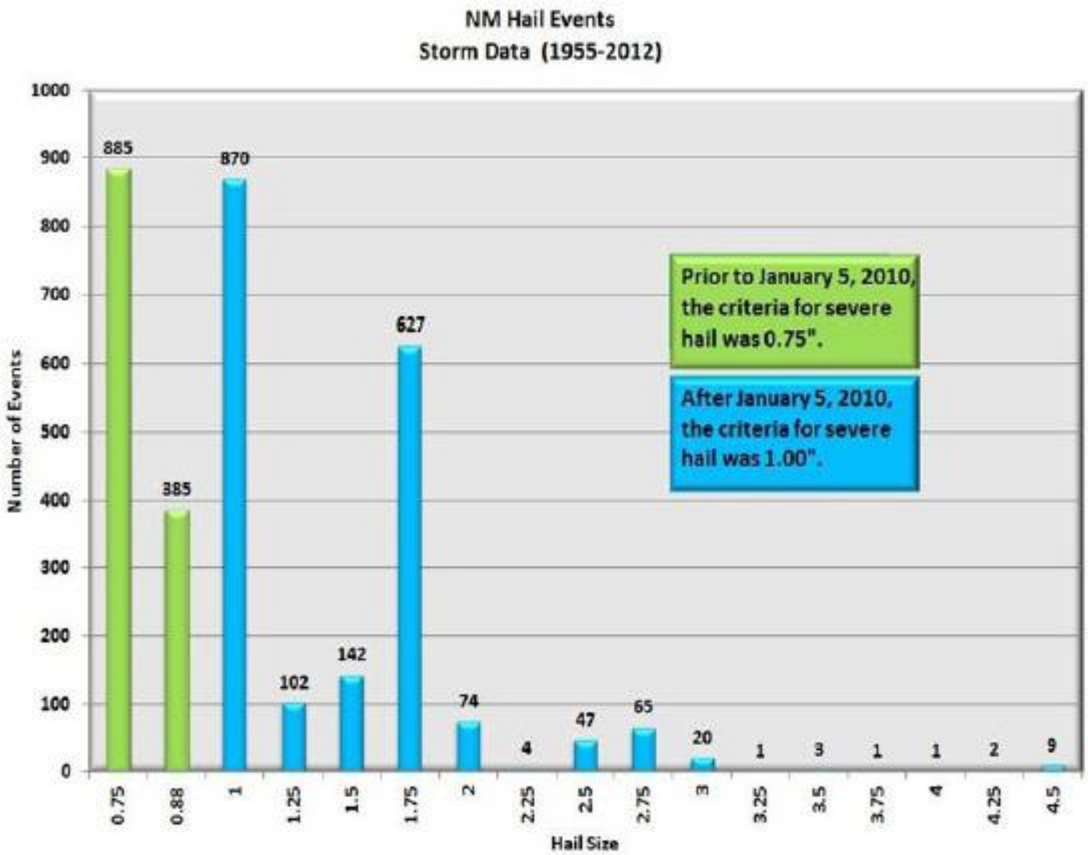
Figure 40: Number of Hailstorms in New Mexico by County[75]



75 Source: http://www.srh.noaa.gov/abq/?n=svrwxclimo

Figure 41 shows the number of storm events in New Mexico related to hail size. Typical hail size in the state is between .75 and 1.75 centimeters.

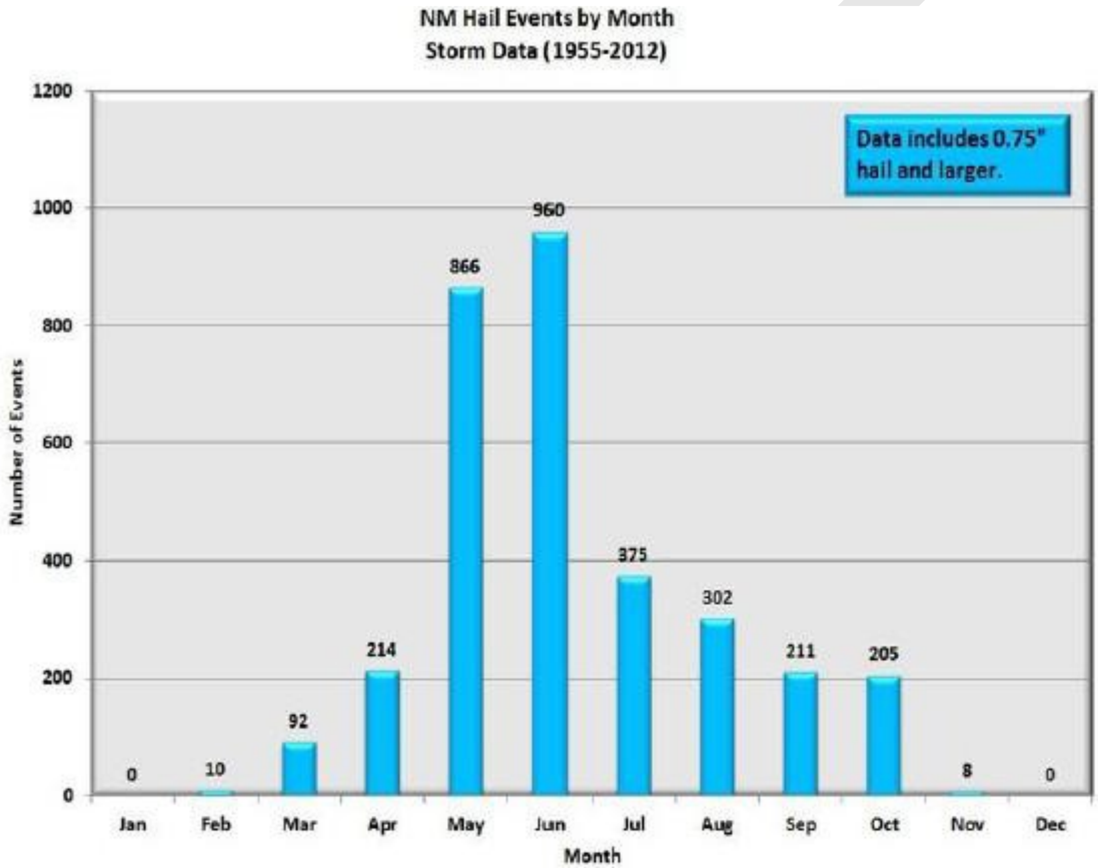
Figure 41: Number of Hailstorms in New Mexico Related to Hail Size[76]



76 Source: http://www.srh.noaa.gov/abq/?n=svrwxclimo

Figure 42 illustrates the number of hailstorms in New Mexico by their month of occurrence. From the data we see that hail events tend to occur between March and October with the majority of occurrences being in May and June.

Figure 42: Number of Hailstorms in New Mexico Related to Month of Occurrence[77]



[77] Source: http://www.srh.noaa.gov/abq/?n=svrwxclimo

Figure 43 briefly explains the most significant thunderstorm events (includes lightning and hail) that have occurred in the State of New Mexico from January 1, 2006 to December 1, 2012. The locations of the events are identified by city or county and Preparedness Area. Source information is from the NCDC and data provided by local authorities.

Figure 43: Significant Thunderstorm Past Occurrence (2006 – 2012)

Date	Location	Significant Event
October 2, 2010	Cedar Crest, NM Preparedness Area 5	A lone severe thunderstorm developed near San Felipe Pueblo and moved east-southeast along the east mountains. Hail up to 2 inches in diameter fell and devastated trees, roofs, windshields and windows across the area. Golf ball sized hail accumulated 2 inches deep on the ground. Over 200 houses sustained significant damage including roof and window damage. Multiple vehicles were also dented and damaged by the large hail. Over $6M in property damage was reported.
July 4, 2009	Bernalillo and Sandoval counties Preparedness Area 5	A 26-year-old man was killed by a lightning strike in the parking lot of Rio Rancho High School before a fireworks show. His wife, 26, was also struck and sustained serious injuries. Their 4 kids, ranging from 18 months to 7 years in age, as well as the wife's 21-year-old sister also sustained injuries. The family was headed for their vehicle to seek shelter from the storm.
August 17, 2006	Santa Fe, NM Preparedness Area 3	Two men in their 20s were struck by lightning while standing on rebar rods at a Santa Fe construction site. One man recovered immediately, but the other had to be revived with CPR.
October 5, 2015	Socorro, Bernalillo, and Los Lunas counties Preparedness Area 5	Strong thunderstorms developed during the mid-morning along the continental divide west of Albuquerque then swept eastward with brief hail again reaching the Albuquerque metro area. A trailing, southern storm that formed over west central Socorro County became intense as it reached the City of Socorro which was pounded by 5 to 10 minutes of baseball size hail with estimated terminal velocities of near 100 mph. This record hailstorm produced widespread and intense damage to automobiles, broken windows and screens as well has destroying home and commercial roofs. Damage estimates included $15 million to the New Mexico Tech campus where nearly every building was damaged, and the fleet of university vehicles was almost a total loss. County wide insurance claims had reached $40 million. The storm passed east into rural and unpopulated areas of Socorro County where it likely produced several small tornadoes.

Analysis of the number of reported occurrences for the six counties with UNM branch campuses and properties from 1994-2014 by the SHELDUS shows a clear concentration of thunderstorm activity in Bernalillo and Sandoval counties. Table 58 provides an overview of the total number of thunderstorms by each Preparedness Area.

Table 58: SHELDUS Thunderstorm History by county (1994-2014)

County Name	Year	Month	Property Damage	Property Damage (ADJ 2014)	Injuries	Fatalities	Records
Bernalillo	1994	1	$2,500.00	$3,993.52	0	0	1
Bernalillo	1995	9	$500.00	$776.70	0	0	1
Bernalillo	1997	7	$0.00	$0.00	1	0	1
Bernalillo	1998	8	$50,000.00	$72,618.40	0	0	1
Bernalillo	2001	7	$15,000.00	$20,051.05	0	0	1
Bernalillo	2003	9	$0.00	$0.00	2	0	1
Bernalillo	2004	6	$1,500.00	$1,879.85	0	0	1
Bernalillo	2004	10	$1,000,000.00	$1,253,234.52	0	0	1
Bernalillo	2006	8	$0.00	$0.00	1	0	1
Bernalillo	2008	2	$2,500.00	$2,748.87	0	0	1
Bernalillo	2008	5	$4,000.00	$4,398.20	0	0	2
Bernalillo	2008	10	$2,500.00	$2,748.87	0	0	1
Bernalillo	2009	7	$750.00	$827.61	0	0	1
Bernalillo	2010	7	$4,000.00	$4,342.66	0	0	1
Bernalillo	2013	6	$10,000.00	$10,162.22	0	0	1
Bernalillo	2013	7	$849,000.00	$862,772.37	0	0	8
Bernalillo	2014	6	$33,500.00	$33,500.00	0	0	3
Bernalillo	2014	8	$0.00	$0.00	2	0	1
Bernalillo	2014	9	$60,000.00	$60,000.00	0	0	2
Bernalillo	2014	10	$500.00	$500.00	0	0	1
McKinley	2003	7	$7,500.00	$9,649.57	0	0	1
McKinley	2005	8	$15,000.00	$18,182.49	0	0	1
Sandoval	1996	6	$20,000.00	$30,176.67	0	0	1
Sandoval	1999	6	$7,500.00	$10,657.39	0	0	1
Sandoval	2001	7	$10,000.00	$13,367.37	0	0	1
Sandoval	2002	9	$2,500.00	$3,289.83	0	0	1
Sandoval	2007	12	$50,000.00	$57,088.29	0	0	1
Sandoval	2010	5	$1,000.00	$1,085.67	0	0	1
Sandoval	2010	10	$500.00	$542.84	0	0	1
Socorro	1997	7	$30,000.00	$44,249.72	0	0	1
Socorro	1997	9	$200,000.00	$294,998.13	0	0	1
Socorro	1998	8	$5,000.00	$7,261.84	0	0	1
Socorro	2010	7	$1,500.00	$1,628.50	0	0	1

County Name	Year	Month	Property Damage	Property Damage (ADJ 2014)	Injuries	Fatalities	Records
Socorro	2013	7	$10,000.00	$10,162.22	0	0	1
Taos	2008	5	$10,000.00	$10,995.48	0	0	1

Frequency

All UNM campuses and properties can be affected by thunderstorms, hail, and lightning. The state has maintained a list of past thunderstorm occurrences highlighting their vulnerabilities as medium in damage from hail and lightning strikes. Preparedness Area 5 has recorded only 49 events with almostthe same amount in damages. This can be contributed to this area being more dense population and infrastructure.

Probability of Future Occurrence

During the spring, from April through June, storms are at a peak mainly in the eastern areas of the state. Storms become more numerous statewide from July through August. Although the vulnerability is statewide those areas with a larger vulnerability to the effects include those areas where the population is concentrated, and buildings are of older design.

To determine the probability of New Mexico experiencing thunderstorm occurrences, the probability or chance of occurrence was calculated based on historical data identified the NCDC database from a period of January 2006 to December 2012 (84 months). Probability was determined by dividing the number of events observed by the number of years and multiplying by 100. This gives the percent chance of the event happening in any given year. In applying this formula, Preparedness Areas probabilities to the following hazards are identified in Table 59. Those Preparedness Areas with the leastprobability of a Thunderstorm event occurring is in Preparedness Areas 3 and 4.

Table 59: Probability of Future Occurrence (Thunderstorm Events)

Probability of Future Occurrence				
Preparedness Area	**Hail**	**Heavy Rain**	**Lightning**	**Thunderstorm Wind**
Preparedness Area 3	16%	0%	33%	7%
Preparedness Area 4	16%	33%	1.6%	.3%
Preparedness Area 5	81%	16%	33%	3.6%

Risk Assessment
Severe weather is difficult to predict precisely in pattern, frequency, and degree of severity. The impact from thunderstorm events (thunderstorms, hail, and lightning) has been moderate, with localized flooding occurring from severe thunderstorms and minor damages from lightning and moderate to heavy damage to specific locations from hail. Highly vulnerable populations include those in recreational vehicles or outdoors, but no area is safe. Table 60 identifies potential impacts from thunderstorms.

Table 60: Potential Thunderstorm Impacts

Subject	Potential Impacts
Health and Safety of the Public	The component elements of a thunderstorm (lightning and hail) can and have impacted the public in the state. Lightning strikes have caused hospitalizations and fatalities. Individuals struck by hail have also sustained injury.
Health and Safety of Responders	Similar to the impacts to the public, any responders who are out of doors at the time of a lightning strike or hailstorm have and can receive serious injuries. Responders are at a higher risk due to the fact that they are often outside during major events assisting the public.
Continuity of Operations	Little to no impacts anticipated, except for facilities that may be damaged or have power failures during an event.
Delivery of Services	Little to no impacts anticipated, except for facilities that may be damaged or have power failures during an event.
Property, Facilities, Infrastructure	Property, facilities and infrastructure can be impacted by thunderstorm events. Lightning and the subsequent fires may destroy a facility or property. Heavy damage to roofs, windows and utilities components may be inflicted by hail.
Environment	Thunderstorms can cause crop or plant damages. Lightning caused fires may burn large areas.
Economic Condition	The overall economic condition is expected to be impacted only slightly.
Public Confidence	Not impacted by the event itself but may be damaged if the response to an event is poor.

Data Limitations
Raw data is available dating back to 1950 for thunderstorm, lightning and hailstorm occurrence however, analysis and summary of the historical data is limited.

Summary of Vulnerability
Thunderstorms are difficult to predict precisely in pattern, frequency, and degree of severity. The impact from severe weather events (thunderstorms to include hail and lightning) has been moderate, with localized flooding occurring from severe thunderstorms and minor damages to specific locations from hail and lightning. All UNM Campuses can be and have been impacted by any one of the thunderstorm events to include hail and lightning.

Tornadoes

Hazard Characteristics

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 have winds exceeding 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, which 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 periods of up 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. The tornado classification, shown in Table 61, is called the Fujita Scale. The Fujita Scale is used to rate the intensity of a tornado by examining the damage caused by the tornado after it has passed over a man-made structure.

Table 61: Fujita Tornado Damage Scale[78]

Fujita Scale			
F-Scale Number	**Intensity Phrase**	**Wind Speed**	**Type of Damage**
F0	Gale tornado	40-72 mph	Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages signboards.
F1	Moderate tornado	73-112 mph	The lower limit is the beginning of hurricane wind speed; peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages may be destroyed.
F2	Significant tornado	113-157 mph	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.
F3	Severe tornado	158-206 mph	Roof and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted
F4	Devastating tornado	207-260 mph	Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.
F5	Incredible tornado	261-318 mph	Strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile sized missiles fly through the air in excess of 100 meters; trees debarked; steel reinforced concrete structures badly damaged.
F6	Inconceivable tornado	319-379 mph	These winds are very unlikely. The small area of damage they might produce would probably not be recognizable along with the mess produced by F4 and F5 wind that would surround the F6 winds. Missiles, such as cars and refrigerators would do serious secondary damage that could not be directly identified as F6 damage. If this level is ever achieved, evidence for it might only be found in some manner of ground swirl pattern, for it may never be identifiable through engineering studies

[78] Information provided by NOAA at http://www.spc.noaa.gov/faq/tornado/f-scale.html

On February 1, 2007, the Fujita scale was decommissioned in favor of the more accurate Enhanced Fujita Scale, shown in Table 62, which replaced it. None of the tornadoes recorded on or before January 31, 2007 will be re-categorized. Therefore, maintaining the Fujita scale will be necessary when referring to previous events.[79]

Table 62: Enhanced Fujita (EF) Scale[80]

Enhanced Fujita (EF) Scale		
Enhanced Fujita Category	**Wind Speed (mph)**	**Potential Damage**
EF0	65-85	**Light damage**: Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over.
EF1	86-110	**Moderate damage**: Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
EF2	111-135	**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	136-165	**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	166-200	**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 in excess of 100 m (109 yd.); high-rise buildings have significant structural deformation; incredible phenomena will occur.

The **Enhanced Fujita Scale**, or **EF Scale**, is the scale for rating the strength of tornadoes in the United States estimated via 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, six categories from zero to five representing increasing degrees of damage. It was revised to reflect better examinations of tornado damage surveys, so as 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.

[79] http://en.wikipedia.org/wiki/Fujita_scale
[80] http://www.spc.noaa.gov/faq/tornado/ef-scale.html

Tornadoes cause an average of 70 fatalities and 1,500 injuries in the U.S. each year. The strongest tornadoes have rotating winds of more than 250 mph and can be one mile wide and stay on the ground over 50 miles. Tornadoes may appear nearly transparent until dust and debris are picked up or a cloud forms within the funnel. The average tornado moves from southwest to northeast, but tornadoes have been known to move in any direction. The average forward speed is 30 mph but may vary from nearly stationary to 70 mph.[81]

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. 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. The publication "FEMA 320 Taking Shelter from the Storm", August 2008, presents a method whereby residents can determine their tornado risk. Table 63 describes the risks associated to tornadoes for determining shelter requirements.

Table 63: Tornado Risk Table as of December 2012[82]

		Wind Zone			
		I	II	III	IV
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		Moderate Risk		High Risk
	High-wind Shelters are a matter of homeowner preference		Shelter should be considered for protection from high winds		Shelter is the preferred method of protection from high winds

[81] Source: http://www.noaawatch.gov/themes/severe.php
[82] Source: FEMA publication "FEMA 320 Taking Shelter from the Storm"

Previous Occurrences

Tornadoes have been verified in most New Mexico counties. The highest risk of tornadoes is in the east during April through July, but tornadoes are possible with any thunderstorm. New Mexico averages about 10 tornadoes in a year.

New Mexico experiences mostly weak, short-lived tornadoes. Strong tornadoes, while rare, are possible and occur about once every 10 years. 75 percent of severe storms with tornadoes occur in eastern New Mexico and are most likely to occur between April and July. However, the latest tornado fatalities in New Mexico occurred on March 23, 2007 when two people died, 1 near Clovis (and 33 were injured) and one in Quay County. Another fatality occurred west of Albuquerque in October 1974 and a rare winter tornado was reported southwest of Roswell in December 1997. This shows that tornadoes can be deadly at any time and nearly anywhere within the state, even at both low and high elevations.

NCDC reports 33 tornado and funnel cloud events between January 1, 1950 and July 30, 2015 with 0 deaths and injuries and $566 thousand dollars in property damage. UNM has experienced zero significant tornado events.

Declared Disasters from Tornado

NMDHSEM reports one State Declared Disaster for tornado between 2003 and 2013. This number is based on how many Executive Orders were signed by the Governor. According to NMDHSEM records, the total cost for the 2007 State declared tornado was $848,660. Research into damage amount per County has yet to be completed. However, all damage associated with this Executive Order was sustained within Preparedness Area 1. There were no federal disaster declarations for tornado from 2003 through 2012.

According to SHELDUS there have been 2 tornados in counties with UNM campuses and properties.

Table 64: SHELDUS History of Tornado and Funnel Cloud Events (1994-2014)

County Name	Hazard	Year	Month	Property Damage	Property Damage (ADJ 2014)	Injuries	Fatalities	Records
Socorro	Tornado	2012	5	$1,000.00	$1,031.11	0	0	1
Taos	Tornado	2009	7	$10,000.00	$11,034.74	0	0	1

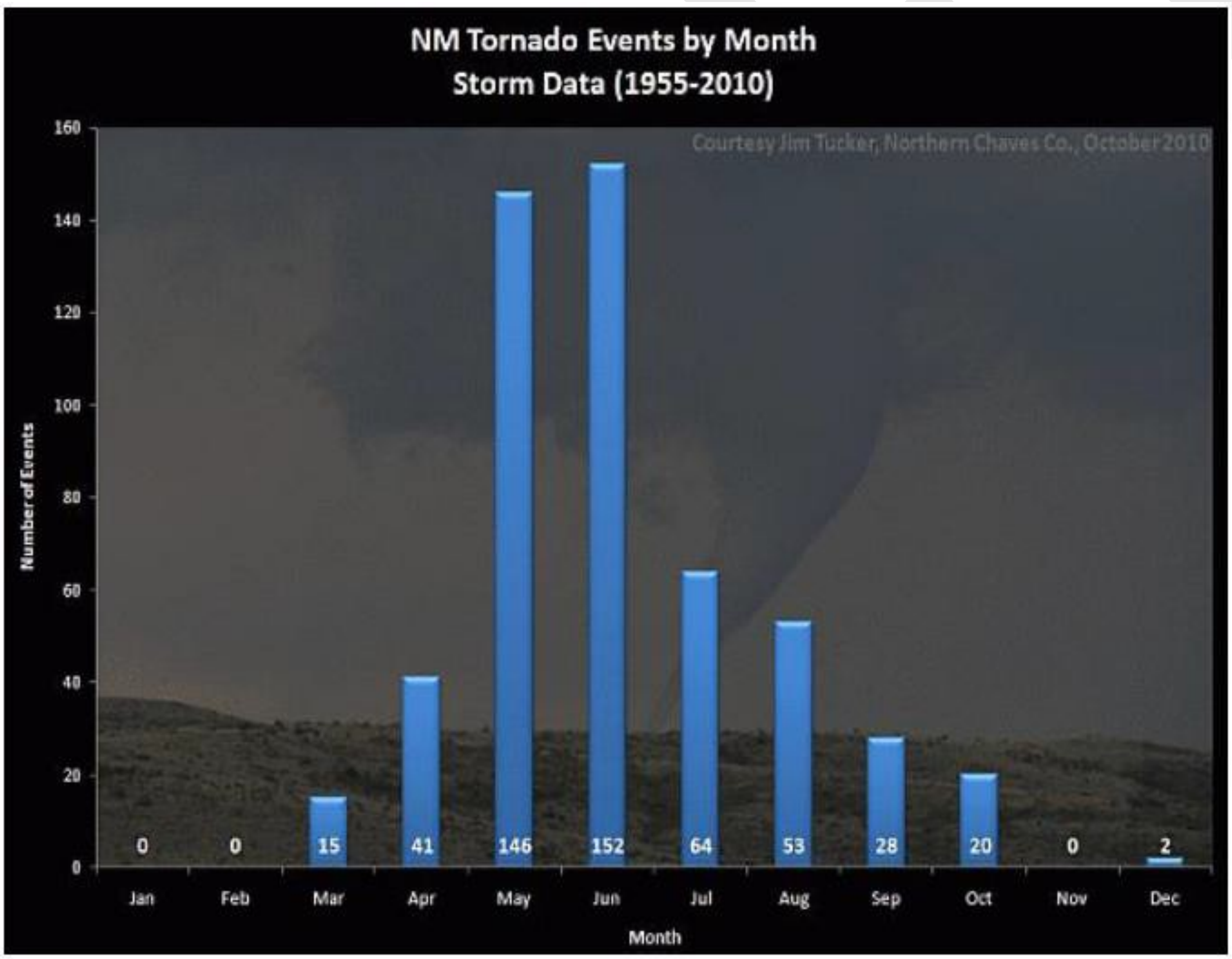
Frequency

The State of New Mexico experiences some tornado activity annually, based on seasonal meteorological patterns and local topographical conditions. New Mexico's complex terrain favors the formation of numerous small landspouts, a weak and short-lived variation of the tornado similar to a dust devil. Landspouts may form without the presence of a strong thunderstorm. The complex terrain in New Mexico, ranging from the eastern plains to the high mountains across the northern and western regions, creates weather regimes that change quickly over relatively short distances. Highway travelers, especially truckers, hit by strong gusts of wind that can make driving hazardous. New Mexico experiences mostly weak, short-lived tornadoes. Strong tornadoes, while rare, are possible and occur about once every 10 years.

Figure 44 provides an overview of the number of tornado events by month in New Mexico. Based on the data collected by the National Weather Service – Albuquerque, tornado frequency is seen most in the May and June time frame. This is consistent with the NWS's assessment in that:

- During the spring, from April through June, storms are at a peak mainly in the eastern areas of the state. Storms become more numerous statewide from July through August.
- Tornadoes have been verified in most New Mexico counties. The highest risk of tornadoes is in the east during April through July, but tornadoes are possible with any thunderstorm. New Mexico averages about 10 tornadoes in a year.

Figure 44: NM Tornado Events by Month as of January 2011



Probability of Future Occurrence

To determine the probability of each Preparedness Area experiencing future tornado occurrences, the probability or chance of occurrence was calculated based on historical data identified in the NCDC. Probability was determined by dividing the number of events observed by the number of years and multiplying by 100. This gives the percent chance of the event happening in any given year. Table 65 provides the probability of each Preparedness Area experiencing a tornado event in any given year.

Table 65: NM Tornado Events by Month as of January 2011

Probability of Future Occurrence	
Preparedness Area	**Tornado**
Preparedness Area 3	86%
Preparedness Area 4	0%
Preparedness Area 5	14%

Risk Assessment

Based on the assessment from data collected in Table 70, Preparedness Area 3 is at risk to experience a tornado event in any given year is great then those in the Preparedness Areas 4 or 5. For those Preparedness Areas with the greatest risk, assessments should be taken in consideration and determine what mitigation actions are appropriate for that location. Risks for consideration include manufactured homes that are not adequately anchored are the most vulnerable structures for damage from tornado events. Other risks for consideration include:

Environmental Risks: Tornadoes pose several risks to the environment. The potential for property damage and disruption of vital, natural resources as a result of a tornado is often very high and increases in proportion to the strength of the storm. Tornadoes produce winds that are strong enough to destroy whole towns. These storms can damage water treatment facilities, block roadways, and destroy animal habitats.

Biological Risks: Tornadoes also pose great risks to living things. The most powerful tornadoes are capable of killing hundreds of people. People are not only killed by the strong winds, flooding and debris, but also by fires, exposure to the elements and loss of electricity. Endangered animals and plants in national parks and forests are also killed during tornadoes.

Table 66 identifies potential impacts from tornadoes.

Table 66: Impacts from Tornadoes

Subject	Potential Impacts
Health and Safety of The Public	Injuries and deaths have occurred in the state due to tornadoes. There is no reason to expect that the impacts will not continue.
Health and Safety of Responders	Responders face the same risks as the public.
Continuity of Operations	Little to no impacts anticipated, except for facilities that may be damaged or during an event.
Delivery of Services	Little to no impacts anticipated, except for facilities that may be damaged or during an event.
Property, Facilities, Infrastructure	A tornado can cause anywhere from minor damage to total destruction of facilities and infrastructure depending on the size of the event. Extensive damages are anticipated.
Economic Condition	A small community can be completely destroyed and by a tornado. The economic base (businesses) and individuals can lose everything, and recovery may require substantial investment.
Public Confidence	Not impacted by the event itself but may be damaged if the response to an event is poor.

Data Limitations

UNM has never experienced a tornado event. Accurate methods to quantify potential future damages are not readily available. The amount of business lost due to tornado events has not been calculated due to the difficulty of attaining this information.

Summary of Vulnerability

Tornado activity in the State of New Mexico is generally on the eastern portion of the state. UNM Campuses generally are not vulnerable to tornado activity as they reside on the western edge of the tornado risk zone. Vulnerability of tornado activity is considered low based on discussions and the hazard analysis.

Wildland/Wildland - Urban Interface Fire

Hazard Characteristics

A wildfire means a fire burning uncontrolled on lands covered wholly or in part by timber, brush, grass, grain or other inflammable vegetation. This is increasing the size of the wildland-urban interface (WUI), defined as the area where structures and other human development meet or intermingle with undeveloped wildland.

Topography, fuel, and weather are the three main factors that influence the behavior of a wildfire. Topography can direct the course of a fire. Depressions, such as canyons, funnel air and act as chimneys, intensifying the fire, causing a faster rate of spread. Saddles on ridge tops draw fires and steep slopes can double the rate of spread, due to the close proximity of fuel (vegetation). The rate of spread is generally stated in chains per hour, feet per minute, or meters per minute.

Fuel type, continuity of fuel, and the moisture content of the fuel all effect wildfire behavior. Continuity of fuel applies both horizontally across the landscape and vertically, from the ground surface up to tree crowns via the understory. Weather can have a profound influence on wildfires. Wind can direct the course of a fire and increase the rate of spread. High temperatures and low humidity can intensify fire, while low temperatures and high humidity can greatly limit the potential of a fire.

There are several types of wildfires. Prescribed fires are planned fires ignited by land managers to accomplish specific natural resource improvement objectives. Fires that occur from natural causes, such as lightning, that are then used to achieve management purposes under carefully controlled conditions with minimal suppression costs are known as wildland fire use (WFU). Wildfires are unwanted and unplanned fires that result from natural ignition, unauthorized human-caused fire, escaped WFU, or escaped prescribed fire. A wildland-urban interface (WUI) fire is a wildfire occurring in areas where structures and other human developments meet or intermingle with wildland vegetation-fuels. WUI fires are a specific concern because they directly pose risks to human lives, property, structures, and critical infrastructure more so than the other types of wildland fires.

A WUI fire involves areas where communities and wildland fuel intermix. Every fire season, catastrophic losses occur as a result of wildfire in WUI areas throughout the western United States. Homes are lost, businesses are destroyed, community infrastructure is damaged, and most tragically, lives are lost. Precautionary action taken before a wildfire strikes often makes the difference between saving and losing a structure. Creating a defensible space around homes, businesses, and other structures is an important component in wildfire hazard reduction. Providing an effective defensible space can be as basic as pruning trees, planting low-flammable vegetation, and cleaning up surface vegetation-fuels and other hazards near a home. These efforts are typically concentrated at a minimum of 30 feet from a building to increase the chance for structure survival and to create an area for firefighters to safely work.

WUI studies suggest that the intense radiant heat of a wildfire is unlikely to ignite a structure that is more than 30 feet away as long as there is no direct flame impingement. Studies of home survivability indicate that homes with noncombustible roofs and a minimum of 30 feet of defensible space have an

85- percent survival rate (Cohen and Saveland 1997). Conversely, homes with wood shake roofs and less than 30 feet of defensible space have a 15 percent survival rate. During a wildfire, structures will burn, wildlife will die or be injured due to burns or smoke inhalation, and death/injury to humans may occur. Wildfires may also create mudslides, landslides by removing the vegetative covering along slopes, and floods and flashfloods due to heat damaged soils that can resist water penetration.

Wildfires can occur at any time of day and during any month of the year, but the peak fire season in New Mexico 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 increased numbers of people use these areas. Fires can extensively affect the economy of an affected 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 the restoration of the burned area. Additionally, agricultural production and food processing systems are highly vulnerable to the effects of wildfire.

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 capability 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. Smoke from fires threatens air quality and can affect both human and livestock production and health.

Along the Rio Grande and other major rivers in the state occurs what is known as the “Bosque,” which is a riparian forest ecosystem consisting largely of cottonwoods, willows, salt cedar, and other native and invasive species. When these areas are stressed by drought, as has happened in recent years, they become tinderboxes.

Land Ownership

Wildfires that occur in New Mexico affect lands of various ownership types including State, private, Tribal and/or federal lands. Diverse and complex landownership presents many different challenges when dealing with wildfires.

The majority of the land acreage in New Mexico is privately owned (44%). Approximately 34% of the land is federally owned. Responsibility for stewardship and management of the forests and woodlands in New Mexico falls primarily to federal agencies and about 43% of the State’s acreage is managed by federal agencies. The primary federal agency that manages forest and woodland acreage in New Mexico is the United States Forest Service; they manage 7.6 million acres (46% of all forest and woodland acreage). Approximately 7% of forest and woodlands are under State ownership, while Native American tribes own 15%. Table 67 shows land ownership in total acres, forest acres and woodland acres. Percent of total acres, forest acres and woodland acres is also presented.

Table 67: Land Ownership in New Mexico

Ownership	Area (acres)	% of NM	Forest (acres)	Woodland (acres)	% of NM Forest & Woodland
Federal					
Bureau of Land Management	13,481,000	17	97,800	2,161,100	10
Department of Defense	2,552,000	3	7,000	156,700	1
Bureau of Reclamation	54,500	<1	0	0	0
Fish and Wildlife Service	383,000	<1	1,500	42,600	0
National Park Service	379,000	<1	11,000	42,600	0
Forest Service	9,223,000	12	4,811,600	2,785,500	35
Other Federal	237,000	<1			0
Federal, Total	**26,309,500**	**34**	**4,928,900**	**5,188,500**	**46**
State	**9,171,000**	**12**	**150,500**	**1,326,700**	**7**
Private	**34,157,000**	**44**	**1,654,800**	**5,617,600**	**33**
Tribal	**8,178,000**	**10**	**802,700**	**2,284,600**	**14**
Local	**3,000**	**<1**	**0**	**0**	**0**
TOTAL	**77,818,500**	**100**	**7,536,900**	**14,417,400**	**100**

The State Forestry Division does not own and manage land within New Mexico, but works with partners to promote healthy, sustainable forests in New Mexico through its various programs, encouraging sustainable economic growth while protecting and enhancing watershed health and community safety. The State Forestry Division provides technical and financial assistance to state, private, and tribal landowners and land managers.[83]

Wildfires happen on private, municipal, County, State and/or federal lands. Ownership is made up of private landowners, the State of New Mexico, Indian Reservations and the Federal Government which include the Forest Service, Bureau of Land Management (BLM), Fish and Wildlife Service, National Park Service, Bureau of Indian Affairs, Bureau of Reclamation and the Military. When wildfires happen, they either happen on private, state and/or federal lands. These 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 and residential properties are developed on both non-forested and forested

[83] New Mexico State Hazard Mitigation Plan (2010)

land and because of the increase of people using these areas. With increased residential growth in or near federal and state lands, both on forested and non-forested land areas and in or near the Bosque areas (WUI), risk from catastrophic wildfire has increased dramatically. Private in holdings are being developed with multiple structures and limited access. This growth has also increased the traffic on roadways, resulting in safety concerns both for emergency response and urban interface fire evacuations.

The only natural cause of wildfire is lightning; however, human carelessness and arson account for the larger portion of all wildfires in the State. Table 68 below is based on State Forestry Division figures for fires on State and private land in 2011 and 2012. Please note that Table 68 is based on State and private land only.[84]

Table 68: Fires on State and private land in 2011 and 2012

	Human Caused Fires				Lighting Caused Fires			
	Number of Fires	% of Yearly Number	Acres Burned	% of Yearly Acres	Number of Fires	% of Yearly Number	Acres Burned	% of Yearly Total
2012	263	57%	20,403	80%	194	42%	5,073	20%
2011	706	63%	438,727	67%	411	37%	217,085	33%

Fires on federal land are tallied separately. Below is listing of human-caused and lighting caused fires for 2011 and 2012 for the federal land management agencies in New Mexico (Table 69). These figures are taken from the Southwest Coordination Center.

Table 69: Fires on Federal land (2011-2012)

	Human Caused Fires				Lightening Caused Fires			
Agency	**Number of Fires**	**% of Yearly Number**	**Acres Burned**	**% of Yearly Acres**	**Number of Fires**	**% of Yearly Number**	**Acres Burned**	**% of Yearly Acres**
BIA 2011	203	80%	20,684	67 %	49	19%	9,896	32%
BIA 2012	119	70%	243	33%	51	30%	494	67%
BLM 2011	100	50%	50,677	49 %	100	50%	53,655	51%
BLM 2012	45	41%	998	56%	64	63%	771	44%
USFW 2011	3	75%	9	9%	1	25%	92	91%
USFW 2012	1	50%	1	1%	1	50%	66	99%
NPS 2011	1	33%	29,078	100%	2	66%	1	Less than

[84] http://www.emnrd.state.nm.us/SFD/FireMgt/Historical.html

	Human Caused Fires				Lightening Caused Fires			
								.01%
NPS 2012	0	-	0	-	8	100%	1,853	100%
USFS 2011	140	25%	265,924	88%	412	75%	35,872	12%
USFS 2012	135	36%	1,938	Less than .01%	242	63%	340,189	99%
Federal 2- year Totals	747		369,552		930		442,880	
State 2- year Totals	969		459,130		605		222,158	
Average per year	1,716	53%	828,682	55%	1,535	47%	665,038	45%

For general comparative purposes only, the State and private land fire data was collapsed with the federal fire data. A total of 3,251 fires burned on federal, State and private land in 2011 and 2012. Of that number, 1,716 (53%) were human-caused and 1,535 (47%) were lightning caused. A total of 1,493,720 acres burned on federal, State and private land in 2011 and 2012. Of that number, 828,682 acres (55%) were human-caused, and 665,038 acres (45%) were lightning caused. From these figures, wecan generalize that more fires and more acres are burned from human caused fires than lightning.

Firefighters use several methods to express fire potential. Some of the indicators are:

Relative Humidity (RH): 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 is expressed in percent. RH is measured directly by automated weather stations or manually by wet and dry bulb readings taken with a psychrometer and applying the National Weather Service, psychrometric tables applicable to the elevations where the reading were taken.

Fuel moisture: Fuel moistures are measured for live Herbaceous (annual and perennial), Woody (shrubs, branches and foliage) fuels, and Dry (dead) fuels. These are calculated values representing 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: computed from the morning (12Zulu) 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 atmosphere 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 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 (KBDI): 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. The index's relationship to fire is that as the index values increase, the vegetation is subjected to greater stress because of moisture deficiency. At higher values, living plants die and become fuel, and the duff/litter layer becomes more susceptible to fire.

KBDI = 0–200 - 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 = 200–400 - Typical of late spring, early growing season. Lower litter and duff layers are drying and beginning to contribute to fire intensity.

KBDI = 400–600 - Typical of late summer, early fall. Lower litter and duff layers actively contribute to fire intensity and will burn actively.

KBDI = 600–800 - 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 (ERC): the estimated potential available energy released per unit area in the flaming front of a fire. The day-to-day variations of the ERC are caused by changes in the moisture contents of the various fuel classes, including the 1,000-hour time lag class. The ERC is derived from predictions of the rate of heat release per unit area during flaming combustion and the duration of flaming.

The Ignition Component: 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: 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 SC 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 SC table is required for each fuel type.[85]

Another is the International Fire Code Index (IFCI) (Table 70), which combines slope and fuel levels:

Table 70: Wildfire Susceptibility Matrix

FEMA/IFCI 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
Note: M = Medium, H = High, E = Extreme. Source: International Fire Code Institute, January 2000									

[85] Source: http://www.nps.gov/nifc/public/pub_und_understandingfire.cfm

All these indicators are taken into account when determining the fire danger for a specific area. These indicators can change daily, which is why the Fire Danger Rating System (Table 71) was created. It is a method of conveying in a simple way the relative danger level to the public.

Table 71: Fire Danger Rating System[86]

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. Woods 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.
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.

[86] Source: http://www.wfas.net/content/view/34/51/

Wildland Fire Readiness Levels

The State Forestry Division's Fire Policy and Procedures established the Wildland Fire Readiness Levels as a method for dictating the overall preparedness levels for the Division. District Foresters and District Fire Management Officers shall assess the following criteria in determining readiness levels:

- Current and long-range forecasted weather;
- Current and forecasted fire behavior;
- Current and trend of five-day average energy release component (ERC);
- Comparison of current and trend of the seasonal ERC chart;
- Southwest Area preparedness levels; and
- Individual agency or district fire activity.

Because of the extreme geographical and topographical differences in the state, the Division's districts may be at different levels of fire readiness throughout the year District Foresters and District Fire Management Officers shall determine fire readiness levels for their respective districts as determined by the following criteria and notify the State Fire Management Officer of the situation.

FIRE READINESS LEVEL 1:

- Most areas have low fire danger.
- Fire activity is light (occasional A, B, and C class fires) and all wildland fires are of short duration, usually lasting only one burning period.
- Moisture content in light fuels is high and heavy fuels are moist.
- State resources and interagency dispatch center cooperators are capable of handling fire incidents with minimum staffing levels.
- Initial attack forces are suppressing wildland fires.
- There is little or no commitment of state resources besides volunteer fire departments.
- ERC-5 day mean average is consistently below 30

FIRE READINESS LEVEL 2:

- Fire danger is moderate.
- Class A, B, and C fires may occur, and the potential exists for escapes to become larger but onlyhave a potential duration of two burning periods.
- Heavy fuels are drying; frontal system winds increase the potential for rapid fire spread over a 36-to-48-hour period.
- State and volunteer fire department resources with limited assistance from the individual dispatch centers are capable of handling the situation.
- Fire department cooperators provide initial attack.
- High wind warnings and "Red Flag" alerts the National Weather Service issues are indicators that the districts may need additional resources.
- ERC-5-day mean average is consistently between 30 and 45.

FIRE READINESS LEVEL 3:

- Generally, all agencies are experiencing high fire danger.
- Numerous A, B, and C class fires, with a high potential for wildland fires to become Class D or larger in size, that may require additional resources.
- Light fuels are cured, and heavy fuels are rapidly drying.
- Fires are escaping initial attack on a consistent basis and require extended attack support.
- The initial attack dispatch centers are requesting additional resources to increase initial attack capabilities.
- Federal cooperators provide critical initial attack and extended attack support during fire suppression.
- FEMA Fire Suppression Grants apply to urban/interface fires. The State Forester initiates FEMA Presidential Emergency Declaration requests.
- ERC-5 day mean average is consistently between 45 and 60.

FIRE READINESS LEVEL 4:

- Division and cooperating agencies are experiencing very high or greater fire danger.
- Numerous A, B, C, and D class fires that have the potential to exhaust dispatch area, state, Southwest Area, and national resources are common within the region.
- Division personnel implement and enforce fire restrictions.
- The Division may have Type 1 and Type 2 Incident Management Teams committed to incidents under this readiness level within the state.
- ERC-5 day mean average is consistently between 60 and 80.

FIRE READINESS LEVEL 5:

- All criteria for Fire Readiness Level 4 plus the following additional criteria are met:
- Fire danger is extreme throughout the state and region;
- Several dispatch centers and agencies are experiencing major fires and national resources are exhausted;
- Air resources are in short supply;
- Fire restrictions require closures;
- EOC is activated;
- Area Command has been implemented;
- High potential for catastrophic fires exists;
- Extreme fire behavior, scarce resources, and extremely unsafe working conditions for fire fighters hinder efforts of Type 1 and 2 Incident
- Management Teams;
- A multi-agency Coordination (MAC) Group is allocating resources to high priority fires; and
- ERC-5-day average is consistently at or above 80.

Previous Occurrences

Table 72 presents past significant wildland fires that have occurred in the State.

Table 72: Previous Occurrences – Wildland/WUI Fires

Date	Location	Significant Event
June 10, 2013	8 miles south of Truchas (Rio Arriba County) Preparedness Area 3	The Jaroso Wildfire burned 11,149 total acres (100% in. National Forest Land). 100% contained as of 8/5/2013.
May 31, 2013	10 miles north of Jemez (Sandoval County) Preparedness Area 5	The Thompson Ridge Wildfire burned 23,965 total acres (99% in National Forest Land). 100% contained as of 7/1/2013.
June 20, 2012	Corrales (Sandoval and Bernalillo County) Preparedness Area 5	The Romero Fire burned 360 acres. FMAG #2982.
June 18, 2012	Northwest Plateau Preparedness Area 4	The Blanco Wildfire burned out of control 10 miles east of Bloomfield consuming more than 350 acres. A wildfire along CR 1491 burned quickly out of control in the Bosque along the San Juan River and consumed more than 350 acres, 5 homes, and 12 outbuildings. Property Damage was $1 Million. FMAG #2981.
March 25, 2012	Lower Chama River Valley Preparedness Area 3	Near record breaking temperatures fueled a human caused fire near Chimayo. The Chimayo Wildfire, near Highway 76 and County Road 87, was started when hot jumper cables were laid on dry vegetation. The fire, 10 acres in size, scorched Bureau of Land Management and privately owned land. In total, two homes and two outbuildings were burned. Total property damage was $300K.

Date	Location	Significant Event
June 26, 2011	Jemez Mountains Preparedness Area 3	The Las Conchas Wildfire began when a tree fell on a power line 12 miles southwest of Los Alamos on June 26th. The fire quickly spread eastward under windy and unstable conditions, covering more than 40,000 acres the first day. The fire was contained by the end of the month. In all, this fire burned 156,593 acres, making it the largest fire in New Mexico history. The Las Conchas wildfire damaged 80 homes, of which, 15 were primary residences. The other 65 homes were seasonal. Numerous outbuildings were also damaged or destroyed, and 10 vehicles were completely destroyed. The fire prompted evacuations of Los Alamos National Labs, Bandelier National Monument, the city of Los Alamos, as well as numerous other campgrounds and homes within the burn area itself. The fire burned portions of the Santa Clara, Cochiti, San Ildefonso and Santa Domingo Indian Reservations as well as portions of Bandelier National Monument and the Valles Caldera National Preserve. This fire burned on both sides of Highway 4, and up to Highway 501, causing both highways to be closed for a time. Some of this area was previously burned by the Cerro Grande Fire in 2000. Fortunately, no member of the public or any emergency responders were seriously injured during the fire suppression efforts. Total property damage was $17 Million. FMAG #2933. State EO 2011-053.
June 26, 2011	Albuquerque Metro Area Preparedness Area 5	Hot, dry and windy conditions allowed this human caused fire in the Bosque to quickly destroy a few residences and outbuildings. The 346 Fire, located 5 miles south of Belen in the Bosque, burned 262 acres over a five-day period. The firedestroyed 3 residences and 7 outbuildings, and also damaged another 3 residences and 7 outbuildings. Total property damage was $700K.
June 16, 2011	South Central Mountains Preparedness Area 5	The Swallow Wildfire quickly engulfed 9 homes amidst breezy, hot and very dry conditions. This human caused fire, named the Swallow Fire for starting on Swallow Drive, burned 10 acres of land in a wooded Ruidoso neighborhood. Nine homes were lost to the blaze. Total Property damage was $3.5 Million.
June 9, 2011	Catron County Preparedness Area 6	Wallow Fire. FMAG #2917.

Date	Location	Significant Event
April 17, 2011	Curry and Roosevelt Counties Preparedness Area 1	Tire Fire. FMAG #2897
June 23, 2010	San Juan Mountains Preparedness Area 3 Preparedness Area 5	Thunderstorms were the result of a back door cold front which slid through the eastern plains of New Mexico during the day. Initially, thunderstorms brought hail and gusty winds across southeast New Mexico. Then later, the thunderstorms evolved into a cluster which slowly moved east into Texas. This cluster of storms brought rainfall amounts of up to 2 inches in one hour's time across the east. Later that night, the front pushed through the gaps of the central mountain chain resulting in east winds topping 60 mph. Tree damage was noted across much of Albuquerque. A 2-acre fire resulted in damage of the Cumbres and Toltec Scenic Railroad by the Lobato Trestle. The fire, which was approximately 5 miles north-northeast of Chama near the Colorado border, destroyed the wooden ties that support the rail bed. As a result, the railroad had to halt train operations through the area. The cause of the fire remains unknown, though arson and natural causes have been ruled out. Property damage was $1 Million.
June 23, 2008	Sandia/Manzano Mountains Preparedness Area 5	Lightning started a wildfire in heavy timber on the east side of the Manzano Mountains, not far from the area of the Trigo Wildfire, which had burned earlier in the spring. Over 5000 acres were consumed before the fire was contained June 30th. The Big Springs Wildfire consumed 5478 acres on the east slopes of the Manzano Mountains about 3 to 6 miles west northwest of Tajique. Six homes and ten outbuildings were destroyed in the fire in the Apache Canyon area. Property damage was $1 Million.

Date	Location	Significant Event
April 30, 2008	Sandia/Manzano Mountains Preparedness Area 5	A human caused fire turned into a large wildfire during several days of strong winds. Very dry conditions were present prior to the wildfire due to a lack of precipitation in the preceding weeks. The Trigo Wildfire began on the west slopes of the Manzano Mountains and was initially spread by southwest wind gusts to 35 mph. The fire reached Osha Peak during the evening of April 16th. On the 20th, the fire spread rapidly northeast due to 40 mph winds. It entered flatter terrain on the east side of the Manzanos, and by April 21st, 3750 acres were burned including nine homes, nine outbuildings and two recreational vehicles. The 4800-acre fire was 95 percent contained by April 29th but was fanned by strong southwest winds of 40 to 50 mph on the 30th, forcing the evacuation of Sufi and Apple Mountain Campgrounds and the Sherwood Forest subdivision, west of Torreon. Over 50 additional homes and one communications tower were damaged or destroyed, mainly in the Sherwood Forest area as the fire grew to more than 11,000 acres. The fire continued to be uncontained into the month of May. Cost was $8.5 Million
November 19, 2007	Sandia/Manzano Mountains Preparedness Area 5	A small human caused wildfire which began in the southern Manzano Mountains early in the morning on the 19th grew to around 7000 acres early on the 21st. Three residences and 4 outbuildings were destroyed. Nearly 100 people were evacuated prior to Thanksgiving Day in the villages of Punta de Agua and Manzano. Cost was $500K
February 23, 2007	Belen (Valencia County) Preparedness Area 5	Fire threatened approximately 150 homes, three businesses in the City of Belen, several power lines and a sewer treatment plant. As a result, an estimated 400 individuals were evacuated, and two shelters were opened to aid in the evacuations. The fire burned at least 500 acres, destroyed two homes and two people were injured. Federal assistance was approved for this event.
June 2003	Albuquerque, NM (Bernalillo County) Preparedness Area 5	Fireworks ignited the Bosque Fire in Albuquerque, which burned hundreds of acres. The threat to surrounding residences, businesses, and infrastructure was very high, response costs and losses were approximately $1 million.

Date	Location	Significant Event
May 2000	Los Alamos County Preparedness Area 3	The Cerro Grande Wildfire was the costliest fire in the state's history. The entire county of Los Alamos was evacuated when a prescribed burn, which was ignited May 4 on property of the Bandelier National Monument quickly, escaped its project area **(**Los Alamos Canyon) and entered the city's western perimeter. Although there was considerable warning, the city's 11,000 residents had only a very short time to evacuate. Over 400 residences were destroyed, with many more damaged by smoke and prolonged power outages. The fire burned nearly 47,000 acres and hundreds of structures in Los Alamos and the adjacent Los Alamos National Laboratory (LANL), before it was completely contained in July 2000. The event resulted in a Federal Disaster Declaration, FEMA-1329.
May 1996	Taos County Preparedness Area 2	In Taos County, the Hondo Wildfire swept through the unincorporated community of Lama, south of Questa. This community was built in the forest and did not stand a chance against the fire that burned over 4000 acres in the first afternoon. Luckily, no one was injured, but the destruction was nearly total. Approximately 32 homes were destroyed, and the fire burned into the high country until it was finally extinguished by summer rains.

Table 73 provides an overview of the total number of wildland/urban interface fires reported in each county with a UNM campus or property.

Table 73: SHELDUS History of Wildland/Urban Interface Fires (1994-2014)

County Name	Year	Month	Property Damage	Property Damage (ADJ 2014)	Injuries	Fatalities	Records
Bernalillo	2007	11	$83,333.33	$95,147.14	0	0	1
Bernalillo	2008	4	$607,142.86	$667,582.76	0	0	1
Bernalillo	2008	6	$166,666.67	$183,258.02	0	0	1
Bernalillo	2011	6	$233,333.33	$245,570.57	0	0	1
Bernalillo	2014	1	$1,666.67	$1,666.67	0	0	1
Bernalillo	2014	2	$1,666.67	$1,666.67	0	0	1
Los Alamos	1994	6	$238,095.24	$380,335.46	0	0	1
Los Alamos	1994	7	$238,095.24	$380,335.46	0	0	1
Los Alamos	2000	5	$1,500,000,000.00	$2,062,160,277.35	0	0	1
Los Alamos	2011	7	$5,666,666.67	$5,963,856.87	0	0	1

County Name	Year	Month	Property Damage	Property Damage (ADJ 2014)	Injuries	Fatalities	Records
Los Alamos	2013	5	$1,666.67	$1,693.71	0	0	1
McKinley	1994	6	$238,095.24	$380,335.46	0	0	1
McKinley	1994	7	$238,095.24	$380,335.46	0	0	1
McKinley	2012	6	$500,000.00	$515,553.54	0	0	1
McKinley	2014	6	$250,000.00	$250,000.00	0	0	2
Sandoval	1994	6	$238,095.24	$380,335.46	0	0	1
Sandoval	1994	7	$238,095.24	$380,335.46	0	0	1
Sandoval	2007	11	$83,333.33	$95,147.14	0	0	1
Sandoval	2008	4	$607,142.86	$667,582.76	0	0	1
Sandoval	2008	6	$166,666.67	$183,258.02	0	0	1
Sandoval	2011	5	$100,000.00	$105,244.53	0	0	1
Sandoval	2011	6	$233,333.33	$245,570.57	0	0	1
Sandoval	2011	7	$5,666,666.67	$5,963,856.87	0	0	1
Sandoval	2013	5	$1,666.67	$1,693.71	0	0	1
Sandoval	2014	1	$1,666.67	$1,666.67	0	0	1
Sandoval	2014	2	$1,666.67	$1,666.67	0	0	1
Socorro	1994	6	$238,095.24	$380,335.46	0	0	1
Socorro	1994	7	$238,095.24	$380,335.46	0	0	1
Socorro	2007	11	$83,333.33	$95,147.14	0	0	1
Socorro	2008	4	$607,142.86	$667,582.76	0	0	1
Socorro	2008	6	$166,666.67	$183,258.02	0	0	1
Socorro	2011	5	$75,000.00	$78,933.40	6.5	0	1
Socorro	2012	5	$1,250,000.00	$1,288,883.86	2.5	0	1
Socorro	2012	6	$1,125,000.00	$1,159,995.47	0	0	1
Taos	1994	6	$238,095.24	$380,335.46	0	0	1
Taos	1994	7	$238,095.24	$380,335.46	0	0	1
Taos	1996	5	$1,500,000.00	$2,263,250.48	0	0	1
Taos	2011	4	$2,666.67	$2,806.52	0	0	1
Taos	2011	7	$2,400.00	$2,525.87	0	0	1
Taos	2012	3	$100,000.00	$103,110.71	0	0	1
Taos	2013	5	$1,250.00	$1,270.28	0	0	1
Taos	2013	6	$250,000.00	$254,055.47	0	0	0

Declared Disasters from Wildfire

NMDHSEM reports seven State Declared Disasters for wildfire between 2003 and 2013. This number is based on how many Executive Orders were signed by the Governor for wildfire. According to NMDHSEM records, the total cost for State declared wildfire events between 2003 and 2012 was $2,681,694 (Table 74). Research into locations for each disaster would need to be completed prior to breaking-out the figures by Preparedness Area.

Table 74: State Disaster Event Information 2003 through 2012

Event Type	State Executive Order	Dollar Loss*
Fire Preparedness	06-009	$6,662.00
Wildfire	08-018	$375,032.00
Wildfire	11-047*	$200,000.00
Wildfire	11-053*	$750,000.00
Wildfire	11-061*	$100,000.00
Wildfire	12-014*	$500,000.00
Wildfire	12-015*	$750,000.00
Total	**7**	**$2,681,694.00**
*The total does not reflect all costs for Executive Orders from 2011 and 2012 which are still being tallied.		

There were 29 Fire Management Assistance Grants at the federal level between 2003 and 2012 (Table 75). The total Public Assistance dollar losses from federal, NMDHSEM and local government entities and all tribal entities was $28,356,974.

Table 75: Federal Disaster Event Information 2003 through 2012

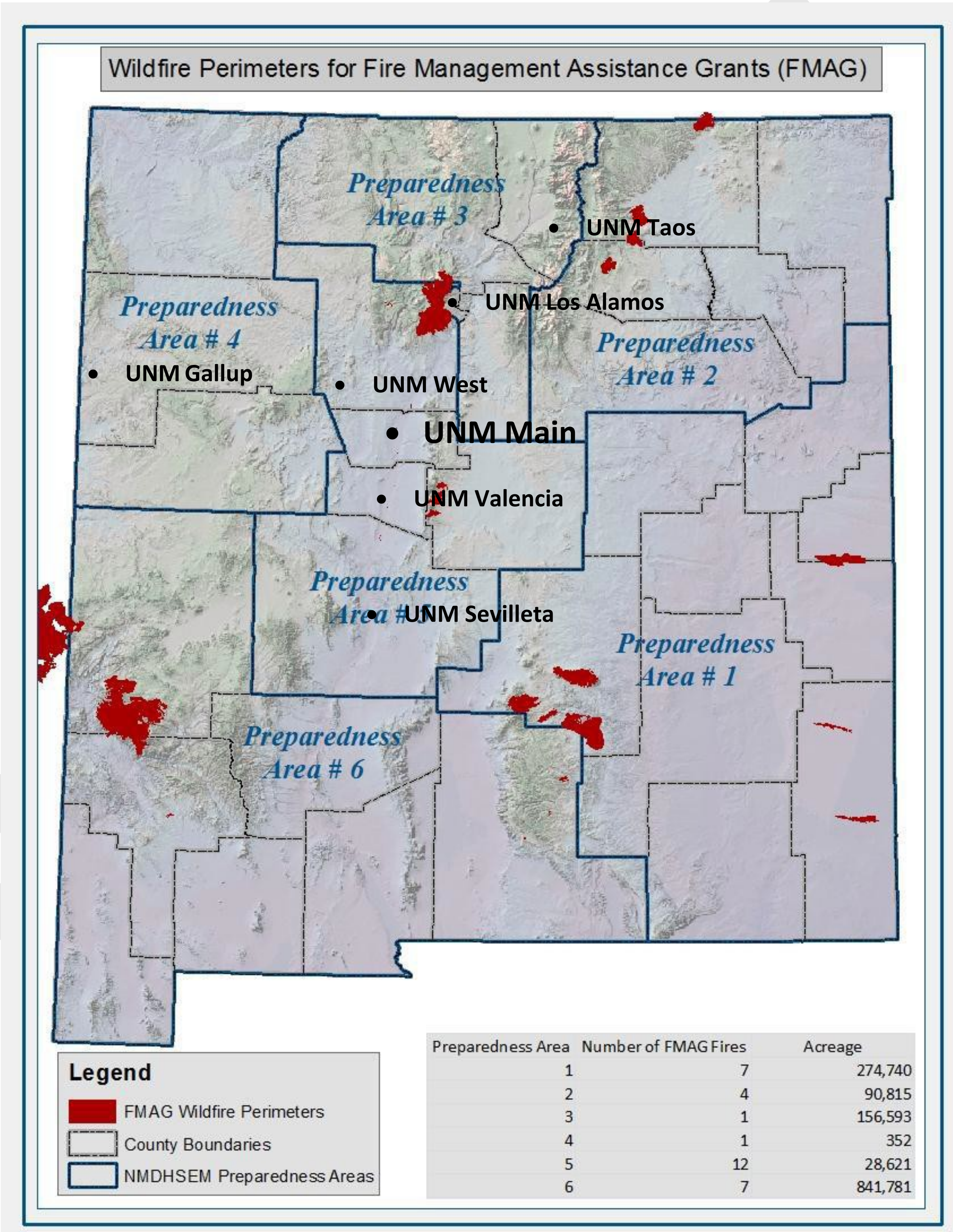
Event Type/Name	Event Number	Federal Share	State (DHSEM) Share	Total Cost	State % of Total
Wildfire - Atrisco Fire	2472	$1,749,609	$583,203	$2,332,812	25%
Wildfire - Walker Fire	2467	$76,176	$25,392	$101,568	25%
Wildfire - Peppin Fire	2518	$283,186	$94,395	$377,581	25%
Wildfire - Bernardo Fire	2522	$238,140	$79,380	$317,520	25%
Wildfire - Casa Fire	2631	$262,647	$87,549	$350,196	25%
Wildfire - Southeast NM Fire	2600	$107,390	$35,797	$143,187	25%
Wildfire - Ojo Feliz Fire	2636	$2,406,369	$802,123	$3,208,492	25%
Wildfire - Malpais Fire	2644	$113,353	$37,784	$151,137	25%
Wildfire - Rivera Mesa Fire	2647	$2,718,248	$906,083	$3,624,331	25%
Wildfire - Belen Fire	2682	$89,839	$29,946	$119,785	25%
Wildfire - Ojo Peak Fire	2741	$17,400	$5,800	$23,200	25%
Wildfire - Trigo Fire	2762	$2,175,243	$725,081	$2,900,324	25%
Wildfire - Big Springs Fire	2777	$406,862	$135,621	$542,483	25%
Wildfire - Buckwood Fire	2818	$339,716		$452,955	0%

Wildfire - Cabezon Fire	2842	$55,680	$0	$74,239	0%
Wildfire - Rio Fire	2843	$55,983		$74,645	0%
Wildfire - Quail Ridge Fire	2866	$267,934	$89,311	$357,245	25%
Wildfire - White Fire	2880	$124,694	$41,565	$166,259	25%
Wildfire - Tire Fire	2897	$75,184	$25,061	$100,245	25%
Wildfire - Wallow Fire	2917	$515,274	$171,758	$687,033	25%
Wildfire - Track Fire	2918	$4,300,099	$1,433,366	$5,733,465	25%
Wildfire - Los Conchas Fire	2933	$1,640,181	$546,727	$2,186,909	25%
Wildfire - Little Lewis Fire	2934	$75,494	$25,165	$100,659	25%
Wildfire - Donaldson Fire	2935	$3,173,028	$1,057,676	$4,230,704	25%
Wildfire - Whitewater/Baldy Complex Fire	2978*	NA	NA	NA	NA
Wildfire - Little Bear	2979*	NA	NA	NA	NA
Wildfire - Blanco Fire	2981*	NA	NA	NA	NA
Wildfire - Romero Fire	2982*	NA	NA	NA	NA
Total	**29**	**$21,267,731**	**$6,938,784**	**$28,356,974**	

*NMDHSEM as the State emergency management agency contributed either 25% of the total cost or zero.

Figure 45 shows a map of statewide wildfire perimeters (including County boundaries) for Fire Management Assistance Grants (FMAGs) between 2003 and 2012.

Figure 45: State Wildfire Perimeters for Fire Management Assistance Grants (2003 - 2012)



Preparedness Area	Number of FMAG Fires	Acreage
1	7	274,740
2	4	90,815
3	1	156,593
4	1	352
5	12	28,621
6	7	841,781

Figures 46 through 48 on the following pages show maps of wildfire perimeters for FMAGs in each of the six state Preparedness Areas. The following chart (Table 76) summarizes the number of FMAGs and acreage for each Preparedness Areas with UNM campuses and properties.

Table 76: Summary of FMAG and Acreage by Preparedness Area[87]

Preparedness Area	Number of FMAGs	Number of Acers per event	Notes
3	1	156,593	Las Conchas Fire impacted area in Los Alamos, Rio Arriba and Santa Fe Counties (Preparedness Area 3) and Sandoval County (Preparedness Area 5)
4	1	352	All acreage in San Juan County
5	12	28,621	Majority of area in Torrance County. Las Conchas Fire impacted Sandoval County but was reported with Preparedness Area 3.
Total	14	185,566	

Figure 46: FMAG Wildfire Perimeters for Preparedness Area 3 (2003 - 2012)

[87] Source: University of New Mexico Earth Data Analysis Center

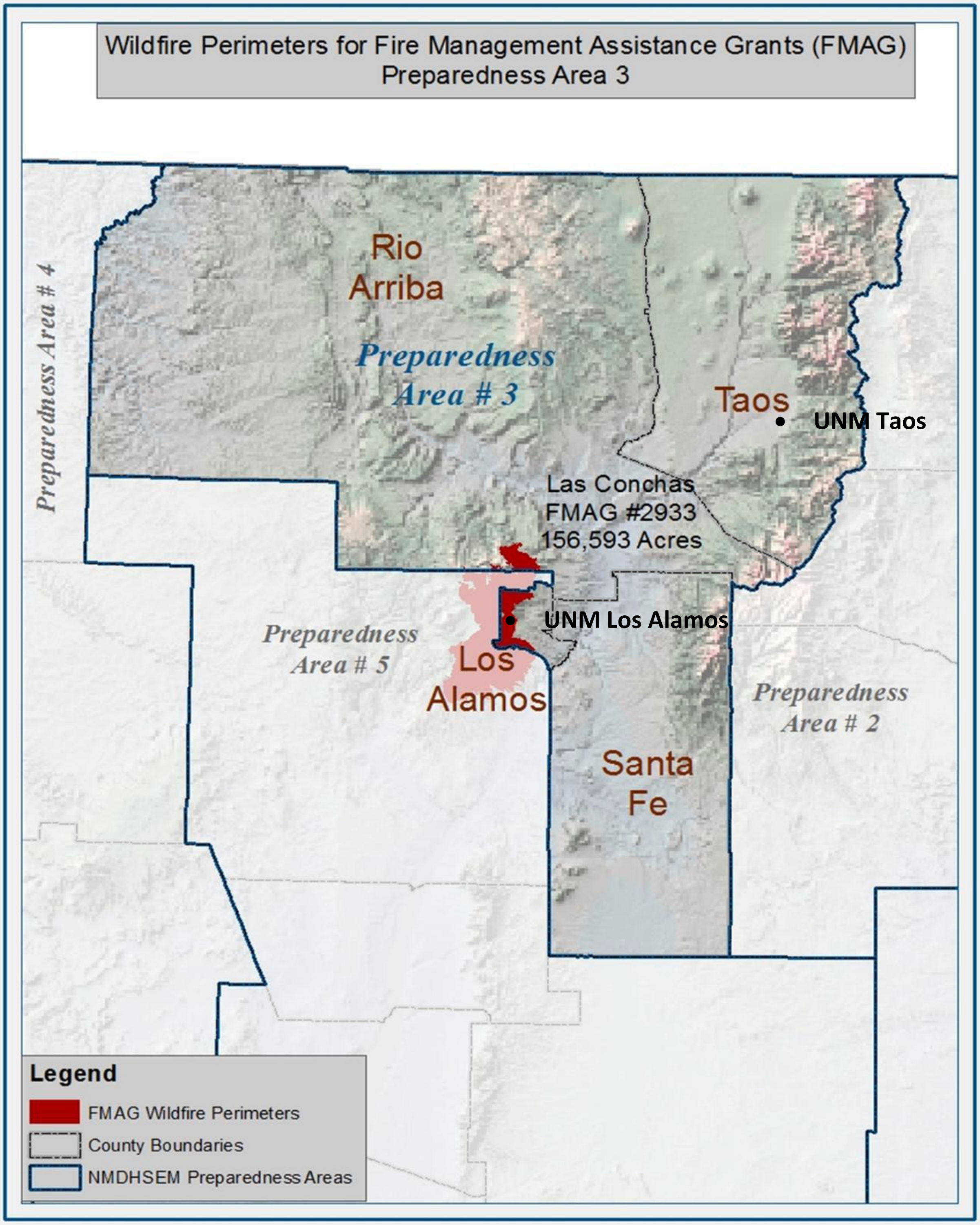

Wildfire Perimeters for Fire Management Assistance Grants (FMAG)
Preparedness Area 3
Rio Arriba
Preparedness Area # 3
Preparedness Area # 4
Taos
UNM Taos
Las Conchas
FMAG #2933
156,593 Acres
UNM Los Alamos
Preparedness Area # 5
Los Alamos
Preparedness Area # 2
Santa Fe
Legend
FMAG Wildfire Perimeters
County Boundaries
NMDHSEM Preparedness Areas

Figure 47: FMAG Wildfire Perimeters for Preparedness Area 4 (2003 - 2012)

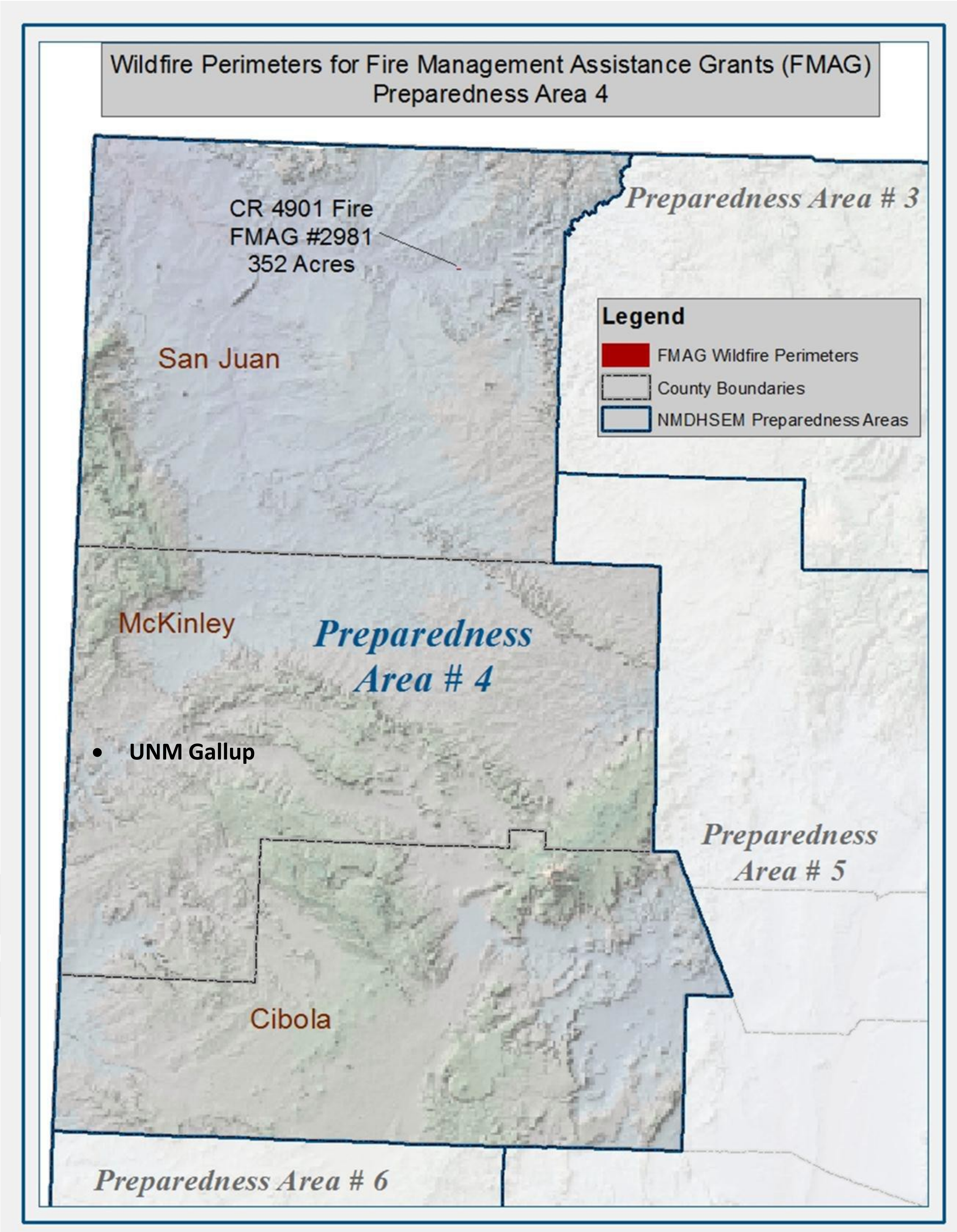
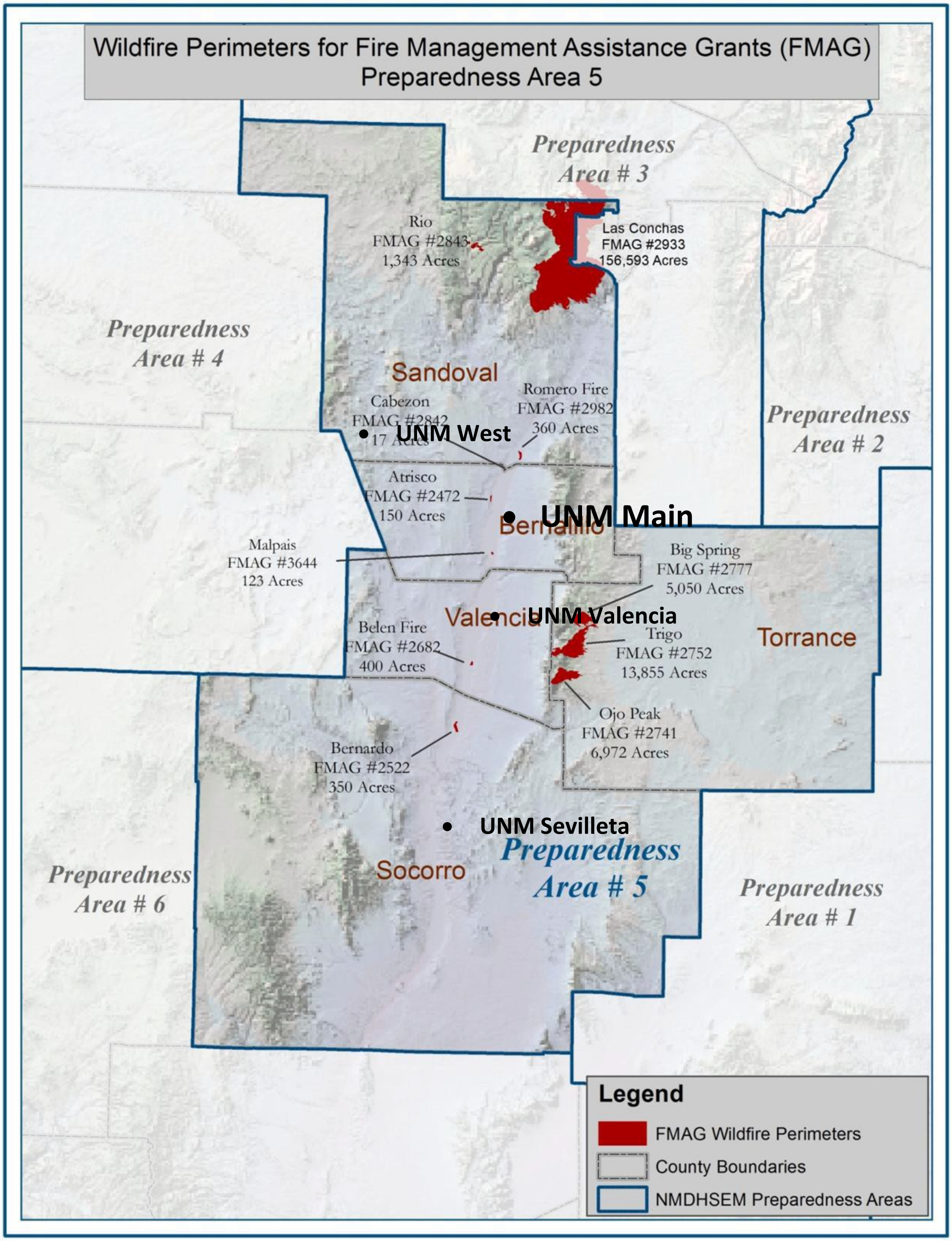


Figure 48: FMAG Wildfire Perimeters for Preparedness Area 5 (2003 - 2012)

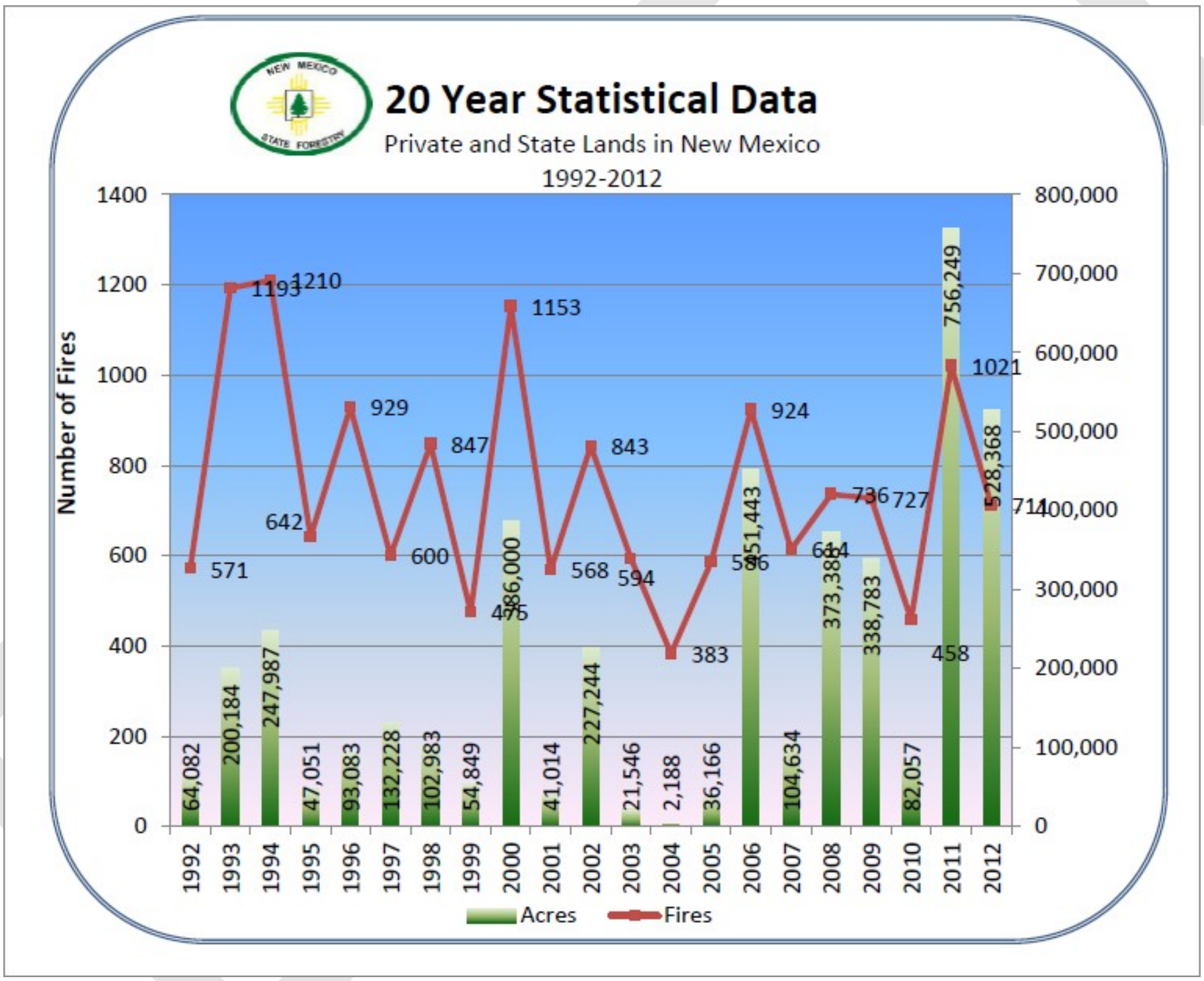


Frequency

Figure 49 and Table 77 identify 20-years of statistical data for the number of fires and acres burned State-wide. From 1992 to 2012, 15,785 fires have burned 4,291,527 acres State-wide. The average results in 752 wildland fires each year that burn 204,358 acres per year.

The data presented here reflects State Forestry Division data. The State Forestry Division keeps records on a State-wide and not County-wide basis. Therefore, wildfire data is not presented by Preparedness Area. It is unclear which specific acreage is included in the Southwest Coordination Center or the National Data Climatic Center figures. Therefore, only the State Forestry Division data is presented in the Mitigation Plan.

Figure 49: 20-Year New Mexico Fire History[88]



[88] Source: ENMRD, NM State Forestry Division

Table 77: Historical Fire Data (1992 – 2012)[89]

20 Year Historical Fire Data (1992-2012)		
Date	**Number of Fires**	**Number of Acres**
1992	571	64,082
1993	1,193	200,184
1994	1,210	247,987
1995	642	47,051
1996	929	93,083
1997	600	132,228
1998	847	102,983
1999	475	54,849
2000	1,153	386,000
2001	568	41,014
2002	843	227,244
2003	594	21,546
2004	383	2,188
2005	586	36,166
2006	924	451,443
2007	614	104,634
2008	736	373,388
2009	727	338,783
2010	458	82,057
2011	1,021	756,249
2012	711	528,368
Total	**15,785**	**4,291,527**
Average	**752**	**204,358**

[89] Adapted from 20-year Statistical Data Chart from State Forestry Division

Figure 50: Total Fires and Acres Burned by County for 2014

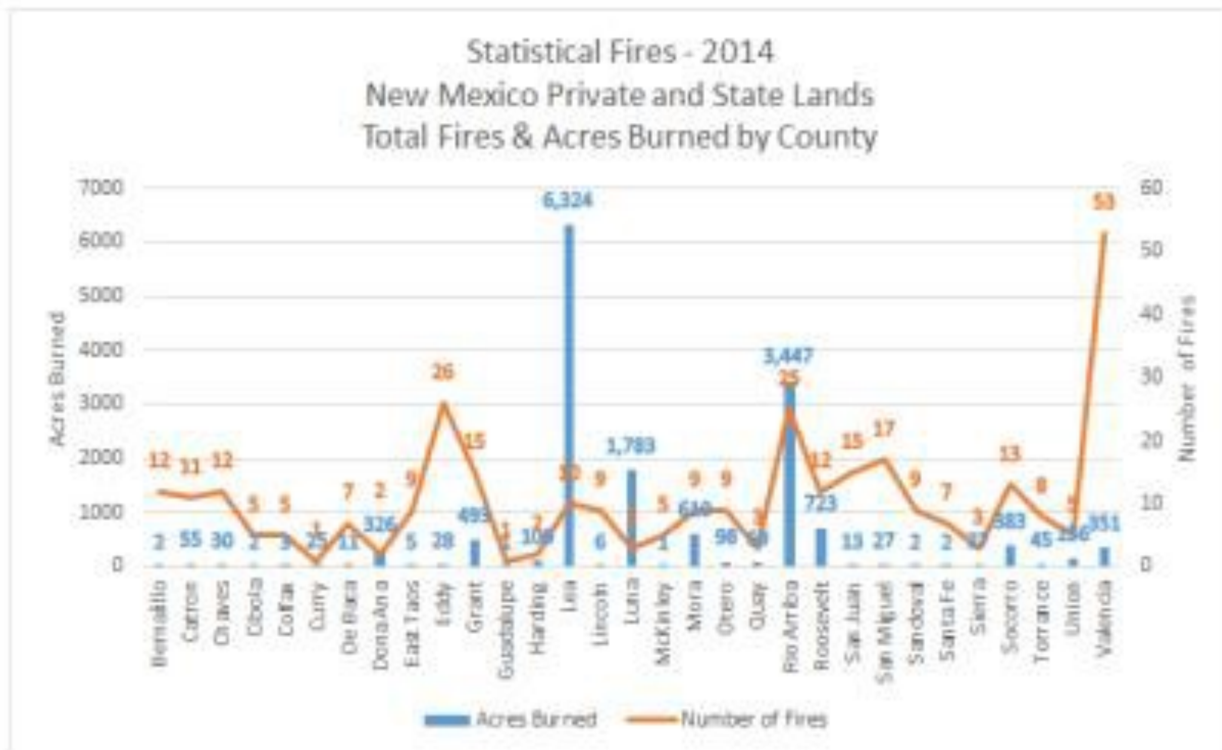
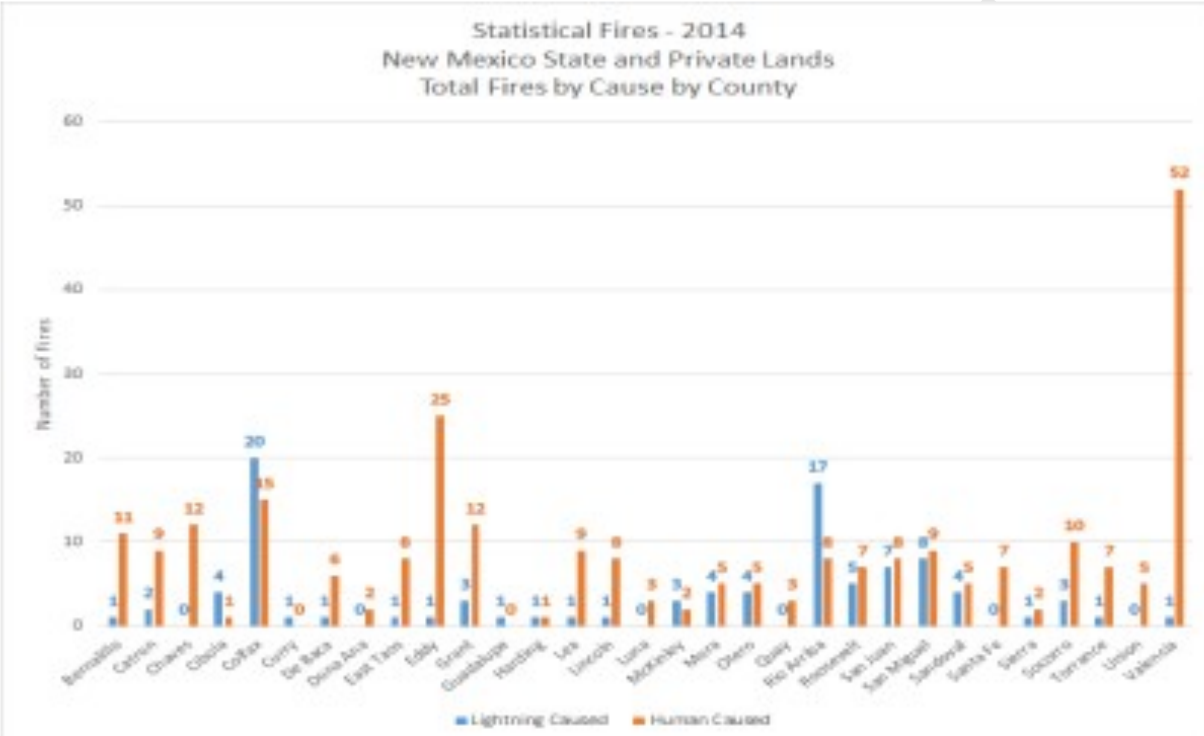


Figure 51: Total Fires and Acres Burned by County for 2014



Probability of Future Occurrence

The threat of wildland/urban interface fires continues to be the number one natural hazard facing the state. Each Preparedness Area has experienced the effects of wildfire. The annual probability of a large fire event is 100%. There are hundreds of communities that are embedded in the forest, are surrounded by the forest, or have their major routes of egress surrounded by forest. This greatly increases the amount of people and infrastructure that are exposed to wildfire risks. With drought conditions persisting and more people locating their residences in the forest, it seems inevitable that all Preparedness Areas will become more susceptible to fires occurring with increased consequences to the population, property, and natural resources.

Risk Assessment

The US Forest Service estimates that approximately 942 thousand acres are in the New Mexican Wildland Urban Interface.

In 2012, the New Mexico Forestry Division updated the Community at Risk Assessment Plan, which ranks communities and tribal areas by how vulnerable they are to wildland-urban interface fires.[90]

The vulnerability criteria used to rank the communities include:

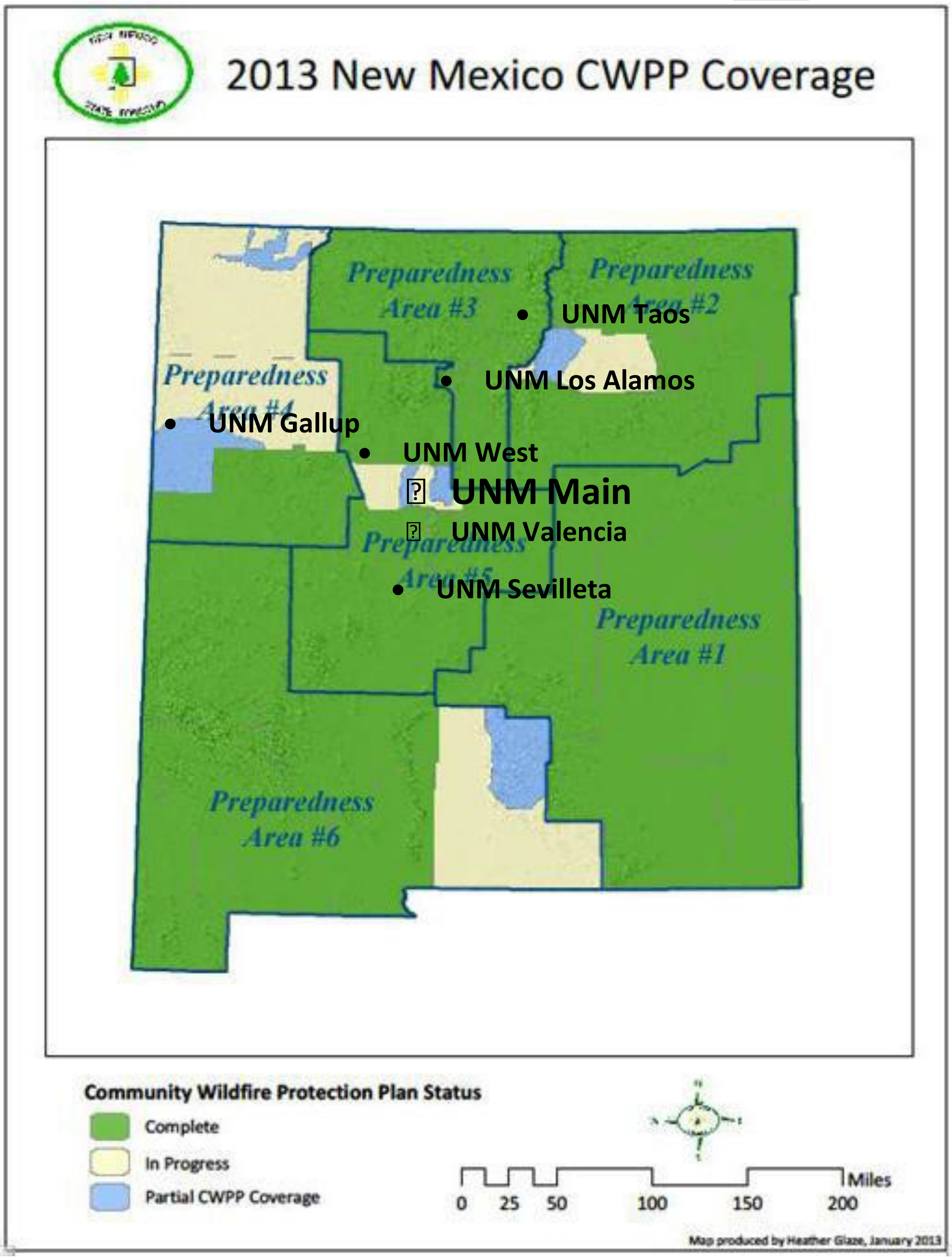
[90] The Plan can be found by visiting the following link: http://www.emnrd.state.nm.us/SFD/FireMgt/documents/2012_CAR_Planreduced.pdf

- Proximity of vegetation types to homes
- Availability of water
- Ease of evacuation
- Topography – ridge, valley, slope, and exposure
- Types of fuel (forest type)
- Number and size of previous fires
- Direction of prevailing and local winds in each community
- Ability of community/subdivision to protect homes

The number of Community Wildfire Protection Plans (CWPP) in New Mexico has increased since 2010. Currently, there are 58 CWPPs in the state. These 58 CWPPs identify 630 communities at risk from wildland fire. Of the 630 communities, 296 are listed as high risk, 224 are listed as moderate risk and 110 are listed as low risk from wildland fire.

The New Mexico Fire Planning Task Force requires that CWPPs be updated within 5 years of adoption. A letter was sent to all CWPP participants to advise them of the updated requirements. Figure 52 is a map showing the communities covered by a CWPP. A full listing of communities and their level of wildfire risk can be found in the Community at Risk Assessment Plan.

Figure 52: Community Wildfire Protection Plan Communities



The Statewide Natural Resource Assessment & Strategy and Response Plans document produced by New Mexico State Forestry in June 2010 includes an analysis of wildfire risk. The document explains several data gaps that would need to be addressed in order to improve the wildfire risk map. The document also includes a more detailed wildfire risk analysis for each of the six State Forestry Districts. Figure 53 displays the state wildfire risk model results by Preparedness Area.

Figure 53: Wildfire Risk Model Results[91]

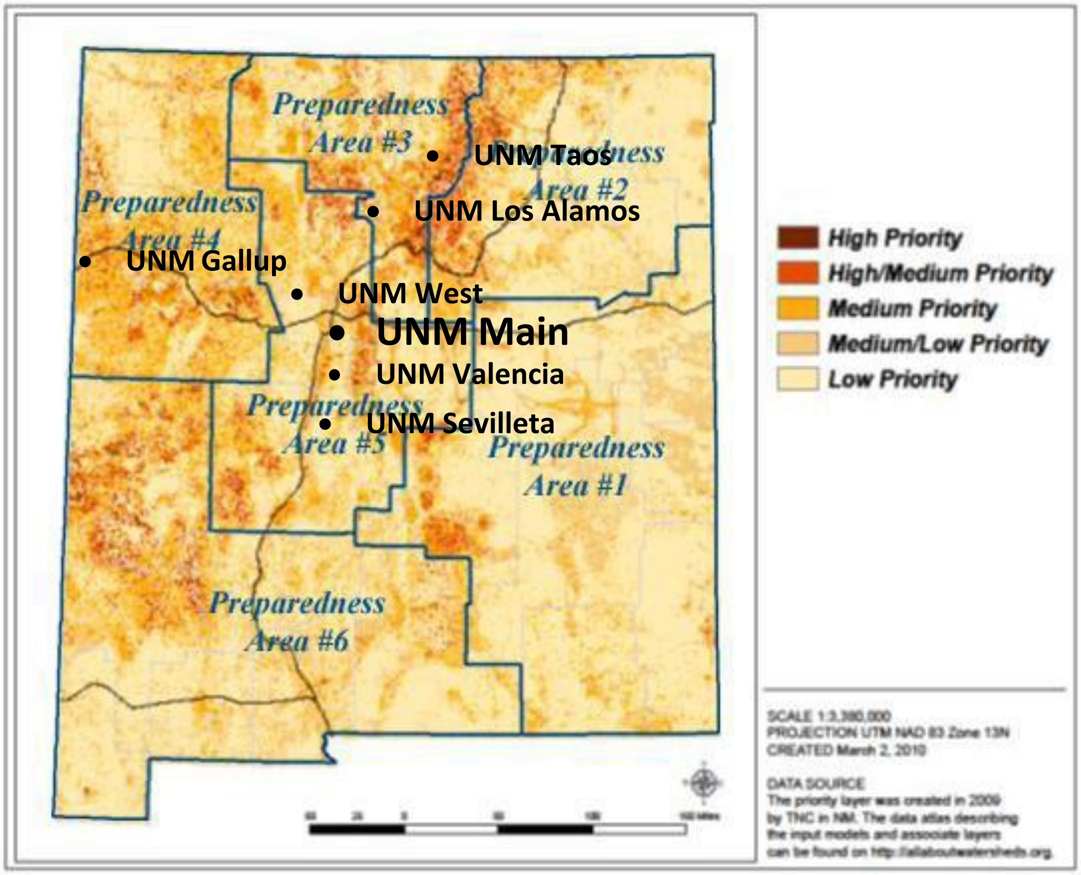


Table 78 identifies potential impacts from a wildland fire.

Table 78: Potential Impacts from Wildland Fire

Subject	Potential Impacts
Health and Safety of the PUBLIC	The public is at risk to injuries from heat and smoke.
Health and Safety of RESPONDERS	Responders are at risk from heat exposure, burns, dehydration, smoke inhalation, etc.
CONTINUITY OF OPERATIONS	Those operations that are in or near the wildfire are may be shut down or even destroyed by the fire.
DELIVERY of SERVICES	Service delays are anticipated to operations within or near the fire areas.

[91] The US Forest Service developed a national-scale 2013 wildfire potential map. It is available for download at: http://www.firelab.org/fmi/data-products/229-wildland-fire-potential-wfp

PROPERTY, FACILITIES, INFRASTRUCTURE	Fire can cause damage or destruction of property and infrastructure. Infrastructure near the fire areas may be barricaded or restricted to use by responders
ENVIRONMENT	Fires can cause large areas to be denuded and plant life and subsequently animal life. These bare areas are susceptible to later erosion issues that can contaminate or fill waterways with contaminants or sediment. High temperature fires can cause the soils to be damaged, and plant recovery may be delayed.
ECONOMIC CONDITION	A wildfire can cause damages to residences and business in a community that can have lasting effects.
PUBLIC CONFIDENCE	Not impacted by the event itself, but may be damaged if the response to an event is poor.

Data Limitations

It would be helpful to have historical information on the number of fires and acres burned organized by County and information on the cause of fire organized by County. If data were available for several years, trends by County and Preparedness Area could be generalized. It would also be helpful to have an analysis of burn scar areas and increased flood/debris flow maps. This type of analysis would enable wildfire and flood mitigation activities to target high risk areas.

Summary of Impact to UNM

Several areas in the state have been identified by the New Mexico Energy, Minerals, and Natural Resources Department Forestry Division as being highly vulnerable to wildland/urban interface fire. A significant number of people could be impacted by a wildfire, especially populations living or working in close proximity to forested areas, residents with asthma or other respiratory sensitivity, and very young and elderly residents. The vulnerability to wildfire is judged highest in the following counties: Bernalillo (UNM Main Campus), Los Alamos (Los Alamos Branch Campus), Sandoval (UNM West), and Taos (Taos Branch Campus).

UNM Main Campus lies within Bernalillo County. Bernalillo County is at risk for wildland/urban interface fire annually. However, UNM Main Campus is at a low risk for experiencing this hazard directly. Poor air quality causing respiratory issues could be a possibility. The UNM Main Campus community may also be affected by a nearby wildland/urban interface fire (evacuations, health issues, loss of property, etc.).

The UNM Gallup Branch Campus, located in McKinley County, vulnerability is due to the two areas of established wildland/urban interface located in the Cibola National Forest to the southeast of Gallup. Additionally, the City of Gallup has a small fuel load at its wildland/urban interface. Though the risk is limited, awareness to the potential hazard is important. The main risk in the event of a wildland/urban fire is the effects of smoke to campus population. Most at risk are those with respiratory problems.

The UNM Los Alamos Branch Campus and Taos Branch Campuses face wildland/urban interface fire threats frequently. The Los Alamos community has faced six major wildfires within LAC and the immediate vicinity.

1. Water Canyon Fire, 1953, 6,000 acres
2. La Mesa Fire, 1977, 15,444 acres
3. Dome Fire, 1996, 16,683 acres
4. Oso Complex Fire, 1998, 5,820 acres
5. Cerro Grande Fire, 2000, 47,658 acres
6. Los Conchas Fire, 2011, 150,000 acres

Based on the number of fires within the last 50 years, the risk of another fire occurring can be viewed as moderate. Though local officials highlight fire safety and awareness through many outlets to the general public, the possibility of a fire starting through natural occurrences (lightning strike) are real.

The risks to the Los Alamos Branch and Taos Campuses include respiratory issues from smoke to complete campus evacuation to loss of facilities should a fire become uncontrollable.

The Sevilleta LTER Field Station vulnerability to wildfires is considered moderate. This location recently experienced a wildfire that burned over 12,000 acres of the LTER site. The site is a research site and instituting fire wise projects is difficult without disrupting the scientific location. The biggest concern for this site is the ongoing research that is being conducted, some 10 years plus. The loss of this site and the experiments will have a huge impact on studies being conducted that are of irreplaceable value.

Conclusion

The hazard identification and risk assessment presented in this section was carried out using best available data and state-specific information. Based on guidance from FEMA's "How-to" document entitled Understanding Your Risks: Identifying Hazards and Estimating Losses (FEMA Publication 386-2), the assessment relies heavily on historical and anecdotal data, stakeholder input, and professional and experienced judgment regarding observed and/or anticipated hazard impacts. This hazard identification and risk assessment presents a reasonable range of hazards that have affected the state in the past. Additionally, it is likely that new hazards (or old hazards in new forms) will affect New Mexico in the future. To contribute the contextual relevance and accuracy of the plan the hazard identification and risk assessment carefully considers and incorporates the findings from other relevant plans, studies and technical reports.

Scenario Analysis

Earthquake

In April of 2015, the FEMA Region 6 Operational Planning Branch provided an earthquake scenario for the Greater Albuquerque, New Mexico area based on a Magnitude 7.0 event involving the Sandia-Rincon Fault. The data for the scenario is based on a US Geologic Survey ShakeMap, a Hazus-MH Earthquake Event analysis, and the Threat and Hazard Identification and Risk Assessment conducted in partnership with stakeholders in the region in support of the New Mexico Rio Grande Rift Catastrophic Earthquake Plan. The availability of this scenario allowed the PDMAC to evaluate the risk and potential impact of an earthquake for the all but two of the UNM campus locations and outposts (UNM Taos and Gallup campuses are not in an area expected to be impacted by a Sandia-Rincon fault event.) The full scenario, including the overview of the project, the analysis, and the damage estimates for the entire region is available upon request and is also on file with the New Mexico Department of Homeland Security and Emergency Management. The elements of the scenario that were considered by the PDMAC to be important for mitigation planning for the UNM campuses are below and include building and infrastructure damage and casualties, with details extracted from the overall scenario report provided by FEMA.

Damage assessment

The MH-Hazus analysis produced estimates that about 25% of the buildings in the region will be at least moderately damaged, including buildings that will be damaged beyond repair. (The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus technical manual.) Table 79 below summarizes the expected damage by general building type.

Table 79: Expected damage by general building type

Type	Level of Damage / % of total structures				
	None (%)	Slight (%)	Moderate (%)	Extensive (%)	Complete (%)
Wood	66.09	72.56	36.99	9.49	0.67
Steel	0.78	0.96	3.73	4.91	4.54
Concrete	0.79	1.06	2.92	4.16	4.00
Precast	0.69	0.76	2.45	4.45	5.45
RM	17.26	12.07	31.36	50.78	41.85
URM	1.58	2.68	3.81	4.71	9.23
MH	12.80	9.92	18.74	26.50	34.26

*Note: RM= Reinforced Masonry; URM= Unreinforced Masonry; MH = Manufactured Housing

Table 80 summarizes the expected damage to utility system facilities in the region impacted by the earthquake.

Table 80: Expected damage to utility system facilities (Albuquerque region)

System Component	Percent with at least moderate damage
Potable Water	0.0%
Wastewater	7.7%
Natural Gas	1.3%
Oil Systems	10.0%
Electrical Power	18.3%
Communication	35.7%

Casualties

Hazus-MH estimates the number of people that will be injured and killed by an earthquake. The casualties are broken down into four severity levels that describe the extent of the injuries as follows:

1. Severity Level 1: Injuries will require medical attention, but not hospitalization.
2. Severity Level 2: Injuries will require hospitalization but are not considered life-threatening.
3. Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
4. Severity Level 4: Victims are killed by the earthquake.

Across the entire region impacted by the 7.0 Sandia-Rincon Fault event, the analysis estimates 16,169 Level 1 injuries, 4,452 Level 2 injuries, 772 Level 3 injuries, and 1,377 deaths. The casualty estimates are further detailed for three times of day: 2:00 AM, 2:00 PM and 5:00 PM, and are distributed according to the type or use of the occupied building. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time. In general, UNM campuses would expect the highest number of casualties to occur within structures used for administration and research (commercial), educational buildings, and residential structures.

Chapter 5 - Updating the Mitigation Strategy

The mitigation strategy chapter is made of the following components: mitigation goals, mitigation actions, changes in mitigation priorities, and action plan for implementation.

Mitigation Goals

Mitigation goals are the guidelines that explain what UNM wants to achieve with the plan. The five mitigation goals are:

1. Save lives, reduce injuries, property damage and recovery
2. Reduce the cost and burden of disasters to UNM
3. Protect UNM's critical assets and facilities
4. Reduce exposure to liability and minimize community disruption
5. Improve preparedness, response, and recovery measures that support the concept of mitigation and may directly support identified mitigation actions.

Mitigation Actions Completed

Several successes have been achieved which will help UNM be more resilient tonatural disasters in the future. These achievements include:

1. Creation and implementation of evacuation videos for athletic venues – The UNM Athletics Department brought in a professional videographer who created two, 2-minute videos that explain the emergency procedures for University Stadium and The Pit. This video is shown prior to eachhome game.
2. StormReady status – Working with the NWS, the Office of Emergency Management showed compliance with the StormReady standards. In 2012, the NWS presented the University with the title StormReady University – the first one in New Mexico, and only the third community in the state. This certification was renewed in 2015 and 2018, and will be pursued again post-Covid.
3. Creation of the campussafety.unm.edu website – The Student Affairs Office, along with the Dean of Student's, Campus Police, University Communications and Marketing and the Office of Emergency Management developed a website to compile all of the University's safety and emergency preparedness information. Students, faculty, staff, parents, and visitors have easy access to the information from this single web source.
4. Creation of educational opportunities for students, faculty and staff
    a. Working with the Provost's Office and the Health, Exercise and Sports Sciences Department, the Office of Emergency Management created a 3-semester hour, for-credit course, offered both at the undergraduate and graduate levels titled "Emergency Management and Preparedness". This course provides a solid foundation of emergency preparedness, teaches skills that the students can use throughout their lifetime, and covers the Community Emergency Response Team (CERT) curricula.
    b. Working with the Academic Communities Program, the Center for Disaster Medicine created a Freshmen Learning Community course titled "Management of Disasters". This course was paired with "Human Geography" and helps show students how

communities, including UNM, work to mitigate the natural disasters they face based upon where they live.

5. Creation of Campus Community Emergency Response Team (CCERT) – The Office of Emergency Management created an emergency response team on campus. Comprised of students, faculty and staff, the CCERT could be used to assist with any incident on campus. They have participated in several exercises and planned events since their inception.
6. Creation of University Healthcare Emergency Response Team (UHERT) – The Emergency Managers for UNMH and UNM created a state-wide medical response team of volunteers primarily affiliated with UNMH and UNM. The goal of this team is to provide qualified medical personnel to the state in the event of an emergency. They were first deployed to the Bataan Memorial Death March/Marathon of 2015, where the 100 volunteers helped treat almost 2,000 patients in a 12-hour period.
7. Requests for state/federal funding of mitigation activities – the University is beginning to benefit from the FEMA-approved HMP which makes the institution eligible for mitigation funding. The two items for which funding has been sought include:
   a. Earthquake bars for specimen collections – This project was funded and implemented, and provides additional protection for valuable research and collections in the event of an earthquake.
   b. Lightning prediction system – Protecting students, faculty, staff and visitors from the effects of a severe storm is a high priority for the University. As such, UNM has requested mitigation funds to install a system to warn the public of a pending electrical storm.

Changes in Priorities

UNM's original 2010 Mitigation Strategy was a broad-based, action-oriented plan to identify and address the natural hazard vulnerabilities. The 2015 revision aimed to address planning barriers and implementation difficulties. The current plan goes back to those 2015 goals, as there has been a huge turnover of leadership across the University.

Implementation goals previously identified include:

1. Focus on problem-based action items;
2. Align the HMP with UNM's institutional strategic plan;
3. Better organize strategies across the UNM operational units to equalize;
4. Focus on UNM's broad-based educational mission; and,
5. Work with UNM branch campuses on better alignment within their local area (government infrastructure, community relations, institution educational mission, institution infrastructure, etc.)

Priorities for implementation and continuation include:

1. Streamline mitigation activities by grouping them to address problems identified, and then categorizing and prioritizing efforts;

2. Establish a subcommittee charged with integrating the HMP and strategies into the institutional strategic plan;
3. Increase chances of implementation and effectiveness of mitigation strategies by leveraging use of community capabilities;
4. Assign strategies to engaged partners based upon functional purpose and need rather than strictly upon organizational lines;
5. Address educational mission strategies based upon function rather than strictly by organization and location; and,
6. Encourage branch campuses to work within their local governments as readily as they do within the institutional structure on preparedness and mitigation efforts.

Prioritization of Mitigation Actions

A comprehensive approach of review and consensus building was utilized to sort and group strategies to create specific, measurable, achievable, realistic and timely (SMART) solutions.

The mitigation actions and strategies address, to the extent possible, the risk from the hazards described in Chapter 4. The actions and strategies are the specific measures to help meet the identified goals and include estimated timeframes for completion. Where a specific dollar estimate for completion of the action was not available, a range of costs was used:

- **High** – Over $500,000
- **Medium** - $100,000 to $499,000
- **Low** – $5,000 to $100,000
- **Minimal** – Less than $5,000

FEMA developed a comprehensive set of criteria and categories that allow communities to evaluate proposed actions in ways that reflect community values and sound principles for finding appropriate and cost-effective mitigation actions (Table 81).

Table 81: STAPLEE Criteria

Evaluation Criteria	Considerations
Social	Does the measure treat people fairly? (i.e., Are different social and demographic groups, different generations, different creeds treated equally?)
Technical	Will it work? (i.e., Does it actually solve the problem and is it feasible?)
Administrative	Does the County and/or its municipalities have the capacity to implement and manage the project?
Political	Does support exist from public and political stakeholders?
Legal	Does the County and/or its municipalities have the legal authority to implement and assume any reasonable liability?
Economic	Is it cost-effective? Is there a federal, state or non-profit source for funding? If federal, can the non-federal match be met locally or through another source? Does it contribute to the local economy?

Environmental	Does it comply with environmental regulations? Will it preserve, protect, or enhance existing natural resources?

Table 82: Prioritization Categories

Category	Timeframe	Comments
High	Begin within 1 year from Plan adoption	Top organizational priority and is generally a well-detailed project idea. Protects population, resource or property at high risk. Uses feasible methods, techniques or technology.
Medium	2-3 years from Plan adoption	A good idea that needs more information or is an action that addresses a moderate hazard.
Low	3-5 years from Plan adoption	An idea that needs a lot more information or will take a lot of preliminary action to build support.

Mitigation Actions

The University of New Mexico is a large and complex institution, with many human and structural vulnerabilities to hazards. Based on the hazard analysis and institutional factors, six problem areas have been identified, and mitigation actions have been grouped into focus areas to address the problems.

These actions are suggestions developed by the PDMAC that will be vetted by UNM leadership for implementation. Actions will be completed on a priority basis and in accordance with the Master Planning process of the institution, and as funds become available. There is no implied or actual commitment on the part of UNM to implement these suggested actions**.**

Objective #1: Because there is not a complete picture as to how vulnerable the UNM infrastructure may be to the hazards identified in the analysis, UNM will evaluate infrastructure needs and vulnerabilities while at the same time addressing the issues encountered.

Mitigation Actions

Electrical Power Protection	
Project Description/Comments:	Review the electrical power creation, distribution, capabilities and needs (generators, voice, and data). Install and maintain a surge protection system for critical electronic equipment and facilities to ensure operation during severe weather.
Hazard(s) Addressed:	Earthquake, High Wind, Thunderstorm, Tornado, and Severe Winter Storm
Mitigation Action Type:	Structural and Infrastructure Projects
Responsible Organization:	FM, IT Department
Estimated Costs:	Low
Possible Funding Sources:	UNM, FEMA
Timeline for Implementation:	Within one year of Plan adoption
Cost-Benefit Review	High benefit, low-cost strategy
STAPLEE Review	No concerns raised
Priority	**High**

ADA Compliant Emergency Communication System	
Project Description/Comments:	Review the emergency communication system to ensure that it is ADA compliant and accessible. Retrofit gaps in ADA compliancy to ensure that all are able to access the emergency communication system.
Hazard(s) Addressed:	Drought, Earthquakes, Extreme Heat, Flood, High Wind, Landslide, Thunderstorm, Tornado, Severe Winter Storms, and Wildland/Urban Interface Fire
Mitigation Action Types:	Structural and Infrastructure Projects
Responsible Organization:	OEM, Accessibility Resource Center, Communication and Marketing
Estimated Costs:	Low
Possible Funding Sources:	FEMA, UNM
Timeline for Implementation:	Within one year of Plan adoption
Cost-Benefit Review	High benefit, low-cost strategy
STAPLEE Review	No concerns raised
Priority	**High**

ADA Compliant Facilities	
Project Description/Comments:	Retrofit gaps in ADA compliancy for all buildings to ensure that all are able to access and evacuate to ADA standards.
Hazard(s) Addressed:	Drought, Earthquakes, Extreme Heat, Flood, High Wind, Landslide, Thunderstorm, Tornado, Severe Winter Storms, and Wildland/Urban Interface Fire
Mitigation Action Types:	Structural and Infrastructure Projects
Responsible Organization:	OEM, Accessibility Resource Center, Communication and Marketing
Estimated Costs:	Low-Medium
Possible Funding Sources:	FEMA, UNM
Timeline for Implementation:	Within one year of Plan adoption
Cost-Benefit Review	High benefit, low-medium cost strategy
STAPLEE Review	No concerns raised
Priority	**High**

Water Rationing Plan	
Project Description/Comments:	Assess impact of severe drought on institution and activities. Work with the local water authorities of each campus to enhance water distribution between UNM and local jurisdictions. Develop a plan to identify trigger points for potential mandatory water rationing, as well as an enforcement plan for such actions.
Hazard(s) Addressed:	Drought
Mitigation Action Type:	Local Plans and Regulations
Responsible Organization:	OEM, FM
Estimated Costs:	Low
Possible Funding Sources:	FEMA, UNM
Timeline for Implementation:	Within two to three years from Plan adoption
Cost-Benefit Review	High benefit, low-cost strategy
STAPLEE Review	No concerns raised
Priority	**Medium**

Objective #2: Hazard mitigation planning at UNM will be more closely aligned with the institutional strategic planning process, and therefore implemented more effectively.

Mitigation Actions

Incorporation of Mitigation Strategies	
Project Description/Comments:	Establish on-going reviews and updates of vulnerabilities, strategies, losses and changes in infrastructure. Form a subcommittee to enhance the COC's awareness of HMP projects. Incorporate mitigation strategies into UNM's Capital Projects Plan and future maintenance and construction projects.
Hazard(s) Addressed:	Drought, Earthquakes, Extreme Heat, Flood, High Wind, Landslide, Thunderstorm, Tornado, Severe Winter Storms, and Wildland/Urban Interface Fire
Mitigation Action Types:	Local Plans and Regulations, Structural and Infrastructure Projects
Responsible Organization:	FM, EHS, RS, OEM
Estimated Costs:	Low-High
Possible Funding Sources:	FEMA, UNM
Timeline for Implementation:	Within one year of Plan adoption
Cost-Benefit Review	High benefit, cost incorporated into maintenance and construction project budget. Long term investment for the institution. Pays for itself over time.
STAPLEE Review	No concerns raised
Priority	**High**

Continuity of Operations Plans and Disaster Recovery Plans	
Project Description/Comments:	Create Continuity of Operations Plans (COOP) and Disaster Recovery Plans (DR) for individual business units as well as University-wide.
Hazard(s) Addressed:	Drought, Earthquakes, Extreme Heat, Flood, High Wind, Landslide, Thunderstorm, Tornado, Severe Winter Storms, and Wildland/Urban Interface Fire
Mitigation Action Type:	Local Plans and Regulations
Responsible Organization:	OEM
Estimated Costs:	Low
Possible Funding Sources:	UNM
Timeline for Implementation:	Within one year of Plan adoption
Cost-Benefit Review	High benefit, low-cost strategy
STAPLEE Review	No concerns raised
Priority	**High**

Objective #3: Because compromise of the UNM infrastructure would have an adverse effect on personnel, the UNM business economy, and the UNM natural environment, construction improvements and technology additions will be implemented.

Mitigation Actions:

Fire Protection	
Project Description/Comments:	Reduce fuel loads and create perimeter fire protection with techniques such as trimming and clearing dead vegetation, selective logging, cutting high grass, and planting fire-resistant vegetation around University facilities vulnerable to wildfires.
Hazard(s) Addressed:	Wildland/Urban Interface Fire
Mitigation Action Type:	Natural Systems Protection
Responsible Organization:	FM
Estimated Costs:	Low-Medium
Possible Funding Sources:	FEMA, UNM
Timeline for Implementation:	Within two-three years from Plan adoption
Cost-Benefit Review:	High benefit, low-cost strategy
STAPLEE Review:	No concerns raised
Priority	**Medium**

Install Seismic Gas Shut-Off Valves	
Project Description/Comments:	Install seismic gas shut-off valves on University buildings with natural gas and propane connections that are determined “most vulnerable”.
Hazard(s) Addressed:	Earthquake
Mitigation Action Type:	Structural and Infrastructure Projects
Responsible Organization:	FM, EHS, RS
Estimated Costs:	Low-Medium
Possible Funding Sources:	FEMA, UNM
Timeline for Implementation:	Within two to three years from Plan adoption
Cost-Benefit Review	High Benefit, low-medium cost
STAPLEE Review	No concerns raised
Priority	**Medium**

Installation of Window Film	
Project Description/Comments:	Install window film in critical facilities to control the amount of heat that enters the building and to prevent injuries from shattered glass.
Hazard(s) Addressed:	Extreme Heat, High Wind, and Thunderstorm
Mitigation Action Type:	Structural and Infrastructure Projects
Responsible Organization:	FM, EHS, RS
Estimated Costs:	Low-Medium
Possible Funding Sources:	FEMA, UNM
Timeline for Implementation:	Within two to three years from Plan adoption
Cost-Benefit Review	Relatively low cost, high benefit strategy
STAPLEE Review	No concerns raised
Priority	**Medium**

Install Alarm System and Notification System	
Project Description/Comments:	Install a University-wide centralized, monitored, and secure alarm and disbursed notification system to protect critical building systems including HVAC, surveillance, and access in all critical health, research, utility and information technologies facilities from natural hazard occurrences.
Hazard(s) Addressed:	Earthquakes, Extreme Heat, Flood, High Wind, Thunderstorm, Tornado, and Severe Winter Storms
Mitigation Action Type:	Structural and Infrastructure Projects
Responsible Organization:	FM
Estimated Costs:	High
Possible Funding Sources:	FEMA, UNM
Timeline for Implementation:	Within three-five years from Plan adoption
Cost-Benefit Review	Benefits of protecting infrastructure will exceed high cost
STAPLEE Review	No concerns raised
Priority	**Low** (will take a lot of preliminary action to build support)

Underground Power, Data, and Communications	
Project Description/Comments:	Move all above ground power, data, and communication lines underground to provide uninterrupted power after severe weather.
Hazard(s) Addressed:	High Winds, Severe Winter Weather, Thunderstorm, and Tornado
Mitigation Action Type:	Structural and Infrastructure Projects
Responsible Organization:	IT, FM
Estimated Costs:	High
Possible Funding Sources:	FEMA, UNM
Timeline for Implementation:	Within three-five years from Plan adoption
Cost-Benefit Review	Benefits of protecting infrastructure will exceed high cost
STAPLEE Review	No concerns raised
Priority	**Low** (will take a lot of preliminary action to build support)

Automatic Fire Suppression System	
Project Description/Comments:	Install automatic fire suppression systems throughout the facilities at the Sevilleta LTER Field Station as wildfire mitigation measure.
Hazard(s) Addressed:	Wildland/Urban Interface Fire
Mitigation Action Type:	Structural and Infrastructure Projects, Natural Systems Protection
Responsible Organization:	FM
Estimated Costs:	Low
Possible Funding Sources:	FEMA, UNM, State appropriations, Legislative Funds
Timeline for Implementation:	Within three-five years from Plan adoption
Cost-Benefit Review	High benefit, low-cost strategy
STAPLEE Review	No concerns raised
Priority	**Low**

Objective #4: Remove barriers to effective communication regarding the hazards that could impact the campus and people, in order to serve the broad mission of the university to provide educational opportunities at all academic levels, and to serve a wide and diverse community.

Mitigation Actions:

Create Multi-Lingual, Mufti-Cultural, and Multi-Media Crisis Communication and Education Materials	
Project Description/Comments:	Create and disseminate multi-lingual, multi-cultural and multi-media crisis communication and education materials designed to reduce hazard risk in formats readily accessible and available to all members of the UNM community.
Hazard(s) Addressed:	Drought, Earthquakes, Extreme Heat, Flood, High Wind, Landslide, Thunderstorm, Tornado, Severe Winter Storms, and Wildland/Urban Interface Fire
Mitigation Action Type:	Public Education and Awareness
Responsible Organization:	UCAM, OEM, EHS, RS
Estimated Costs:	Low
Possible Funding Sources:	FEMA, UNM
Timeline for Implementation:	Within one year of Plan adoption
Cost-Benefit Review	High benefit, low-cost strategy
STAPLEE Review	No concerns raised
Priority	**High**

Public Awareness / Education Program	
Project Description/Comments:	Create a public awareness / education program, which identifies educational resources and training opportunities for all members of the UNM community.
Hazard(s) Addressed:	Drought, Earthquakes, Extreme Heat, Flood, High Wind, Landslide, Thunderstorm, Tornado, Severe Winter Storms, and Wildland/Urban Interface Fire
Mitigation Action Type:	Public Education and Awareness
Responsible Organization:	UCAM, HSC Communications
Estimated Costs:	Low
Possible Funding Sources:	FEMA, UNM
Timeline for Implementation:	Begin within one year of Plan adoption
Cost-Benefit Review	High benefit, low-cost strategy
STAPLEE Review	No concerns raised
Priority	**High**

Objective #5: Provide training and education so that UNM staff, faculty and students can significantly and effectively participate in mitigation of the wide range of hazards that could impact the university.

Mitigation Actions:

Campus Risk Reduction Website	
Project Description/Comments:	Create a website devoted to campus risk reduction.
Hazard(s) Addressed:	Drought, Earthquakes, Extreme Heat, Flood, High Wind, Landslide, Thunderstorm, Tornado, Severe Winter Storms, and Wildland/Urban Interface Fire
Mitigation Action Type:	Public Education and Awareness
Responsible Organization:	UCAM, EHS, RS, OEM
Estimated Costs:	Low
Possible Funding Sources:	FEMA, UNM
Timeline for Implementation:	Within one year of Plan adoption
Cost-Benefit Review	High benefit, low-cost strategy
STAPLEE Review	No concerns raised
Priority	**High**

StormReady Program	
Project Description/Comments:	Coordinate with the National Weather Service to develop a StormReady program for faculty, staff, students, and visitors to enable preparedness for the impacts of severe weather.
Hazard(s) Addressed:	Flood, High Wind, Severe Winter Storms, Thunderstorm, and Tornado
Mitigation Action Type:	Public Education and Awareness
Responsible Organization:	OEM, UCAM
Estimated Costs:	Minimal-Low
Possible Funding Sources:	FEMA, UNM
Timeline for Implementation:	Begin within one year of Plan adoption
Cost-Benefit Review	High benefit, low-cost strategy
STAPLEE Review	No concerns raised
Priority	**High**

Training	
Project Description/Comments:	Provide training for UNM employees and affiliates on emergency preparedness, mitigation strategies and any other plans developed through this process.
Hazard(s) Addressed:	Drought, Earthquakes, Extreme Heat, Flood, High Wind, Landslide, Thunderstorm, Tornado, Severe Winter Storms, and Wildland/Urban Interface Fire
Mitigation Action Type:	Public Education and Awareness
Responsible Organization:	EHS, RS, OEM, UCAM
Estimated Costs:	Low
Possible Funding Sources:	FEMA, UNM
Timeline for Implementation:	Within one year of Plan adoption
Cost-Benefit Review	Low cost, high benefit
STAPLEE Review	No concerns raised
Priority	**High**

While these mitigation actions represent the current priorities (high, medium, and low) of the mitigation planning process, further actions will be addressed as an on-going process. The PDMAC will continue to utilize the STAPLEE criteria, changing hazard conditions, and the institutions progress toward long-term goals to determine the priority and implementation schedule other mitigation actions.

Action Plan for Implementation

The grouping of strategies leads to a cycle of activity which should serve as a long-term model for implementation and success. The cycle begins with a study of existing infrastructure and vulnerabilities. From there, the planning process will establish the tactics to address opportunities that lead to long-term resilience. Next is the incorporation of these strategies into ongoing maintenance and construction projects through active involvement with the COC. The COC administers the process, identifies potential targets for the following year in conjunction with Deans and Leadership, facilitates communications with the Higher Education Department, and reviews the Comprehensive Capital Outlay List for completeness, cost, and phasing. Capital Outlay projects are submitted annually for NM Legislative funding after approval by the Dean (project specific), Provost, Executive Vice President of Health Sciences Center, Executive Vice President of Administration, President and the Board of Regents. This is the best opportunity to prevent future occurrences or limit their impact by incorporating mitigation actions into the UNM Master Plan and the 5 and 10-year Capital Outlay Plans. Finally, the process will be maintained for long-term success by establishing on-going reviews and updates of the vulnerabilities, strategies, and changes in infrastructure.

To institutionalize the mitigation planning process, the whole community must be engaged. This will be accomplished through the communication of risks, strategies and expected actions, and by soliciting feedback to improve the process. Training students, faculty, staff and visitors in risk reduction strategies and responsibilities is the next step to make the process permanent.

To overcome the organizational structure issues, planning and action will be at the function and capability level rather than managerial or administrative unit. Strategies will be assigned to those engaged partners and encourage partnerships. Planning will acknowledge the diverse educational mission which may have roots in many different units across the campuses. Branch campuses will be encouraged to work within their local governments as readily as they do within the institutional structure for their mutual preparedness and mitigation efforts.

Any mitigation actions involving improvements or additions to UNM's existing authorities, policies, and programs and resources will follow the process by which UNM has set forth through the University Administrative Policies and Procedures Manual. The UNM Policy Office develops new policies and revises existing policies through a collaborative process. Input is solicited from representatives of campus constituencies, including subject matter experts, Faculty Senate, Staff Council, Associated Students of UNM, Graduate and Professional Students Association, Deans' Council, Health Sciences Center Academic Affairs Office, Executive Vice President for Administration, Office of University Counsel, and Executive Cabinet. After the Executive Cabinet has an opportunity to review and comment on policy drafts, the entire campus community is given an opportunity to review and comment on the policy drafts during a 30-day review and comment period.

The UNM Office of Emergency Management has been charged with the implementation of this plan. All of the identified actions have been prioritized and assigned to specific individuals and functional positions within the institution. The committee has agreed to meet on an annual basis at a minimum to assure that implementation continues as scheduled, and that any issues that are identified are addressed appropriately. The committee will also meet if a loss is suffered as a result of natural disaster, or if the footprint or infrastructure of the institution changes so that the plan can be adjusted accordingly.

Communication

An effective communications plan is imperative for full implementation and institutionalization. Several strategies will be engaged in order to gain buy-in, solicit input, and provide updates to those working within the plan as well as members of the community at large. First, the website being used to inform the public of the plan update progress will be modified to announce the final version. Notification will also be given as a press release and released through the University Communications and Marketing department via the website news.unm.edu. The community will also be notified through updates provided through the University President, Provost, Executive Vice-President and Chancellor. Students, Faculty and Staff will also receive updates as part of the semesterly test of the Campus Warning Siren System. Finally, as the new training modules are built and implemented, all of the above methods will again be activated to share the information.

Chapter 6 - Plan Maintenance

The UNM HMP is a living document that will guide UNM's actions over the next five years. In this plan maintenance section, the method and schedule and evaluation processes are discussed.

Method and Schedule

The lead agency for coordinating and monitoring the plan will be the UNM Office of Emergency Management (OEM). OEM and PDMAC will work together to review and monitor the UNM HMP at a minimum of every six months to assure that no required actions fall behind schedule. Any changes to the HMP will be updated as plan maintenance is conducted. OEM will stay current with federal and state laws, statutes, and grant programs and will advise UNM of changes that affect them.

OEM, or designated member(s) of the PDMAC, will ensure that the HMP remains up to date and that UNM is ready for the next 5-year update. Specific tasks OEM is responsible for include:

1. Maintain a list of "in progress" and "completed" mitigation action items
2. Prepare reports, perform site visits, and maintain files for mitigation grants received
3. Document UNM's physical and functional changes and additions
4. Document changes in natural hazards
5. Maintain an up-to-date list of UNM's disaster history
6. Maintain an up-to-date list of UNM's critical assets and infrastructure
7. Advocate for progress in achieving mitigation goals
8. Submit annual reports to NMDHSEM and the PDMAC
9. Hold an annual meeting with the NMDHSEM Mitigation Officer (at a minimum)
10. Hold meetings with the PDMAC as necessary (at least once a year).
11. Attend Capital Outlay meetings
12. Keep the PDM website up to date
13. Document records of correspondence, phone calls, financial transactions, meetings, and other pertinent information regarding the HMP

Annual meetings will be planned with the PDMAC and NMDHSEM over the next three years. Ad hoc and meetings to address critical issues will be held in the interim as needed. At the annual PDMAC meeting, OEM will report the status of various mitigation projects being funded by the State/FEMA throughout UNM. These reports will include, but are not limited to, the following information:

1. Name of FEMA grant program
2. Applicant name
3. Title of project
4. Brief description of project
5. Location of project
6. Which goal and objective this project works toward
7. Amount of funding requested, allocated, and obligated
8. Amount of funding paid

9. Problems encountered
10. Benefits achieved
11. Projected completion date

In OEM's report, each on-going project will be linked to one or more of the action items identified in the mitigation strategies. Action items for which there are no projects will also be identified. This process will allow the PDMAC to focus on action items that either might be favored for future funding or be deleted from the list. These reports will be available through the UNM mitigation website for public review and comment.

In November of 2021, OEM will reconvene monthly meetings with the PDMAC to ramp up mitigation planning activities in preparation for the 2026 mitigation plan update.

Public Participation

Public participation in plan maintenance will be accomplished by utilizing the University Communication and Marketing Office (UCAM) and the mitigation website. UCAM provides news, social media, and media relations services. UCAM staff participate in in the PDMAC and have agreed to assist in delivering messages regarding the plan, risks, risk reduction strategies, expected actions, and more to the public through the plan maintenance stage. The mitigation website will continue to host all information pertaining to the plan, including the plan itself. The public will be invited to annual mitigation meetings over the next five years. These meetings will be announced on both the mitigation website and through UCAM outlets.

Evaluation Process

Progress will be evaluated to gauge effectiveness of the plan, mitigation goals, and actions items. OEM will convene an annual meeting with PDMAC to review the plan. PDMAC will assist OEM in reviewing andevaluating the mitigation goals and objectives with respect to continuing relevance and will consider priorities. The PDMAC may change the wording of goals and objectives and may write new ones.

OEM will perform interim inspections (if needed) and final inspections of mitigation projects funded by federal grants. These inspections will include whatever paperwork is required by the granting agency as well as photographs and other documentation from the grant recipient that may be useful in establishing the value and importance of the project. These reports will be incorporated into the annual update.

OEM will attempt to document these cases whenever there is anything specific to record. However, often when mitigation is successful, often nothing happens, and one must presume that something serious would have happened had not the project been done.

OEM will also collect and report examples of situations where mitigating actions would probably have prevented significant damage, as well as examples of failed mitigation projects, should any occur.

OEM will report any mitigation success stories at the annual meeting for inclusion in the yearly annex. Additionally, mitigation success stories will be posted on the UNM mitigation website for the public to review and provide comment as necessary.

Appendix A: Local Mitigation Planning Tool

LOCAL MITIGATION PLAN REVIEW TOOL

The *Local Mitigation Plan Review Tool* demonstrates how the Local Mitigation Plan meets the regulation in 44 CFR §201.6 and offers States and FEMA Mitigation Planners an opportunity to provide feedback to the community.

- The Regulation Checklist provides a summary of FEMA's evaluation of whether the Plan has addressed all requirements.
- The Plan Assessment identifies the plan's strengths as well as documents areas for future improvement.
- The Multi-jurisdiction Summary Sheet is an optional worksheet that can be used to document how each jurisdiction met the requirements of each Element of the Plan (Planning Process; Hazard Identification and Risk Assessment; Mitigation Strategy; Plan Review, Evaluation, and Implementation; and Plan Adoption).

The FEMA Mitigation Planner must reference this *Local Mitigation Plan Review Guide* when completing the *Local Mitigation Plan Review Tool*.

Jurisdiction: University of New Mexico	**Title of Plan:** University of New Mexico Hazard Mitigation Plan	**Date of Plan:** February 2021

Local Point of Contact: Laura Banks	**Address:** 1 University of New Mexico MSC 11 6025 Albuquerque, NM 87131
Title: Principal Investigator	
Agency: UNM Department of Emergency Medicine	
Phone Number: (505) 272-6240	Lbanks@salud.unm.edu

State Reviewer:	**Title:**	**Date:**

FEMA Reviewer:	**Title:**	**Date:**
Date Received in FEMA Region VI		
Plan Not Approved		
Plan Approvable Pending Adoption		
Plan Approved		

SECTION 1:
REGULATION CHECKLIST

INSTRUCTIONS: The Regulation Checklist must be completed by FEMA. The purpose of the Checklist is to identify the location of relevant or applicable content in the Plan by Element/sub-element and to determine if each requirement has been 'Met' or 'Not Met.' The 'Required Revisions' summary at the bottom of each Element must be completed by FEMA to provide a clear explanation of the revisions that are required for plan approval. Required revisions must be explained for each plan sub-element that is 'Not Met.' Sub-elements should be referenced in each summary by using the appropriate numbers (A1, B3, etc.), where applicable. Requirements for each Element and sub-element are described in detail in this *Plan Review Guide* in Section 4, Regulation Checklist.

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)	**Location in Plan** (section and/or page number)	**Met**	**Not Met**
ELEMENT A. PLANNING PROCESS			
A1. Does the Plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement §201.6(c)(1))	How: pgs. 20-27 Who: pgs. 22-23	X	
A2. Does the Plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development as well as other interests to be involved in the planning process? (Requirement §201.6(b)(2))	pgs. 22-24, App. B & C	X	
A3. Does the Plan document how the public was involved in the planning process during the drafting stage? (Requirement §201.6(b)(1))	pgs. 22-24 App. C	X	
A4. Does the Plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement §201.6(b)(3))	CH. 4 - Incorporated into each hazard pgs. 45-205 EarthquakeScenario - pg.203-205	X	
A5. Is there discussion of how the community(ies) will continue public participation in the plan maintenance process? (Requirement §201.6(c)(4)(iii))	Communication pg. 220 Public participation pg. 222	X	
A6. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a 5-year cycle)? (Requirement §201.6(c)(4)(i))	Method and Schedule - pgs. 221-222 Evaluation – pgs. 222 - 223	X	

ELEMENT A: REQUIRED REVISIONS

ELEMENT A: RECOMMENDED REVISIONS

ELEMENT B. HAZARD IDENTIFICATION AND RISK ASSESSMENT			
B1. Does the Plan include a description of the type, location, and extent of all-natural hazards that can affect each jurisdiction(s)? (Requirement §201.6(c)(2)(i))	Ch. 4 - incorporated into each hazard starts on pg. 45-205	X	
B2. Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for each jurisdiction? (Requirement §201.6(c)(2)(i))	Ch. 4 - incorporated into each hazard under Previous Occurrences and Probabilities Sections pgs.45-205	X	
B3. Is there a description of each identified hazard's impact on the community as well as an overall summary of the community's vulnerability for each jurisdiction? (Requirement §201.6(c)(2)(ii))	Ch. 4 - incorporated into each hazard under Impact to UNM Sections pgs. 45-205	X	
B4. Does the Plan address NFIP insured structures within the jurisdiction that have been repetitively damaged by floods? (Requirement §201.6(c)(2)(ii))	pgs. 95 - 99	X	

ELEMENT B: REQUIRED REVISIONS

ELEMENT B: RECOMMENDED REVISIONS

ELEMENT C. MITIGATION STRATEGY			
C1. Does the plan document each jurisdiction's existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs? (Requirement §201.6(c)(3))	Planning and Regulatory - pgs. 28- 38 Administrative and Technical - pgs. 39- 40 Financial - pgs.41-42 Educational and Outreach - pgs. 43-44 Ability to expand and improve - pg. 220 (2nd paragraph)	X	
C2. Does the Plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement §201.6(c)(3)(ii))	pgs. 44, 95 - 99	X	
C3. Does the Plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement §201.6(c)(3)(i))	Ch. 5 pg. 206	X	
C4. Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (Requirement §201.6(c)(3)(ii))	Ch. 5 pgs. 210 - 219	X	
C5. Does the Plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered by each jurisdiction? (Requirement §201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii))	Ch. 5 Prioritization pgs. 208-209 Action Plan for Implementation pgs.219-220	X	
C6. Does the Plan describe a process by which local governments will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement §201.6(c)(4)(ii))	Ch. 5 Action Plan pgs. 219-220 Ch. 4 pgs. 210, 213	X	

<u>ELEMENT C: REQUIRED REVISIONS</u>

<u>ELEMENT C: RECOMMENDED REVISIONS</u>

ELEMENT D. PLAN REVIEW, EVALUATION, AND IMPLEMENTATION (applicable to plan updates only)			
D1. Was the plan revised to reflect changes in development? (Requirement §201.6(d)(3))	pgs. 26 - 27, 57 - 58	X	
D2. Was the plan revised to reflect progress in local mitigation efforts? (Requirement §201.6(d)(3))	Ch. 5 pgs. 206 - 207	X	
D3. Was the plan revised to reflect changes in priorities? (Requirement §201.6(d)(3))	Ch. 5 pgs. 207 - 208	X	
ELEMENT D: REQUIRED REVISIONS			
ELEMENT E. PLAN ADOPTION			
E1. Does the Plan include documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval? (Requirement §201.6(c)(5))			X
E2. For multi-jurisdictional plans, has each jurisdiction requesting approval of the plan documented formal plan adoption? (Requirement §201.6(c)(5))			X
ELEMENT E: REQUIRED REVISIONS			
ELEMENT F. ADDITIONAL STATE REQUIREMENTS (OPTIONAL FOR STATE REVIEWERS ONLY. NOT TO BE COMPLETED BY FEMA)			
F1.			
F2.			
ELEMENT F: REQUIRED REVISIONS			

February 2021

Appendix B: Committee Attachments

FEMA Pre-Disaster Mitigation Plan Update
Meeting Agenda

Date: Wednesday, March 10, 2021
Time: 3:00 pm - 4:00 pm
Location: Zoom: https://hsc-unm.zoom.us/j/9167542036

https://hsc.unm.edu/medicine/departments/emergency-medicine/programs/prehospital-care/cdm/pre-disaster-mitigation/

I. Welcome and introductions
II. Website (above) – List of Advisory Committee Members
III. Overview of the current UNM Pre-Disaster Mitigation Plan and planning process
IV. Overview of the requirements for the 5-year plan update
V. Discussion of planning team roles
VI. Discussion of immediate tasks for planning team
  a. Review 2015 plan
  b. Identify changes to your department and University infrastructure
  c. Document any natural hazards experienced and resulting losses since 2015
  d. Finalize team membership and meeting schedule
  e. Review and evaluate the necessity and effectiveness of 2015 priorities
VII. Discussion of near-term tasks for planning team
  a. Re-establish public outreach and participation
  b. Review progress toward mitigation priorities from current plan
  c. Update the hazard analysis
  d. Update the University profile, vulnerabilities, and list of critical infrastructure
  e. Create new or carry forward priorities for next 5-year period
VIII. Discussion of future tasks for planning team
  a. Grant applications
  b. Mitigation strategy implementation
  c. Documentation of losses
  d. Revision of plan as needed
IX. Other discussion
X. Future meetings

FEMA Pre-Disaster Mitigation Plan Update
Meeting Minutes

Date: Wednesday, March 10, 2021
Time: 3:00 pm - 4:00 pm
Location: via Zoom

In attendance:

Abra Altman
Ben Begaye
Brian Pietrewicz
Byron Piatt
Cinnamon Blair
Deborah Kuidis
Dennis-Ray Armijo
Florencio Olguin
Greg Trejo
James Madrid
James Shaw
Joanne Kuestner
Laura Banks
Mark Reynolds
Megan Chibanga
Michael Archuleta
Michael McCord
Michael Tuttle
Miranda Harrison-Marmaras
Pamala Garcia-Ramirez
Shawn Penman
Shirley Baros
Thomas Walmsley
Zachary Peterson

Items discussed

1. Please let Byron or Laura know if you do not want your name listed on the UNM website for the project.
2. In past years, UNM has used contractors or employees funded by FEMA planning grants to develop and update the PDM plans. This cycle of PDM plan update activities will not be funded by FEMA due to the timing of the available funding and the due date for the update. Laura and Byron will contribution most of the effort with help from the committee.
3. The purpose of the PDM plan is to identify natural disaster and hazard risks for all UNM campuses as well as mitigation strategies for those risks. The planning process allows us to think into the future to better protect our infrastructure.
4. We will use the same type of hazard and vulnerability analysis as in previous plans, which includes an assessment of the likelihood and severity of each category of natural disaster.
5. In past years, infection disease outbreaks and pandemics have not been considered to be within the scope of the FEMA PDM program, and we assume the same is true now. That doesn’t mean that UNM should not continue to plan for these events and use lessons learned to help with future responses.
6. A fully updated and approved PDM plan makes UNM eligible for FEMA reimbursement funding for damages due to natural disasters – we are ineligible without one.
7. UNM’s Earth Data Analysis Center also has an active funded relationship with FEMA, serving as a Cooperating Technical Partner Coordinator for FEMA Region 6.

8. A fully updated and approved PDM plan also makes us eligible to submit proposal to FEMA for mitigation projects on our campuses. An example of a previously funded project is the earthquake mitigation retrofits of the collection racks at the Museum of Southwest Biology. Several other proposals have been submitted but not funded (lightening detection system, hospital generators).
9. The mitigation strategies in the current 2015 PDM plan are still valid, but changes to the UNM infrastructure and activities requires that the plan be updated and reconciled.
10. Although various UNM annual audit and progress reports will continue to be a useful tool for identifying new facilities and to identify losses, it will be necessary for committee members to review the current plan and assist with updating the content in their area of responsibility.
11. Committee members are asked to identify changes or additions to infrastructure, changes to departmental administrative structure that should be reflected in the plan (new divisions or reorganization), changes or additions to equipment and collections, and any large losses due to natural hazards that have occurred in the past 5 years.
12. Committee members are also asked to review and evaluate the current catalog of mitigation priorities in the plan for completion or continued necessity and effectiveness.
13. Representatives from the emergency management offices of Bernalillo County and the City of Albuquerque have been included in the committee to provide insight into similar risks and hazards addressed in their plans.
14. Many UNM structures and their contents are considered to be rare, unique, historic and even irreplaceable. Although UNM has sufficient insurance coverage for damages caused by natural disasters, the process of pre-disaster mitigation planning is still needed to lessen or prevent disruptive and tragic damages to our campus treasures whenever and wherever possible.
15. The project will use a website that will house meeting agendas and minutes, the list of committee members, and the current and past plans: https://hsc.unm.edu/medicine/departments/emergency-medicine/programs/prehospital-care/cdm/pre-disaster-mitigation/
16. The planning process will seek input from campus personnel and UNM/HSC neighborhood members, via email solicitations for comments.
17. The project will use Office 365/One-Drive to house documents.
18. Committee members are welcome to provide their input into the plan update in the most effective way – either through document track-change edits, outlines for suggested new or significantly modified sections, or verbally via individual meetings with Byron or Laura.
19. Future meetings will be scheduled at times that are offset from prior meetings to allow attendance for members with standing meeting conflicts, and invitations will be send via email.

Contact information:

Byron Piatt	UNM Emergency Manager	277-0330	BPiatt@salud.unm.edu
Dr. Laura Banks	Principal Investigator	272-6279	LBanks@salud.unm.edu

FEMA Pre-Disaster Mitigation Plan UpdateMeeting Agenda

Date: Friday, March 26, 2021
Time: 1:00 pm - 2:00 pm
Location: Zoom: https://hsc-unm.zoom.us/j/9167542036
https://mitigationplan.unm.edu

I. Welcome

II. Website (above) – List of Advisory Committee Members

III. Recap of last meeting

  a. Hazard Mitigation Plan, update requirements, planning team and roles

  b. Immediate tasks

    i. Review 2015 plan

    ii. Identify changes to your department and University infrastructure

    iii. Document any natural hazards experienced and resulting losses since 2015

    iv. Update the hazard analysis (WebMail, OneDrive, Files Shared with Me)

    v. Review and evaluate the necessity and effectiveness of 2015 priorities

  c. Near-term tasks

    i. Re-establish public outreach and participation

    ii. Review progress toward mitigation priorities from current plan

    iii. Update the University profile, vulnerabilities, and list of critical infrastructure

    iv. Create new or carry forward priorities for next 5-year period

  d. Discussion of future tasks for planning team

    i. Grant applications

    ii. Mitigation strategy implementation

    iii. Documentation of losses

    iv. Revision of plan as needed

IV. Homework – Due Not Later Than April 7 – ITEMS III.b.

V. Other discussion

VI. Future meetings (Every other Friday through May, 1 pm to 2 pm

Contact information:

Byron Piatt	UNM Emergency Manager	277-0330	BPiatt@salud.unm.edu
Dr. Laura Banks	Principal Investigator	272-6279	LBanks@salud.unm.edu

FEMA Hazard Mitigation Plan UpdateMeeting Agenda

Date: Friday, March 26, 2021
Time: 1:00 pm - 2:00 pm
Location: Zoom: https://hsc-unm.zoom.us/j/9167542036
https://mitigationplan.unm.edu

In attendance:

Al Sena	Kathy Agnew	Pamala Garcia-Ramirez
Amanda Butrum	Laura Banks	Ruth Stoddard
Byron Piatt	Matt McKernan	Shawn Penman
Cinnamon Blair	Michael McCord	Tim Gutierrez
Florencio Olguin	Miranda Harrison-Marmaras	Zachary Peterson
James Madrid	Nick Zubel	Abdulmohsen Alquarni
Jeff Gassaway		

Items discussed or presented:

1. The website for the project (mitigationplan.unm.edu) will include the names of the AdvisoryCommittee Members and house the previous plans and final draft of the 2021 update. The website and other methods of outreach (emails, posting) will be used to engage internal stakeholders (UNM personnel) and external stakeholders (neighborhood associations, individuals, businesses).
2. The Advisory Committee will use OneDrive to share draft documents. Byron sent a link andadded the committee members to the folder. Committee members who cannot see the folderin their "Files Shared with Me" link in OneDrive, please let Byron know.
3. FEMA is now using the term "Hazard Mitigation Plan" rather than "Pre-Disaster MitigationPlan" so this update process will follow suit.
4. The committee members should focus on the immediate tasks for the plan update process, tobe completed by April 7th:
   - Review the 2015 plan to:
     - Identify administrative and management changes to your department such as changes in division or unit names, division or unit splits, or new divisions or units. Propose modification to the plan to address the new structure of yourarea of responsibility.
     - Identify changes in University infrastructure that could be impacted by naturaldisasters, or changes in policies that are relevant to hazard mitigation

- Review and evaluate the necessity and effectiveness of 2015 priorities in thecurrent plan

- Document any natural hazards experienced and resulting losses since 2015

5. The next step for the update process will include:
   - Re-establishing public outreach and participation
   - Review progress toward mitigation priorities from current plan
   - Update the University profile, vulnerabilities, and list of critical infrastructure
   - Create new or carry forward priorities for next 5-year period
6. The mitigation plan draft and meeting recordings for the City of Albuquerque/BernalilloCounty can be found here: https://www.cabq.gov/office-of-emergency-management/resources/hazard-mitigation-plan Work is on-going to further align the metro area plan with the State's mitigation planning efforts: https://www.nmdhsem.org/preparedness-bureau/mitigation/
7. Future tasks for planning team will include submitting grant applications for mitigation projects, implementing the mitigation strategies in the plan, assisting with the documentationof losses, and revision of plan as needed
8. Future meetings of the committee will be for the purpose of providing feedback, discussionand technical assistance on components of the plan being updated by the members, to supplement document upload and review via OneDrive. Meetings will occur every other Friday through May, 1 pm to 2 pm, via Zoom. A calendar invitation will be sent.

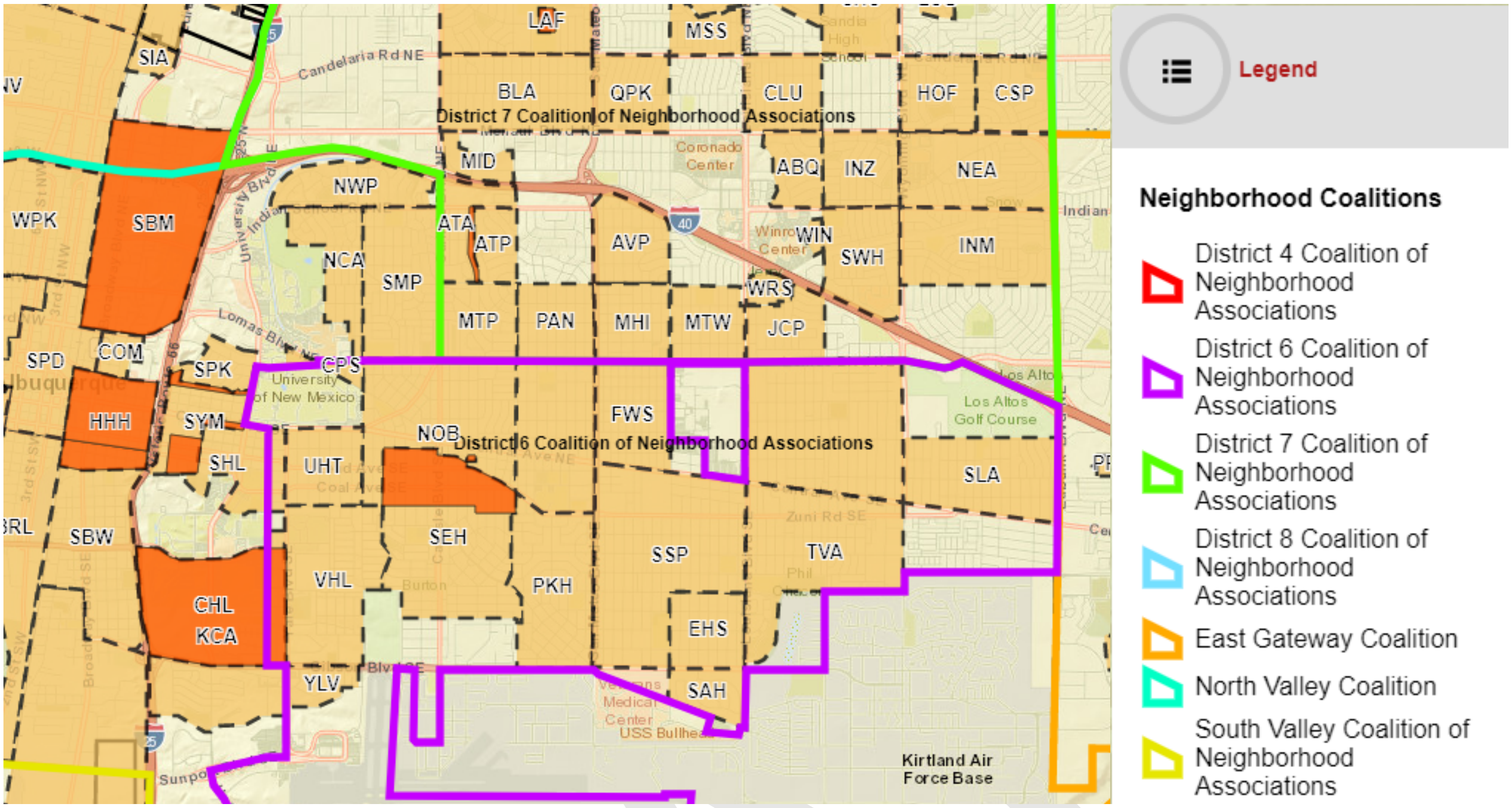
Contact information:

Byron Piatt	UNM Emergency Manager	277-0330	BPiatt@salud.unm.edu
Dr. Laura Banks	Principal Investigator	272-6279	LBanks@salud.unm.edu

University of New Mexico-area
Neighborhood Associations

Association Name	First Name	Last Name	Email
Campus NA	Calvin	Martin	calmartin93@gmail.com
Campus NA	Sara	Osborne	saralosborne@gmail.com
Clayton Heights Lomas del Cielo NA	Eloisa	Molina-Dodge	e_molinadodge@yahoo.com
Clayton Heights Lomas del Cielo NA	Isabel	Cabrera	isabel_f_cabrera_617@msn.com
Kirtland Community Association	Elizabeth	Aikin	bakieaikin@comcast.net
Kirtland Community Association	Kimberly	Brown	kande0@yahoo.com
Netherwood Park NA	Sara	Mills	saramills@comcast.net
Netherwood Park NA	William	Gannon	wgannon@unm.edu
Nob Hill NA	Gary	Eyster	meyster1@me.com
Nob Hill NA	David	Garcia	david@halflifedigital.com
North Campus NA	Tim	Davis	tdavisnm@gmail.com
North Campus NA	Sara	Koplik	sarakoplik@hotmail.com
Silver Hill NA	James	Montalbano	ja.montalbano@gmail.com
Silver Hill NA	Don	McIver	dbodinem@gmail.com
Spruce Park NA	Allen	Parkman	parkman@unm.edu
Spruce Park NA	James	Tolbert	jamestolbert81@gmail.com
Sycamore NA	Richard	Vigliano	richard@vigliano.net
Sycamore NA	Mardon	Gardella	mg411@q.com
University Heights NA	Julie	Kidder	juliemkidder@gmail.com
University Heights NA	Don	Hancock	sricdon@earthlink.net

Neighborhood Associations



Accessed at: https://cabq.maps.arcgis.com/apps/Viewer/index.html?appid=99ec3a3e32494f2cac74fd6c321e7c0b, May 25, 2021

THE UNIVERSITY OF NEW MEXICO

March 2, 2021

Dear Neighborhood Association Leader,

The University of New Mexico emergency planning group is in the process of updating the Hazard Mitigation Plan for the campus. The purpose of this plan is to address potential damages from natural hazards and includes actions to be taken to reduce or eliminate the long-term risk to human life and property. The current UNM Hazard Mitigation Plan was finalized and approved by FEMA and the New Mexico Department of Homeland Security and Emergency Management in 2015. The plan expires in 2021 and must be updated in order to address changes that have occurred on the campus (i.e. new buildings and activities) and to maintain the university's eligibility to receive disaster funds.

Mitigation is most effective when it is based on a comprehensive, long-term plan that is developed before a disaster occurs. Mitigation policies and actions are identified based on an assessment of hazards, vulnerabilities, and risks and the participation of a wide range of stakeholders and the public in the planning process. Hazard mitigation planning is intended to identify actions that can be taken before a disaster strikes, and is not the same as the UNM Emergency Operations Plan which addresses how the university would respond in real time to an actual disaster.

As the leader of a neighborhood association that is adjacent to the campus, we invite you and your association's input into the update of the Hazard Mitigation Plan. We have created a website that provides additional information regarding mitigation planning in general and the process that is on-going at UNM. The website also provides a copy of the current and past plans. Please view the website here, and contact me with any questions or comments about the plan or planning activities. Your participation in this process can include simply becoming aware of the update activities by reviewing the posted material, or you can take further action by submitting questions or comments or meeting with members of the committee. We would also be happy to provide an informational presentation to your neighborhood association.

Thank you for your service to our community!

Regards,
Dr. Laura Banks
Chair, UNM Hazard Mitigation Planning Committee
Associate Professor
University of New Mexico
LBanks@salud.unm.edu
505-272-6279

March 5, 2021

To: UNM Staff and Faculty

The University of New Mexico emergency planning group is in the process of updating the Pre-Disaster Mitigation Plan for the campus. The purpose of this plan is to address potential damages from natural hazards and includes actions to be taken to reduce or eliminate the long-term risk to human life and property. The current UNM Pre-Disaster Mitigation Plan was finalized and approved by FEMA and the New Mexico Department of Homeland Security and Emergency Management in 2010. The plan expires at the end of 2015 and must be updated in order to address changes that have occurred on the campus (i.e. new buildings and activities) and to maintain the university's eligibility to receive disaster funds.

Mitigation is most effective when it is based on a comprehensive, long-term plan that is developed before a disaster occurs. Mitigation policies and actions are identified based on an assessment of hazards, vulnerabilities, and risks and the participation of a wide range of stakeholders and the public in the planning process. The Pre- Disaster Mitigation Plan is intended to identify actions that can be taken before a disaster strikes, and is not the same as the UNM Emergency Operations Plan which addresses how the university would respond to an actual disaster.

As a staff or faculty member of UNM , we invite your input into the update of the Pre-Disaster Mitigation Plan. We have created a website that provides additional information regarding mitigation planning in general and the process that is on-going at UNM (http://mitigationplan.unm.edu). The website also provides a copy of the current Pre-Disaster Mitigation Plan. Please review the website and the current plan, and feel free to contact me with any questions. Your participation in this process can include simply becoming aware of the update activities by reviewing the posted material, attending meetings of the planning committee, sending questions or comments via email or U.S. Mail, or meeting with a member of the planning committee individually. We would also be happy to provide an informational presentation to any interested campus group.

Warmest regards,

Dr. Laura Banks Assistant Professor
University of New Mexico
LBanks@salud.unm.edu
505-272-6279