


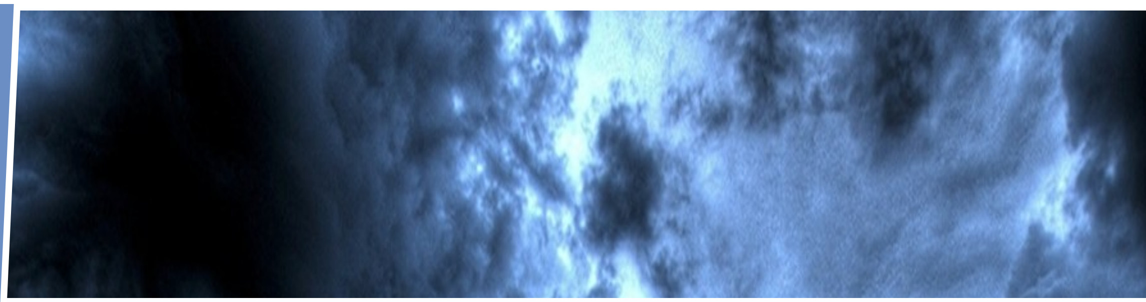

2024
Hazard Mitigation Plan

THE UNIVERSITY OF
NEW MEXICO

Plan Adoption

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 June 2024 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 its commitment to 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 June 2024 shall be effective immediately upon its signing. This adoption supersedes and rescinds the previous Pre-Disaster Mitigation Plan dated November 2015 (approved June 9, 2016) and shall remain in full force and effect until amended or rescinded by further promulgation.

Signatures:

____ ____________

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

____ ____________

Teresa Costantinidis, MBA — DATE
Executive Vice President for Finance & Administration

____ ____________

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

____ ____________

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

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Section 1: Introduction

Purpose

Hazard mitigation is defined by FEMA as "any sustained action taken to reduce or eliminate long-term risk to human life and property from a hazard event." Each year in the U.S., disasters take the lives of hundreds of people and injure thousands more. Nationwide, taxpayers pay billions of dollars annually to help communities, organizations, businesses, and individuals recover from disasters. Additional expenses to insurance companies and non-governmental organizations are not reimbursed by tax dollars, making the costs of disasters several times higher than calculated amounts.

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.

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.

Glossary of Terms

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)
FDC	Facilities, Design and Construction
FEMA	Federal Emergency Management Agency
FMAG	Fire Management Assistance Grants
HMAC	Hazard Mitigation Advisory Committee (formally PDMAC)
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

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

The Emergency Management Cycle & Mitigation

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 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.

Section 2: Planning Process

Plan Introduction

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 who 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

Plan Development

UNM's plan update process began in December 2019, lasting approximately 18 months. A draft was submitted to the New Mexico Department of Homeland Security and Emergency Management in June 2021 and feedback was provided. The mitigation planning process resumed in October 2023, lasting approximately 10 months. Plan development included seven major areas that 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 May 2023 Local Mitigation Planning Handbook, the most up-to-date FEMA guidance available. Additional planning documents referenced include:

- State of New Mexico Natural Hazard Mitigation Plan (2023-2028)
- Albuquerque/Bernalillo County Hazard Mitigation Plan (March 2021)
- Los Alamos County Local Hazard Mitigation Plan 2023 (draft)
- McKinley County Hazard Mitigation Plan (2021)
- Sandoval County Natural Hazard Mitigation Plan (2019)
- Taos County Hazard Mitigation Plan (2018)

- Valencia County Hazard Mitigation Plan (2022)

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. The UNM Administrative Team hired Oregon-based Vanderjagt Consulting, LLC in October of 2023 to facilitate the completion of the plan update.

During the update process, the Administrative Team:

1. Collected data for the plan update
2. Developed outreach strategy
3. Launched and maintained the public hazard mitigation website
4. Met with the State Mitigation Officer
5. Organized HMAC meetings
6. Reviewed the 2015 HMP and 2021 HMP draft documents
7. Reviewed the most up to date hazard information
8. Reviewed the Mitigation Workbook and Checklist
9. Updated the 2024 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.

Stakeholder Participation

UNM Hazard Mitigation Advisory Committee

In the fall of 2019, the UNM Administrative Team reconvened the UNM Hazard Mitigation Advisory Committee (HMAC), formally known as the Pre-Disaster Mitigation Advisory Committee (PDMAC). HMAC consists of key stakeholders from multiple departments across UNM and the surrounding jurisdiction, as well as each of the branch campus locations, voluntarily advising the UNM Administrative Team in the update of the HMP. These individuals are uniquely qualified to assist, and have institutional knowledge, along with specific program experience. The 2024 HMAC includes several individuals who participated in the 2015 plan update as well as many new members. Individuals were invited to participate in the HMAC through email and telephone correspondence and meetings were largely held "virtually" due to COVID-19.

UNM HMAC Meetings

Regular meetings of the HMAC were held bi-weekly on Fridays from March 2021 through June 2021 and bi-monthly December 2023 – May 2024. These meetings were conducted via Zoom as COVID-19 restrictions remained in place. Meetings were scheduled in advance and posted on the PDM website. Meetings were open to the public. Additional "Technical Support" meetings were also conducted to assist with the online nature of data retrieval and information sharing.

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

Table 1: UNM Hazard Mitigation Advisory Committee

Name	Organization/Department	Title
Abigail Montoya	UNM Gallup Branch	Facilities Coordinator
Adiel Sanchez	UNM Information Technologies	Associate Director Enterprise Voice, Wireless & Alarm Services
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
Amy Coburn	Planning, Design & Construction	University Architect & Director of Planning, Design & Construction
Ashley M. Vanderjagt	Vanderjagt Consulting	Contractor
Ben Begaye	UNM Student Union Building Facilities	Facilities Services Manager
Bob Harmon	UNM Los Alamos	Director of Business Operations
Brian Pietrewicz	UNM Information Technologies	Deputy CIO
Bridgette Noonen	UNM Office of the President	Deputy Chief of Staff, President's Office
Bryan Killinger	UNM Valencia Campus	Police Lieutenant
Byron Piatt	Crisis Management and Planning Department	Director
Cinnamon Blair	UNM Communication and Marketing	Director, University Communication
Coco Rae	UNM Los Alamos	Student Services Manager - Student Services
Damian Wasson	UNM University Libraries	Facilities Coordinator
Dave Mansfield	UNM Taos	Librarian
Deborah Kuidis	UNM Office of Research Compliance	Manager, Industrial Security
Dee Goines	UNM Residence Life Student Housing	Assistant Director of Facilities and Maintenance
Dennis-Ray Armijo	UNM Student Union Building Facilities	Operations Manager
Greg Trejo	UNM Office of the Vice President for Research	Strategic Support Manager
Jaime Tillotson	UNM College of Fine Arts, Art Museums	Assistant to the Dean
James Shaw	UNM Facilities Management Department	Interim Assoc. Director/Utilities Division
Jeff Gassaway	UNM Information Technologies	University Information Security Officer
Jeff Zumwalt	UNM Utility Services	Director
Jenna Crabb	UNM Division of Student Affairs	Executive Director for Student Resources
Jessica Ramos	UNM Center for Student Success	Director
Joanne Kuestner	UNM Museum of Southwestern Biology	Museum Administrator
John Elliot	UNM Los Alamos	Facilities Coordinator
John Miller	City of Albuquerque, Office of Emergency Management	Emergency Planning Coordinator
Joseph Malouff	UNM Risk Services	Manager
Laura Banks	UNM Department of Emergency Medicine, Center for Disaster Medicine	Principle Investigator, Director
Laura Musselwhite	UNM Valencia Campus	Dean of Instruction
Lea Briggs	UNM Office of the Provost	Academic Facilities and Space Manager
Leticia Gallardo	UNM Environmental Health and Safety	Administrative Assistant
Marty Desautels	UNM Financial Services Division	Director of Financial Operations
Matt McKernan	UNM Athletics	Manager, Sports Facilities and Events

Name	Organization/Department	Title
Matthew Pena	Central New Mexico Community College	Emergency Manager
Megan Chibanga	UNM Residence Life Student Housing	Director
Michael Archuleta	City of Albuquerque, Office of Emergency Management	Office of Emergency Management Manager
Michael Cabral	UNM Taos Branch	Facilities Management
Michael McCord	UNM Facilities Management Department	Environmental Services Manager
Miranda Harrison-Marmaras	UNM Information Technologies	Technical Analysist
Oswaldo Guerrero	UNM Gallup Branch	Facilities Management
Paul Allen	UNM Los Alamos	Dean of Instruction
Richard Goshorn	UNM Valencia Branch	Director of Business Operations
Robert Paul Griego	UNM Gallup Branch	Director of Business Operations
Robert Perry	University of New Mexico Hospital	Hospital Emergency Manager
Ronald Petranovich	UNM Gallup Branch, Physical Plant	Manager
Rosie Dudley	UNM Planning, Design & Construction	University Planner
Sabrina Ezzell	UNM Gallup Branch	Chancellor
Sarah Fernandez	UNM Taos, Facilities	Administrative Assistant
Sarah Scott	UNM Office of the Vice President of Human Resources	Strategic Support Manager
Shawn Penman	UNM Earth Data Analysis Center	GIS Specialist/Programmer
Shirley Baros	UNM Earth Data Analysis Center	Director
Tabia Murray Allred	UNM Campus Environments & Facilities	Strategic Planner
Tara Ooms	UNM Health Sciences Center	Veterinarian
Thanatos VonFox	UNM Environmental Health and Safety	Unit Administrator
Thomas Duran	UNM Taos Branch	Business Manager
Thomas Walmsley	Bernalillo County Office of Emergency Management	Deputy Emergency Manager
Tim Muller	UNM HSC Office of Research	University Biosafety Officer
Tim Stump	UNM Police	Lieutenant
Tracy Bailey	UNM Los Alamos Branch	Marketing and Social Media Assistant
Travis Broadhurst	University of New Mexico	Student Representative
Vincent Chavez	UNM Facilities Management Department	Manager, Facilities Maintenance
Virginia Severns	UNM Health Sciences Center	Bio Safety Specialist
Zachary Peterson	UNM Environmental Health and Safety	Interim Manager

UNM Hazard Mitigation Website

The UNM Hazard Mitigation website was developed as a way to disseminate information on the Hazard Mitigation Plan to HMAC 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, administrative contact information, Advisory Committee members, and previous versions of the UNM HMP. 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, Microsoft OneDrive was used as an information-sharing tool for the HMAC members to facilitate their online interactions.

Community Involvement

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 HMAC 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 HMAC and review the material available online. These letters and invitations are included in Appendix (TBD).

Public outreach brought new members to the HMAC from the University community, including UNM staff, students, and representatives from all UNM branch campus locations. These individuals became members of the HMAC and attended meetings when possible. A meeting agenda was sent to all members of the HMAC prior to the meetings for their review. During meetings, all members of the HMAC were encouraged to comment and give feedback. Comments were also sent via email to the HMP administrative team from members of the HMAC throughout the updating process. Feedback from the HMAC was incorporated into the entire update process. As feedback was given, it was reviewed by the HMAC 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 the general public to review and comment. Local emergency management partners and neighborhood associations from all UNM locations were invited via email to review the document and attend a meeting of the HMAC. These emails are included in Appendix (TBD).

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

To maintain consistency with local and State information, both the State of New Mexico and Albuquerque/Bernalillo County 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 2023, and the combined local jurisdiction plan as of March 2021. New to the 2024 HMP update is the availability of county-specific hazard mitigation plans for UNM branch campus locations. The hazard mitigation plans for Los Alamos, McKinley, Sandoval, Taos, and Valencia counties were referenced to ensure county-specific information is captured for all UNM branch campus locations.

Integration of plans is extremely important for efficiency, and 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. The HMP took into consideration the hazard and risk stratification analysis of the state and local jurisdictional plans.

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

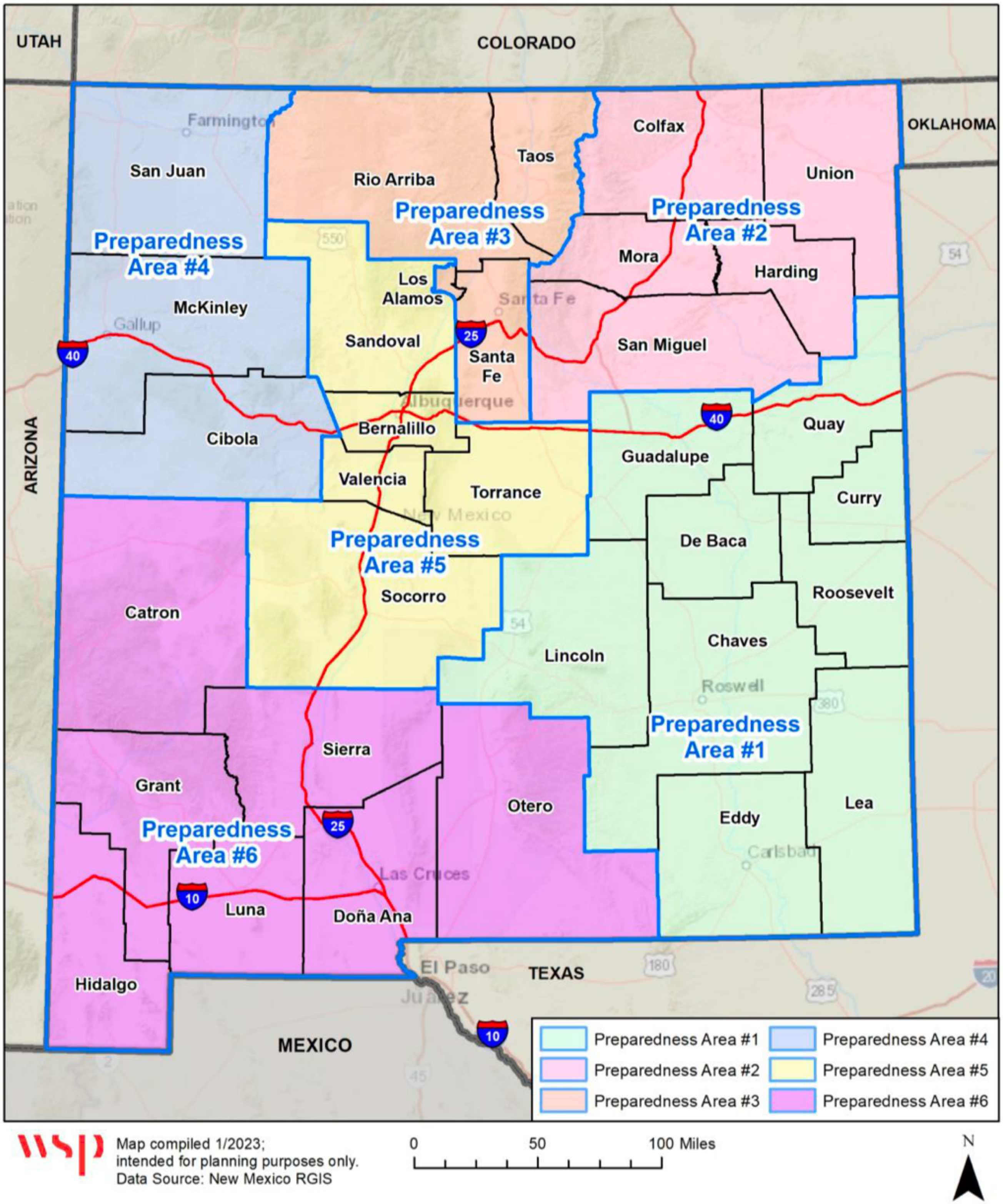
Preparedness Area #4

- UNM-Gallup/Zuni Campus

Preparedness Area #5

- University of New Mexico Albuquerque Campus
- UNM Sevilleta LTER Field Station
- UNM-Valencia Branch
- UNM Health Sciences Rio Rancho Campus
- UNM Sandoval Regional Medical Center

Figure 1: 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.

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

Section 3: The Planning Area

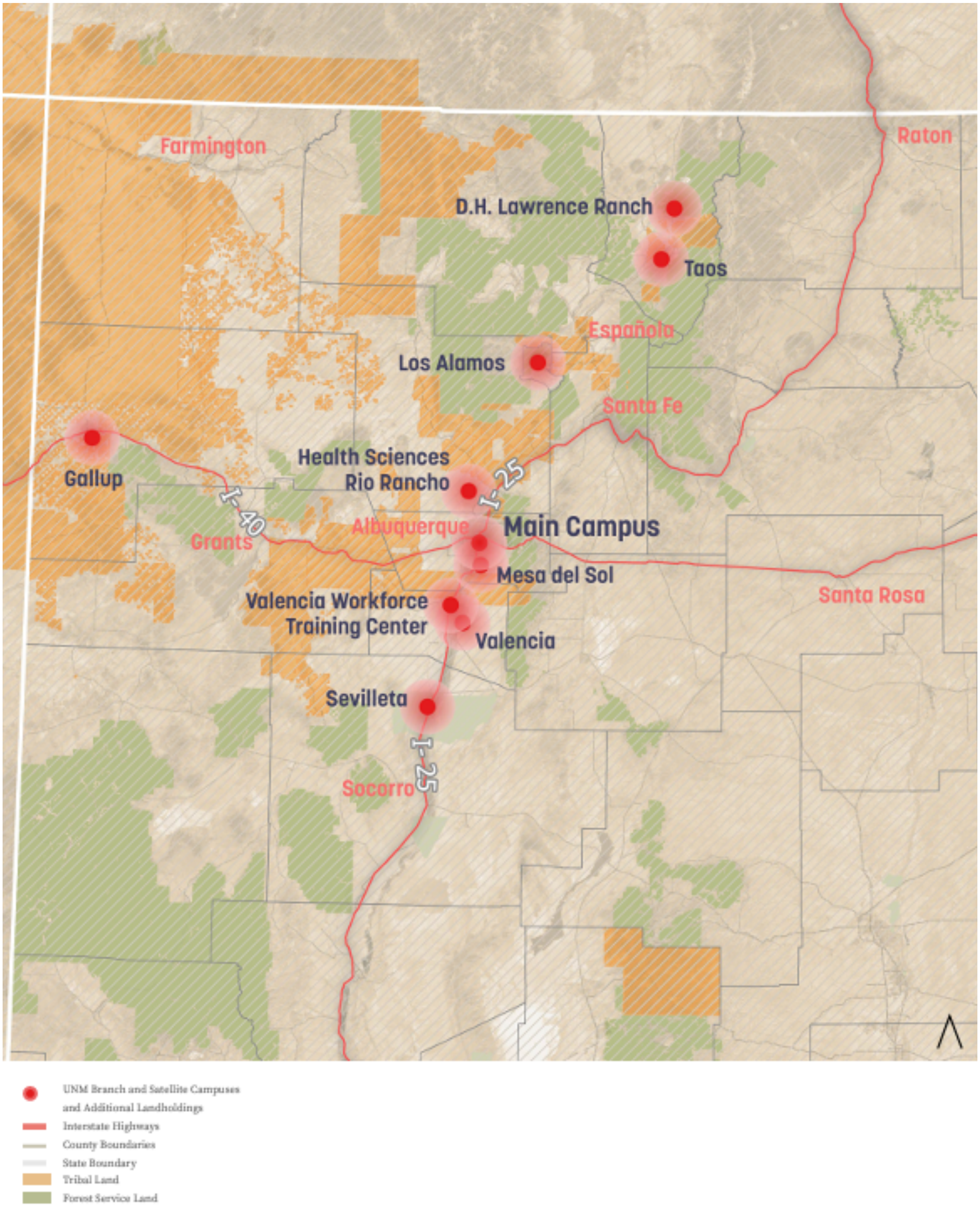
University of New Mexico Planning Area: History, Demographics, Economy, Geography, Utilities, and Future Development Trends

University of New Mexico Overview

Founded in 1889 as New Mexico's flagship institution, 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 200,000 active alumni worldwide, with Lobos in every state. More than half of UNM's alumni choose to remain in New Mexico.

UNM Albuquerque Campus consists of the Central Campus, North Campus, and South Campus, and includes the UNM Health Sciences Center and UNM Hospital. The University has branch campuses in Gallup/Zuni, Los Alamos, Taos, and Valencia County, as well as the extension UNM Health Sciences Rio Rancho Campus, UNM Sandoval Regional Medical Center, and the Sevilleta LTER Field Station located in Socorro, New Mexico. UNM offers bachelor and graduate degree completion programs throughout the state via Extended Learning and has education centers located at the four branch campus locations as well as in Santa Fe, Farmington, and Kirtland Air Force Base. UNM's libraries, museums, galleries, and performance spaces are rich cultural resources for the state. Home to the Lobos and contenders in the Mountain West Conference, UNM athletics draw fans from all over. The University Arena or "The Pit" is one of college basketball's most famous and recognizable buildings.

Figure 2: UNM Planning Area



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 is composed of seven members who are appointed by the Governor of New Mexico with the consent of the Senate for staggered terms of six years, except for the student regent, who is appointed for a two-year term. The Board's power to govern the University includes fiduciary responsibility for the assets and programs of the University, establishment of goals and policies to guide the University, and 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 Albuquerque Campus

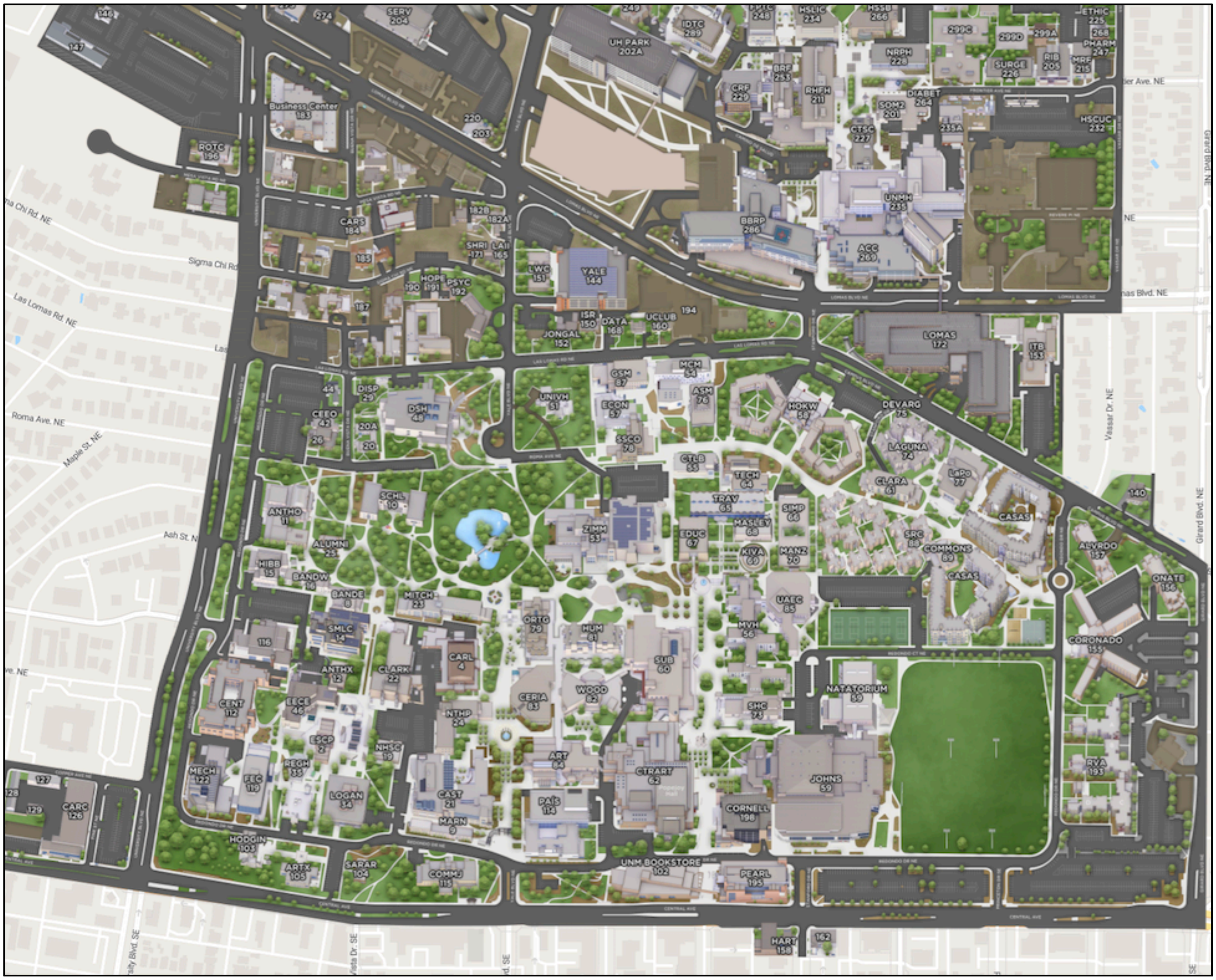
UNM Albuquerque Campus is located near old Route 66 in the heart of Albuquerque, a metropolitan area of more than 955,000 people. Albuquerque is a blend of culture and cuisine, styles and stories, people, pursuits, and panoramas, from the magnificent mesas to the west, past the banks of the historic Rio Grande to the Sandia Mountains to the east. 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 the Albuquerque Campus occupies nearly 800 acres, boundaried by University Blvd. on the West, Central Avenue on the South, Girard Blvd. on the East, and Indian School Road on the North. The Albuquerque 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. The University of New Mexico offers a wide variety of academic programs through twelve Colleges and Schools. These academic options include more than 215 degree and certificate programs, including 94 baccalaureates, 71 master's, and 37 doctoral degrees. In addition, there are 5 doctoral professional practice programs—in law, medicine, nursing, pharmacy, and physical therapy.

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.

Figure 3: Map of Central Campus (South of Lomas Blvd.)



North Campus

The North Campus is located north of Lomas Avenue and is home to the nationally recognized Health Sciences Center (HSC) and the 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, College of Population Health, and School of Medicine. UNMH is New Mexico's only Level I Trauma Center and is home to the first NIH-designated Comprehensive Cancer Center and the award-winning Advanced Care Stroke Center. UNMH receives 900,000 outpatient visits, 22,000 surgical cases, and 100,000 emergency room visits each year. UNMH providers specialize in over 150 areas of medicine and employ over 7,000 professionals. 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, New Mexico's only dedicated children's hospital.

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

Figure 4: Map of North Campus

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 Central Campus on a Monday-through-Friday schedule, operating from 7:00 a.m. to 10:00 p.m.

Figure 5: Map of South Campus

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 community 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.

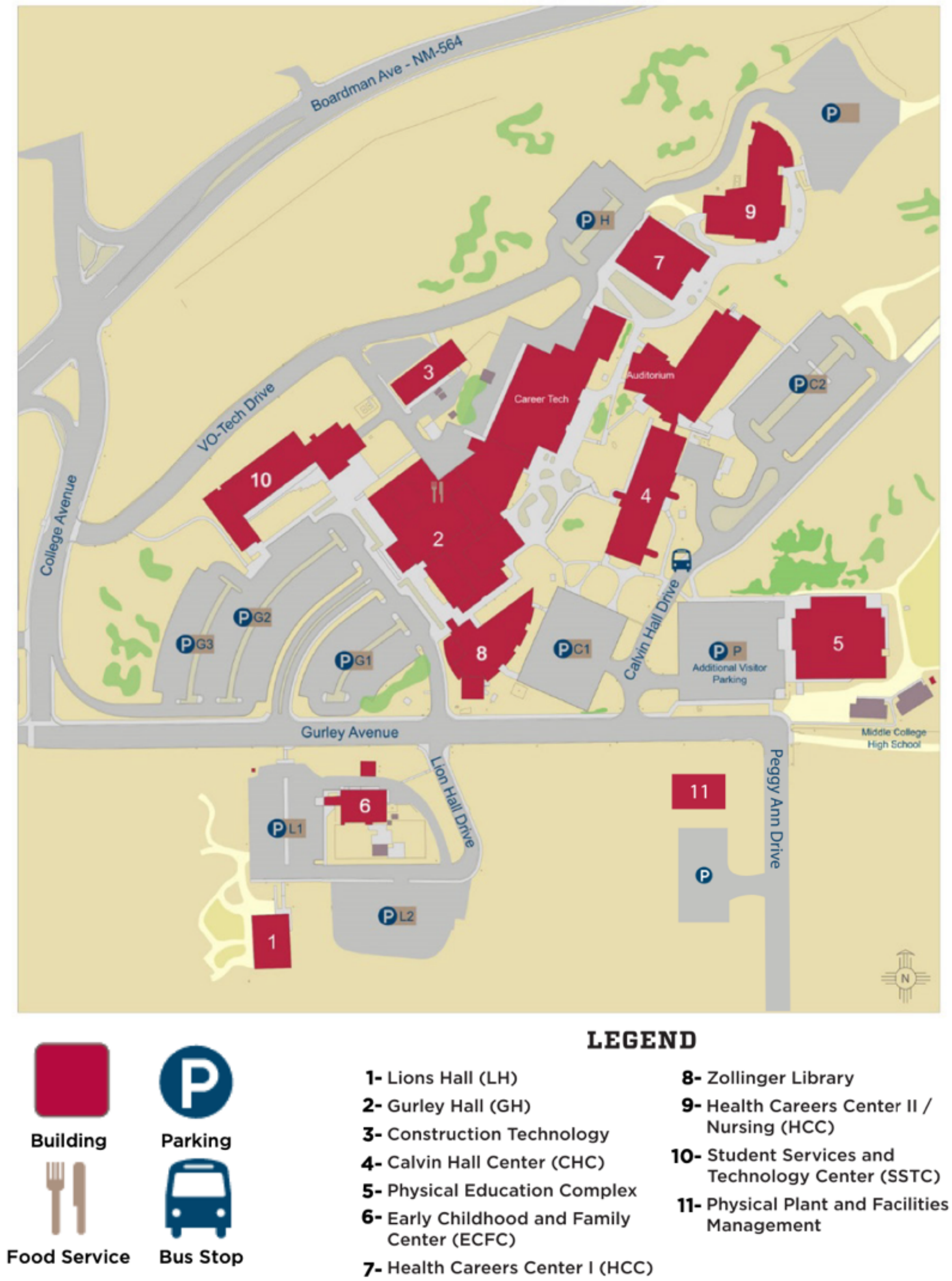
The branch community colleges pledge themselves to protect the quality and integrity of all academic curricula, and the Albuquerque Campus pledges its resources, whenever appropriate and practical, to the fulfillment of the branches' varied missions. UNM's Office of the Provost is responsible for establishing policies and procedures relative to all branch operations.

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 km^2) in New Mexico's High Desert Country. 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 a 2,500-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 or 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 reservation and the Zuni pueblo, this campus has the largest Native American student body of New Mexico public institutions and is designated as a Native American Serving Non-Tribal Institution. The branch regularly repairs its older structures and is currently renovating multiple areas that include the programs of Career and Technical Education, Fine Arts, and Student Services.

Figure 6: Map of UNM Gallup Branch Campus



UNM – Los Alamos (UNM-LA) Branch Campus

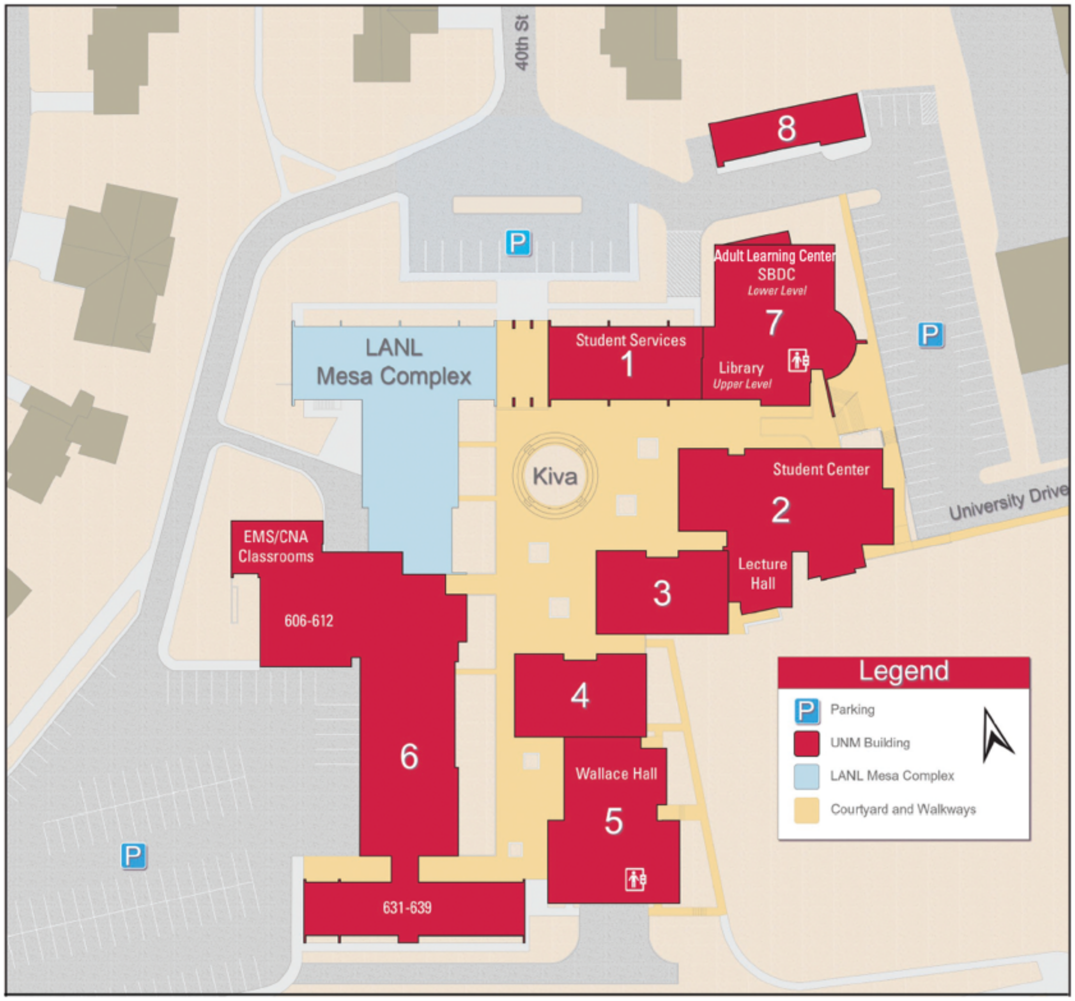
UNM Los Alamos offers a number of outstanding programs and services to meet a variety of student needs and interests, including: certificate programs and associate degree programs; community education and customized training courses; small business development seminars through Small Business Development Centers (Los Alamos and Sandoval Counties); Adult Basic Education programs including High School Equivalency credential (HSE) and English as a Second Language (ESL); and bachelor and graduate degree programs through UNM's Distance Education Program.

The University of New Mexico began its presence in Los Alamos in 1956 with the establishment of the UNM Los Alamos Center for Graduate Studies. The Graduate Center has been in continuous operation since that time. It has a distinguished history of offering graduate degrees in scientific, engineering, management, and health-related fields. The first significant UNM undergraduate offerings in Los Alamos began with the establishment of the University of New Mexico Residence Center in Los Alamos in the fall of 1970. In 1973, the University of New Mexico Northern Branch College came into existence with Los Alamos as one of its campuses. In 1977, as a result of Legislative action, the UNM Northern Branch College was absorbed into Northern New Mexico Community College (NNMCC). In 1980, after a local referendum and BEF and Legislative approval, the Los Alamos Branch Campus of the University of New Mexico was founded. It began operations on July 1, 1980, in the Little Valley School on Orange Street. The new Director assumed his duties at that time, and several key NNMCC employees were transferred to the UNM Los Alamos Branch College, which subsequently assumed the informal title of UNM Los Alamos, abbreviated UNM-LA.

In October 1980, the Branch campus moved from the Little Valley School to its present site, 4000 University Drive. In January 1981, the staff of UNM–LA assumed, under a contractual arrangement, the daily operations of the UNM Los Alamos Center for Graduate Studies from the Training Office of the Los Alamos National Laboratory, and the Director of the Graduate Center moved his office to UNM–LA. During 1982-83, the UNM–LA facilities were remodeled and expanded. The new UNM–LA facility was dedicated by the Governor of New Mexico, Toney Anaya, on January 6, 1984. In 1989, Mesa Gymnasium was acquired from the Los Alamos Schools and was remodeled to provide additional classrooms. The new, sixth building was opened in spring 1990. The Learning Resource Center, an addition to the existing facility, was completed in early 1996. It houses the Library, Tutorial Center and the Adult Basic Education Program. The remodeled Student Services Center was completed and opened in the summer of 2000. The graduate and upper divisions programs offered in Los Alamos are part of the University of New Mexico’s Extended University, the institution’s distance education program.

The mission of the center, in cooperation with Los Alamos National Laboratory and the Albuquerque and branch campuses of UNM, is the delivery of instruction in traditional face-to-face teaching, as well as through a variety of technologies, including televised programming via satellite, ITFS, video conferencing or the Internet.

Figure 7: UNM Los Alamos Branch Campus Map



1. Student Services / Chancellor
2. *Upper Level:* Student Center / Lecture Hall / Classrooms / Academic Support Center (ASC) / Secret City Kitchen
   Lower Level: Business Services / Cashier / Facility Services / Marketing
3. Computer Lab / Faculty Offices / Science Lab
4. Computer Lab / Electronics / Robotics / Faculty Offices
5. *Upper Level:* Jeannette O. Wallace Hall / Art Studio / Physics Lab / Computer Lab / Faculty Offices
   Lower Level: Ceramics Studio / Machine and Welding Shop
6. Classrooms / Computer Labs / Faculty Offices / Office of Instruction / EMS and CNA Classrooms
7. Upper Level: Library
   Lower Level: Adult Learning Center (ALC) / Community Education / Small Business Development Center (SBDC)

LOS ALAMOS

4000 University Drive
Los Alamos, NM 87544
505-662-5919
losalamos.unm.edu

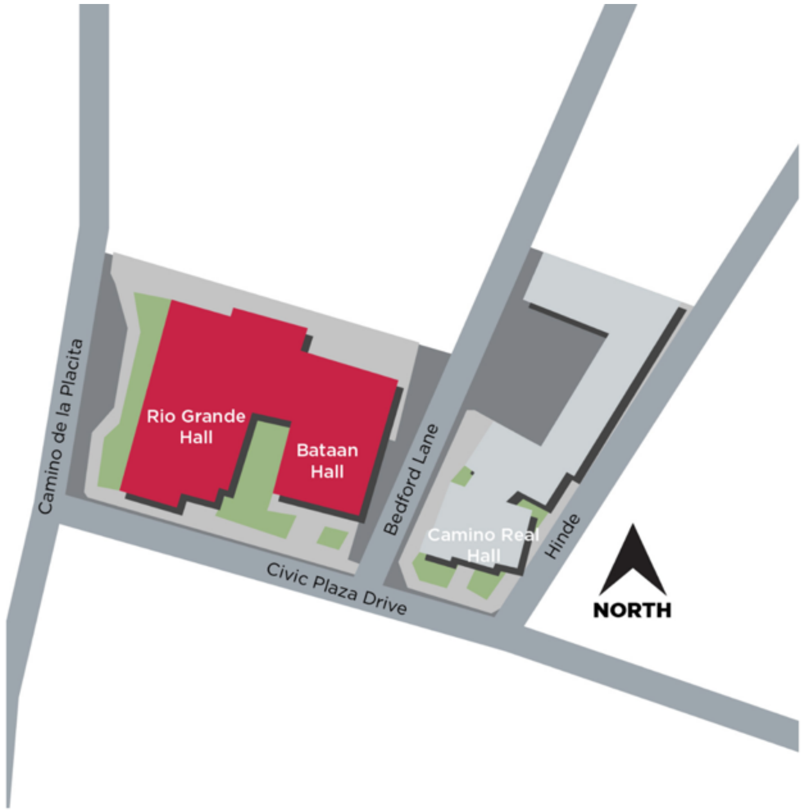
UNM – Taos Branch Campus

The UNM-Taos Branch Campus spreads over 45 acres (.18 km^2). 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).

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. Klauer Campus reflects Taos' laid-back style, known throughout the Southwest. It honors the area's connection to the land and conservation efforts; the campus is fully powered by one of the largest solar arrays in New Mexico.

Figure 8: UNM Taos Branch Campus Map - Klauer Campus

Figure 9: UNM Taos Branch Campus - Civic Plaza



UNM – Valencia Branch Campus

UNM-Valencia, which is composed of ten buildings, is located in Tomé, N.M., between Belen and Los Lunas, the two most populated areas in Valencia County. The campus consists of 150 acres of rural land with scenic vistas of the Rio Grande Valley to the West, the Manzano Mountains to the East, and historic Tomé Hill to the north. Additionally, the UNM-Valencia Workforce Training Center is located in Los Lunas, near the I-25 Los Lunas exit. The Workforce Training Center sits on nine acres of land directly across from Los Lunas Hill.

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. The creation of this Satellite Center ended nearly two decades of work by members of the Los Lunas and Belen School districts to provide a stable source of post-secondary education and vocational training in Valencia County. A total of $93,000 in seed money was raised to help open the facility.

In 1979, the State Legislative Finance Committee indicated that expanding satellite centers, such as the one in Belen, should be established as branch campuses to be supported by an ongoing mil levy as well as with student tuition and general fund appropriations. The local community indicated its continued support by voting overwhelmingly in favor of creating a branch campus. Additional assistance came from the Board of Educational Finance, the New Mexico State Legislature, and the Eastern Valencia County Higher Education Committee, Inc. As a result, a formal proposal to establish the branch was accepted by UNM in March 1981.

Classes began in August of that year. Technical certificates and associate degrees could now be completed locally for the first time in Valencia County history. Continued growth in enrollment and program offerings soon created a pressing need for additional space and new facilities. A new campus in Tomé was built in response, opening its doors in the Summer 1986. A Library and Learning Resource Center were added in 1994. Extensive renovations in the spring of 1995 provided additional classroom and office space, and the completion of the Student Community Center in the spring of 2000 added additional classrooms, office space, and a wellness/fitness center.

In the spring of 2005, a new Health Sciences building opened, providing an anatomy and physiology lab, allied health lab, presentation lecture hall, and four classrooms, two of which are equipped with student workstations. An ADN Nursing program began in 2010 and gained full ACEN accreditation in 2017. Many new technical and academic programs have begun in the past five years, and UNM Valencia now offers thirty-five degrees and certificates. The Workforce Training Center opened in January 2022.

Figure 10: UNM Valencia Branch Campus Map

Figure 11: UNM Valencia Branch Campus - Workforce Training Center

UNM Other Site Locations

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 to create a public memorial to the world-renowned writer D.H. Lawrence and to be used for educational, cultural, charitable, and recreational purposes. 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 Health Sciences Rio Rancho Campus (formally UNM West)

The UNM Health Sciences Rio Rancho campus is located adjacent to the Sandoval Regional Medical Center (SRMC) in the heart of Rio Rancho's City Center within Sandoval County. The campus is a 40,000-square-foot building that houses general-purpose classrooms, a computer lab, a common area, office space, and a wellness center. The campus is leading the way in developing health educational programs designed for both traditional and non-traditional students, providing life-long learning opportunities to help them integrate seamlessly into the communities they wish to serve. Rural New Mexico has been managing a healthcare provider shortage for years. With that in mind, in 2017, the university dedicated the Rio Rancho campus exclusively for health professional education to provide cutting-edge classes and resources for undergraduate and graduate coursework.

The campus serves the community by providing compassionate, respectful behavioral health clinical services through the UNM Medical Group, Behavioral Health Clinic located on the campus. The clinic not only offers assistance with substance use and mental health conditions, but it also provides learning opportunities for health professionals.

Current programs include College of Nursing courses for the Bachelor of Nursing program, a collaborative venture with Central New Mexico College offering Medical Assistant training, Pre-health outreach (Health Careers Academy and DreamMakers program through the Health Sciences Center Office of Diversity Equity and Inclusion), Mental Health Outreach programs, and behavioral health training. Future programs will continue to expand learning opportunities so students train on state-of-the-art equipment while interacting with the communities they will one day serve.

UNM Rainforest Innovations

UNM Rainforest Innovations is a 501(c)(3) nonprofit corporation formed and owned entirely by the University of New Mexico Board of Regents (a 501(c)(3) with an independent board of directors. Located at the Lobo Rainforest Building in the heart of the Innovation District in Albuquerque, New Mexico, UNM Rainforest Innovations is close to research and development and laboratory facilities and other technology-based companies, many of which were created by UNM Rainforest Innovations.

UNM Sandoval Regional Medical Center (SRMC)

UNM Sandoval Regional Medical Center (SRMC) is in the Rio Rancho City Center near the Rio Rancho City Hall and UNM UNM Health Sciences Rio Rancho Campus. Hospital-based UNM faculty physicians serve SRMC in radiology, pathology, emergency medicine, anesthesiology, psychiatry, cardiology, and more. The 240,000-square-foot acute care facility houses 60 inpatient beds, 20 emergency department beds, and 12 imaging suites including MRI CT, and mammography. In addition, UNM SRMC has a 55,000 square-foot Medical Office Pavilion, also known as the Professional Arts Building, that houses Physical & Occupational Therapy, the hospital dining hall, hospital administrative and business functions, medical education space, and more than 24,000 square feet for Primary Care and Specialty Care Clinics.

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 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 68 people for periods ranging from a single night to multiple months. The station has a total of 11 completely furnished residence buildings.

Albuquerque 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 the University of New Mexico Hospital. In spring of 2024, 21,075 students attended the Albuquerque campus with another 3,975 students at branch campuses.

Figure 12: UNM Campus Headcounts[1]

Spring Semesters					
As of Census Date, March 18, 2024					
Campus Location Headcount	**2020**	**2021**	**2022**	**2023**	**2024**
Albuquerque Campus	21,198	20,144	19,556	20,408	21,075
Branch Campuses					
Gallup Branch	1,812	1,323	1,292	1,424	1,484
Los Alamos Branch	700	529	526	471	453
Valencia Branch	1,665	1,023	1,162	1,193	1,237
Taos Branch	850	526	538	801	801
Branch Totals	5,027	3,131	3,518	3,889	3,975

Populations on the Albuquerque 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. Students also attend events and use university services on campus after 5:00 p.m., (i.e., libraries, Student Union Building (SUB) activities, or Johnson Center Recreation). The SUB, Johnson Center, and libraries are often open until 11:00 p.m. or later. In addition, the community at large also utilizes UNM campuses after 5:00 p.m. for sports, exercise, events, or other activities.

Faculty and staff are dispersed in various buildings around campus and generally have offices within their departments. Senior administration staff (The President of UNM, the Regents, and the Provost, as well as many other top administrative positions) are located in Scholes Hall. Many other administrative staff are scattered across the campus including 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 Albuquerque 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 UNM Albuquerque 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.)

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[1] Information retrieved from University of New Mexico Office of Institutional Analytics Tableau Public on March 18, 2024, https://public.tableau.com/app/profile/unm.oia/viz/UNMOfficialEnrollmentReport/Story1

Approximately 10% of UNM's student population resides on campus in university housing. Student Housing facilities are located on UNM's Central 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 8 residence halls and one dining facility. The total building replacement costs for all Student Housing facilities combined are estimated to be $87M.

Residence Life and Student Housing provides lodging, community center, and food service facilities to approximately 2,000 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.

Campus Economy

UNM is one of New Mexico's most valuable economic assets. UNM enhances workforce productivity, attracts revenue and investment, and drives economic growth statewide. UNM's quantifiable economic impact has four major components: university operations, student expenditures, alumni human capital, and technological innovation and transfer. In 2022, these components accounted for 47,053 jobs, $1.9 billion in labor income, and $5.2 billion in economic output. UNM's operational expenditures totaled $3.4 billion in the academic year 2022. That year, UNM employed over 16,000 faculty and staff and paid roughly $2 billion in wages, salaries, and benefits. UNM's 2022 non-labor operational expenditures exceeded $1.4 billion. [2]

Spending by UNM generates a net positive economic impact when funds originating outside the state are spent in New Mexico. Roughly half of UNM's operational spending meets both these criteria. As these monies are re-spent within the New Mexico economy by UNM's suppliers and employees, they stimulate additional economic activity resulting in further increases in employment, wages, and productivity. When these multiplier effects are accounted for, the total economic impact of UNM operations is 32,098 jobs, $1.8 billion in labor income, and $2.8 billion in economic output.[3]

For fiscal year 2022, federal and state agencies, industry, foundations, and national laboratories awarded well over $300 million in contract and grant awards to UNM for sponsored projects ranging from engineering to medicine and education to the humanities.[4] The University of New Mexico Health Sciences alone was awarded nearly $239 million in external funding in fiscal year 2022, a new record that builds on year-over-year increases in grant funding for 17 of the past 18 years. In addition, UNM Health Sciences researchers have for the first time collectively received more than 1,000 active grants.[5]

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[2] https://innovations.unm.edu/wp-content/uploads/2023/11/UNM-EconomicImpact_2022-released-18Nov23.pdf
[3] https://innovations.unm.edu/wp-content/uploads/2023/11/UNM-EconomicImpact_2022-released-18Nov23.pdf
[4] https://budgetoffice.unm.edu/assets/documents/budget/fy23_opcapbook.pdf
[5] https://hsc.unm.edu/news/2022/08/health-sciences-record-239-million-external-research-funding-2022.html

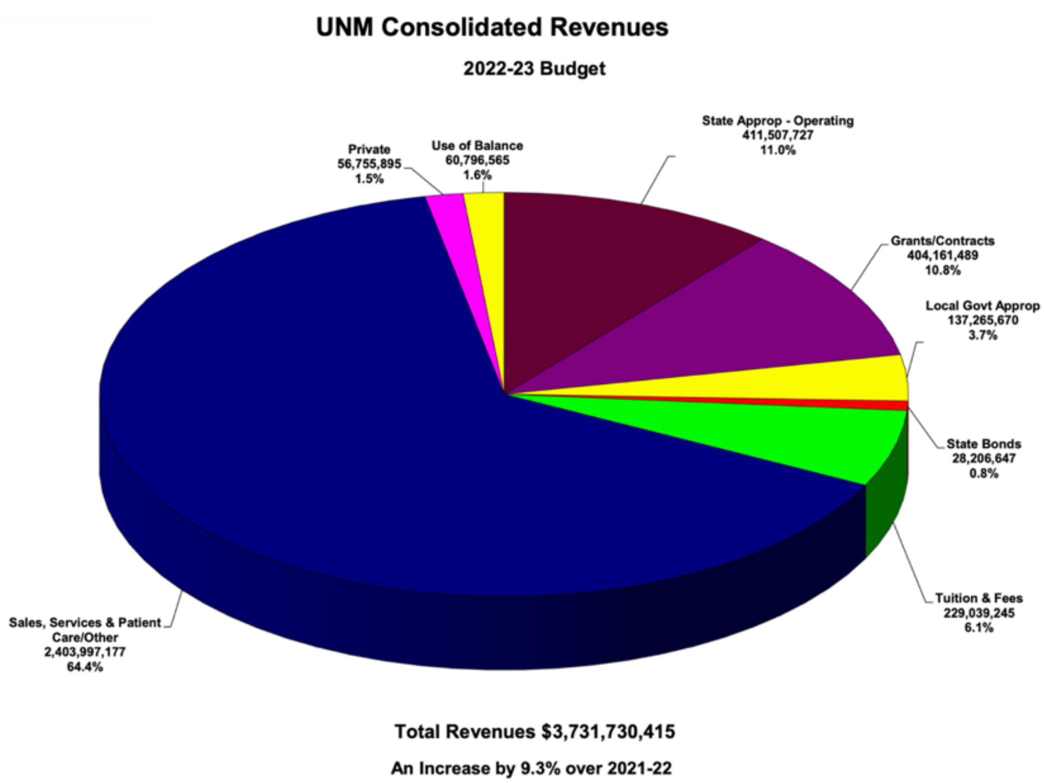
In addition to providing compensated healthcare services to many New Mexico residents, UNM HSC provided services to patients who are either uninsured or under-insured and who do not meet the criteria for financial assistance. These accounts are fully reserved and recorded as provision for uncollectible accounts. Provision expenses recorded for the years ending June 30, 2023, 2022, and 2021 were $35.0 million, $48.4 million, and $59.0 million, respectively.[6]

[6] https://unmhealth.org/about/_files/_files-financial-reports-unm-hospitals-pdfs/university-of-new-mexico-hospital-fy2023-fs-final.pdf

Table 2: 2022-2023 UNM Consolidated Revenue (in millions)[7]

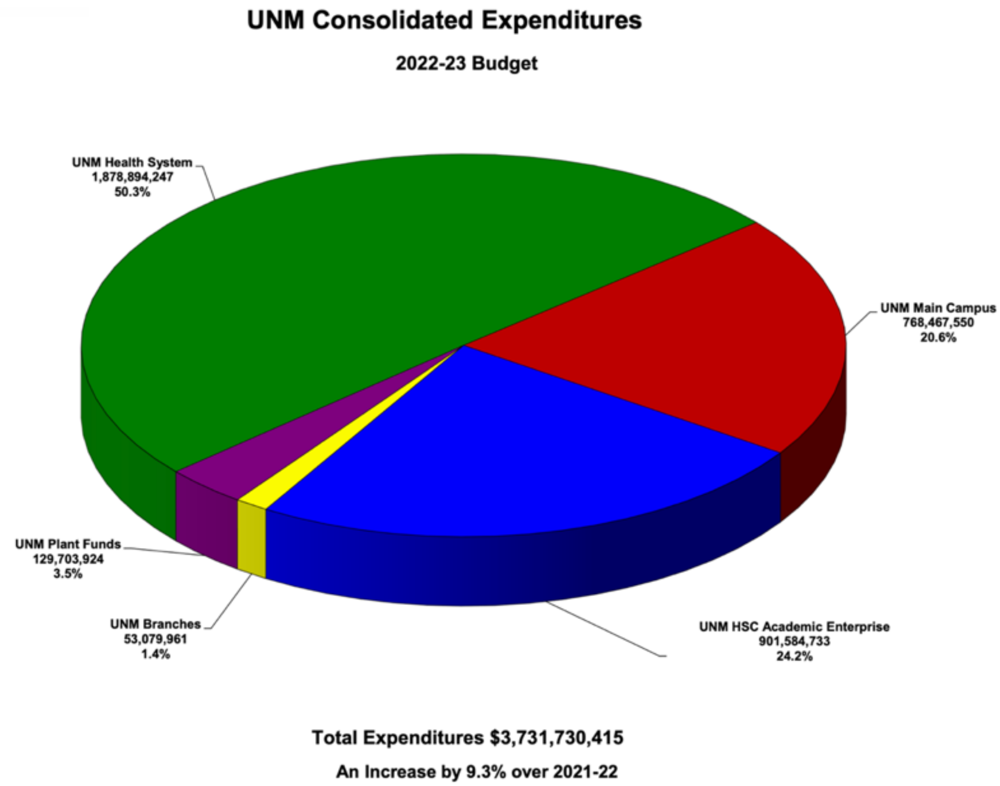
Description	Total	Percent
State Appropriations (Operating)	$ 411.5	11.0%
Grants/Contracts	$ 404.1	10.8%
Local Government Appropriations	$ 137.3	3.7%
State Bonds	$ 28.2	0.8%
Tuition and Fees	$ 229.0	6.1%
Sales, Services, & Patient Care/Other	$ 2,403.9	64.4%
Private (Gifts and Contracts/Grants)	$ 56.8	1.5%
Use of Balance	$ 60.8	1.6%
Total Revenue	**$ 3,731.8**	**100.0%**

Figure 13: UNM Consolidated Revenues 2022-23 Budget[8]



[7] https://budgetoffice.unm.edu/assets/documents/budget/fy23_opcapbook.pdf
[8] https://budgetoffice.unm.edu/assets/documents/budget/fy23_opcapbook.pdf

Figure 14: UNM Consolidated Expenditures 2022-23 Budget[9]



UNM's fiscal year 2022-23 (July 1, 2022-July 30, 2023) Operating Budget includes Operating Budgets for the Albuquerque 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.

Academic and Research Programs

UNM offers a wide variety of academic programs through twelve Colleges and Schools. These academic options include more than 215 degree and certificate programs, including 94 baccalaureate, 71 master's, and 37 doctoral degrees. In addition, there are 5 doctoral professional practice programs—in law, medicine, nursing, pharmacy, and physical therapy. 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 of dollars into New Mexico's economy, fund new advancements in healthcare, and augment teaching –

[9] https://budgetoffice.unm.edu/assets/documents/budget/fy23_opcapbook.pdf

giving students valuable hands-on training in state-of-the-art laboratories. UNM is identified as having "very high research activity" by the Carnegie Classification. As a Hispanic-serving institution, the University represents a cross-section of cultures and backgrounds.[10]

The Health Sciences Center is the state's largest integrated healthcare treatment, research, and education organization. U.S. News and World Report's 2023-2024 edition of "America's Best Graduate Schools" ranks the UNM School of Medicine 4th in primary care and 81st in research. Additionally, UNM's College of Nursing is ranked in the top 15% of undergraduate nursing programs in the county. 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.

UNM Online

Online education brings higher education to rural communities and areas with limited access to transportation and technology. Its flexibility creates a pathway for students to attend school while meeting other important commitments such as work and family care. The flexibility also allows students to decide when and where learning takes place while commuting less saves them money.

In the Fall 2023 semester, 491 UNM faculty provided instruction in 1,136 online course sections, with 24,830 students enrolled. The online student headcount was 12,224, or 64% of the Albuquerque Campus population, and of that group, 3,435 students attended exclusively online. The University offers 14 bachelor's degree completion, 20 fully online graduate programs, and 2 graduate certificates. Most programs are in a fast-paced accelerated format.

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: 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, Armond H. Seidler Natatorium, Mark Paulsen Athletic Performance Center, New Mexico Mutual Champions Training Center, and Davalos Basketball Center. Other UNM athletic facilities located elsewhere on campus are the UNM North Golf Course, the Championship Course, the Johnson Center, and the Indoor Track at the Albuquerque Convention 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 high school 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 facility currently has a capacity of 15,411.

The Pit underwent a massive upgrade and expansion that was completed in time for the 2010-2011 season that included $60 million of improvements. Among the improvements were the U.S. Bank

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[10] 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.

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.

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. In August of 2013, a new video board was installed in the north end zone. The 80-foot by 32-foot high-definition display gave New Mexico the largest video board in the Mountain West. Current official capacity of the University Stadium is 39,224. The building also houses one of two telecommunication hubs on the South Campus. Much of the internet and phone lines for South Campus run through the press level of this facility.

UNM Utilities

The University of New Mexico Utility Services Department oversees and facilitates utility operating processes across campus to ensure a comfortable and conducive environment for students, staff, faculty, and visitors. Utility Services manages four locations across five focus areas: electricity, heating steam, chilled water, domestic water, and compressed air. UNM Utility Services must be delivered continuously every day of the year. Operators are on site 24/7 running the equipment to meet the demands.

The Ford Utilities Center can generate 219,000 pounds of steam per hour, 4,000 tons of chilled water, 14 megawatts of electricity, and enough compressed air to keep the entire campus comfortable. Utility Services 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 8,300 tons. The fourth location is the Campus Utility Plant, which can generate 24,000 pounds per hour of steam and 1,000 tons of chilled water. In addition, the Utilities Services Water Section manages the production and distribution of domestic water to the Albuquerque campus.

The utility plants and buildings are all connected by an intricate piping system. This system must be properly managed to ensure utilities are delivered at the appropriate pressure and temperature for the building's HVAC systems. UNM mechanics align and maintain these piping systems. They also maintain the equipment in the utility plants alongside the instrumentation and control technicians. These technicians ensure that all of the equipment is communicating properly and following the programmed sequence of operations.

Utility Services also has a comprehensive domestic water system. The water team oversees the safe delivery of water to the campus per the regulatory requirements of a drinking water system.

The North, Central, and South campus electricity is delivered from three substations to the buildings on campus. This system is operated and maintained by UNM electricians. The electrical system is "dual-radial" which allows the electrical team to complete most of their work without disturbing power to the buildings.

UNM Facilities Management
Facilities Management (FM) oversees the physical infrastructure and facilities of UNM. This includes the operation and maintenance of UNM's buildings, grounds, landscaping, and vehicles, to meet the needs of students, faculty, and staff. FM plays a crucial role in coordinating various aspects, such as energy management and sustainability initiatives, to ensure that UNM incorporates energy-efficient practices into its operations and design standards. Additionally, the department is responsible for establishing and maintaining design, maintenance, and custodial standards that align with The University's mission and create a conducive environment for all.

Future Planning and Development
An institution of the size and complexity of UNM requires continuous long-term campus planning. UNM Campus Capital & Space Planning (CCSP) guides the strategic use and development of UNM's institutional space, facility physical assets, and capital resources, as well as providing strategic guidance for campus framework planning, facility planning, and programming. Facilities Design & Construction (FDC) is the department of Institutional Support Services (ISS) that plans, designs, renovates, and constructs the physical spaces of UNM with a focus on collaborative outcomes aligned with the University's mission. Together, CCSP and FDC departments facilitate best practices in capital project planning, development, and construction and provide strategic guidance supportive of campus master planning, programming, architectural development, building efforts, and best design practices. The HMAC investigated CCSP and FDC resources to identify future large, non-recurring expenditures such as the construction of new buildings, repairs, and campus improvements.

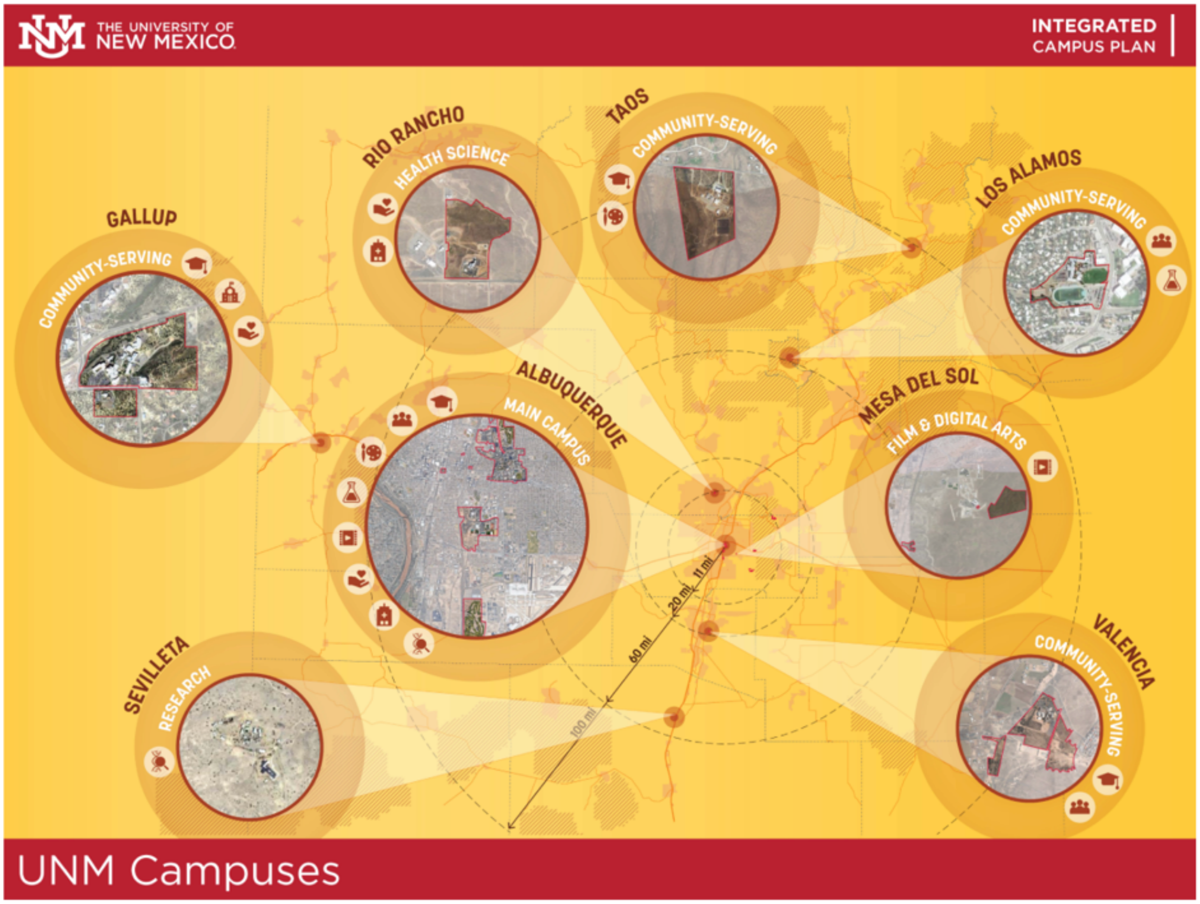
UNM continues to undergo construction of new buildings as well as renovations to existing buildings. Some of the ongoing major projects include:

- The $401.9 million University of New Mexico Hospital (UNMH) New Hospital Tower construction project is a 570,000-square-foot New Hospital Tower, projected to open in Spring 2025, is a new 96-bed adult critical care tower and 1,400-space parking structure. The New Hospital Tower is needed to address longstanding overcrowding at UNMH by adding intensive care capacity, new operating rooms, and a new emergency department.
- The $2.3 million Los Alamos Workforce Development includes the design, construction, and renovation of the workforce development and continuing technical education laboratory at buildings at the Los Alamos Campus.
- The $9.8 million Lobo Welcome Center (LWC) project involves renovations to the original building (11,090 GSF), as well as an addition (2,209 GSF). The original building dates from the early 1940s and is an example of John Gaw Meem's historic architecture on UNM's campus. Historic elements will be retained and restored while the building receives an addition, which will serve as a gathering space for larger events. The LWC will provide a first landing place on campus for prospective students and their families. The renovation will communicate the University's commitment to tradition and its pursuit of innovation in teaching and research while creating a unique and rich experience for visitors to the campus.
- The $4.6 million Taos Campus Infrastructure Repair and Improvement project involves the repair and improvement of infrastructure around the entire Campus. The project improves grading and drainage, new curb and gutters, asphalt paving and markings, security lighting and fencing, accessibility, and general site improvements, as well as the regrading and paving of the West Loop Road.

- The $6.4 million Gurley Hall, Center for Career Tech facility at the Gallup Campus project includes the renovation of the Welding Tech, Construction Tech, Automotive Tech, and associated common area facilities.

Capital Outlay Planning, an annual and 5-year planning process that occurs within the CCSP Division, conjoins strategic facility plans, feasibility studies, and needs assessments with the 2009 Master Plan. In 2023, UNM initiated its Integrated Campus Plan (ICP) that will replace the 2009 Master Plan. The ICP will address all UNM properties and guide the University's decisions on the physical environment, including the character of each campus, safety, access, mobility, and sustainability. The ICP will focus on the facilities, grounds, and physical assets of the institution to provide a "road map" to fulfill the vision and goals set forth in the University's Strategic Plan UNM 2040: Opportunity Defined (UNM 2040). Until the Integrated Campus Plan is complete, the 2009 Master Plan is the University's plan.

Figure 15: UNM Campuses (image from the Integrated Campus Plan)



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 nearly 3,700 in the southwest to 2,800 in the north-central portions. Relative humidity ranges from an average of nearly 65 percent at sunrise to nearly 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.

Section 4: Mitigation Capabilities and Capability Building

The HMAC conducted a thorough review of all capabilities and resources available to accomplish mitigation and reduce long-term vulnerability. This mitigation capabilities and capability building 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. HMAC 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, statutes, codes, 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 considered in the creation of mitigation goals.

Table 3: List of current UNM Plans as of April 2024

Department	Title	Last Modified
UNM	5-Year Capital List 2025-2030	2024
UNM	Animal Resource Facility Incident Response Plan	1/2/24
UNM	Annual Capital Priorities (list)	8/1/23
UNM	Art Museum and ITS Jonson Gallery Emergency/Disaster Response and Preparedness Plan	6/30/05
UNM	Center on Alcoholism, Substance Abuse, and Addictions (CASAA) Environmental Plan	3/1/06
UNM	College of University Libraries and Learning Sciences Strategic Plan 2023-2025	1/1/22
UNM	Communication and Marketing Department (UCAM) Emergency Plan	11/1/20
UNM	Consolidated Master Plan	7/7/05
UNM	Department of Electrical & Computer Engineering Building Emergency Response Plan	11/1/08
UNM	Division of Genomic Resources (DGR)/Museum of Southwest Biology Disaster Mitigation Plan	1/1/21

Department	Title	Last Modified
UNM	Emergency Communication Plan	1/1/20
UNM	Facilities Management (FM) Standards & Guidelines	Various
UNM	Health Sciences Library and Informatics Center Area Emergency Plan	5/1/20
UNM	Information Technologies Strategic Plan	7/9/05
UNM	IT Standards	Various
UNM	Libraries' Emergency Recovery Plan	11/1/20
UNM	Institutional Support Services (ISS) Standards & Guidelines	Various
UNM	Facilities, Design & Construction (FDC) Standards & Guidelines	Various
UNM	Stormwater Guidance for UNM Staff & Contractors	11/11/21
UNM	UNM 2040 Strategic Planning Framework	4/13/22
UNM	UNM Integrated Strategic Plan	TBD
UNM	Utility Services Standards & Guidelines	Various
UNM Hospital	Communications Equipment Failure Plan	12/8/14
UNM Hospital	Emergency Operations Plan 2021	1/30/21
UNM Hospital	Hazardous Materials and Waste Management Plan	6/12/19
UNM Hospital	Life Safety Management Plan	6/12/19
UNM Hospital	Safety Management Plan	6/12/19
UNM Hospital	Utility System Management Plan	6/12/19
UNM-Gallup	UNM-Gallup Emergency Management Plan	5/1/23
UNM-Gallup	UNM-Gallup Strategic Plan Plan Refresh 2019 – 2024	7/11/05

Department	Title	Last Modified
UNM-Taos	UNM Taos Emergency Management Plan	Spring 2023
UNM-Taos	UNM-Taos Strategic Plan 2014-2019	8/1/14
UNM-Valencia	UNM-Valencia Emergency Operations Plan	3/1/19

Table 4: 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.

Policy	Description	Effect
APPM-3250: Employee Orientation	Defines responsibilities and describes the process to ensure consistency	UNM is committed to giving new employees information
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

Table 5: 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 for disaster 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) Purpose; Emergency planning and coordination; 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 local government 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 assist counties 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

Policy/Statute	Description	Effect
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 from the 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.
72-4A-2 Findings and purpose (NMSA, 2003) through 72-4A-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.

Policy/Statute	Description	Effect
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 6: 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

Type of Capability	Listing of Capabilities
	• 2019 Taos County Hazard Mitigation Plan • Various Sector and Neighborhood Development Plans

Table 7: 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 8: 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.
UNM Utility Services	Knowledge and technical expertise on campus utility systems.

Table 9: 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 10: 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 related to mitigation. Some are for specific hazards, while others can be applied to any hazard that UNM needs to address.

Table 11: Federal and State Funding Sources

Name of Program	Primary Purpose
FEMA Public Assistance 406Mitigation	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 canbe 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 GrantProgram (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 MitigationProgram (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 asconstruction 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	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
(CFRP)	
USGS Earthquake Hazards Program	Annual Program announcement through http://www.grants.gov/ for competitive proposals for grants and cooperative agreements to support research in earthquakehazards, 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 12: 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.
HMAC	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.

Program	Description
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 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 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 is digital maps created for floodplain management and insurance purposes, which are 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.

Section 5: Hazard Identification and Risk Assessment (HIRA)

The risk assessment chapter reviews the 11 identified natural hazards, the impacts they have on the UNM community, economy, and the natural and built environment, and sets the stage for identifying mitigation goals and activities. The identified natural hazards and impacts of this risk assessment have been based on the most up-to-date information from the 2023 State of New Mexico Hazard Mitigation Plan. In the State of New Mexico Hazard Mitigation Plan, a hazard identification/analysis and a vulnerability analysis answered the following questions: What are the hazards that could affect the State of Mexico? What can happen as a result of those hazards? How likely is each of the possible outcomes? When the possible outcomes occur, what are the likely consequences and losses, and how does this vary across the state? The University of New Mexico will reference the State's information to best answer the same questions on a hazard-by-hazard basis based on the best available data for the University.

UNM followed the recommended steps in the Local Mitigation Planning Handbook for conducting a risk assessment. The five steps are:

1. Identify hazards
2. Describe hazards
3. Identify UNM assets
4. Analyze the impacts
5. Summarize the vulnerability to UNM

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

44 CFR Part 201.4
The Risk assessments that provide the factual basis for activities proposed in the strategy portion of the mitigation plan. Statewide risk assessments must characterize and analyze natural hazards and risks to provide a statewide overview. This overview will allow the State to compare potential losses throughout the State and to determine their priorities for implementing mitigation measures under the strategy, and to prioritize jurisdictions for receiving technical and financial support in developing more detailed local risk and vulnerability assessments. The risk assessment shall include the following: ▪ *(i) An overview of the type and location of all natural hazards that can affect the State, including information on previous occurrences of hazard events, as well as the probability of future hazard events, using maps where appropriate;* ▪ *(ii) An overview and analysis of the State's vulnerability to the hazards described in this paragraph (c)(2), based on estimates provided in local risk assessments as well as the State risk assessment. The State shall describe vulnerability in terms of the jurisdictions most threatened by the identified hazards, and most vulnerable to damage and loss associated with hazard events. State owned or operated critical facilities located in the identified hazard areas shall also be addressed;* ▪ *(iii) An overview and analysis of potential losses to the identified vulnerable structures, based on estimates provided in local risk assessments as well as the State risk assessment. The State shall estimate the potential dollar losses to State owned or operated buildings, infrastructure, and critical facilities located in the identified hazard areas.*

The Federal Emergency Management Agency (FEMA) defines risk assessment terminology as follows:

- **Hazard**—A hazard is an act or phenomenon that has the potential to produce harm or other undesirable consequences to a person or thing.
- **Vulnerability**—Vulnerability is susceptibility to physical injury, harm, damage, or economic loss. It
- depends on an asset's construction, contents, and economic value of its functions.

- **Exposure**—Exposure describes the people, property, systems, or functions that could be lost to a hazard. Generally, exposure includes what lies in the area the hazard could affect.
- **Risk**—Risk depends on hazards, vulnerability, and exposure. It is the estimated impact that a hazard would have on people, services, facilities, and structures in a community. It refers to the likelihood of a hazard event resulting in an adverse condition that causes injury or damage.
- **Risk Assessment**—Risk assessment is the process of measuring the potential loss of life, personal injury, economic injury, and property damage resulting from hazards.

This Hazard Identification and Risk Assessment (HIRA) is an update to the 2016 UNM Hazard Mitigation Plan and the foundation upon which the state mitigation strategies and actions are based.

Hazard Identification

The University of New Mexico's geographic area spreads across six counties of the state, including 3 separate preparedness areas as defined by NMDHSEM. UNM needs to document natural hazards that may affect the Albuquerque campus, branch campuses, or other UNM properties, which are located across the State. The UNM HMP references the State of New Mexico Hazard Mitigation Plan's information about potential hazards. The State of New Mexico obtained the hazard information in a number of ways, including reviewing past State and Federal Declarations of disasters; conducting searches of State and Federal resources, such as the NOAA's National Centers for Environmental Information (NCEI), and US Army Corps of Engineers (USACE); reviewing historic records; and reviewing archived newspaper articles.

There are 14 natural hazards profiled in the State's 2023 Plan. Of those 14 hazards, 11 are profiled in this plan.

Table 13: Hazards Identified in the 2023 State of New Mexico Plan

Natural Hazard
Dam Failure
Drought
Earthquake
Extreme Heat
Expansive Soils
Flood/Flash Floods
High Wind
Landslide
Land Subsidence
Severe Winter Storms
Thunderstorms (including Lightning & Hail)
Tornadoes
Volcanoes
Wildfire

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. Thunderstorms
4. Drought

Table 14: 2023 Hazard Risk Rankings

Hazard	Ranking
Wildland/Wildland Urban Interface Fires	High
Floods	High
Thunderstorm	High
Drought	High
Winter Storm	Medium
High Wind	Medium
Extreme Heat	Medium
Dam Failure	Medium
Tornado	Medium
Earthquake	Low
Landslide	Low
Land Subsidence	Low
Expansive Soil	Low
Volcanoes	Low

The SHMT reiterates in the State Hazard Mitigation Plan that while prioritization of hazards is important for prioritizing mitigation efforts, it does not mean that lower-risk hazards should be neglected completely.

Three 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 2023 State Plan states that there are few estimates of the future occurrence of volcanic eruptions in New Mexico in recent history. New Mexico's numerous volcanoes are considered dormant, not extinct. The last volcanic episode in the State occurred approximately 3,900 years ago. Based on past occurrences of volcanism in the State, it can be crudely estimated that there is roughly a 1% chance that some type of volcanic eruption could occur somewhere in New Mexico in the next 100 years and a 10% chance that an eruption will occur in the next 1,000 years. Due to this extremely low probability of occurrence (0.1% chance in 10 years), this hazard will not be addressed further in this Plan.

Expansive Soils - There are no previous occurrences and expansive soils pose no risk to the University, faculty, staff, or students. Due to the low frequency of this hazard and its minor potential impact, the risk is considered negligible, and the hazard is not 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.

Data Collection

Hazard information is referenced directly from the State of New Mexico Hazard Mitigation Plan (2023), as well as county-level hazard mitigation plans (varying years). 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 (NCEI – formerly the National Climatic Data Center (NCDC)) and the 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 2023. Calculating the 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.

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 a major disaster or emergency, thus activating an array of Federal programs to assist in the response and recovery effort.

New Mexico has experienced numerous major Federal disasters and emergency declarations. Table 15 and Table 16 identify the Federal Disaster and Emergency Declarations in New Mexico, 1954 – May 2023. These tables include the following information: the year the disaster was declared, the FEMA Disaster Number, and the disaster type.

Table 15: New Mexico Major Disaster Declarations 1954 - May 2023

Year	Disaster Number	Disaster Type
2022	FM-5431	Hermit's Peak Fire
2022	FM-5433	Nogal Canyon Fire
2022	FM-5430	Big Hole Fire
2021	FM-5386	Three Rivers Fire
2020	DR-4529 & 12 EMs	COVID-19 Pandemic
2019	FM-5281	Ironworks Fire
2018	FM-5240	Soldier Canyon Fire
2018	FM-5239	Ute Park Fire
2017	DR-4352	Severe Storms, Flooding

Year	Disaster Number	Disaster Type
2017	FM-5184	El Cajete Fire
2016	FM-5134	Timberon Fire
2016	FM-5127	Dog Head Fire
2014	DR-4199	Severe Storms, Flooding
2014	DR-4197	Severe Storms, Flooding
2013	DR-4152	Severe Storms, Flooding, Mudslides
2013	DR-4151	Severe Storms, Flooding
2013	DR-4148	Severe Storms, Flooding
2013	DR-4147	Severe Storms, Flooding
2013	FM-5026	Tres Lagunas Fire
2012	DR-4079	Flooding
2012	FM-2982	Romero Fire
2012	FM-2981	Blanco Fire
2012	FM-2979	Little Bear Fire
2012	FM-2978	Whitewater-Baldy Fire
2011	DR-4047	Flooding
2011	FM-2935	Donaldson Fire
2011	FM-2933	Little Lewis Fire
2011	FM-2933	Las Conchas Fire
2011	FM-2918	Track Fire
2011	FM-2917	Wallow Fire
2011	FM-2934	Little Lewis Fire
2011	DR-1962	Severe Winter Storms and Extreme Cold Temperatures
2010	DR-1936	Severe Storms, Flooding
2008	DR-1783	Severe Storms, Flooding
2007	DR-1690	Severe Storms, Tornadoes
2006	DR-1659	Severe Storms, Flooding
2005	EM-3229	Hurricane Katrina Evacuation
2004	DR-1514	Severe Storms, Flooding
2000	DR-1329	New Mexico Wildfire
2000	EM-3154	New Mexico Fire
1999	DR-1301	Severe Storms, Flooding
1998	EM-3128	Extreme Fire Hazard
1998	DR-1202	Severe Winter Storms
1993	DR-992	Flooding, Severe Storm
1992	DR-945	Flooding, Hail, Thunderstorms
1985	DR-731	Severe Storms, Flooding
1984	DR-722	Severe Storms, Flooding
1983	DR-692	Severe Storms, Flooding
1979	DR-589	Severe Storms, Snowmelt, Flooding
1979	DR-571	Flooding
1997	EM-3034	Drought
1973	DR-380	Severe Storms, Snow Melt, Flooding

Year	Disaster Number	Disaster Type
1972	DR-361	Heavy Rains, Flooding
1972	DR-353	Heavy Rains, Flooding
1972	DR-346	Severe Storms, Flooding
1965	DR-202	Severe Storms, Flooding
1955	DR-38	Flooding
1954	DR-27	Flooding

The Governor of New Mexico also has the authority to declare a state disaster or emergency via Executive Order. From January 2019 through July 2023, the Governor has issued 99 state disaster declarations, as shown in the following table.

Table 16: Governor of New Mexico State Disaster Declarations, January 2019 – July 2023

Year	EO Number	Location	Disaster type
2023	2023-081	Luna County	Flood
2023	2023-080	City of Farmington	Mass shooting
2023	2023-079	San Miguel County	Wildland Fire
2023	2023-060	State of New Mexico	Drought and Severe Fire Conditions
2023	2023-040	Sandoval County	Flood
2023	2023-036	State of New Mexico	Renewal of Public Health Emergency, COVID-19
2023	2023-018	Guadalupe County	Wildland Fires, multiple
2023	2023-017	State of New Mexico	Renewal of Public Health Emergency, COVID-19
2023	2023-001	State of New Mexico	Renewal of Public Health Emergency, COVID-19
2022	2022-165	State of New Mexico	Renewal of Public Health Emergency, COVID-19
2022	2022-149	State of New Mexico	Renewal of Public Health Emergency, COVID-19
2022	2022-148	Mora County	Severe Winter Weather
2022	2022-147	State of New Mexico	Renewal of Public Health Emergency, COVID-19
2022	2022-143	Sierra County	Flood
2022	2022-134	Catron County	Flood
2022	2022-131	State of New Mexico	Renewal of Public Health Emergency, COVID-19
2022	2022-129	Hidalgo County	Flood
2022	2022-128	Grant County	Flood
2022	2022-124	Sandoval County	Water Shortage
2022	2022-120	State of New Mexico	Renewal of Public Health Emergency, COVID-19

Year	EO Number	Location	Disaster type
2022	2022-119	Rio Arriba County	Flood
2022	2022-115	State of New Mexico	Renewal of Public Health Emergency, COVID-19
2022	2022-114	City of Las Vegas	Flood, Drinking Water Shortage
2022	2022-113	City of Las Vegas	Flood, Drinking Water Shortage
2022	2022-112	City of Las Vegas	Flood, Drinking Water Shortage
2022	2022-109	State of New Mexico	Renewal of Public Health Emergency, COVID-19
2022	2022-106	Rio Arriba County	Water Shortage
2022	2022-087	Sierra County	Wildland Fire
2022	2022-077	San Miguel County	Ash and Fire Debris
2022	2022-067	State of New Mexico	Renewal of Public Health Emergency, COVID-19
2022	2022-025	Sandoval County	Wildland Fire
2022	2022-024	State of New Mexico	Renewal of Public Health Emergency, COVID-19
2022	2022-022	State of New Mexico	Drought and Severe Fire Conditions
2022	2022-021	Mora County	Wildland Fires, multiple
2022	2022-020	Lincoln County	Wildland Fire
2022	2022-019	Colfax County	Wildland Fire
2022	2022-018	Valencia County	Wildland Fire
2022	2022-017	San Miguel County	Wildland Fire
2022	2022-016	State of New Mexico	Renewal of Public Health Emergency, COVID-19
2022	2022-014	Colfax County	Snow
2022	2022-012	State of New Mexico	Renewal of Public Health Emergency, COVID-19
2022	2022-007	State of New Mexico	Renewal of Public Health Emergency, COVID-19
2022	2022-004	State of New Mexico	Renewal of Public Health Emergency, COVID-19
2022	2022-003	Pueblo of Laguna	Flood
2022	2022-002	Rio Arriba County	Snow
2022	2022-001	Socorro County	Flood
2021	2021-067	State of New Mexico	Renewal of Public Health Emergency, COVID-19
2021	2021-065	Socorro County	Flood
2021	2021-064	Catron County	Flood
2021	2021-061	State of New Mexico	Renewal of Public Health Emergency, COVID-19

Year	EO Number	Location	Disaster type
2021	2021-058	State of New Mexico	Renewal of Public Health Emergency, COVID-19
2021	2021-056	Doña Ana County	Flood
2021	2021-054	State of New Mexico	Renewal of Public Health Emergency, COVID-19
2021	2021-053	Rio Arriba County	Flood
2021	2021-051	Village of Ruidoso	Flood
2021	2021-050	Mora County	Flood
2021	2021-049	State of New Mexico	Renewal of Public Health Emergency, COVID-19
2021	2021-047	Doña Ana County	Flood
2021	2021-044	State of New Mexico	Renewal of Public Health Emergency, COVID-19
2021	2021-042	City of Belen	Flood
2021	2021-041	Eddy County	Flood
2021	2021-040	Valencia County	Flood
2021	2021-030	State of New Mexico	Renewal of Public Health Emergency, COVID-19
2021	2021-028	State of New Mexico	Drought and Severe Fire Conditions
2021	2021-027	City of Roswell	Flood
2021	2021-026	Lincoln County	Flood
2021	2021-025	Chaves County	Flood
2021	2021-023	State of New Mexico	Renewal of Public Health Emergency, COVID-19
2021	2021-012	State of New Mexico	Renewal of Public Health Emergency, COVID-19
2021	2021-011	State of New Mexico	Renewal of Public Health Emergency, COVID-19
2021	2021-010	State of New Mexico	Renewal of Public Health Emergency, COVID-19
2021	2021-004	State of New Mexico	Renewal of Public Health Emergency, COVID-19
2021	2021-002	State of New Mexico	Threat of Riots and Insurrection
2021	2021-001	State of New Mexico	Renewal of Public Health Emergency, COVID-19
2020	2020-085	State of New Mexico	Renewal of Public Health Emergency, COVID-19
2020	2020-084	State of New Mexico	Drought
2020	2020-083	State of New Mexico	Renewal of Public Health Emergency, COVID-19

Year	EO Number	Location	Disaster type
2020	2020-080	State of New Mexico	Renewal of Public Health Emergency, COVID-19
2020	2020-079	Socorro County	Flood
2020	2020-078	Truth or Consequences	Flood
2020	2020-077	Village of Williamsburg	Flood
2020	2020-073	State of New Mexico	Renewal of Public Health Emergency, COVID-19
2020	2020-064	State of New Mexico	Renewal of Public Health Emergency, COVID-19
2020	2020-059	State of New Mexico	Renewal of Public Health Emergency, COVID-19
2020	2020-055	State of New Mexico	Renewal of Public Health Emergency, COVID-19
2020	2020-053	State of New Mexico	Renewal of Public Health Emergency, COVID-19
2020	2020-040	State of New Mexico	Drought and Severe Fire Conditions
2020	2020-036	State of New Mexico	Renewal of Public Health Emergency, COVID-19
2020	2020-033	Curry and Eddy Counties	Flood
2020	2020-032	Roosevelt County	Flood
2020	2020-030	State of New Mexico	Renewal of Public Health Emergency, COVID-19
2020	2020-027	City of Gallup	Public Health Emergency, COVID-19
2020	2020-026	State of New Mexico	Renewal of Public Health Emergency, COVID-19
2020	2020-022	State of New Mexico	Renewal of Public Health Emergency, COVID-19
2020	2020-004	State of New Mexico	Public Health Emergency, COVID-19
2019	2019-035	Hidalgo, Luna, and Socorro Counties	Flood
2019	2019-014	Rio Arriba and Sandoval Counties	Flood
2019	2019-009	State of New Mexico	Severe Wind, Tornados, Hail, and Power Outages
2019	2019-008	State of New Mexico	Severe Winter Storms

UNM Disaster History
Recent natural disasters and associated costs for UNM properties are shown in Appendix (TBD) (This information will be added to the Appendix once the accurate information is received.

UNM does not report any losses under $2,500 to insurance as a claim (this is the property insurance deductible for damages resulting from natural disasters/weather). Losses resulting in damages of lesser value will not be reported to the attention of Risk Services consistently. Many of the losses fall in this category. Maintenance issues identified above are not reported as an insurance claim based on standard insurance language.

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

In this document 'critical asset' means UNM people, functions, and structures that are vital to maintaining 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 UNM HMAC member was asked to review the current list of UNM buildings and infrastructure components related to their area of responsibility and 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. Additionally, the 2009 UNM Consolidated Master Plan (adopted in 2011) was analyzed to determine the potential risk associated with future land use and development.

The following table shows the categories of assets addressed in the UNM HMP planning process, including people, infrastructure, and facilities.

Table 17: 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 ongoing 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 HMAC and is maintained by the UNM's Emergency Management.

UNM contains many significant historical resources. 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 creating a sense of place. Details about these historic resources can be viewed on the UNM Board of Regents' Historic Preservation Committee website (https://historicpreservation.unm.edu/preservation-plan/index.html).

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, both operational and geographical. Based on the evaluation conducted by the HMAC (as described under the Critical Assets section), significant changes in development have been documented. Relevant examples of new construction and renovation of pre-existing facilities include[11]:

- Clark Hall Renovation
- Farris Engineering Center Renovation
- Johnson Center Expansion and Renovation
- La Posada Renovation
- Lobo Rainforest
- McKinnon Center for Management (MCM) Construction
- Natural History Science Center Renovation
- New Hospital Tower and Parking Garage Construction
- New Mexico Mutual Champions Training Center
- Physics & Astronomy Interdisciplinary Science Building (PAIS)
- ROTC Education Complex Renovation
- Smith Plaza Renovation
- UNM Los Alamos Library Renovation
- UNM Taos Pathways to Careers Center Construction
- UNM Valencia Campus Modernization
- UNM Valencia Campus Workforce Training Center (VWTC) Construction

The HMAC 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 dams). 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 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 13. 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 is alphabetical and does not reflect the relative levels of risk they pose to the state.

Exposure and Vulnerability of the Built Environment

[11] https://pdc.unm.edu/construction/recently-completed-projects.html

Dam Failure

Hazard Characteristics

Any malfunction or abnormality outside the design assumptions and parameters that adversely affect a dam's primary function is considered a dam failure. A catastrophic dam failure is characterized by a sudden, rapid, and uncontrolled release of impounded water. The sudden release of water may result in downstream flooding affecting life, property, and agriculture. Flooding, earthquakes, blockages, landslides, lack of maintenance, improper operation, poor construction, vandalism, or acts of terrorism can cause dam failures. The sudden release of the impounded water can occur during a flood that overtops or damages a dam, or it can occur on a clear day if the dam has not been properly constructed or maintained. Dam failures can occur anywhere there is a dam, but the threat from dam failures can increase as existing dams age. In New Mexico, floodplain maps do not include dam breach inundation areas, because the probability of occurrence is not the same. Therefore, downstream residents can be unaware of the potential dangers.

The Office of the State Engineer (OSE) Dam Safety Bureau regulates the design, construction, reconstruction, modification, removal, abandonment, inspection, operation, and maintenance of dams 25 feet or greater in height with more than 15 acre-feet of storage or dams that store 50 acre-feet or more with at least six feet in height. Dams that fall below these height and storage criteria are considered non-jurisdictional dams. While the Office of the State Engineer does not regulate non-jurisdictional dams, the Office of the State Engineer can exercise authority over a non-jurisdictional dam if it is considered unsafe and a threat to life or property. Federal dam owners are required to obtain a permit for new dams, although the Office of the State Engineer does not ensure the continued safety of Federal dams.

Standard practice among Federal and State dam safety offices is to classify a dam according to the potential impact a dam failure (breach) or mis-operation (unscheduled release) would have on downstream areas. The hazard potential classification system categorizes dams based on the probable loss of human life and the impacts on economic, environmental, and lifeline facilities. The Dam Hazard Potential Classification definitions are based on the probable loss of human life and the impacts of economic, environmental, and lifeline facilities. These classifications were provided by the OSE and may be used as a tool to exercise authority over non-jurisdictional dams to determine safety and potential threats to life.

The NID utilizes 4 categories to indicate the potential hazard to the downstream area resulting from failure including Low, Significant, High, and Undetermined.

- High Hazard Potential – dams for which failure or disoperation would probably cause a loss of life.
- Significant Hazard Potential – dams where the failure results in no probable loss of human life but can cause economic loss, environment damage, disruption of lifeline facilities, or impact other concerns.
- Low Hazard Potential – dams where failure results in no probable loss of human life and low economic and/or environmental losses (typically limited to the owner's property).
- Undetermined – dams that have not yet been adequately assessed.

Note that the hazard potential ratings do not reflect the likelihood of dam failure, merely the consequences if a failure did occur. While a dam failure is considered unlikely, given the presence of high-hazard potential dams in the planning area, the magnitude of impacts could include loss of life and extensive property damage.

According to the National Inventory of Dams (NID), as of January 1, 2023, there are 401 dams in the State classified as follows:

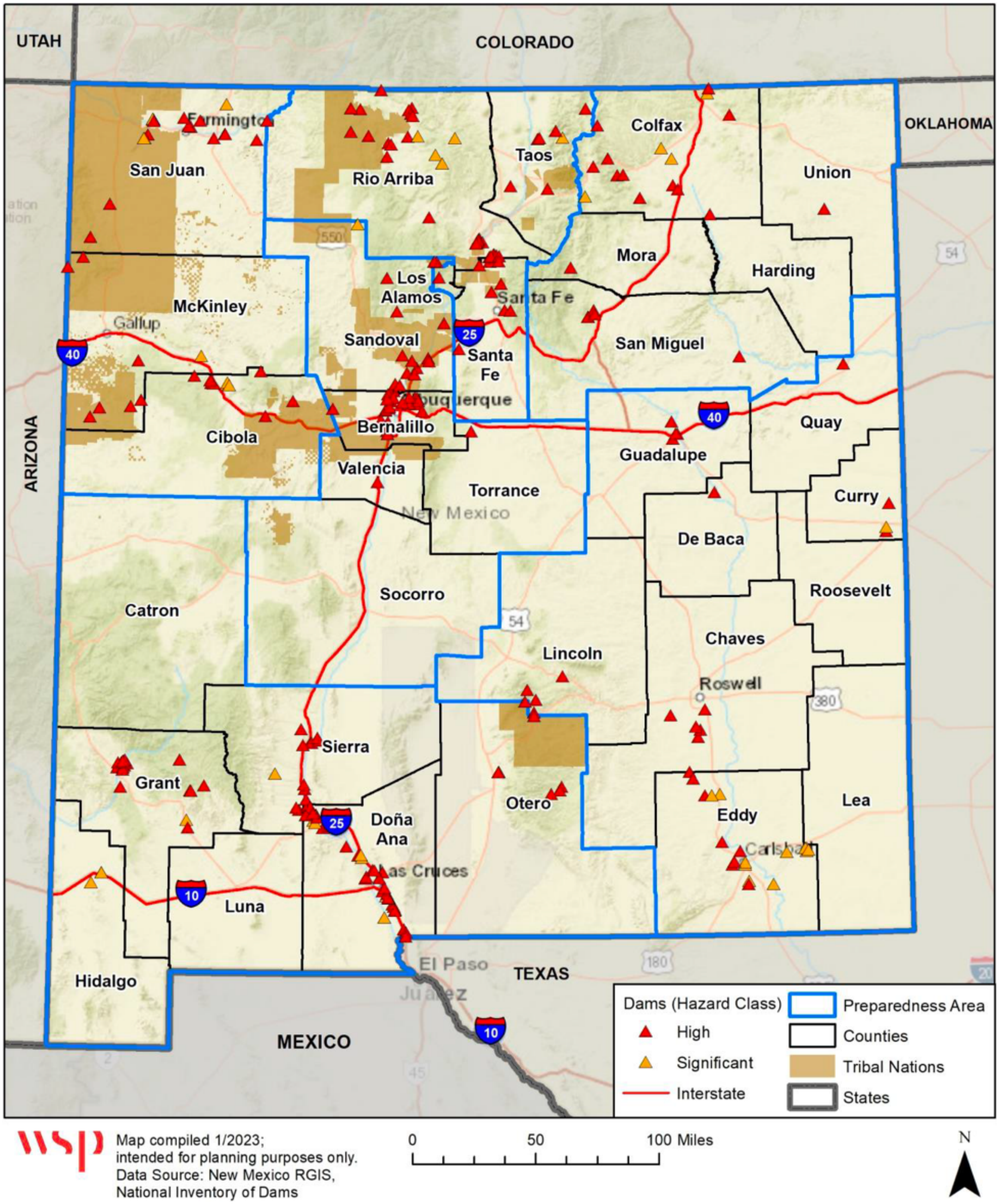
- 222 high hazard potential
- 45 significant hazard potential
- 128 low hazard potential
- 6 undetermined

Of these 401 dams, 292 come under the jurisdiction of the State Dam Safety Bureau.

The Association of State Dam Safety Officials indicates that, in the absence of a formal inundation map, for dams with a maximum storage capacity of 100,000 acre-feet or more High hazard dams, downstream development within five miles is considered to be at risk to potential dam failure hazards. For dams with a maximum storage capacity between 10,000 and 100,000 acre-feet or Significant hazard dams, downstream development within three miles is considered at risk to potential dam failure hazards. For dams with a maximum storage capacity of less than 10,000 acre-feet, or Low hazard dams, downstream developments within one mile are considered at risk to potential dam failure hazards.

The high and significant hazard dams in the State are mapped as follows:

Figure 16: High and Significant Hazard Dams in New Mexico



Dams classified as high or significant hazard potential are required to prepare, maintain, and exercise of an Emergency Action Plan (EAP). The EAP identifies defensive action to prevent or minimize property damage, injury, or loss of life due to an emergency at the dam. Each EAP has inundation maps based on modeling the dam failure under various operational conditions. About half of the State's high hazard potential dams, reported having an EAP in place, while the other half do not have an EAP on record. Assisting dam owners in the development of EAPs was addressed as a Mitigation Action in the State of New Mexico's 2018 and 2023 HMP.

Albuquerque - This hazard may be overlooked during times of drought. Due to data limitations related to mapped dam inundation zones in the planning area, it is not entirely clear what the impacts of a dam failure would be. Therefore, an initial step towards mitigating the risk would be a dam failure inundation map and study (Bernalillo County has added this as an action item). There are 27 High Hazard Potential dams located within Bernalillo County; 9 other High Hazard Potential dams are located upstream in Sandoval County, including Cochiti and Jemez dams, and many others in northern New Mexico could affect the Rio Grande, Most of the High Hazard dams in the County are designed as flood detention dams and are typically dry. The probability of dam failure is remote and considered to be "unlikely" in terms of frequency classification.

Taos - Per the Taos County Hazard Mitigation Plan, "There are 10 high-hazard dams within Taos County that could result in loss of life and property damage if they failed. According to the National Performance of Dams program, Taos County has never suffered a failure of one of these dams. The probability of future occurrence is considered unlikely. There are no known dam failure events that have occurred in the County. The State Hazard Mitigation Plan made efforts to determine the probability of the occurrence of dam failure. Taos County falls in Preparedness Area 3, which the State determined had a 6% chance of a dam failure occurring in a given year in the region.

Gallup - Per the McKinley County Hazard Mitigation Plan, there is no history of high-hazard dam failures. High hazard dams in the county do not have inundation areas that could impact Gallup and/or UNM Gallup Campus.

Los Alamos – Per the Los Alamos County Plan there is a low likelihood of future occurrences — "No dam failure events have occurred in the County. Further, based on input from the Los Alamos County Hazard Mitigation Planning Committee, it is unlikely that a major dam failure event will occur in Los Alamos County."

Valencia – The USACE National Inventory of Dams (NID) lists one dam in Valencia County. The Houston Arroyo Dam, located north of Belen, is not rated as a high-hazard dam. There have been no known dam incidents/failures involving property damage in Valencia County. The probability of future occurrences is unlikely, less than a 1% annual chance. There are two mitigation action items in the Valencia County Plan – 1. Coordinate with other communities and dam operators to develop a gauge and communication system that would provide warning in the event of a dam failure and 2. Map potential dam failure inundation area. It was noted in the 2022 Valencia County Hazard Mitigation Plan that there has been no measurable progress on these mitigation actions. UNM Valencia Campus will monitor any progress on these Valencia County action items and update this plan accordingly.

Westside – Dam failure inundation limits were available for three dams located in the Rio Rancho area: Corrales Heights Dam No. 1, Enchanted Hills Dam No. 1, and the Montoyas Arroyo Sportsplex Dams. Only a very small portion of Rio Rancho is located within a high-hazard dam failure area, and the majority of that exposure is over areas dedicated for drainage conveyance or owned by SSCAFCA.

UNM Health Sciences Rio Rancho Campus and UNM Sandoval Regional Medical Center are located outside of this high-hazard dam failure area.

Previous Occurrences

According to the State of New Mexico HMP, there have been 43 Dam Incident Notifications in New Mexico from 1890 to 2022, with 18 total failures. Of those 18 failures, 13 were at dams ranked as high hazard, two were at medium hazard dams, two were at low hazard dams, and one was at a dam that no longer exists. UNM has never experienced any impact from a dam failure.

Past Frequency

From 1973 through 2022, there were 20 dam incidents in the state, 5 of which resulted in dam failure. This equates to a past frequency of a dam incident happening every 2.5 years on average, with a dam failure every 10 years. 0 UNM properties were impacted by these 20 dam incidents.

Probability of Future Occurrence

To determine the probability of the University experiencing impacts from future dam failure, the probability or chance of occurrence for the State was calculated based on historical data. Probability was determined based on the number of events that have occurred in each preparedness area over the past 50 years. This gives the percent chance of the event happening in any given year. Table 18 identifies the probability that each Preparedness Area that UNM is present in experiences a Dam Failure event annually.

Table 18: Probability of Occurrence - Dam Incident

Preparedness Area	# of Dam Incidents 1973-2022	Annual Probability of a Dam Incident
PA 3	2	4%
PA 4	1	2%
PA 5	1	2%

Based on previous occurrences and frequency, the probability of dam failure is remote and considered to be unlikely. The HMAC will continue to monitor the availability of dam and levee data and State assessments, and will base future probability estimates on updated, more robust data.

Climate Change Impacts

With a potential for increases in extreme precipitation events due to climate change, dam failure, and dam incidents could become a larger issue if increased rainfall events result in large floods that stress dam infrastructure. Dams are designed partly based on assumptions about a river’s flow behavior. Changes in weather patterns can have significant effects on flow behavior that were not accounted for in the design of a dam. If there are changes, it is conceivable that the dam can lose some or all of its designed margin of safety. Dam operators may be forced to release increased volumes earlier in a storm cycle to maintain the required margins of safety. Such early releases of increased volumes can increase flood potential downstream. Throughout the west, communities downstream of dams have historically experienced increases in stream flows from earlier dam releases.

Data Limitations
As stated in the State HMP, the lack of inundation maps impacts the ability to evaluate the consequences of dam failure which is used to define the risk related to dams. All high hazard dams should have an EAP to better prepare the dam operators and the downstream public in case there is a breach.

What Can Be Mitigated
Potential areas for mitigation activities include gaining access to any EAPs and inundation maps for high-hazard dams that have the potential to impact any UNM property, as well as communicating the risks of living with dams to the UNM community through education and outreach. Many of the flood mitigation actions listed contained within this plan can also be used to reduce the risk of dam inundation.

Summary of Risk to UNM
The lack of inundation maps has impacted the ability to evaluate the consequences of dam failure. UNM Albuquerque Campus, UNM-Valencia, and UNM-Taos are all located in areas with high hazard dams. At this time, with the information known, these UNM properties are not considered to be at direct risk. These campuses should monitor for updates from local/city planners and emergency managers and update this plan accordingly.

Table19: Potential Impacts from Dam Failure Events

Subject	Potential Impacts
Health and Safety of the Public	Flash flooding from dam failure could occur quickly and without warning, putting lives at risk.
Health and Safety of Responders	Same impact as the public
Continuity of Operations	Flash flooding from dam failure can shut down an entire communityfor 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 totalloss. Utilities such as water and sewage may be completely unusable
Environment	Flash flooding from dam failure can cause massive amounts of erosion and can divert natural waterways.
Economic Condition	For any community impacted there can be 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, for the lack of preparedness, or the lack of public awareness of the risk.

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 a particular crop at a particular time. Agricultural drought usually occurs after or during meteorological drought, but before hydrological drought, and can affect livestock and other dryland agricultural operations.
- **Hydrological** drought refers to deficiencies in surface and subsurface water supplies. It is measured as stream flow, snowpack, and lake, reservoir, and groundwater levels. There is usually a delay between a 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 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) (Table 19) 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. hydrological impacts of drought (e.g., reservoir levels, groundwater levels, etc.) take longer to develop. Table 19 depicts the magnitude of drought while Table 20 describes the classification descriptions.

Table 19: Palmer Drought Index

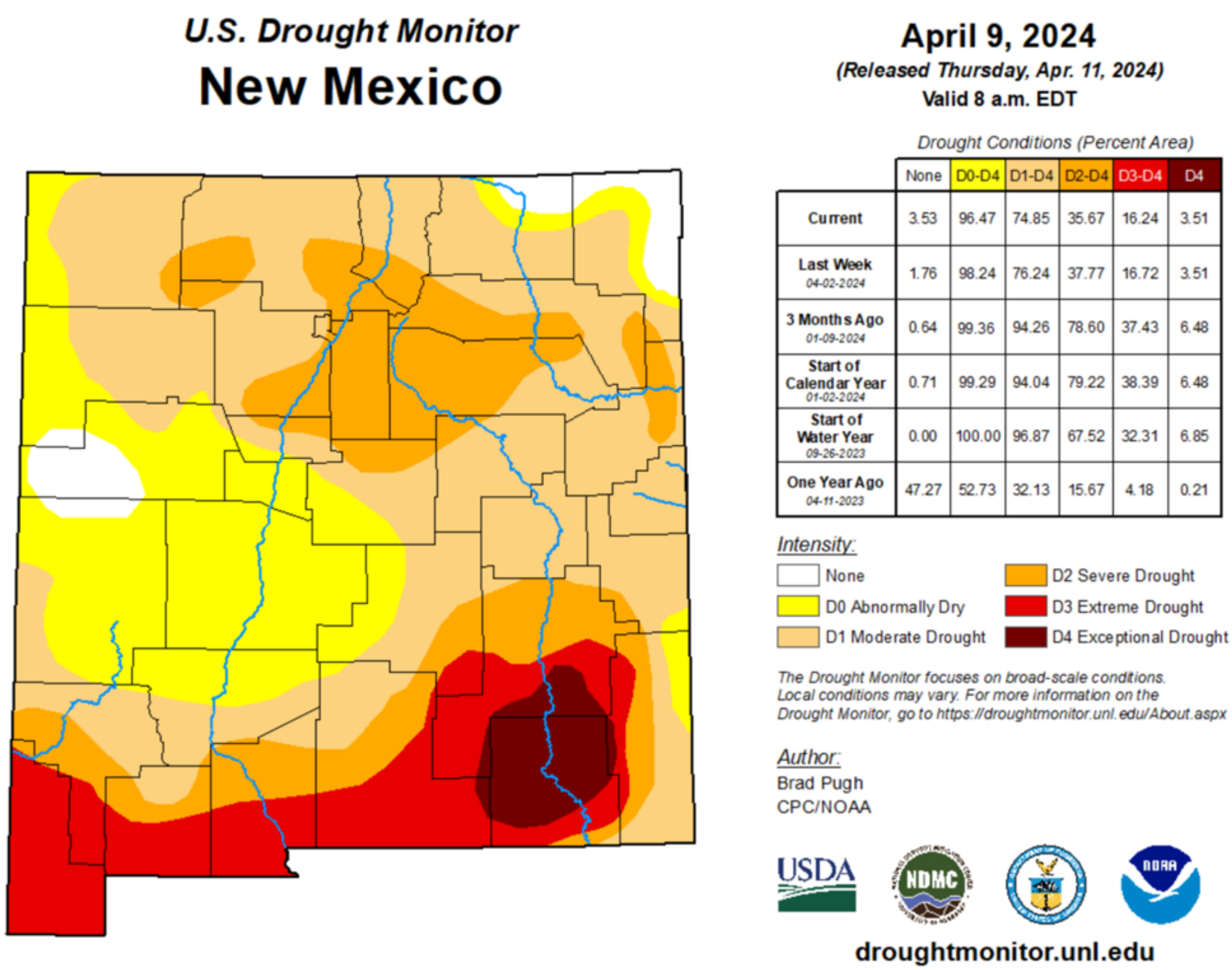
DROUGHT INDEX	DROUGHT CONDITION CLASSIFICATIONS						
	Extreme	Severe	Moderate	Normal	Moderately Moist	Very Moist	Extremely Moist
Z Index	-2.75 and below	-2.00 to -2.74	-1.25 to -1.99	-1.24 to +.99	+1.00 to +2.49	+2.50 to +3.49	n/a
Meteorological	-4.00 and below	-3.00 to -3.99	-2.00 to -2.99	-1.99 to +1.99	+2.00 to +2.99	+3.00 to +3.99	+4.00 and above
Hydrological	-4.00 and below	-3.00 to-3.99	-2.00 to -2.99	-1.99 to +1.99	+2.00 to +2.99	+3.00 to +3.99	+4.00 and above

Table 20: Palmer Drought Category Descriptions

CATEGORY	DESCRIPTION	POSSIBLE IMPACTS	PALMER DROUGHT INDEX
D0	Abnormally Dry	Going into drought: short-term dryness slowing planting, growth of crops or pastures; fire risk above average. Coming out of drought: some lingering water deficits; pastures or crops not fully recovered.	-1.0 to -1.9
D1	Moderate Drought	Some damage to crops, pastures; fire risk high; streams, reservoirs, or wells low, some water shortages developing, or imminent, voluntary water use restrictions requested.	-2.0 to -2.9
D2	Severe Drought	Crop or pasture losses likely; fire risk very high; water shortages common; water restrictions imposed.	-3.0 to -3.9
D3	Extreme Drought	Major crop/pasture losses; extreme fire danger; widespread water shortages or restrictions.	-4.0 to -4.9
D4	Exceptional Drought	Exceptional and widespread crop/pasture losses; exceptional fire risk; shortages of water in reservoirs, streams, and wells, creating water emergencies.	-5.0 or less

Drought is monitored nationwide by the National Drought Mitigation Center (NDMC). Indicators are used to describe broad-scale drought conditions across the U.S. Indicators correspond to the intensity of drought.

Figure 17: US Drought Monitor – New Mexico as of Thursday, April 9, 2024



	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	3.53	96.47	74.85	35.67	16.24	3.51
Last Week 04-02-2024	1.76	98.24	76.24	37.77	16.72	3.51
3 Months Ago 01-09-2024	0.64	99.36	94.26	78.60	37.43	6.48
Start of Calendar Year 01-02-2024	0.71	99.29	94.04	79.22	38.39	6.48
Start of Water Year 09-26-2023	0.00	100.00	96.87	67.52	32.31	6.85
One Year Ago 04-11-2023	47.27	52.73	32.13	15.67	4.18	0.21

Water Use at UNM

UNM Albuquerque Campus is a designated “large water system” by the New Mexico Environment Department. Over 40,000 people use 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.

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 removed for a more sustainable landscape.
- Electricity-saving efforts in unoccupied buildings (holidays and weekends).
- 4 million gallons of water per year are conserved by using reverse osmosis in its heating system.

Precipitation and Reservoir Storage
According to the NWS, precipitation varies between 30-50% below normal across the entire State of New Mexico and is predicted to be so until March 2025 at least (January-March 2025).[12] Snowpack continues to trend downward on the average. The U.S. Environmental Protection Agency found that snowpacks in New Mexico shrunk anywhere from 6% to 62% between 1955 and 2023.[13] Reservoir storage is less than 75% across most of the state, with some as low as 3%, according to the US Geological Services' Current Water Data for New Mexico.[14]

Previous Occurrences
According to the New Mexico Drought Plan, the State has experienced droughts since prehistoric times. Extended drought conditions in the region evidently led to the collapse of many early civilizations. Periods of drought since 1950 have been documented during 1950-1957, 1963-1964, 1976-1978, 1989, 1996, 1998-1999, 1999-2003, 2003-2006, 2011-2013, 2017-2018, and 2020-2022.

All Preparedness Areas in New Mexico have experienced drought conditions over the last 16 years, but much of the State experienced exceptional drought in 2021. 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

Date	Location	Significant Event
Winter 2021	Bernalillo, Catron, Chaves, Cibola, Colfax, Curry, De Baca, Dona Ana, Eddy, Grant, Guadalupe, Harding, Hidalgo, Lea, Lincoln, Los Alamos, Luna, McKinley, Mora, Otero, Quay, Rio Arriba, Roosevelt, Sandoval, San Juan, San Miguel, Santa Fe, Sierra, Socorro, Taos, Torrance, Union, Valencia (PAs 1, 2, 3, 4, 5, and 6)	The US Department of Agriculture designated 33 counties statewide as natural disaster areas due to drought
Spring 2019	Bernalillo, Catron, Chaves, Cibola, Colfax, De Baca, Dona Ana, Eddy, Grant Guadalupe, Harding, Hidalgo, Lea, Lincoln, Los Alamos, Luna, McKinley, Mora, Otero, Quay, Rio Arriba, Roosevelt, Sandoval, San Juan, San Miguel, Santa Fe, Sierra, Socorro, Taos, Torrance, Union, Valencia	The US Department of Agriculture designated 32 counties statewide as natural disaster areas due to drought.

[12] https://www.cpc.ncep.noaa.gov/products/predictions/long_range/lead10/off10_prcp.gif
[13] https://sourcenm.com/2024/03/06/despite-snows-new-mexico-drought-to-continue/
[14] https://waterdata.usgs.gov/nm/nwis/rt

Date	Location	Significant Event
Winter 2018	Colfax, Dona Ana, Harding, Hidalgo, Los Alamos, Luna, McKinley, Mora, Quay, Rio Arriba, San Juan, Taos, Union, Catron, Cibola, De Baca, Grant, Guadalupe, Lea, Otero, Roosevelt, San Miguel, Sandoval, Valencia, Bernalillo, Chaves, Eddy, Lincoln, Santa Fe, Sierra, Socorro, Torrance (PAs 1, 2, 3, 4, 5, and 6)	Every Preparedness Area experienced at least one USDA natural disaster designations due to drought, with counties in Areas 1, 3, 5, and 6 receiving three separate disaster declarations.
January 2015	Bernalillo, Catron, Cibola, Colfax, De Baca, Grant, Guadalupe, Harding, Hidalgo, Lincoln, Los Alamos, Luna, McKinley, Mora, Quay, Rio Arriba, San Juan, San Miguel, Sandoval, Santa Fe, Sierra, Socorro, Taos, Torrance, Union, and Valencia (PAs 1, 2, 3, 4, 5, and 6)	The US Department of Agriculture designated 26 counties statewide as natural disaster areas due to drought.
Winter 2014	Catron, Chaves, Colfax, Curry, De Baca, Dona Ana, Grant, Guadalupe, Harding, Hidalgo, Lea, Lincoln, Los Alamos, Luna, Mora, Otero, Quay, Rio Arriba, Roosevelt, San Juan, San Miguel, Sandoval, Santa Fe, Sierra, Socorro, Taos, Torrance, Union, and Valencia (PAs 1, 2, 3, 4, 5, and 6)	The US Department of Agriculture designated 29 counties statewide as natural disaster areas due to drought.
Summer 2013	Bernalillo, Chaves, Eddy, Luna, Sierra, Catron, Hidalgo, Otero, Socorro, Dona Ana, Lincoln, Sandoval, Valencia, McKinley, Sante Fe, Cibola, Guadalupe, Rio Arriba, Torrance, De Baca, Los Alamos, and San Juan (PAs 1,3, 4, and 5)	The US Department of Agriculture designated 19 counties, from Union and San Juan in the north to Eddy County in the southeast, as natural disaster areas due to heat and drought.

Emergency Management Agency Declared Disasters from Drought
New Mexico Department of Homeland Security and Emergency Management (DHSEM) reports five State Declared Disasters for drought between 2003 and 2022, which had State reimbursement funds available. In the State of New Mexico, there were no Federal Disaster Declarations for drought from 2003 through 2022. From 2012 to 2021, there were 112 USDA Secretarial Disaster designations due to drought in New Mexico. All Preparedness Areas have experienced an USDA Secretarial designation due to drought.

Table 22: State Disaster Event Information 2003 through 2022

Event Type	State Executive Order	Dollar Loss
Drought	2012-006	$500,000.00
Drought	2018-031	
Drought and Severe Fire Conditions	2020-040	
Drought	2020-084	
Drought and Fire Conditions	2022-022	
Total	**5**	**$500,000.00**

Climate Change Impacts
Projections show a decline in snowpack across western states by the mid-21st century, including severe declines at lower elevations and modest declines at high elevations. Additionally, warming temperatures have been resulting in earlier onset of streamflow from melting snow, which may cause a reduction in late summer flows.

The Fourth National Climate Assessment reports that throughout the southwest region, increased temperatures are resulting in decreases in snowpack and its water content, an earlier peak of snow-fed streamflow, and increases in the proportion of rain to snow, all of which exacerbate hydrological drought. Additionally, drought risk is being exacerbated by the depletion of groundwater.

With a warmer climate, droughts could become more frequent, more severe, and longer lasting. From 1987 to 1989, losses from drought in the U.S. totaled $39 billion (Congressional Office of Technology Assessment [OTA] 1993). More frequent extreme events such as droughts could end up being more cause for concern than the long-term change in temperature and precipitation averages. In addition, drought conditions can greatly increase the likelihood and severity of wildfire.

In all likelihood, the direct impacts of climate change on water resources will be hidden beneath natural climate variability. With a warmer climate, droughts and floods could become more frequent, severe, and longer lasting. The potential increase in these hazards is a great concern given the stresses being placed on water resources and the high costs resulting from recent hazards.

Past Frequency
Drought is a regular event in all areas of New Mexico and 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 1999 and continued until 2021. The longest general drought since 1930 was in the 1950's. According to a study published in Nature, the 2000-2021 drought is the driest 22-year period since 800 CE.

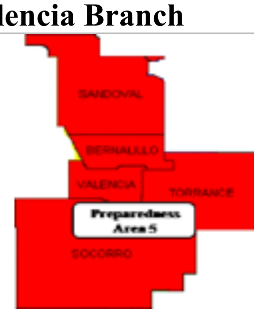
Probability of Future Occurrence
The odds of some parts of the state experiencing drought conditions are nearly 100% per year, even before considering the impacts of climate change. According to the NOAA Climate Prediction Center, the Seasonal Drought Outlook indicates drought conditions will persist for the remainder of 2024.

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

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 23 provides an overview of the drought conditions of Preparedness Areas with UNM campuses and properties that exist as of April 2024.

Table 23: Current Drought Conditions as of April 16, 2024, for Preparedness Areas 3-5

Preparedness Area 3 **UNM-Los Alamos Branch and UNM-Taos Branch**	
Moderate Drought/Severe Drought	
Preparedness Area 4 **UNM-Gallup Branch**	
Abnormally Dry/ Moderate Drought	
Preparedness Area 5 **UNM Albuquerque Campus, UNM Health Sciences Rio Rancho Campus UNM Sandoval Regional Medical Center, UNM Sevilleta Long Term Ecological Research (LTER) Field Station, and UNM-Valencia Branch**	
Abnormally Dry/ Moderate Drought	

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 NCEI.

What Can Be Mitigated

Drought can have lasting impacts on a community, including contributing to the risk of other hazards such as wildfire and flooding. Potential mitigation actions can include building and land use codes, water use restrictions, landscaping regulations, management of invasive plant species, forest and vegetation management, improving water system supply efficiency, and public education on reducing water use.

UNM is a pioneer in sustainability and a committed steward of the Earth's natural resources. The University encourages sustainable practices that support the University's academic, research, health care, and community service mission. UNM has the expertise to tackle water resources and the sustainability of New Mexico's economy, environment, and unique social fabric.

In the Spring of 2019, UNM launched Grand Challenges. Grand Challenges are problems of global, national, and regional significance that require a team of researchers to work together across disciplinary boundaries to develop and implement solutions. When solved, Grand Challenges have a significant positive impact on people and society, in New Mexico and beyond. On February 5, 2019, UNM President Garnett S. Stokes announced one of UNM's Grand Challenges teams will focus on Sustainable Water Resources.

The Sustainable Water Resources research team commits to the following[15]:

- Use the size and strength of UNM's interdisciplinary programs in law, policy, natural sciences, social sciences, and engineering to conduct the research necessary to help decision makers, communities, and individuals make better choices about how they manage water.
- Become a repository of expertise that the state needs to sustainably manage its water, collaborating with other institutions, stakeholders, and citizens throughout the state.
- Train the next generation of water managers and leaders needed to solve the state's water problems.
- Partner with stakeholders and other agencies in the state to develop, refine, and meet water sustainability goals for New Mexico.
- Develop a next-generation decision platform that provides policymakers with superior information with which to make decisions.

Summary of Risk 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 Albuquerque and Branch Campuses' vulnerability to drought is determined low.

Table 24 identifies the potential impacts of a drought.

[15] https://grandchallenges.unm.edu/teams/2019/sustainable-water-resources/index.html

Table 24: Potential Impacts from Drought

Subject	Potential Impacts
HEALTH and SAFETY of the PUBLIC	Increased number of wildfires; Health problemsrelated to low water flows and poor water quality; Health problems related to dust;
HEALTH and SAFETY of RESPONDERS	Increased wildfire risk coupled with limited watersupply 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
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

Earthquake

Hazard Characteristics

Earthquake 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 the earth's interior (body waves) and along the earth's surface (surface waves). P (primary) waves in the earth's interior are physically similar to sound waves in the 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 as 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: Richter Scale and Felt Effects of Earthquakes

Magnitude	Mercalli Intensity	Effects	Frequency Worldwide
Less than 2.0	I	Microearthquakes, not felt or rarely felt; recorded by seismographs.	Continual
2.0-2.9	I to II	Felt slightly by some people; no damage to buildings.	Over 1M per year
3.0-3.9	II to IV	Often felt by people; rarely causes damage; shaking o indoor objects noticeable.	Over 100,000 per year
4.0-4.9	IV to VI	Noticeable shaking of indoor objects and rattling noises; felt by most people in the affected area; slightly felt outside; generally, no to minimal damage.	10K to 15K per year
5.0-5.9	VI to VIII	Can cause damage of varying severity to poorly constructed buildings; at most, none to slight damage to all other buildings. Felt by everyone.	1K to 1,500 per year
6.0-6.9	VII to X	Damage to a moderate number of well-built structures in populated areas; earthquake-resistant structures survive with slight to moderate damage; poorly designed structures receive moderate to severe damage; felt in wider areas; up to hundreds of miles/kilometers from the epicenter; strong to violent shaking in epicentral area.	100 to 150 per year
7.0-7.9	VIII and greater	Causes damage to most buildings, some to partially or completely collapse or receive severe damage; well-designed structures are likely to receive damage; felt across great distances with major damage mostly limited to 250 km from epicenter.	10 to 20 per year
8.0-8.9	VIII and greater	Major damage to buildings, structures likely to be destroyed; will cause moderate to heavy damage to sturdy or earthquake-resistant buildings; damaging in large areas; felt in extremely large regions.	One per year
9.0 and Greater	VIII and greater	At or near total destruction - severe damage or collapse to all buildings; heavy damage and shaking extends to distant locations; permanent changes in ground topography.	One per 10-50 years

Source: US Geological Survey

Table 26: Modified Mercalli Intensity (MMI) Scale

MMI	Felt Intensity
I	Not felt except by a very few people under special conditions. Detected mostly by instruments.
II	Felt by a few people, especially those on upper floors of buildings. Suspended objects may swing.
III	Felt noticeably indoors. Standing automobiles may rock slightly.
IV	Felt by many people indoors and by a few outdoors. At night, some people are awakened. Dishes, windows, and doors rattle.
V	Felt by nearly everyone. Many people are awakened. Some dishes and windows are broken. Unstable objects are overturned.
VI	Felt by everyone. Many people become frightened and run outdoors. Some heavy furniture is moved. Some plaster falls.
VII	Most people are alarmed and run outside. Damage is negligible in buildings of good construction considerable in buildings of poor construction.
VIII	Damage is slight in specially designed structures, considerable in ordinary buildings, and great in poorly built structures. Heavy furniture is overturned.
IX	Damage is considerable in specially designed buildings. Buildings shift from their foundations and partly collapse. Underground pipes are broken.
X	Some well-built wooden structures are destroyed. Most masonry structures are destroyed. The ground is badly cracked. Considerable landslides occur on steep slopes.
XI	Few, if any, masonry structures remain standing. Rails are bent. Broad fissures appear in the ground.
XII	Virtually total destruction. Waves are seen on the ground surface. Objects are thrown in the air.

Source: Multi-Hazard Identification and Risk Assessment, FEMA 1997

Previous Occurrences

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 elongated 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 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 analog 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 from 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 for 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.

Human activity has also triggered some small earthquakes in New Mexico. Earthquake-like ground shaking may be related to oil and gas production and fluid reinjection.

Figure 18 shows the identified faults located in the State of New Mexico. Faults and associated folds are included that are believed to be the source of earthquakes with a magnitude greater than six during the Quaternary Period (the past 1,600,000 years).

Figure 18: Preparedness Areas and Fault Lines in New Mexico

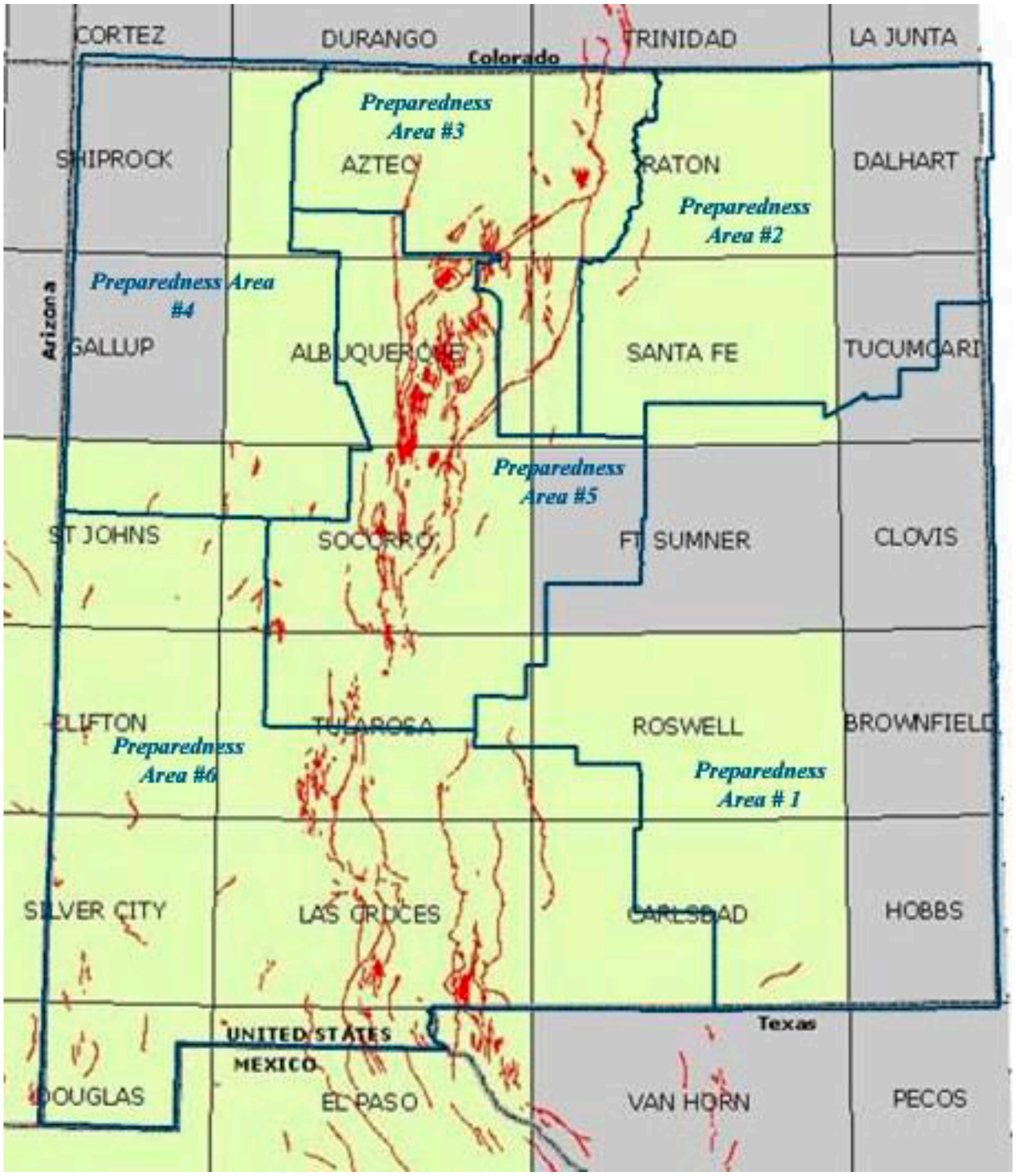
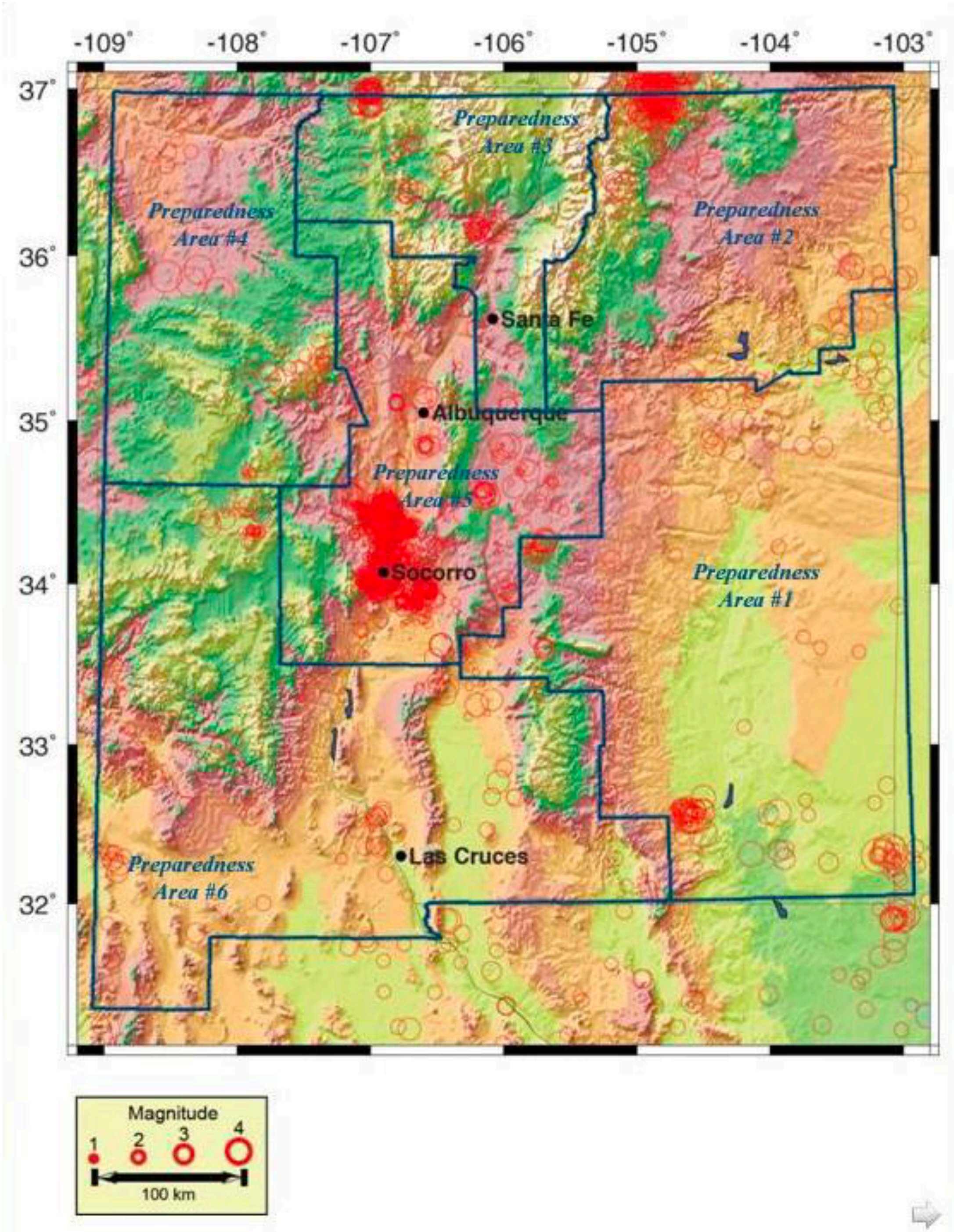


Figure 19 illustrates the earthquake hazard areas in the State of New Mexico. There has been a clustering of earthquake activity around the cities of Socorro and Albuquerque (both located in Preparedness Area 5). Additionally, significant amounts of high-magnitude seismic activity have been recorded in the northeast area of the State in Preparedness Areas 2 and 3.

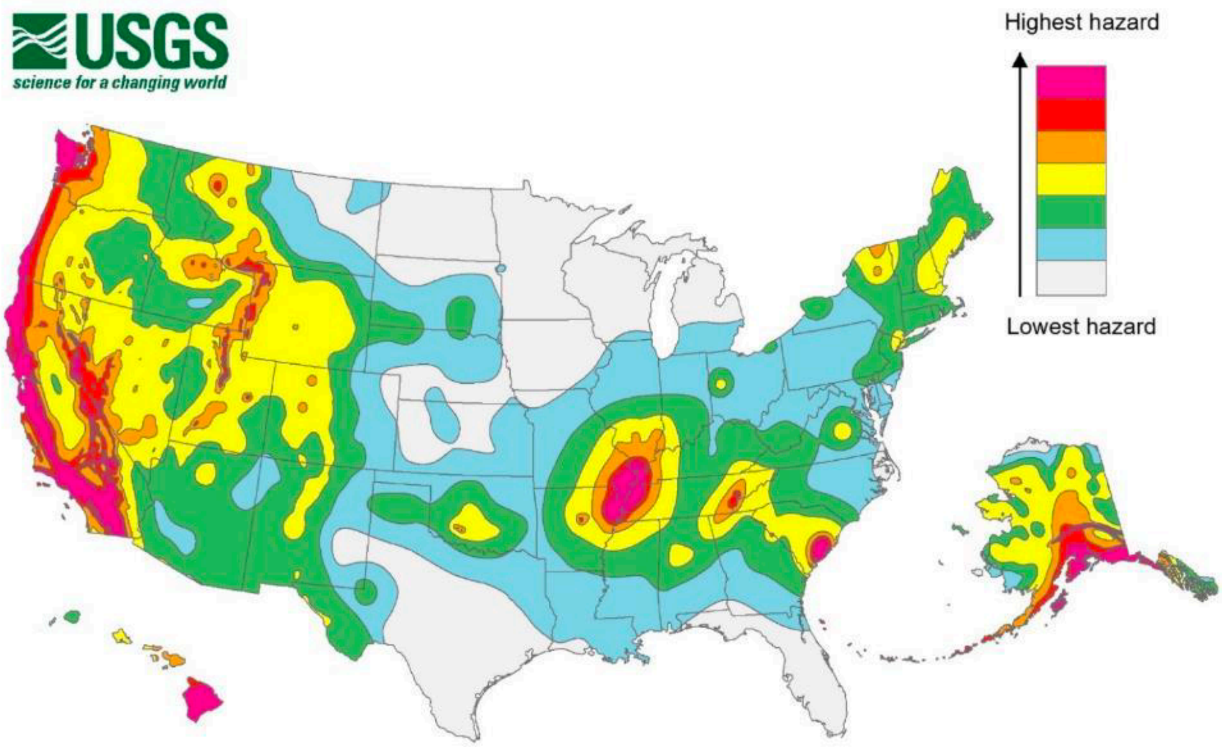
Figure 19: Earthquakes in New Mexico, 1962-2012



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 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.

Figure 20 illustrates the relative seismic risk for New Mexico as compared to the United States overall. While the risk is low to moderate, almost the entire state is potentially at risk of earthquakes.

Figure 20: Seismic Risk in the United States



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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 four 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 seven 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.

Table 27 lists the locations and dates of the strongest earthquakes that have occurred in or near a city/location with a UNM property. There have been no earthquakes reported in the State larger than 4.5 since 2014.

Table 27: Strongest Earthquakes 4.5 and Greater in New Mexico (1989-2022)

Date	Time			Approx. Location		MMI	Moment Magnitude	Nearby City
	Hr.	Min	Sec	Lat.	Long.			
7-Sept-1893	-	-	-	34.7	106.6	VII	5.2	Belen
5-Feb-1931	4	48	-	35	106.5	VI	4.5	Albuquerque
22-Dec-1935	1	56	-	34.7	106.8	VI	4.5	Belen
6-Nov-1947	16	50	-	35	106.4	VI	4.5	Albuquerque
23-Jul-1960	14	16	-	34.4	106.9	VI	4.5	Bernardo
5-Jan-1976	6	23	29	35.9	108.5	VI	4.7	Gallup
29-Nov-1989	6	54	39	34.5	106.9	VI	4.7	Bernardo
29-Jan-1990	13	16	11	34.5	106.9	VI	4.6	Bernardo

Table 28 outlines earthquakes where additional information was available regarding damage reports or unique conditions.

Table 28: Significant Past Occurrence - Earthquake 1918 – 2010

Date	Location	Significant Event
June 29, 2014	50 km west-northwest of Lordsburg, NM	An earthquake that was felt across southwestern New Mexico as far as Roswell. Shaking reported in the cities of Lordsburg, Deming, Las Cruces, and Albuquerque. The greatest intensities (Intensity IV) occurred in Lordsburg, but there was no reported damage. However, across the border in Arizona in the towns of Duncan and Safford, cracks locally occurred on ceilings and floors, picture frames were knocked off walls, and ceiling tiles fell.
September 1, 2009	Socorro, NM (Socorro County) (Preparedness Area 5)	A felt earthquake of local 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 with fairly shallow depths 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 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. 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
September 12, 2007	Reserve, NM (Catron, County) (Preparedness Area 6)	A minor felt earthquake (3.5 USGS) occurred on September 8, 2007 at 1:15:40 am MDT (07:15:40 UTC). The event was located approximately 6 miles (10 km) west-southwest of Reserve, the Catron County seat. The Sheriff's Department in Reserve logged felt reports as far away as Luna (20 miles N) and Apache Creek (15 miles east), as well as reports from the Catron County jail. The

Date	Location	Significant Event
		event was part of a small swarm that lasted several hours. This is an unusual location, historically, for a felt earthquake, although a swarm of felt earthquakes estimated to be as large as 4.5 occurred in the Glenwood Springs, NM region in 1938-1939.
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.
January 23, 1966	Dulce, NM (Rio Arriba County) (Preparedness Area 3)	A magnitude 5.5 earthquake centered near Dulce (Rio Arriba County) affected about 39,000 square kilometers of northwestern New Mexico and southwestern Colorado. Nearly every building in Dulce was damaged to some degree; many buildings had exterior and interior damage and considerable chimney damage was noted. The principal property damage was sustained at the Bureau of Indian Affairs School and Dormitory Complex and at the Dulce Independent Schools. Rock falls and landslides occurred along Highway 17, about 15 to 25 km west of Dulce; in addition, some minor cracks appeared in the highway. Minor damage was also reported at Lumberton, New Mexico, and Edith, Colorado. More than $200,000 damage was inflicted on Indian school facilities in Dulce, NM.
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 the epicenter. Felt over most of New Mexico and in parts of Arizona and Texas.26F

Past Frequency

New Mexico has experienced eight earthquakes of magnitude 4.5 or larger during the 117 years from 1906 to 2022. This equates to a significant quake roughly every 15 years, or a 6% chance in any given year. The greatest threat is along the Rio Grande rift.

Climate Change Impacts
The best available data does not indicate significant impacts on the frequency or severity of earthquakes due to climate change.

Probability of Future Occurrence
The probability of future earthquakes of magnitude 4.5 or larger is estimated to be occasional.

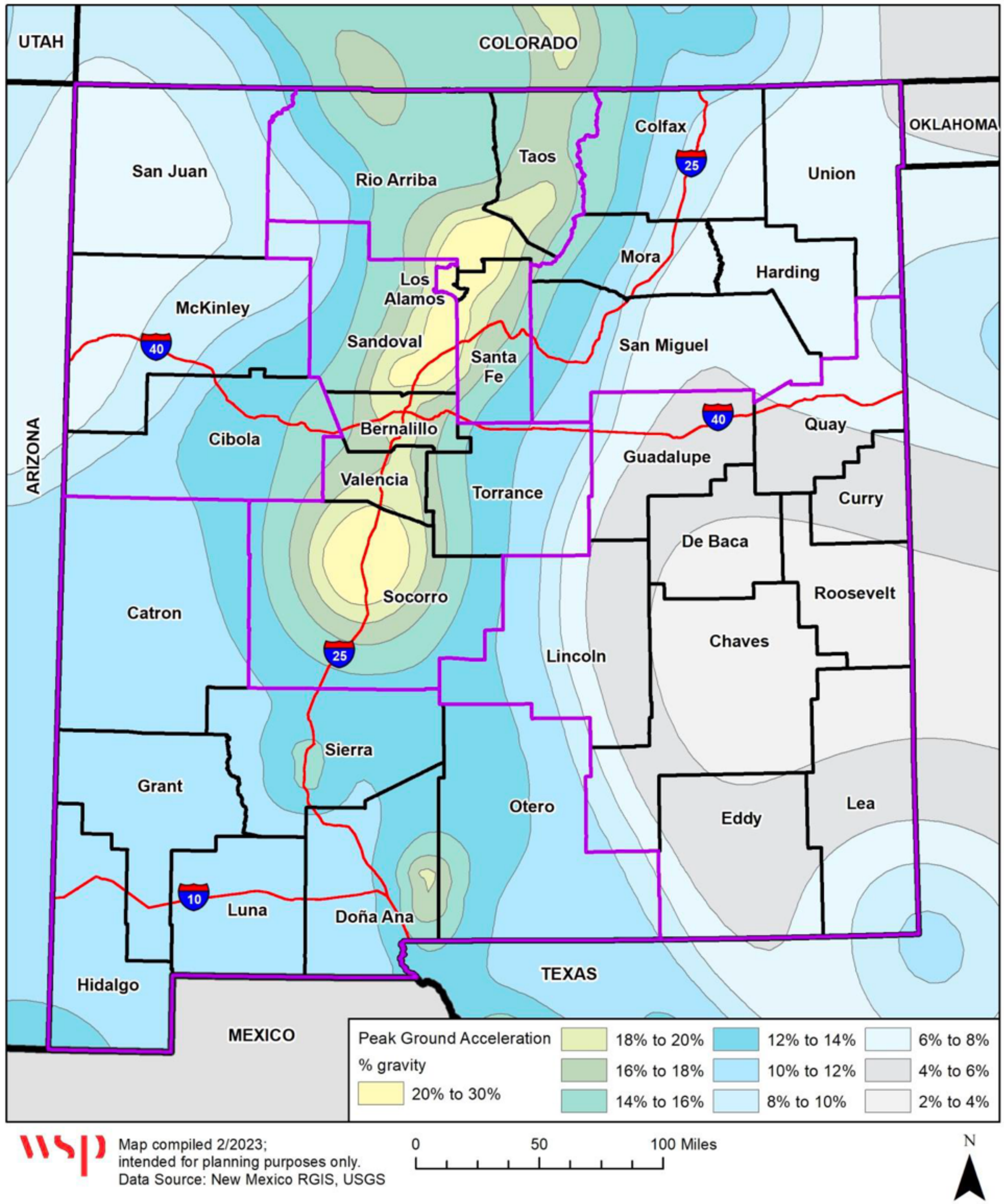
Data Limitations
Present seismic monitoring in New Mexico is conducted by the New Mexico Institute of Mining and Technology and the U.S. Geological Survey National Earthquake Information Center in Golden, CO. Levels of instrumentation and staffing are presently sufficient to generally characterize events 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.

Vulnerability 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 Albuquerque Campus, UNM Valencia Branch, UNM West, UNM Los-Alamos Branch, and the Sevilleta LTER Field station. According to Arup Maji (Professor of Civil and Structural Engineering, University of New Mexico), the likely consequence to New Mexico is the 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.

The following map depicts the maximum probable earthquake epicenter and peak ground acceleration (PGA) calculations. 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 21: Maximum Probable Earthquake Epicenter and Potential Peak Ground Acceleration



Hazus modeling runs were done for each Preparedness Area based on the highest magnitude most probable earthquake, as listed in Table 29. Only Preparedness Areas with UNM properties are listed.

Table 29: Hazus Earthquake Parameters for Each Preparedness Area

	PA 3	PA 4	PA 5
Location	Los Alamos	Farmington	Albuquerque
Longitude	-106.31	-108.22	-106.62
Latitude	35.89	36.72	35.22
Magnitude	7.3	5.5	7.3
Rupture depth (km)	15	5	15
Rupture length	78	3	51
Rupture orientation			0.00 degrees
Fault width (km)			16.4
Note: Albuquerque rupture includes "faults north of Placitas" in addition to the Sandia and Rincon faults. Los Alamos rupture includes the entire Pajarito fault system and the southern Embudo fault system. Nomenclature of faults follows Machette et al. (1998).			

The summary results of the Hazus loss estimations are presented below in Table 30 per Preparedness Area. The modeled losses vary greatly across the State. There are over $2 Billion in anticipated losses for the most probable maximum magnitude earthquake in Preparedness Area 3.

Table 30: Hazus Earthquake Loss Estimates by Preparedness Area

Loss Estimates	PA 3	PA 4	PA 5
Wage	$79.05 M	$28.28 M	$46.82 M
Capital-Related	$62.56 M	$19.87 M	$41.20 M
Rental	$78.08 M	$20.38 M	$50.20 M
Relocation	$195.82 M	$49.96 M	$119.09 M
Income Losses (subtotal)	$415.51 M	$118.50 M	$257.31 M
Structural	$339.00 M	$77.01 M	$180.95 M
Non-Structural	$1.093 B	$233.18 M	$542.11 M
Content	$341.03 M	$101.35 M	$194.90 M
Inventory	$4.63 M	$2.72 M	$3.08 M
Capital Stock Losses (subtotal)	$1.778 B	$414.26 M	$921.04 M
Total Estimated Building-Related Losses	$2.193 B	$532.76 M	$1.178 B
Total Estimated Utility System Losses	$15.90 M	$0.00 M	$1.27 M
Total Estimated Transportation System Losses	$26.43	$4.70 M	$8.20 M
Personal Injury Estimates	734-1,177	125-175	281-421

Preparedness Area 3

As shown in Figure 22, the central portion of the Preparedness Area 3 would experience the most building damage from this modeled earthquake.

Figure 22: Hazus Earthquake Building-Related Loss Estimates by Census Tract

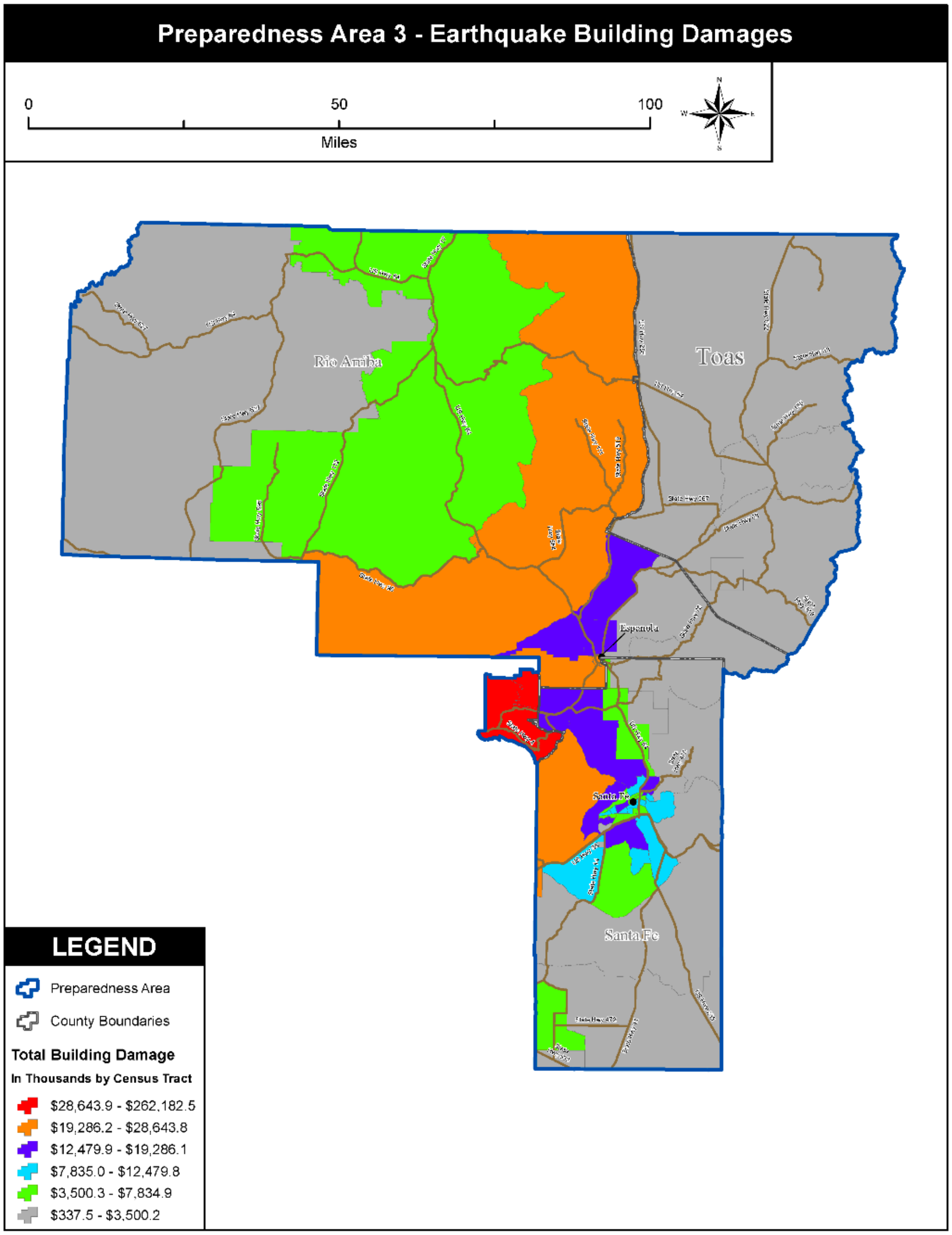


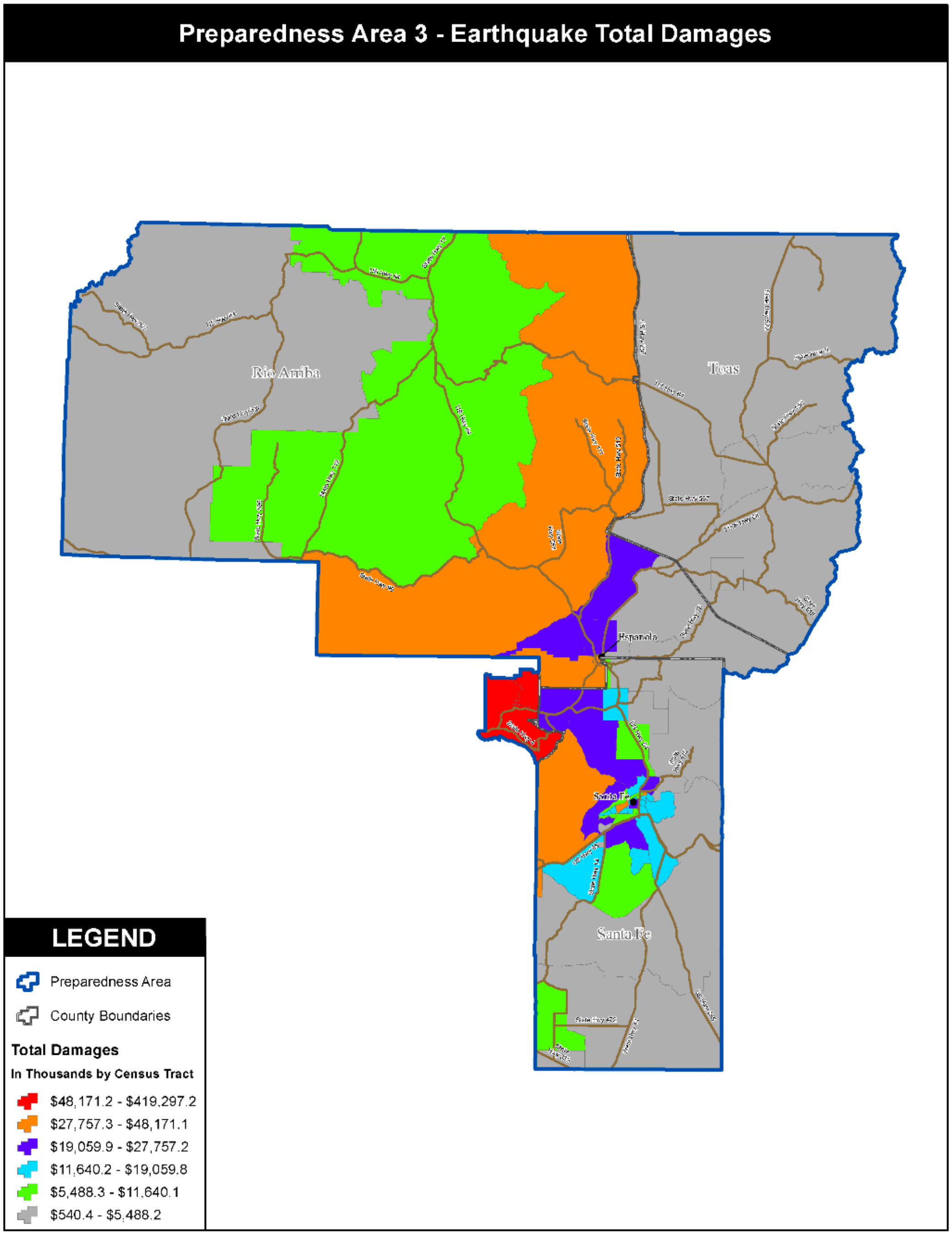
Table 31 presents additional modeled impacts from this same event. Note that all definitions are taken from the Hazus Global Summary Report (GSR).

Table 31: Hazus Earthquake Impacts and Loss Estimates (PA 3)

Impact	Summary of Modeled Impacts
Total Buildings Damaged	Slight: 17,296 Moderate: 12,728 Extensive: 5,239 Complete: 2,224
Total Economic Losses (includes building and lifeline losses)	$2,236.33 million
Damage to Schools	15 with at least moderate damage
Damage to Medical Facilities	2 with at least moderate damage
Damage to Fire Stations	15 with at least moderate damage
Damage to Transportation Systems	5 highway bridges, at least moderate damage 0 highway bridges, complete damage 0 railroad bridges, moderate damage 1 airport facilities, moderate damage
Households without Power/Water Service	Power loss, Day 1: 0 Water loss, Day 1: 0 Water loss, Day 3: 0 Water loss, Day 7: 0 Water loss, Day 30: 0 Water loss, Day 90: 0
Displaced Households	2,032
Shelter Requirements	999 people out of 235,303 total population
Debris Generation	0.74 million tons

Figure 23 shows the total damages resulting from an earthquake in Preparedness Area 3 by census tract. Similar to building damages, the central portion of the Preparedness Area would experience the most in total damages due to an earthquake.

Figure 23: Total Earthquake Damages by Census Tract (PA 3)



Preparedness Area 4

Figure 24 shows this information by census tract on a map. Only a small portion of the north-central region of the Preparedness Area would account for the building damages experienced from this modeled earthquake.

Figure 24: Hazus Earthquake Building-Related Loss Estimates by Census Tract

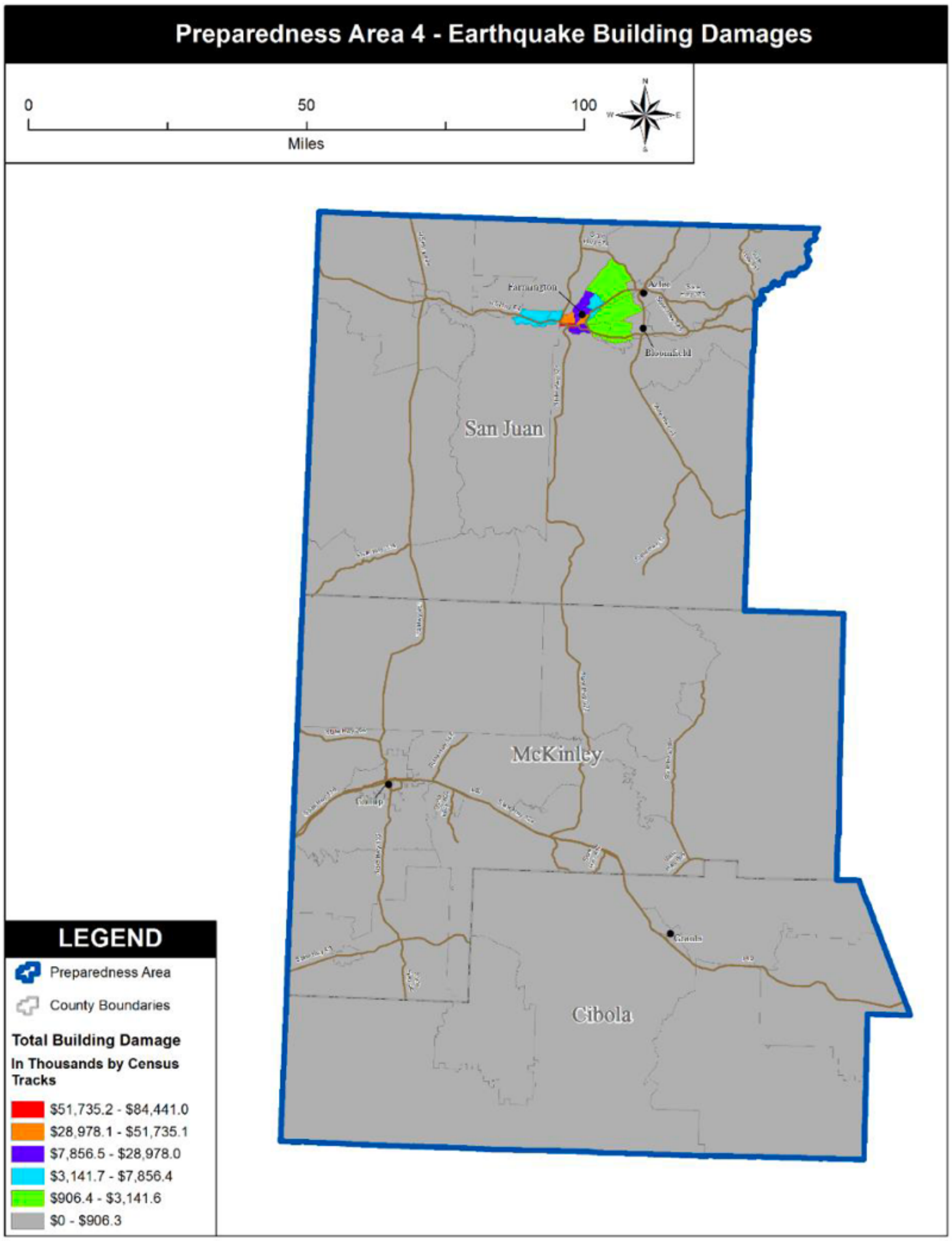


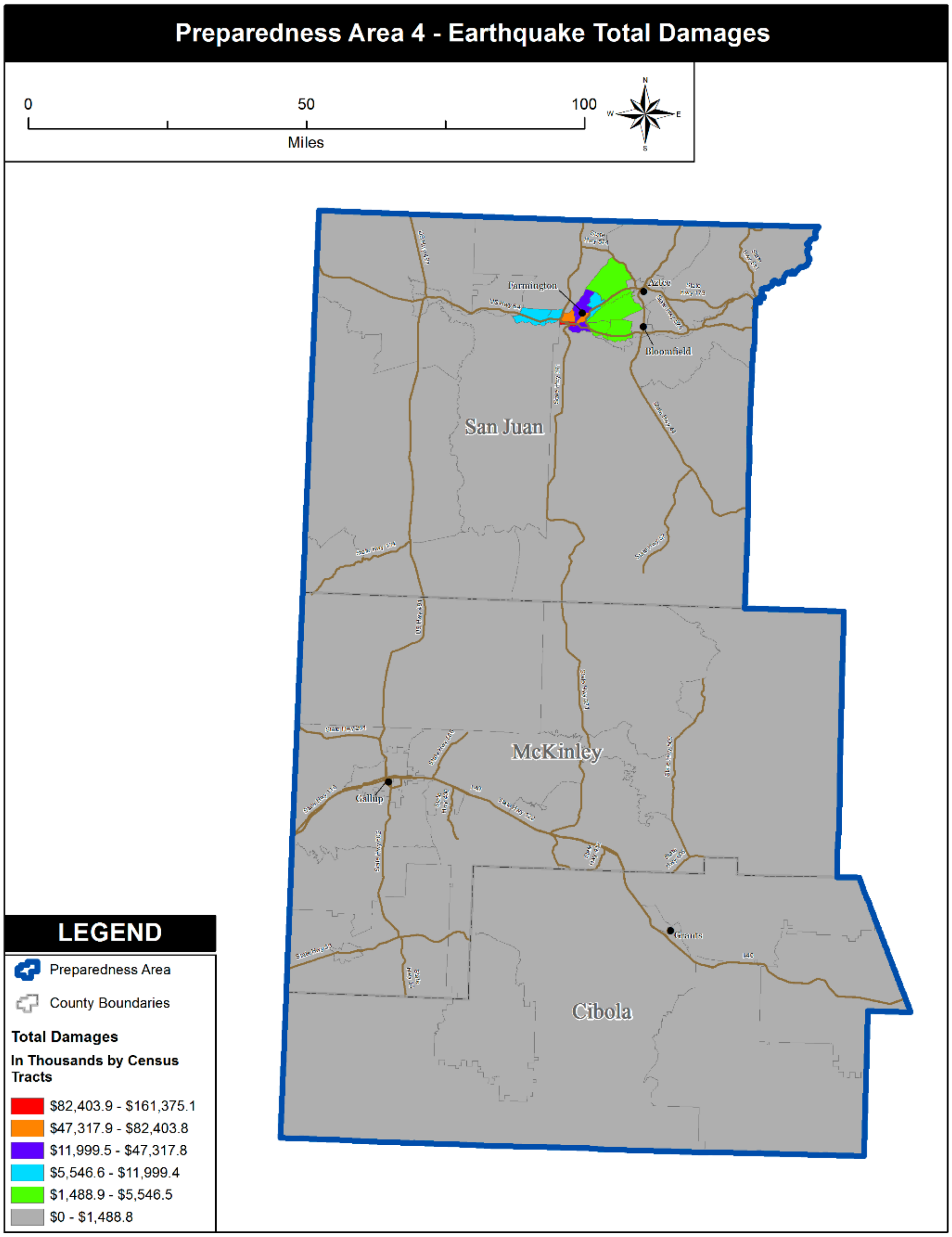
Table 32 presents additional modeled impacts from this same event. Note that all definitions are taken from the Hazus Global Summary Report (GSR).

Table 32: Hazus Earthquake Impacts and Loss Estimates (PA 4)

Impact	Summary of Modeled Impacts
Total Buildings Damaged	Slight: 6,087 Moderate: 4,312 Extensive: 1,384 Complete: 221
Total Economic Losses (includes building and lifeline losses)	$537.50 million
Damage to Schools	0 with at least moderate damage
Damage to Medical Facilities	0 with at least moderate damage
Damage to Fire Stations	0 with at least moderate damage
Damage to Transportation Systems	0 highway bridges, at least moderate damage 0 highway bridges, complete damage 0 railroad bridges, moderate damage 1 airport facility, moderate damage
Households without Power/Water Service	Power loss, Day 1: 0 Water loss, Day 1: 0 Water loss, Day 3: 0 Water loss, Day 7: 0 Water loss, Day 30: 0 Water loss, Day 90: 0
Displaced Households	312
Shelter Requirements	211 people out of 228,749 total population
Debris Generation	0.19 million tons

Figure 25 shows the total damages resulting from an earthquake in Preparedness Area 4 by census tract. Similar to building damages, a small area of the north-central region of the Preparedness Area would experience the most in total damages due to the modeled earthquake.

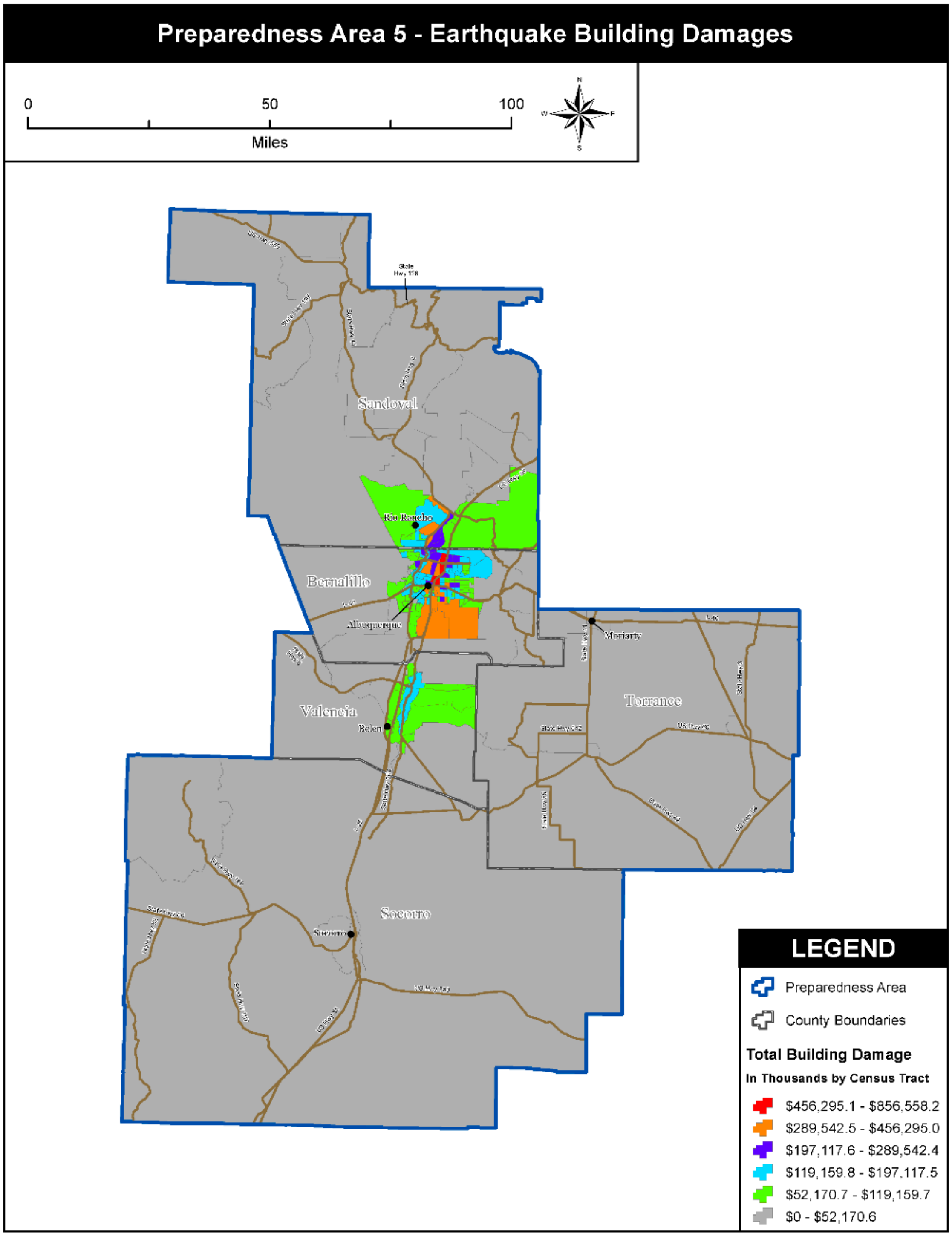
Figure 25: Total Earthquake Damages by Census Tract (PA 4)



Preparedness Area 5

Figure 26 shows building damage information by census tract on a map. The north-central region of the Preparedness Area would experience the most in building damages due to the modeled earthquake.

Figure 26: Hazus Earthquake Building-Related Loss Estimates by Census Tract (PA 5)



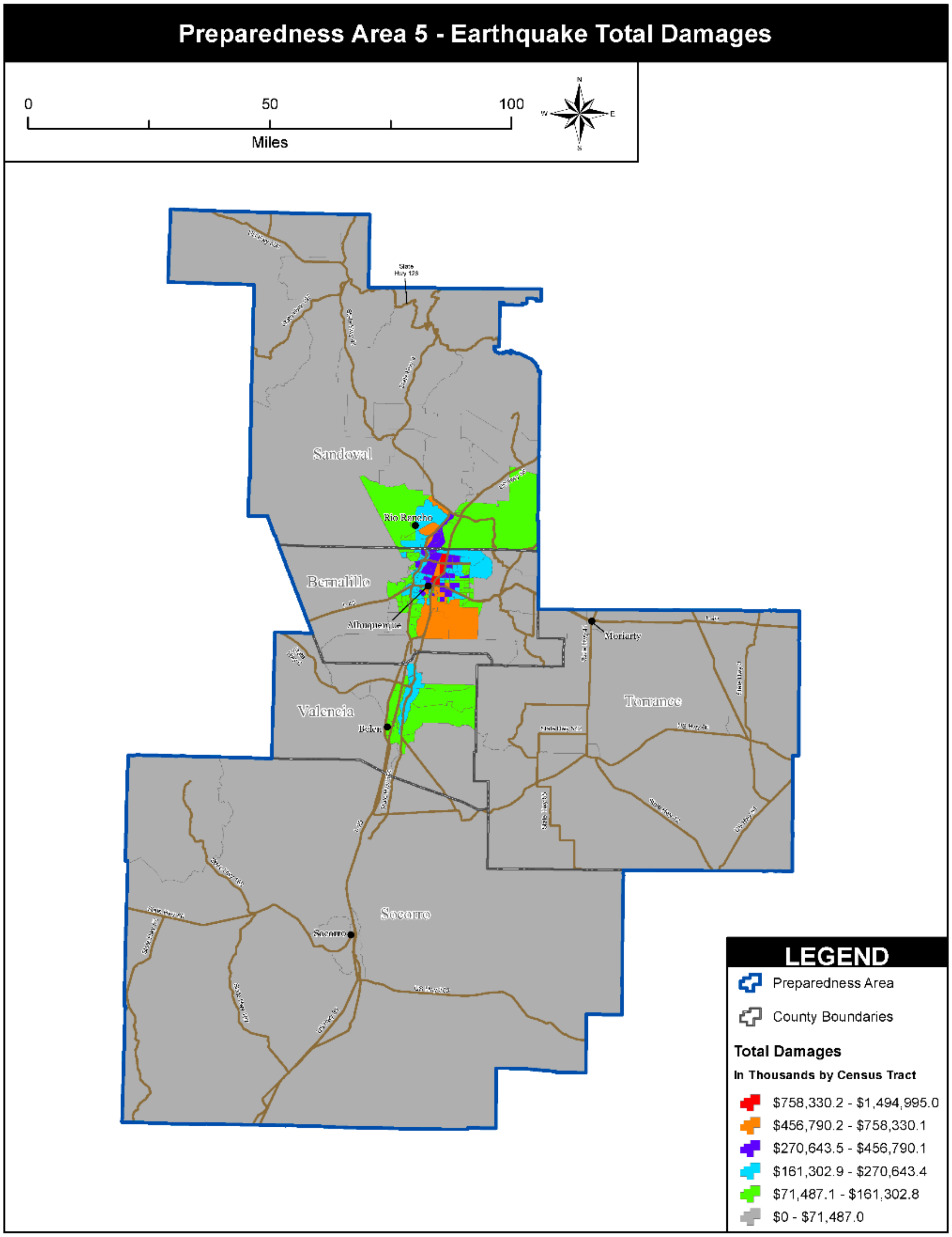
The following Table 33 presents additional modeled impacts from this same event. Note that all definitions are taken from the Hazus Global Summary Report (GSR).

Table 33: Hazus Earthquake Impacts and Loss Estimates (PA 5)

Impact	Summary of Modeled Impacts
Total Buildings Damaged	Slight: 70,823 Moderate: 79,760 Extensive: 52,368 Complete: 68,581
Total Economic Losses (includes building and lifeline losses)	$41,977.57 million
Damage to Schools	122 with at least moderate damage
Damage to Medical Facilities	18 with at least moderate damage
Damage to Fire Stations	4 with at least moderate damage
Damage to Transportation Systems	143 highway bridges, at least moderate damage 67 highway bridges, complete damage 0 railroad bridges, moderate damage 1 airport facilities, moderate damage
Households without Power/Water Service	Power loss, Day 1: 0 Water loss, Day 1: 0 Water loss, Day 3: 0 Water loss, Day 7: 0 Water loss, Day 30: 0 Water loss, Day 90: 0
Displaced Households	67,228
Shelter Requirements	44,206 people out of 904,943 total population
Debris Generation	14.41 million tons

Figure 28 shows the total damages resulting from the modeled earthquake in Preparedness Area 5. Similar to building damages, the north-central region of the area would experience the most in total damages.

Figure 27: Total Earthquake Damages by Census Tract (PA 5)



What Can Be Mitigated

There are no credible seismic damage estimates for UNM Albuquerque Campus, UNM Health Sciences Rio Rancho Campus, UNM Sandoval Regional Medical Center, Gallup Branch Campus, Los Alamos Branch Campus, Taos Branch Campus, Valencia Branch Campus, and Sevilleta LTER Field. More information is needed on the types of structures —their age, condition, and construction type—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 Albuquerque Campus buildings range in age from 1889 to the 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.

Summary of Risk 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 Albuquerque Campus, UNM Health Sciences Rio Rancho Campus, UNM Sandoval Regional Medical Center, Los Alamos Branch Campus, Taos Branch Campus, Valencia County Branch, and Sevilleta LTER Field Station are located within the Rio Grande fault line and are vulnerable to earthquake damage.

The following Table 34 identifies the potential impacts of an earthquake.

Table 34: 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	Not impacted by the event itself, but may be damaged if the response to an event is poor.

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. 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 35). 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 35 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.

Table 35: Heat Index/Heat Disorders

Danger Category	Heat Disorders	Apparent Temperature (0F)
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

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

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

Heat syncope is typically associated with exercise by people who are not acclimated to 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, they are thought to result from a mild imbalance of fluids and electrolytes.

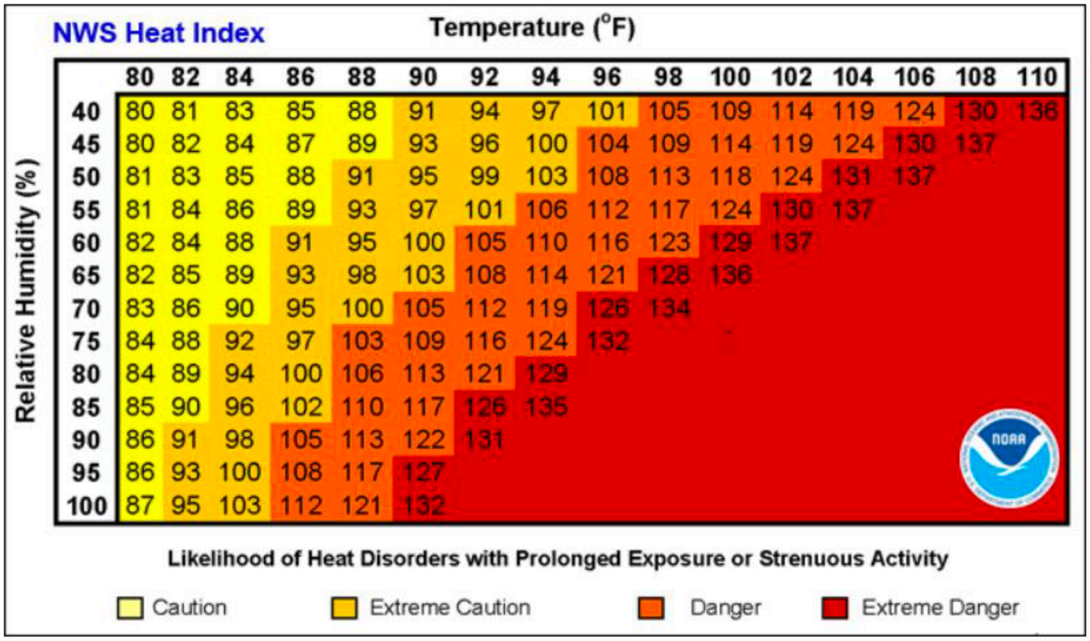
The elderly, disabled, and debilitated are especially susceptible to heat stroke. Large and highly urbanized cities can create an island of heat that can raise the area's temperature by 3° to 5° F. Populations of elderly, disabled, and debilitated people could face a significant medical emergency during 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 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 a heat wave.

A unique aspect of extreme heat in New Mexico is the fact that UVB radiation also increases with increasing altitude or distance above the surface of the earth. For every 1,000 feet of altitude, the UV radiation increases by about 4 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 a similar latitude but at sea level. This can exacerbate heat effects at high altitudes.

In 1979, meteorologist R.G. Steadman developed a heat index (Figure 28) 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. It measures how hot it feels when relative humidity is factored in with the actual air temperature.

Figure 28: Heat Index


NWS Heat Index

Relative Humidity (%) \ Temperature (°F)	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 or Strenuous Activity

Caution · Extreme Caution · Danger · Extreme Danger

Several deaths due to heat events have been recorded by the New Mexico Environmental Public Health Tracking, summarized in Table 36. According to the NWS, young children and infants, older adults, people with chronic medical conditions, and pregnant women are all particularly susceptible to extreme heat. Socially vulnerable communities and communities that have experienced historical oppression are likely to suffer disproportionate impacts from extreme heat events. This may be due to existing disparities in the prevalence of medical comorbidities, inadequate access to healthcare, and residing in areas with a higher risk of extreme heat exposure. Outdoor workers are also at higher risk due to greater exposure to heat.

Table 36: Heat-Related Death by Descendant's County of Residence, 2018-2022

PA	County of Residence	2017	2018	2019	2020	2021	Total
PA 3	Rio Arriba County	0	1	0	0	0	1
	Santa Fe County	0	1	0	0	0	1
PA 4	McKinley County	0	2	0	1	4	7
	Sandoval County	0	1	3	0	0	4
PA 5	Bernalillo County	4	3	2	2	5	16

Previous Occurrences

The State of New Mexico experiences extreme heat events annually. Table 37 highlights significant past occurrences of extreme heat for those areas with UNM facilities recorded by the Department of Homeland Security and Emergency Management.

Table 37: Significant Past Occurrences - Extreme Heat (June 1980 - December 2022)

Date	Location	Significant Event
May 2022	Mora, San Miguel, and Taos Counties (Preparedness Areas 2 and 3)	Hermits Peak fire becomes the largest in New Mexico history, fueled by prolonged drought and unfavorable fire weather (hot, dry, and windy), conditions conducive for wildfire ignition and spread.
June 2021	State of New Mexico (All Preparedness Areas)	New Mexico experienced its warmest nighttime temperatures on record for June, with an average minimum temperature of 62.9°F.
August 2020	State of New Mexico (All Preparedness Areas)	Warmest August on record, with average temperature of 76.2°F 5.3°F above average.
Jan-Dec 2017	State of New Mexico (All Preparedness Areas)	New Mexico had its warmest year on record, with an average +3.5°F anomaly for the year.
November 2017	Albuquerque, NM (Preparedness Area 5)	Albuquerque logged its warmest November in a 127-year record at 52.8° F, 7.9° F above normal.
March 2017	State of New Mexico (All Preparedness Areas)	Warmest March on record, with an average temperature of 51.4°F, 7.9°F above average.
March 2017	Albuquerque, NM Las Cruces, NM (Preparedness Areas 5 and 6)	Albuquerque and Las Cruces, both with over 120 years of record, observed their warmest March. Temperatures at Albuquerque were 6.7° F above normal and 6.6° F above normal in Las Cruces.
July 2016	State of New Mexico (All Preparedness Areas)	The New Mexico statewide average temperature was 76.8°F, 4.1°F above average, tying July 2003 as the warmest month of any month for the state.
June 10, 2013	Albuquerque, NM (Preparedness Area 5)	An infant left inside a hot car for over 2 hours during the afternoon was left in critical condition due to the heat. Temperatures around the city were in the upper 90's to low 100's Fahrenheit.
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 Fahrenheit. 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 93°F.
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°F which may have resulted in temperatures exceeding 135°F in the vehicle.

Date	Location	Significant Event
July 2003	State of New Mexico (All Preparedness Areas)	Hottest month ever recorded in New Mexico. There were 14 days of highs of 100°F or more, and no cooling at night. A new all- time high low temperature of 78°F is set. 21 days do not go below 70°F. Average temperature of 84.6°F for the entire month shatters 1980vrecord of 82.7°F.
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 had been unusually warm and dry throughout the month, but the heat intensified beginning on the 20th with daily high temperatures climbing well above 100°F, except in mountain communities at elevations above 7500 feet. Readings in the southeast section of the State peaked at 108°F to 113°F as these locations exceeded 10 consecutive days with daily highs above 100 ▯ Fahrenheit. New records for duration of 100°F 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°F.
June 27, 1994	Albuquerque, NM (Bernalillo County) (Preparedness Area 5)	Albuquerque area hits 107°F, the highest temperature ever recorded in Albuquerque (the 104°F on June 26 tied the previous record).
Summer (June through August) 1980	Albuquerque, NM (Bernalillo County) (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°F.

Table 38 outlines previously recorded extreme heat events within each Preparedness Area. Note the information in the table below only includes data presented by county and does not include data presented by National Weather Service Forecast Zones.

Table 38: Preparedness Areas 3-5 Extreme Heat History (January 1980 - December 2022)

Preparedness Area 3
UNM-Los Alamos Branch and UNM-Taos Branch

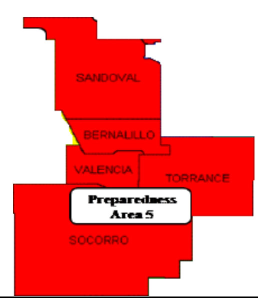
Hazard Type	# of Events	Mag	Deaths	Injuries	Property Damage	Crop Damage
Extreme Heat	0	-	0	0	$0	$0
Heat	2	-	0	0	$0	$0
Total	2	0	0	0	$0	$0

Preparedness Area 4
UNM-Gallup Branch

Hazard Type	# of Events	Mag	Deaths	Injuries	Property Damage	Crop Damage
Extreme Heat	0	-	0	0	$0	$0
Heat	5	-	1	0	$0	$0
Total	5	-	0	0	$0	$0

Preparedness Area 5
UNM Albuquerque Campus, UNM Health Sciences Rio Rancho Campus UNM Sandoval Regional Medical Center, UNM Sevilleta Long Term Ecological Research (LTER) Field Station, and UNM-Valencia Branch

Hazard Type	# of Events	Mag	Deaths	Injuries	Property Damage	Crop Damage
Extreme Heat	0	-	0	0	$0	$0
Heat	7	-	2	0	$0	$0
Total	7	-	2	1	$0	$0



Past Frequency
It is difficult to predict the patterns, frequency, and degree of severity of extreme heat events. The State can experience average summer temperatures from 70 to well over 78 degrees, with temperatures 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 29 displays the average monthly temperature for July from 1950 to 2022, and it shows observed and modeled temperatures from 1900 to 2100, both of which show a clear trend of increasing temperatures.

Figure 29: 2012 Average Temperature and Preparedness Area Map of New Mexico

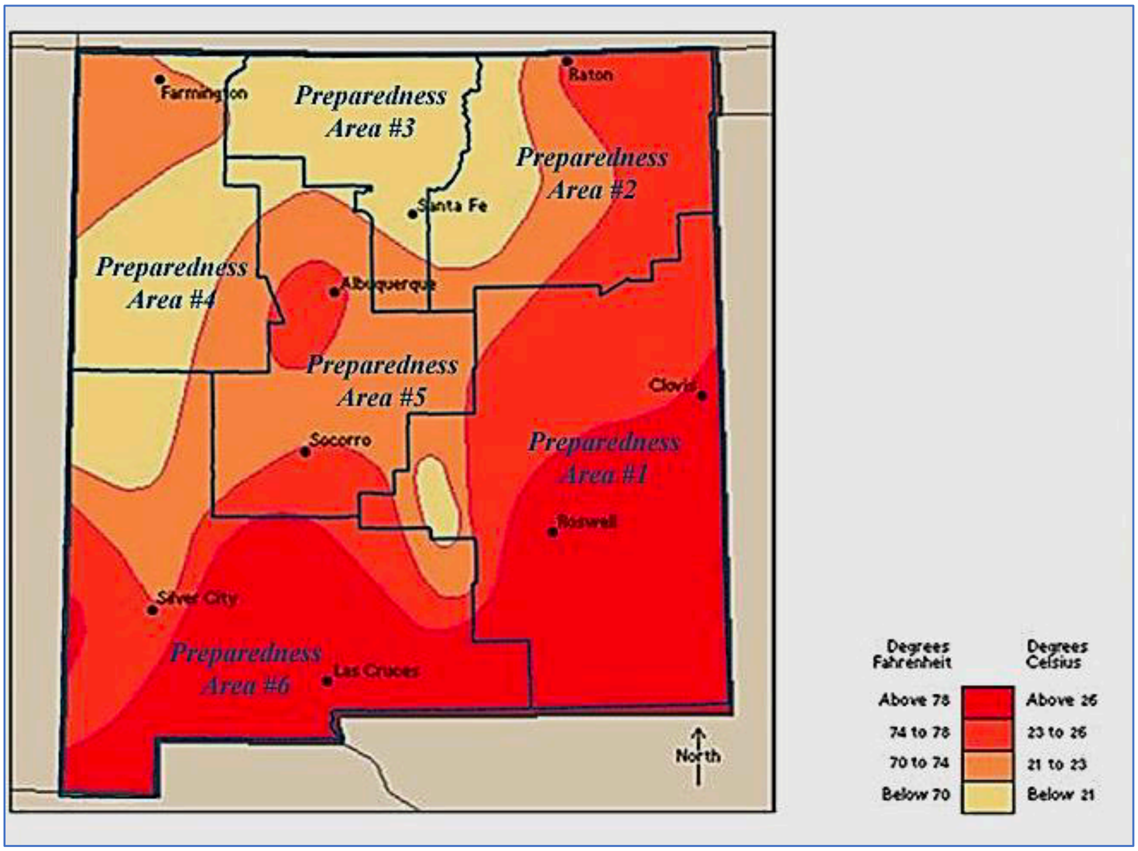


Figure 30: New Mexico Average 1-Month Temperature for July 1950-2023

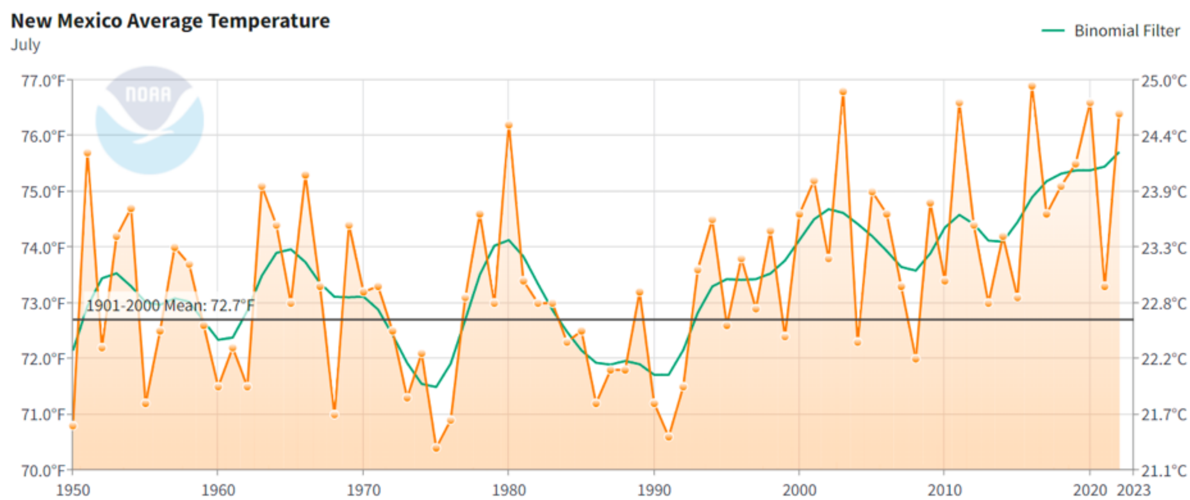
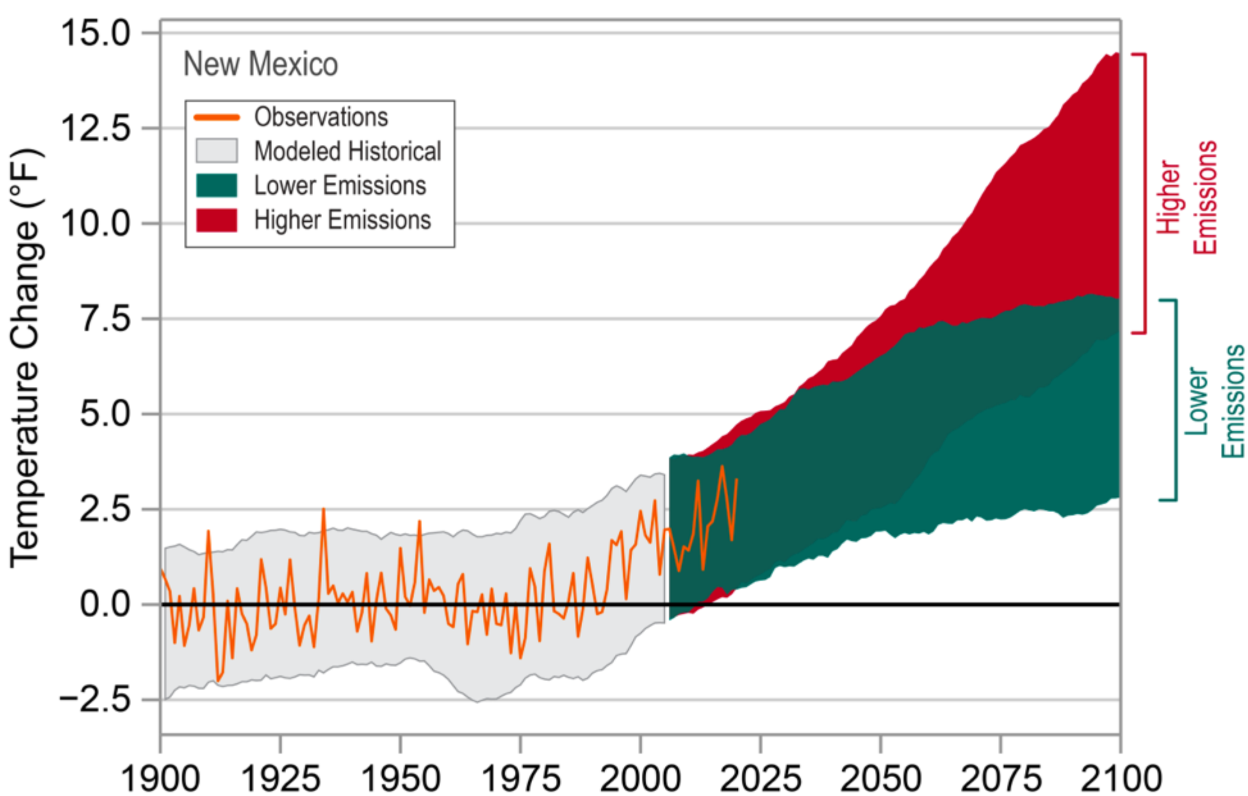


Figure 31: Observed and Projected Temperature in Near-Surface Air Temperature in New Mexico



The National Oceanic and Atmospheric Administration reported above average monthly temperatures in New Mexico for 2017, which was the warmest year since records began in 1893. At each of their climate stations, the average annual temperature was above average. In Albuquerque, the 2017 average temperature was 60.1˚F, almost 3˚F above the mean.

Climate Change Impacts
Climate change is projected to increase the uncertainty of weather patterns and produce more extreme climate-induced events. Scientists have suggested that warming in the Arctic has been linked to changes in the jet stream which may lead to increased polar vortex events. The polar vortex is well documented and is described as large areas of low pressure and cold air surrounding the North and South poles. Increased temperatures in the polar regions have weakened and destabilized the jet stream leading polar air to dip into lower latitudes, bringing it farther south than typical (UC Davis).

Research cited in the Fourth National Climate Assessment indicates that average temperatures have already increased across the Southwest and will likely continue to rise. Figure 32 shows the difference between the 1986-2016 average temperature and the 1901-1960 average temperature. This trend toward higher temperatures is expected to continue and would cause more frequent and severe droughts in the Southwest as well as drier future conditions and an increased risk of megadroughts (dry periods lasting 10 years or more). Additionally, current models project decreases in snowpack, less snow and more rain, shorter snowfall seasons, and earlier runoff, all of which may increase the probability of future water shortages (Gonzalez et al., 2018).

Figure 32: Change in Average Temperature Across the Southwest, 1901-1960 to 1986-2016

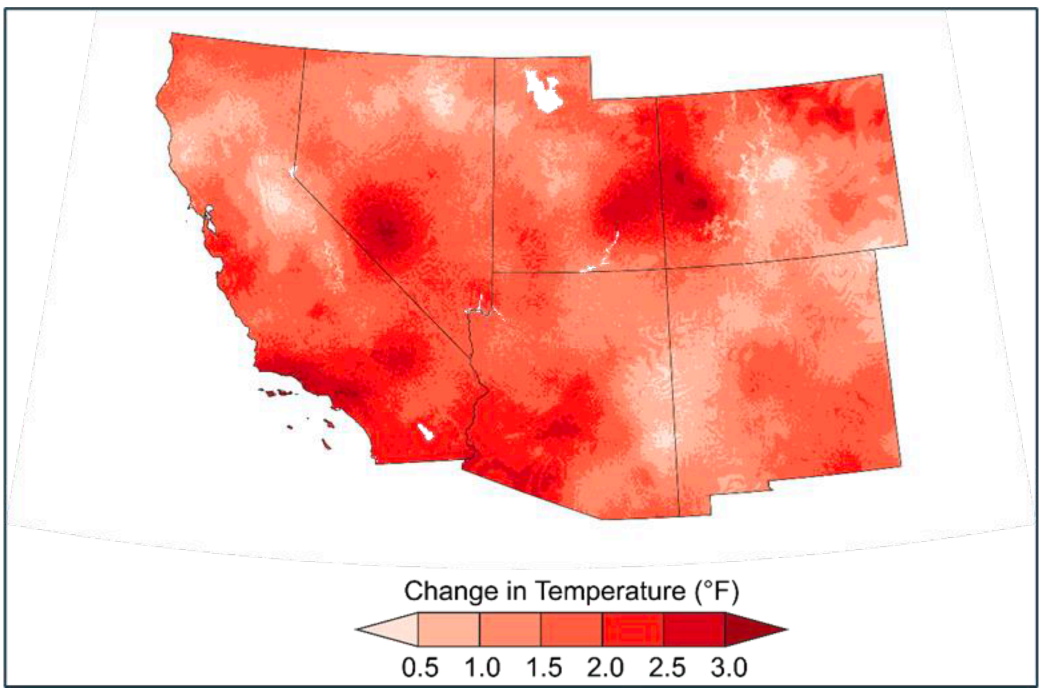
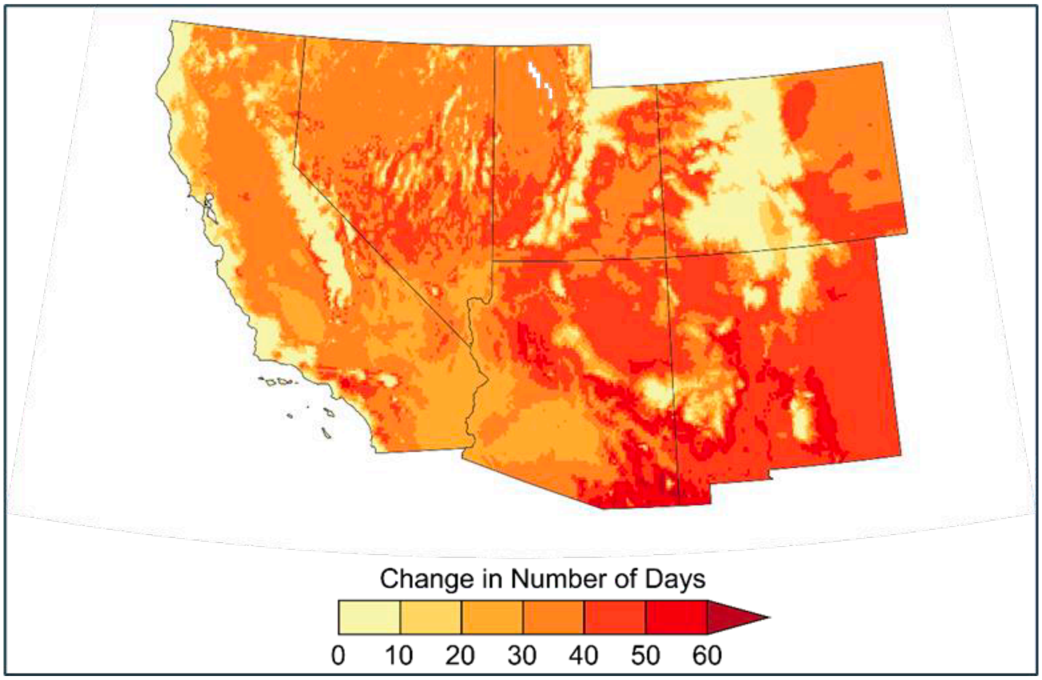


Figure 33: Projected Increases in Extreme Heat



Extreme heat is also expected to increase in frequency. Figure 33 above shows projected increases in extreme heat as an increase in the number of days per year when the temperature exceeds 90°F by the period 2036-2065 compared to the period 1976-2005. Under the higher emissions scenario (RCP8.5), the number of days of extreme heat in much of New Mexico could increase by 30 to 50 days.

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. Table 39 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 (42 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 NCEI would make this probability seem low as extreme heat events are an annual occurrence.

Table 39: Probability of Occurrence - Extreme Heat

Preparedness Area	Extreme Heat
PA 3	5%
PA 4	12%
PA 5	17%

Data Limitations

It is difficult to quantify the vulnerability of individual structures to damage from extreme heat hazards. The NCEI is limited in the number of extreme heat incidents that have occurred in New Mexico.

Vulnerability Assessment
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 the university has many facilities that 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 require a controlled environment. These experiments' losses are of such significance that they are considered irreplaceable due to the years of research involved.

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 types of 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 facilities due to high temperatures. UNM dormitories do not have generators, but they do have emergency power for light.

What Can Be Mitigated
One important part of mitigating extreme heat hazards is education and communication so that people can prepare. UNM can utilize internal and external communication tools to notify students, staff, patients, and other UNM stakeholders of impending extreme heat. UNM can advise stakeholders of the actions they need to take, such as to stay home or to use caution if they must go out. UNM may limit or cancel outdoor activities. UNM can also reduce heat islands on UNM property through tree planting and green infrastructure.

Summary of Risk to UNM
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.

Table 40: Extreme Heat Impacts

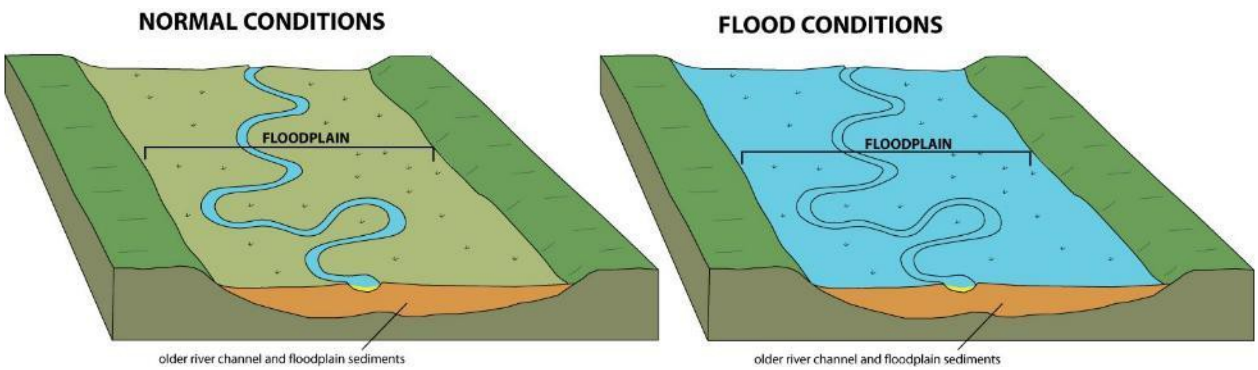
Subject	Impacts
Health and Safety of The Public	Injuries and death have resulted from extreme heat events. Individuals caught outdoors can suffer dehydration and death from high temperatures; Increased wildfire risk
Health and Safety of Responders	Responders face the same impacts as the public.
Continuity 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

Floods/Flash Flooding

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 34 shows the inundation of floodplains during a large-scale weather system with prolonged rainfall from storms or snowmelt.

Figure 34: Flood Definition



For this Plan, 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 underwater for an extended period.

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 41 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, rapid snowmelt, increased impervious surface, or burn scar run-off and can occur suddenly. Although the State of New Mexico experiences riverine flooding, flash flooding is a more common and more damaging type of flooding.

Table 41: Flood Probability Terms

Flood Recurrence Intervals	Chance of Exceedance 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 10th highest flash flood fatality rate in the nation. Flash floods cannot be predicted; however, some conditions are known to make certain areas more vulnerable to flash floods. For example, the presence of hydrophobic soils following high-severity wildfires increases flood hazards in and downstream of the affected watershed. 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.

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 from 2006 - 2012. The flash flooding problem stems from several 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 42 lists the major contributing factors of riverine flooding vs. flash flooding.

Table 42: Flooding vs. Flash Floods – Contributing Factors[16]

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

Alluvial Fans

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". "Over 15-25% of the arid west is covered by alluvial fans," reports FEMA.42F 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 that produce fan floods occur randomly, they nevertheless can develop very rapidly at any time and can recur with frequency. 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. 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,

[16] http://www.weatherexplained.com/Vol-1/Floods-Flash-Floods.html

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 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.

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 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 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 wildfires. 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 a 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.

National Flood Insurance Program, Floodplain Mapping, and Current Status of DFIRMs Maps
UNM does not participate in the National Flood Insurance Program (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 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 of 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).

Through FEMA's flood hazard mapping program, Risk Mapping, Assessment and Planning (Risk MAP), FEMA identifies flood hazards, assesses flood risks, and partners with states and communities to provide accurate flood hazard and risk data to guide them to mitigation actions. Flood hazard mapping is an important part of the National Flood Insurance Program (NFIP), as it is the basis of the NFIP regulations and flood insurance requirements. 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 maintains and updates data through Flood Insurance Rate Maps (FIRMs) and risk assessments. FIRMs include statistical information such as data for river flow, storm tides, hydrologic/hydraulic analyses, and rainfall and topographic surveys. During FEMA's Map Modernization program, Digital Flood Insurance Rate Maps (DFIRMs) for 23 of New Mexico's 33 counties were developed.

Flood hazard areas depicted on the Flood Insurance Rate Map are identified as a Special Flood Hazard Area (SFHA). SFHA's are defined as the area that will be inundated by the flood event having a 1% chance of being equaled or exceeded in any given year. The 1% annual chance flood is also referred to as the base flood or 100-year flood. SFHAs are labeled as Zone A, Zone AO, Zone AH, Zones A1-A30, Zone AE, Zone A99, Zone AR, Zone AR/AE, Zone AR/AO, Zone AR/A1-A30, Zone AR/A, Zone V, Zone VE, and Zones V1- V30. Moderate flood hazard areas, labeled Zone B or Zone X (shaded), are also shown on the FIRM and are the areas between the limits of the base flood and the 0.2-percent-annual-chance (or 500-year) flood. The areas of minimal flood hazard, which are the areas outside the SFHA and higher than the elevation of the 0.2-percent-annual-chance flood, are labeled Zone C or Zone X (unshaded).48 Zone D Areas with possible but undetermined flood hazards, no flood hazard analysis has been conducted. Flood insurance rates are commensurate with the uncertainty of the flood risk. Approximately 34% of mapped areas in New Mexico are designated as Zone D, including nine counties and 18 Tribal Reservations. This Zone D designation adversely impacts residents and local communities economically; communities are unable to determine the actual risk to their residents and businesses, and economic opportunities have been lost due to this zone designation. The large area of New Mexico designated as Zone D significantly impacts local communities and a strategy to lessen the impacts of unknown flood risk needs to be developed.

Figure 35 shows the status of FEMA regulatory maps as of February 2023. Significant additional mapping has been done in recent years. While non-regulatory, these maps are still useful for planning purposes. Figure 36 adds those newer non-regulatory mapped areas to the FEMA mapped areas.

Figures 37-42 delineate Special Flood Hazard Areas (SFHA), or land areas that are identified by FEMA maps as subject to inundation by a flood, for each campus. On these maps, the SFHAs are shaded with different colors and divided into distinct flood hazard zones depicted on the map legend. Floodplain maps are useful tools for identifying the location of flood-prone areas. This information contributes to the development of strategies that may mitigate the potential impacts of a flooding event. The major population centers have zoning and regulatory authority that is adequate to control development and offer some regulatory protections to the population, limiting or restricting development in high-hazard areas. In more remote locations, communities may be eager to encourage development and less prepared to educate the public about the risks from natural hazards ahead of an event. Resources in remote locations for assisting communities after a hazard event are also limited. Remote locations present challenges to providing adequate floodplain mapping to programs such as FEMA's Risk Mapping, Assessment, and Planning (Risk MAP), which can lead to inadequate information on existing maps or a lack of flood maps.

Almost all of New Mexico's recent disaster declarations have been flood-related, and all of the flood declarations since 2008 have been for public assistance (infrastructure) and Hazard Mitigation Grant Program (HMGP) only. This means that vital infrastructure such as roads and bridges are being affected by flooding. While approximate flood mapping allows for flood insurance rates to be determined, it does not provide information about whether bridges and roads may be overtopped or the true depth of flooding. Therefore, the heights that structures and infrastructure need to be elevated to are unknown.

Outdated maps pose similar problems in some jurisdictions. Flood events can alter the floodplain over time or, in some cases, during a single event. The City of Corrales saw up to three feet of silt and sand deposited in some areas and extreme erosion in others during the July 2013 floods. The silt and erosion caused significant changes in elevations in some areas, decreasing or eliminating the usefulness of effective FIRM maps for the area. Several potential mitigation techniques can be applied here. The first would be to update FIRMs which would allow communication of updated risk. Another would be to account for debris in drainage infrastructure since it is a known problem. One other option would be to apply bank stability and erosion protection in the areas where the silt and debris originate.

Figure 35: New Mexico Regulatory Floodplain Maps

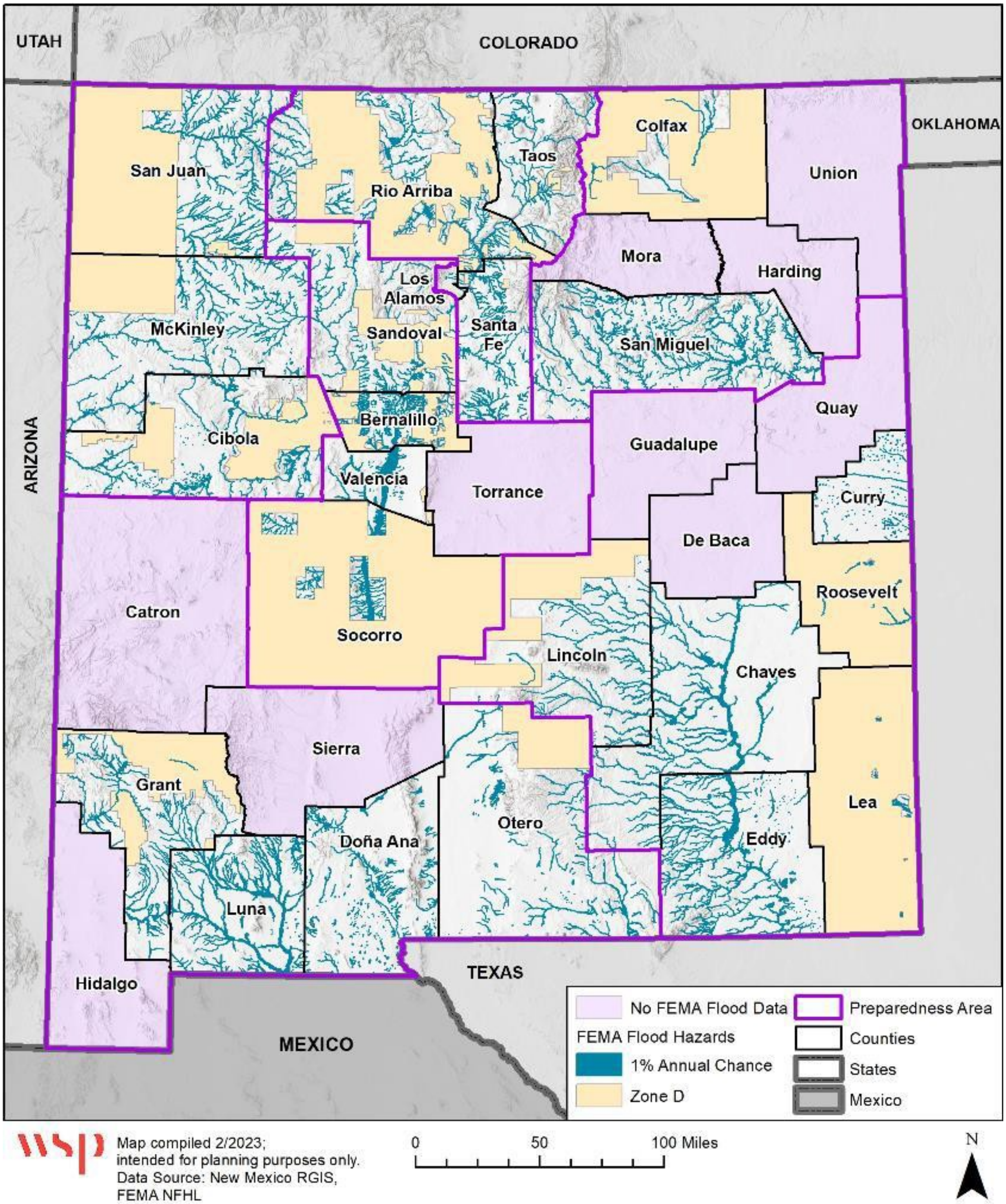


Figure 36: New Mexico Regulatory and Non-regulatory Flood Hazards

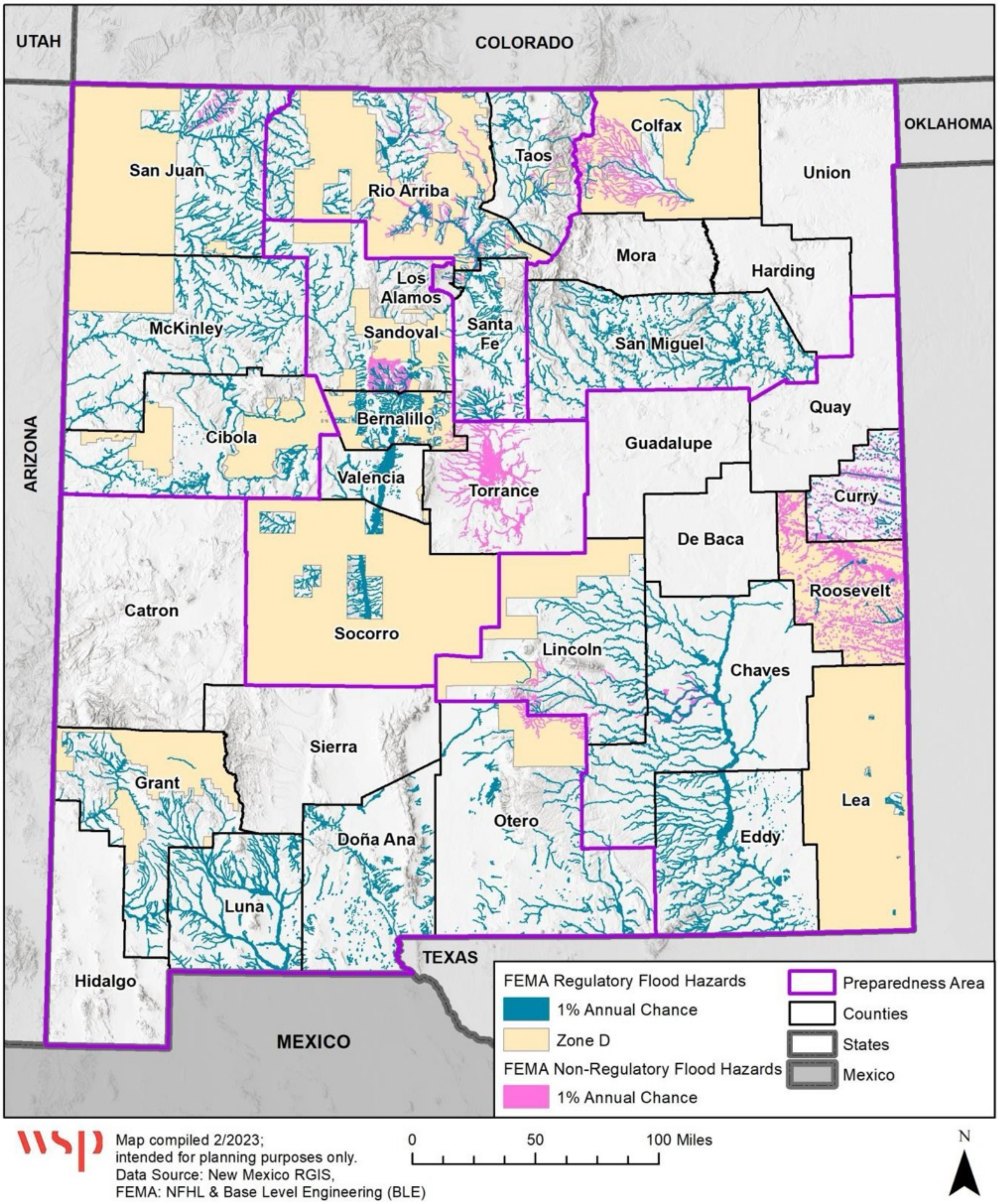


Figure 37: UNM Central and North Campuses FEMA National Flood Hazard Layer (Data retrieved on April 29, 2024)

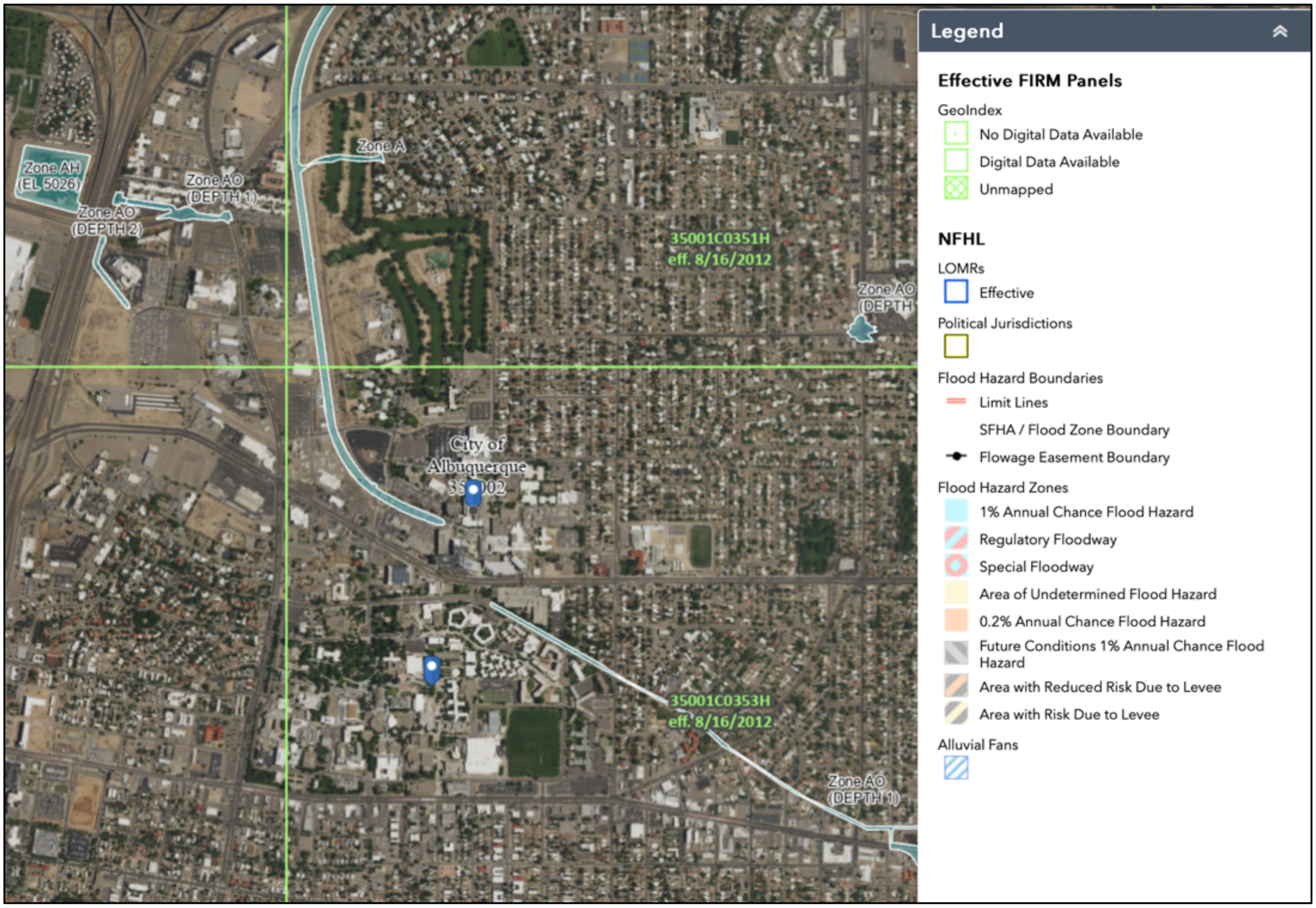


Figure 38: UNM South Campus FEMA National Flood Hazard Layer (Data retrieved on April 29, 2024)

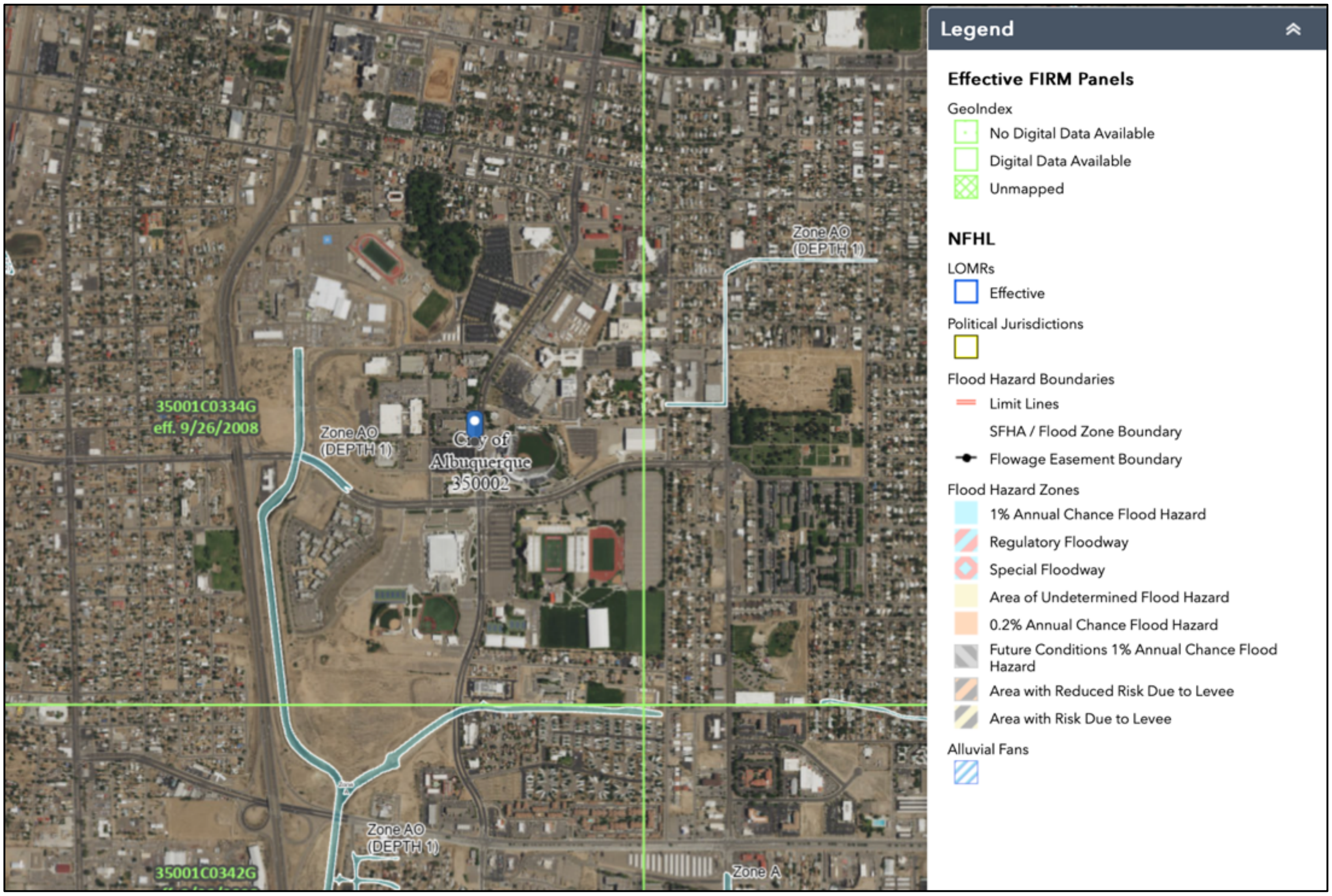


Figure 39: UNM Gallup Branch Campus National Flood Hazard Layer (Data retrieved on April 29, 2024)

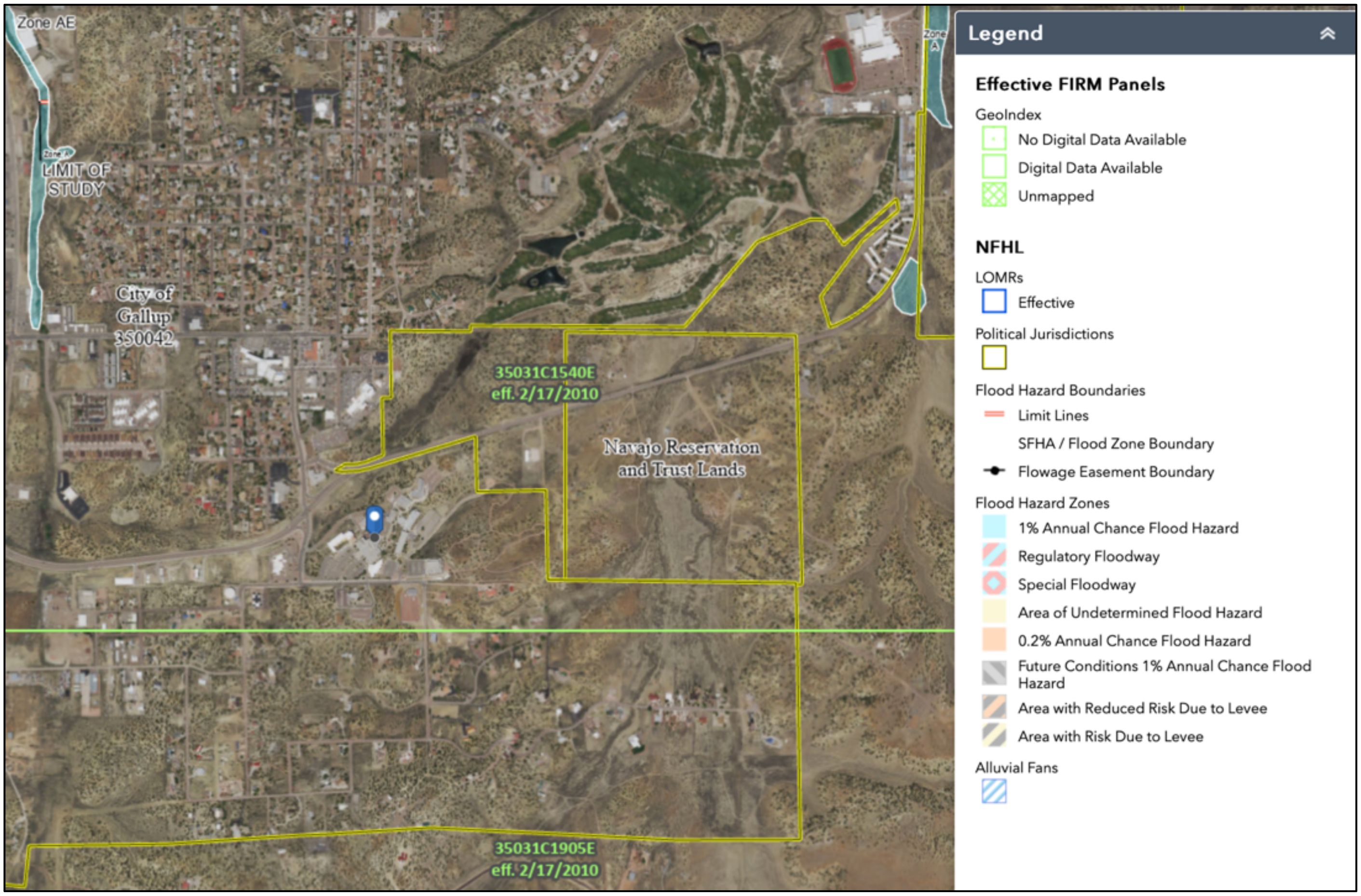


Figure 40: UNM Valencia Branch Campus National Flood Hazard Layer (Data retrieved on April 29, 2024)

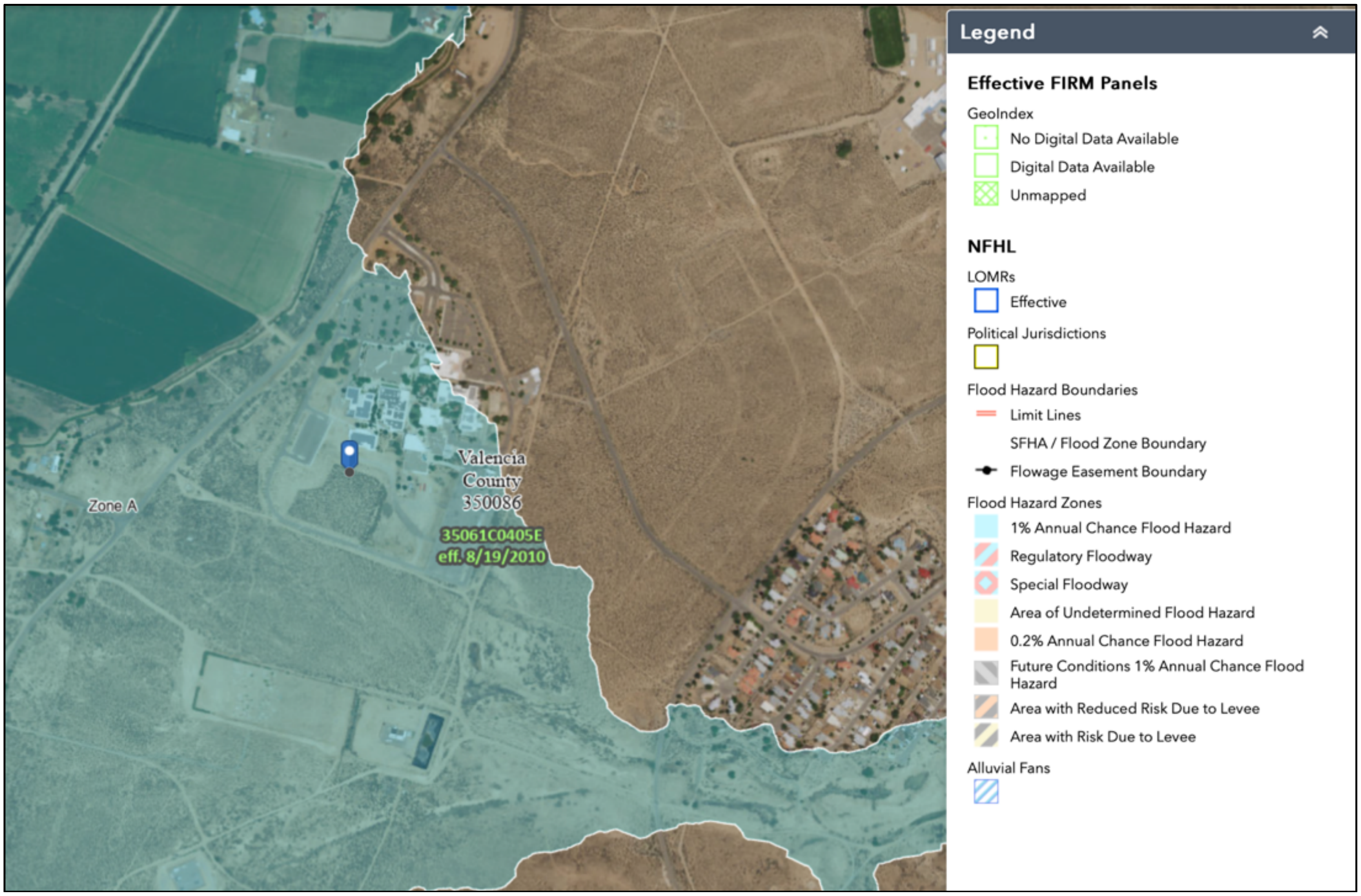


Figure 41: UNM Taos Branch Campus National Flood Hazard Layer (Data retrieved on April 29, 2024)

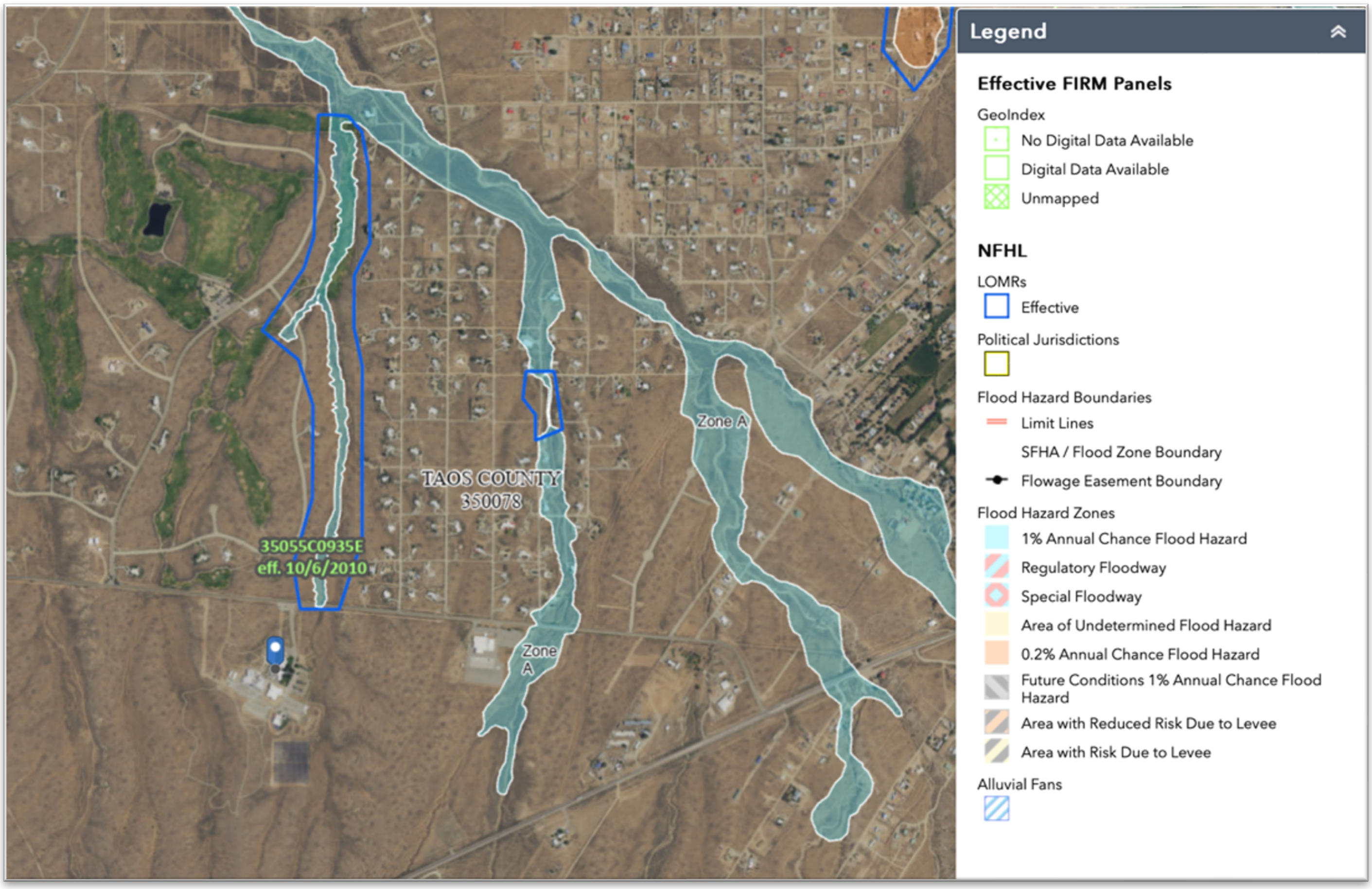
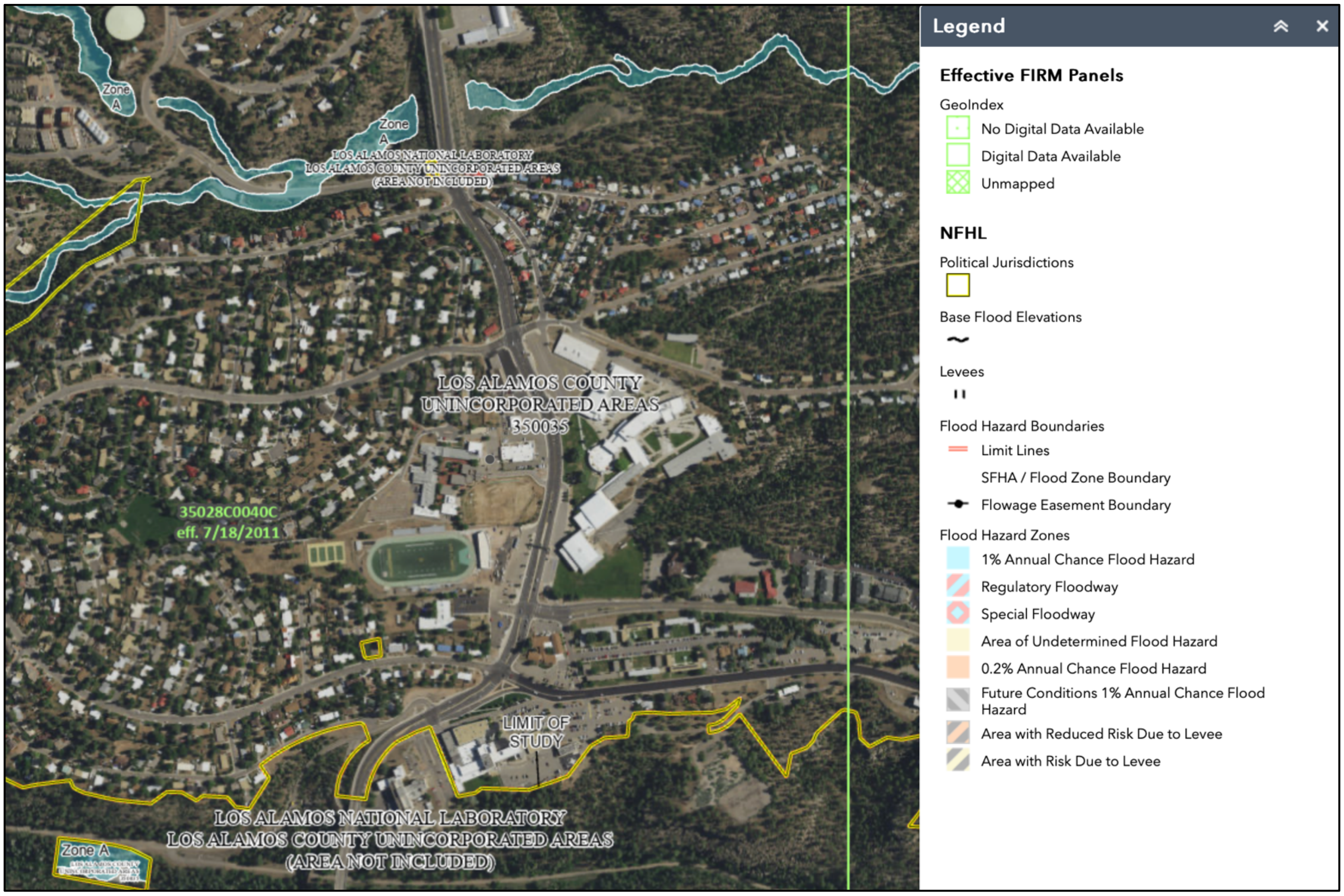


Figure 42: UNM Los Alamos Branch Campus National Flood Hazard Layer (Data retrieved on April 29, 2024)



Acequias

Acequias and ditches have played an important role in the settlement of New Mexico and today remain an integral part of community life. The words “acequia” and “ditch” can be defined in both a physical and political context. As a physical structure, an acequia or ditch is typically a man-made earthen channel that conveys water to individual tracts of land. As a political organization, a community ditch or acequia is a public entity that functions to allocate and distribute irrigation water to the landowners who are its members.

The physical characteristics of an acequia or ditch typically include a diversion dam and headgate, a main ditch channel commonly called the acequia madre, lateral ditches leading from the main channel to irrigate individual leading from the main channel to irrigate individual parcels of land, and wasteway channel that returns surplus water from the acequia or ditch system back to the stream. Occasionally, the works include a storage reservoir or transbasin ditch. The diversion structures can be built or readily available materials, such as timber, bush, and rocks, or consist of concrete and masonry. The channels are usually unlined, open, and operated by gravity flow.

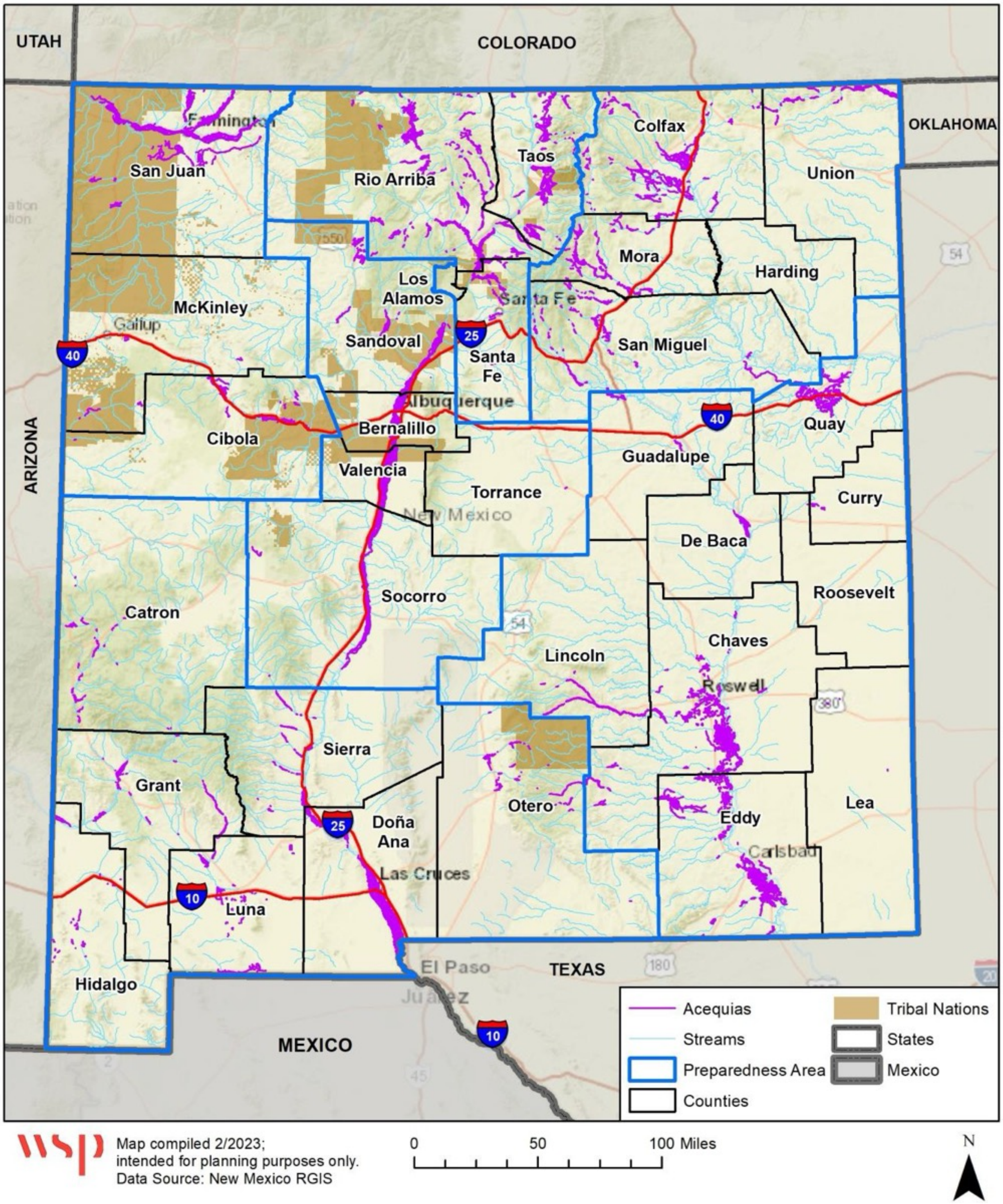
The community acequia or ditch association is composed of owners of the lands irrigated by a ditch. Landowners are assessed dues by the acequia association for the operation and maintenance of, and improvements to the ditch systems. Three commissioners and a mayordomo, elected by association members, manage the allocation and distribution of irrigation water, and all members participate in acequia maintenance.

Acequias are vulnerable to flooding, which can damage the acequia itself as well as cause property damage surrounding the acequia. Flood waters can damage culverts and diversion dams, and fill acequias with silt, requiring extensive restoration efforts. All acequias and acequia associations were mapped for each Preparedness Area and are displayed in each Preparedness Area vulnerability section below. Table 43 shows a summary of acequia data, and Figure 43 shows acequia information on a Statewide map.

Table 43:Acequia Summary by Preparedness Area

	PA 3	PA 4	PA 5
Acequia Miles	1,958	1,006	1,413
DR Claims	81	16	30
Flood Risk Miles	1,056	508	1,098
# of Acequia Associations	15	2	5

Figure 43: New Mexico Acequias



Previous Occurrences
Most of New Mexico has experienced below-average rainfall for the last several years. Nevertheless, New Mexico has experienced numerous flood/flash flooding events across the state. The years 2013 and 2014 saw very heavy flooding throughout the State of New Mexico. The flooding during this time resulted in over $20 million in property damage and six Presidential Disaster Declarations. From September 9th-18th, 2013, New Mexico experienced a major precipitation event that resulted in extensive flooding in some drainages, and record and near-record flows in many streams. The interaction between monsoonal circulation from the south that tracked in moisture sourced from tropical storms over Mexico, and a trough over Arizona and Nevada that helped steer this moisture into New Mexico and Colorado and, eventually, Texas, resulting in widespread flooding and approximately $18.5 million in damages. Portions of the State experienced 1,000-year rainfall events.

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 bunkhouse filling it with 4 feet of water, mud, and debris destroying the property. The property is now owned by the New Mexico State Land Office.

Declared Disasters from Flood/Flash Flooding
The following Table 44 summarizes the declaration title, year, incident type, and county or reservation where each Federally Declared Flooding Disaster between 1955 and 2023 occurred. The timespan between 2013 and 2016 has seen some of the busiest flood event periods within New Mexico. With DR-4152 and DR-4197 affecting many counties within the state.

Table 44: Federally Declared Flooding Disasters, 1955-2023, in Counties with UNM Properties

Declaration	Year	Incident	Title	County
DR-4197-NM	2015	Severe Storm	Severe Storms and Flooding	Guadalupe, Lincoln, Pueblo of Santa Clara, Otero, Rio Arriba, Sandoval, San Miguel
DR-4152-NM	2014	Flood	Severe Storms, Flooding, and Mudslides	Catron, Chaves, Cibola, Colfax, Eddy, De Baca, Dona Ana, Guadalupe, Harding, Isleta Pueblo Reservation, Los Alamos, Lincoln, McKinley, Mora, Navajo Nation Reservation (Also AZ and UT), Otero, Rio Arriba, Sandia Pueblo Reservation, Sandoval, Santa Fe, San Juan, San Miguel, Sierra, Socorro, Taos, Torrance
DR-4148-NM	2013	Severe Storm	Severe Storms and Flooding	Bernalillo, Luna, Sandoval, Santo Domingo Pueblo Indian Reservation

Declaration	Year	Incident	Title	County
DR-4079-NM	2012	Flood	Flooding	Los Alamos, Lincoln, Mescalero Tribe, Sandoval, Santa Clara Pueblo (Indian Reservation)
DR-4047-NM	2012	Flood	Flooding	Cibola, Cochiti Pueblo Indian Reservation, Pueblo of Acoma, Los Alamos, Sandoval, Santa Clara Pueblo Reservation
DR-1936-NM	2010	Flood	Severe Storms and Flooding	Cibola, Mora, McKinley, Navajo Nation Reservation, Pueblo of Acoma, San Juan, Socorro
DR-1659-NM	2006	Severe Storm	Severe Storms and Flooding	Cibola, Dona Ana, Grant, Guadalupe, Harding, Hidalgo, Lincoln, Luna, McKinley, Navajo Nation Reservation, Otero, Mora, Rio Arriba, Sandoval, San Miguel, Sierra, Socorro, Taos, Torrance, Valencia
DR-1514-NM	2004	Severe Storm	Severe Storms and Flooding	Bernalillo, Eddy, Mora, San Miguel
DR-992-NM	1993	Flood	Severe Storms and Flooding	Catron, Grant, Hidalgo, McKinley
DR-589-NM	1979	Flood	Severe Storms, Snowmelt, and Flooding	Mora, Lincoln, Rio Arriba, Santa Fe, San Miguel, Taos
DR-380-NM	1973	Flood	Severe Storms, Snowmelt, and Flooding	Colfax, Harding, McKinley, Mora, Rio Arriba, Sandoval, Santa Fe, San Miguel, Taos, Union, Valencia
DR-353-NM	1972	Flood	Heavy Rains and Flooding	Dona Ana, McKinley, Sierra
DR-27-NM	1955	Flood	Flood	Statewide

Source: FEMA.GOV

Table 45 outlines significant past events that have occurred in New Mexico Preparedness Areas.

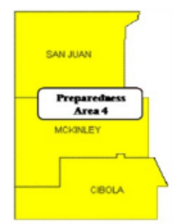
Table 45: Preparedness Areas 3 - 5 Flood/Flash Flood History, 2018 - 2022

Preparedness Area 3
UNM-Los Alamos Branch and UNM-Taos Branch

Hazard Type	# of Events	Mag	Deaths	Injuries	Property Damage	Crop Damage
Flood	0	0	0	0	$0	$0
Flash Flooding	29	0	1	0	$2,273,000	$0
Total	29	0	1	0	$2,273,000	$0

Preparedness Area 4
UNM-Gallup Branch

Hazard Type	# of Events	Mag	Deaths	Injuries	Property Damage	Crop Damage
Flood	0	0	0	0	$0	$0
Flash Flooding	27	0	0	0	$1,015,000	$0
Total	27	0	0	0	$1,015,000	$0



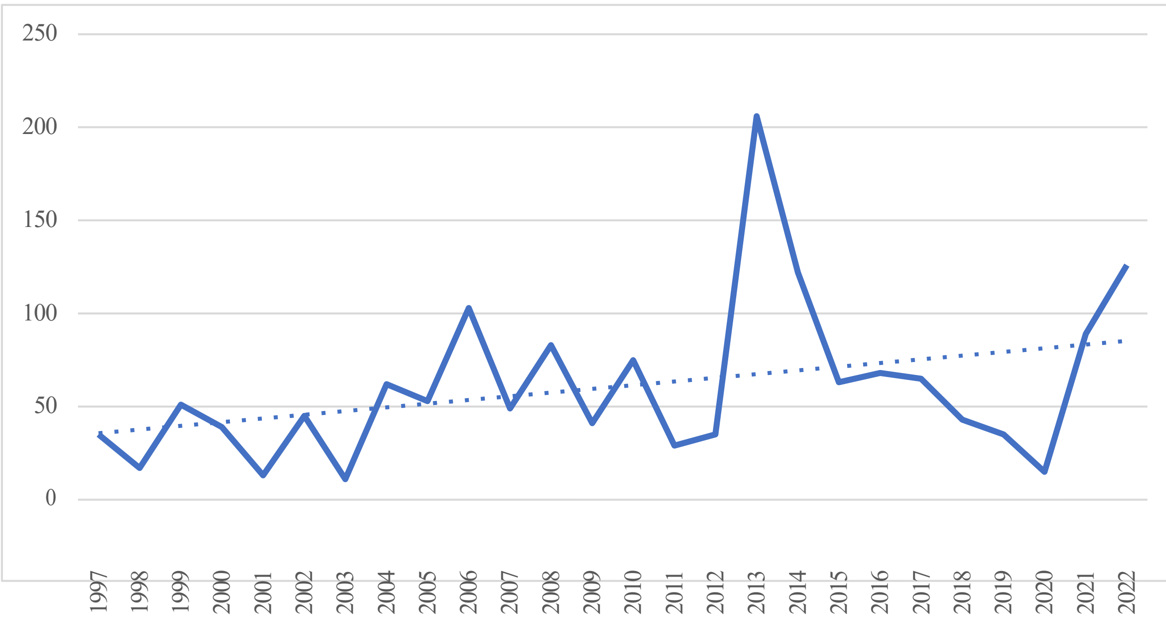
Preparedness Area 5
UNM Albuquerque Campus, UNM Health Sciences Rio Rancho Campus UNM Sandoval Regional Medical Center, UNM Sevilleta Long Term Ecological Research (LTER) Field Station, and UNM-Valencia Branch

Hazard Type	# of Events	Mag	Deaths	Injuries	Property Damage	Crop Damage
Flood	0	0	0	0	$0	$0
Flash Flooding	48	0	4	0	$4,550,000	$0
Total	48	0	4	0	$4,550,000	$0

Source: NCEI

Past Frequency
New Mexico experiences flooding somewhere in the State every year. NCEI records 1573 flood events from 1997 through 2022, an average of 60 per year. There have been 25 Federal Disaster Declarations for flooding in New Mexico since 1950, an average of roughly one every 3 years. Figure 44 shows the number of flash flood events per year, showing a clear trend upward over the past 26 years.

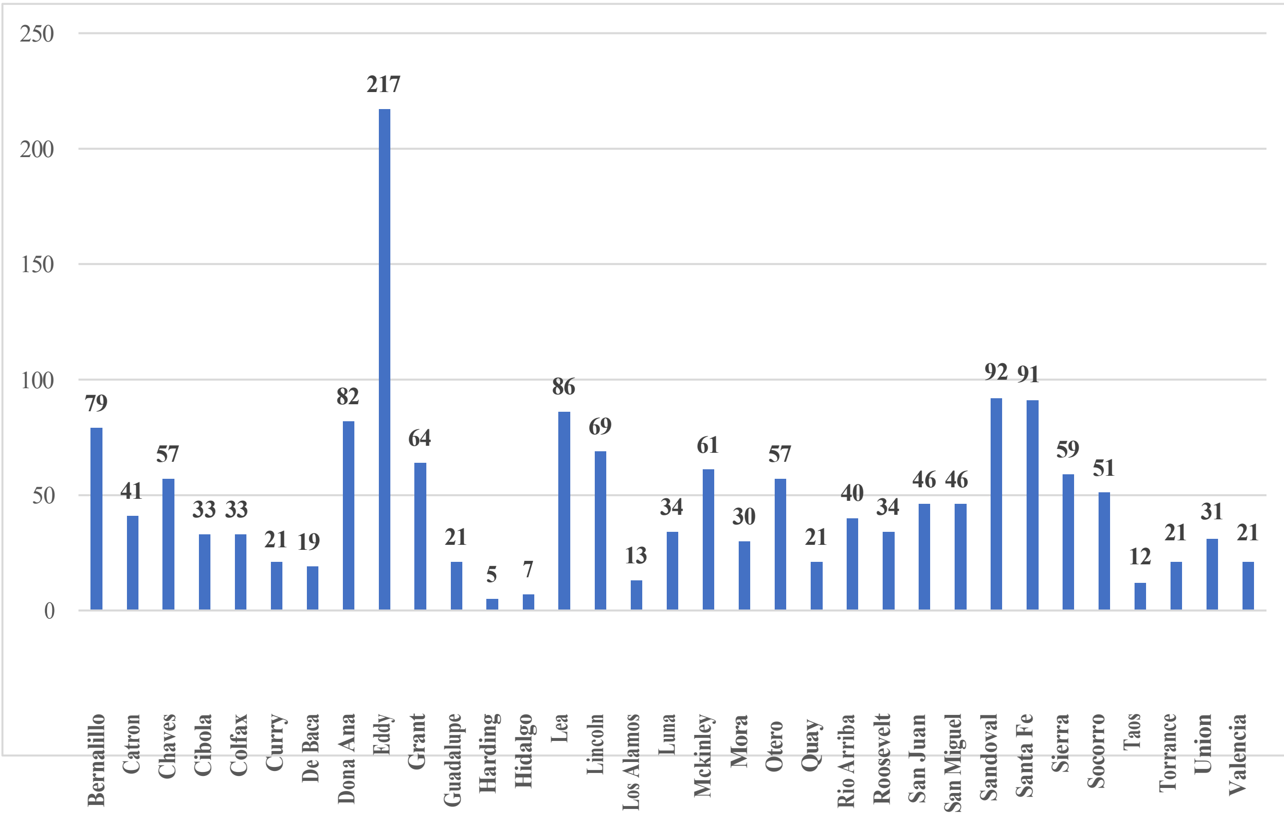
Figure 44: Flood/Flash Flood Events by Year, 1997-2022



Source: NCEI

Figure 45 breaks out the number of floods and flash floods per county.

Figure 45: Flood/Flash Flood Events by County, 1997-2022

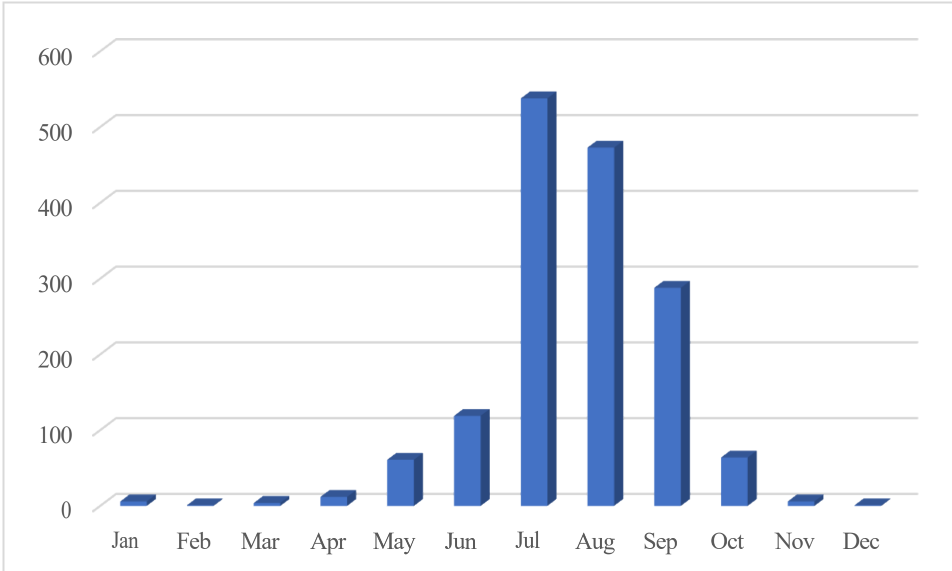


Source: NCEI

New Mexico and other areas across the Southwest U.S. are 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. These pages were prepared to help promote awareness of the life-threatening weather hazards that affect New Mexico during the Summer Monsoon.

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 triggers afternoon thunderstorms that can be devastating.

Figure 46: Flood/Flash Flood Events by Month, 1997-2022



Source: NCEI

Spring floods 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. Although all the eastern plains are subject to this type of event, the greatest frequencies have been in the far southeast part of the state.

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.

Figure 47: Flooding in Preparedness Areas 4, 5, and 6 (DR-4197) 2013

Climate Change Impacts

Climate projections across the United States have shown that while total annual precipitation will likely decrease in the Southwest region, the heaviest annual rainfall events will become more intense. Extreme precipitation, one of the controlling factors in flood statistics, is observed to have generally increased and is projected to continue to do so across the United States in a warming atmosphere. As a result, damaging flood events have the potential to increase with climate change[17]. Also, with wildfires already being a problem in New Mexico, increasing periods of drought and lack of precipitation are expected to exacerbate conditions for fires to occur, and in turn, worsen the potential for runoff and flooding associated with burned areas.

Warming is likely to directly affect flooding in many mountain settings, as catchment areas receive increasingly more precipitation as rain rather than snow, or more rain falling on existing snowpack. In some such settings, river flooding may increase as a result – even where precipitation and overall river flows decline.

[17] (Climate Science Special Report, Fourth National Climate Assessment 2017, https://science2017.globalchange.gov/chapter/8/)

According to the 2014 National Climate Assessment, southwestern river basins will experience gradual runoff declines during this century but flooding in the region is generally expected to increase. There are no specific projections or trends that have been noted to indicate that more substantial or more frequent flooding events can be expected to occur.

Global warming may also lead to more ice-jam flooding along mountain streams, when heavy rainfall or upstream melting raises stream flows to the point of breaking up the ice cover, which can pile up on bridge piers or other channel obstructions and cause flooding behind the jam.

Once the ice jam breaks up, downstream areas are vulnerable to flash floods. Global warming could create conditions ripe for ice-jam floods. The increasing possibility of mid-winter thaws and heavy rainfall events could increase the risk of sudden ice breakup. Flooding can be further exacerbated if the ground is still frozen and unable to soak up rainwater.

Other influences on flood generation that should be considered in projections of future flood risks are land cover, flow and water supply management, soil moisture, and channel conditions. In addition to discouraging development in flood-prone areas and protecting natural systems such as wetlands, local government planners and engineers should design infrastructure with the capacity to accommodate heavy rains and manage stormwater runoff during extreme events.

Probability of Future Occurrence

As noted, from 1997 through 2022 New Mexico has an average of 60 per year and one Disaster Declaration for flooding roughly every 3 years. The frequency of flooding events has been increasing over the last several decades. If current trends continue, in 5-10 years New Mexico may be experiencing and average of 80-100 floods per year.

To determine the probability of New Mexico experiencing a flood/flash flood event, the probability or chance of occurrence was calculated based on historical data identified in the NCEI database from the period of 1997 through 2022. Applying this formula at the Preparedness Areas level gives the following probabilities.

Table 46: Probability of Occurrence - Flood/Flash Flood

Preparedness Area	Riverine Flood	Flash Flooding
PA 3	33%	100%
PA 4	19%	100%
PA 5	57%	100%

Vulnerability Assessment

From 1997 through 2022, NCEI reports 38 deaths and 16 injuries from flooding, across the State. 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 stormwater 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 one day to a couple of weeks. Winter flooding occurs between November and February and usually affects the southwest portion of the State.

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

- **Steep Slopes**: 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. Wildfires result in extreme soil damage. 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. Large floods can occur in these burned areas from average monsoonal rainstorms.

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.

Below are preparedness area scale floodplain maps (for preparedness areas 3-5) based on existing flood insurance rate maps. Figure 48 – Figure 50 delineate Special Flood Hazard Areas (SFHA), or land areas that are identified by FEMA maps as subject to inundation by a flood. Flood zones are geographic areas that FEMA has defined according to varying levels of flood risk. These zones are depicted on a community's Flood Insurance Rate Map (FIRM) or Flood Hazard Boundary Map. On this map, the SFHAs are shaded with different colors and divided into distinct flood hazard zones depicted on the map legend. Each zone reflects the severity or type of flooding in the area. The following flood zone maps have been included to allow for a finer level of analysis by depicting flood risks by Preparedness Area.

Figure 48: Preparedness Area 3 Floodplain Map

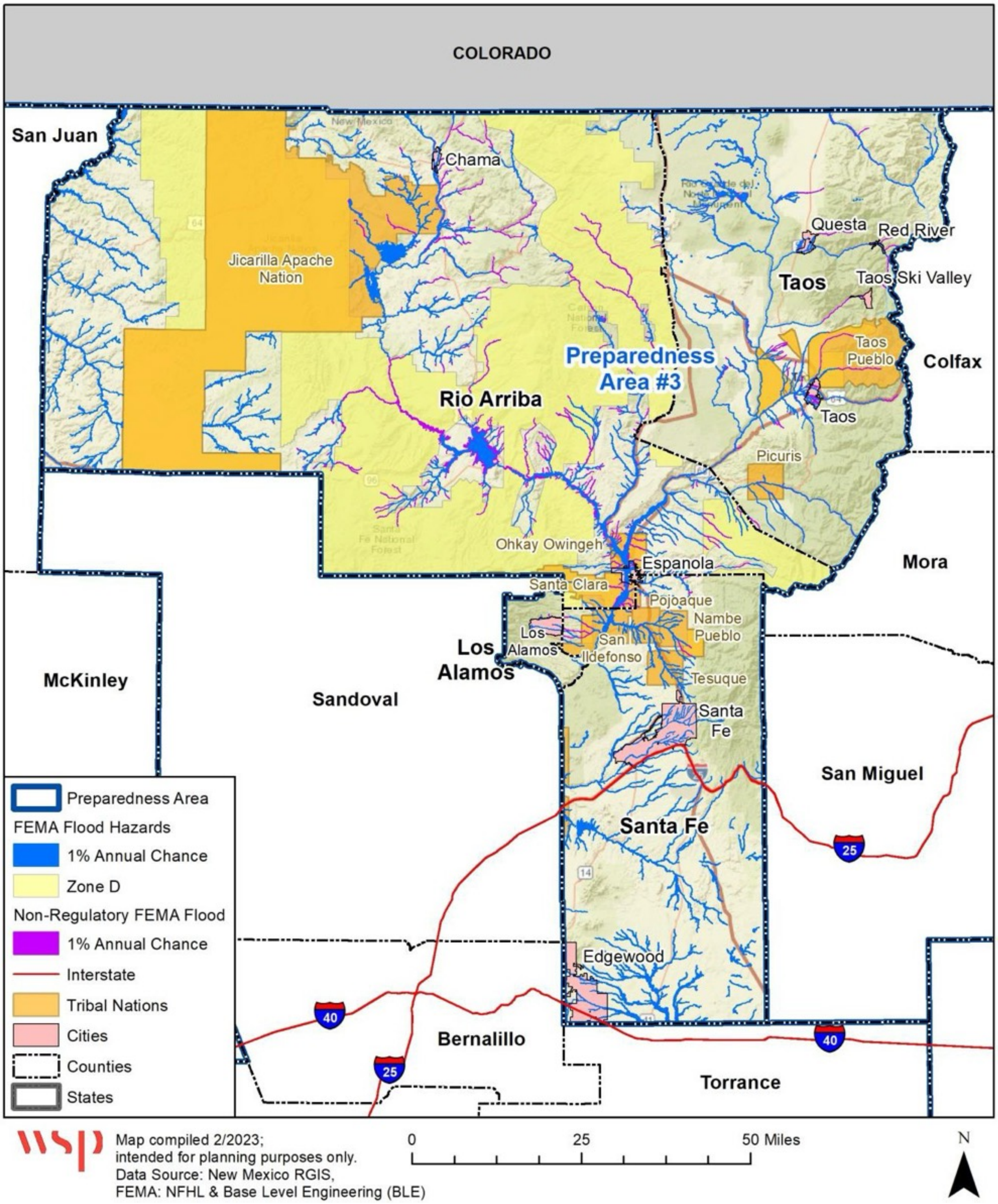


Figure 49: Preparedness Area 4 Floodplain Map

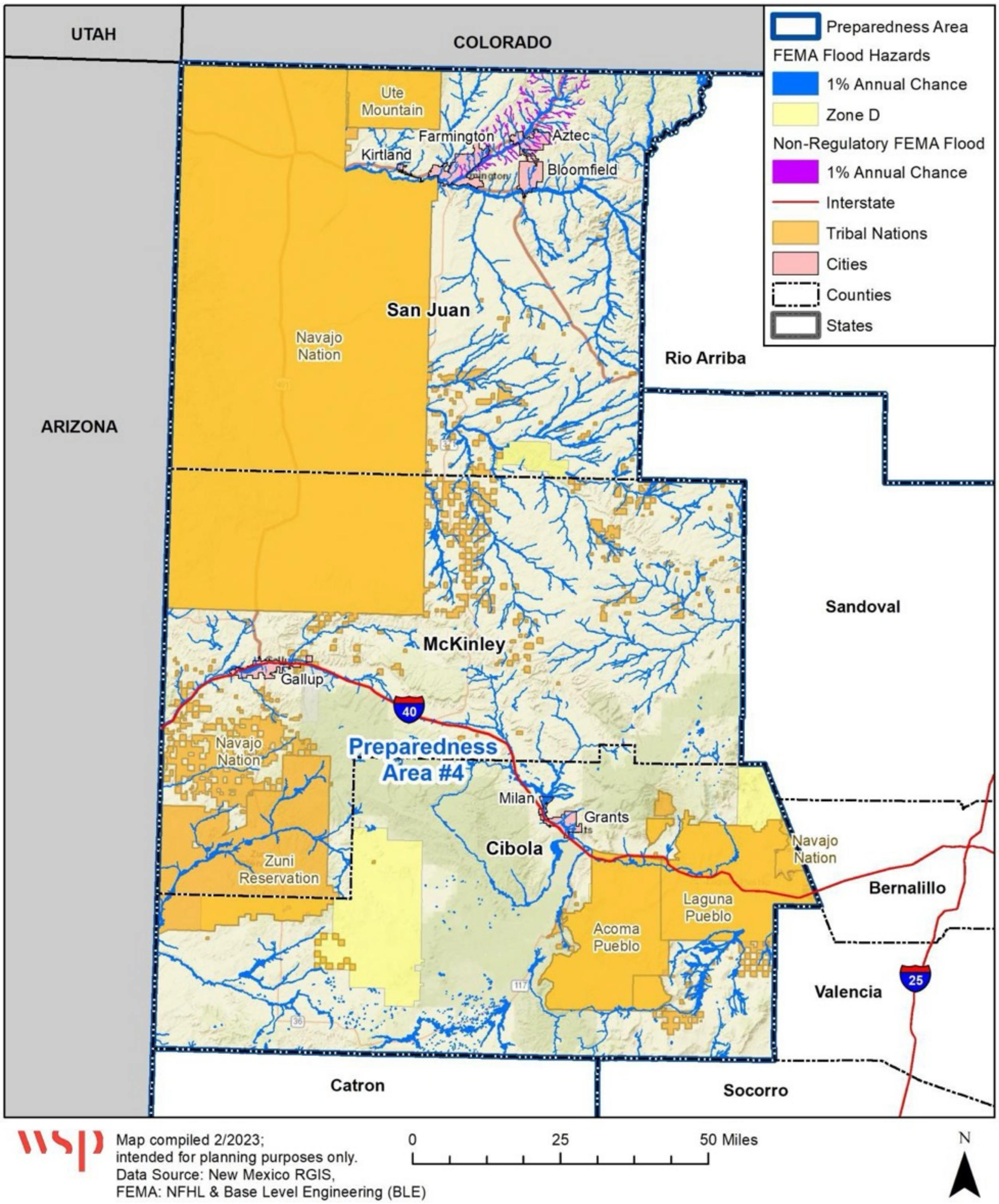
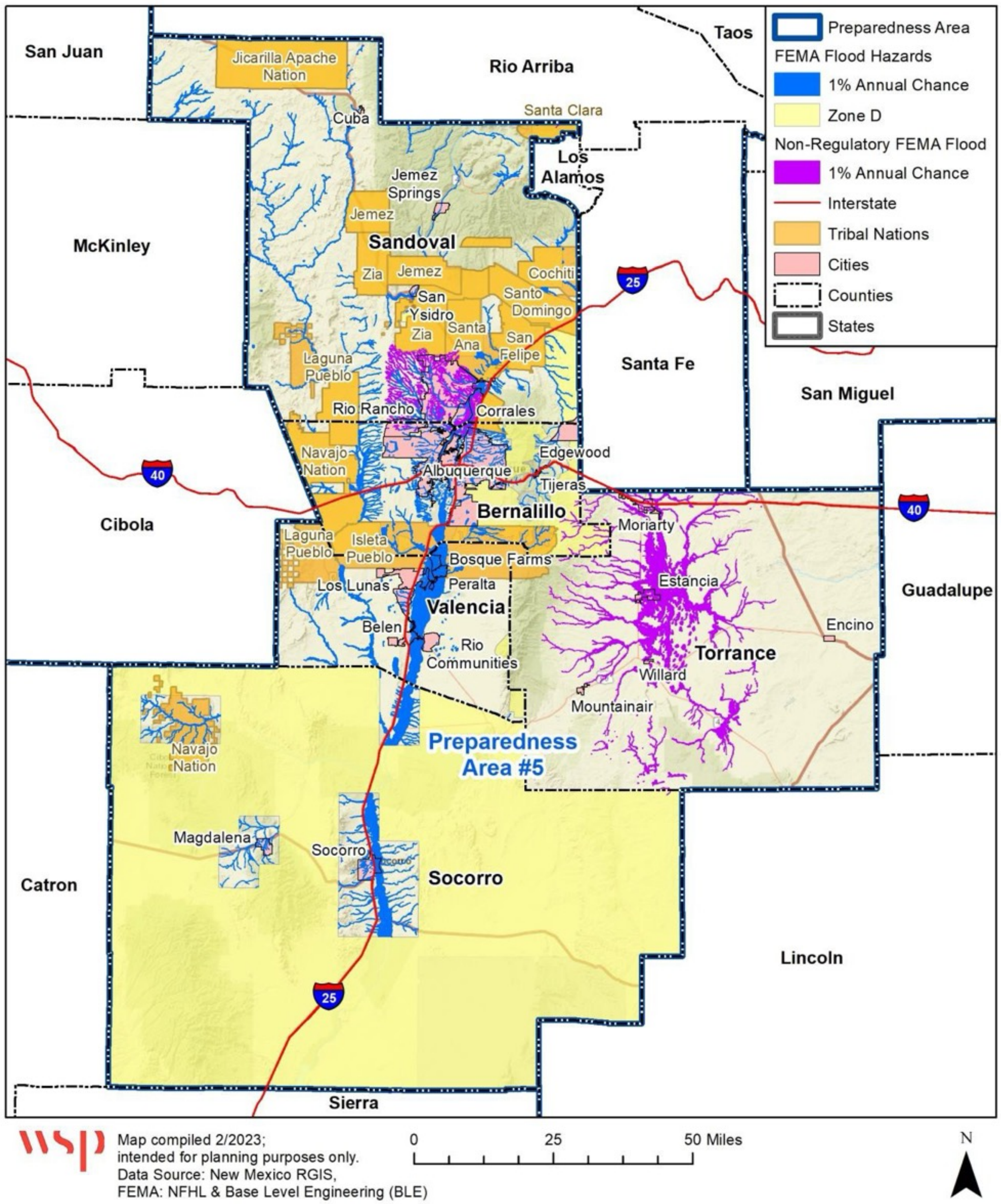


Figure 50: Preparedness Area 5 Floodplain Map



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

What Can Be Mitigated?
Mitigation actions can include addressing stormwater runoff issues through landscape design, protecting and enhancing landforms that serve as natural mitigation measures, elevating or floodproofing structures, removing structures from flood hazard areas, constructing flood control measures, and public education about safety during flood conditions. The University should also work with local and state emergency managers and floodplain managers to stay up to date on the latest flood frequency predictions and debris flow hazard assessments.

Summary of Risk to UNM

Table 47: 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 totalloss. 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 forallowing development to occur in hazardous areas, or for allowing adverse impacts downstream form development.

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 51) because it is specifically adapted to wind effects on land.

Figure 51: 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
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.

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.

High wind events are experienced in every region of the United States. Figure 52 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. Table 48 shows how New Mexico Preparedness Areas relate to the wind speed map.

Figure 52: Wind Zones in the United States

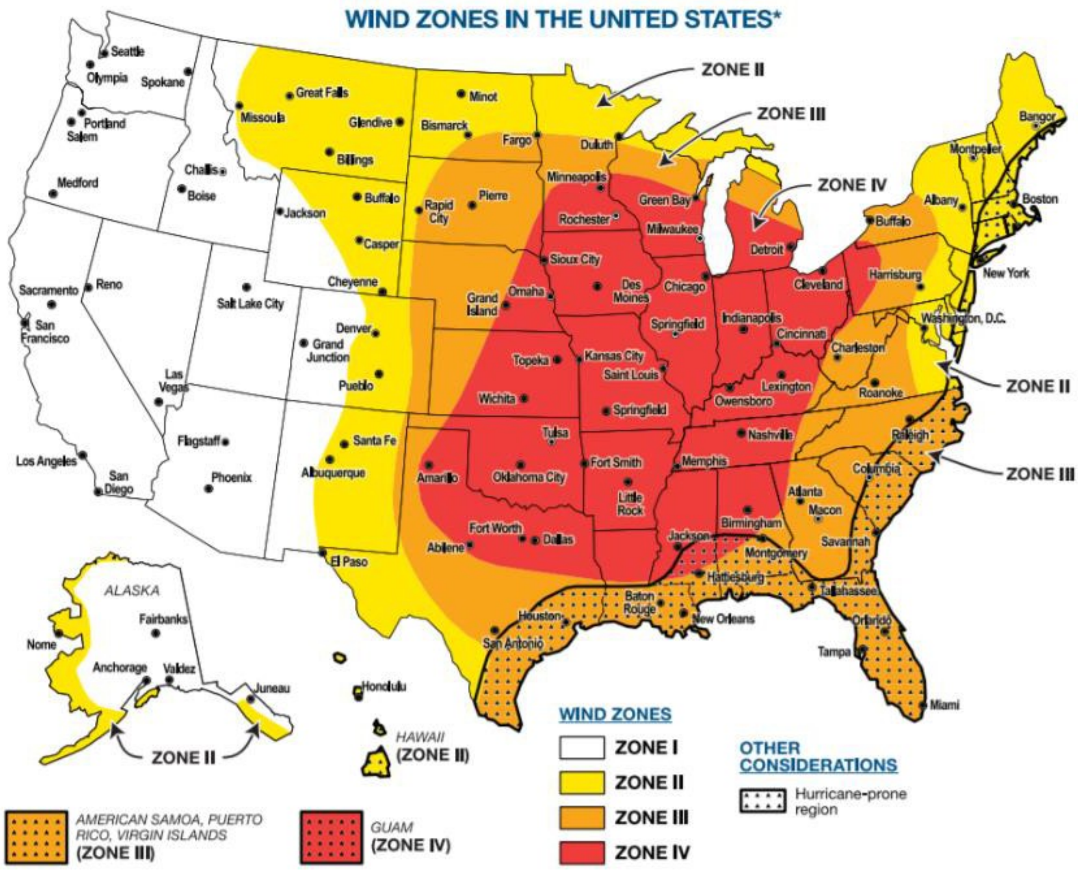
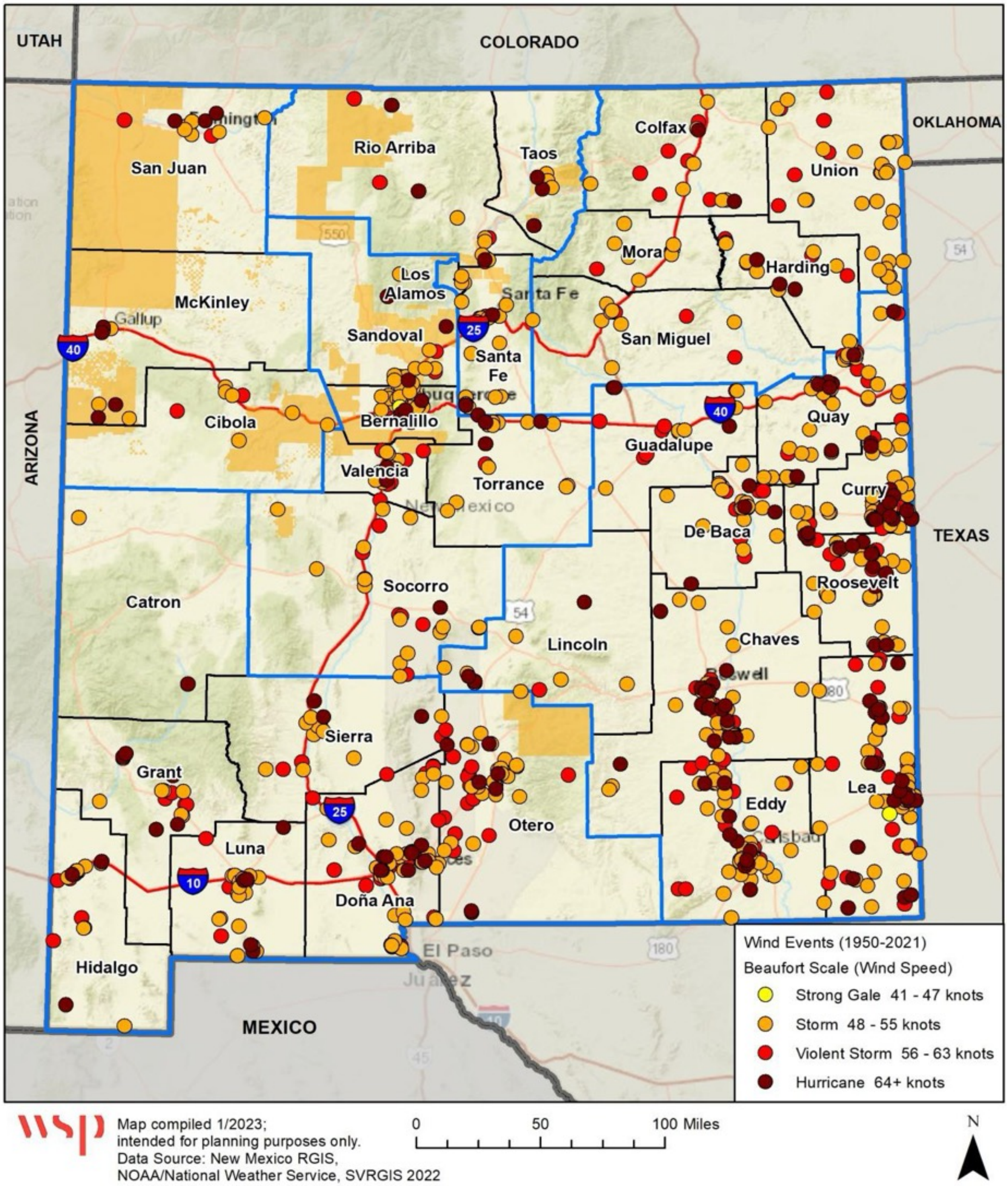


Table 48: Wind Speed Experienced by New Mexico Preparedness Areas

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

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 53 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. 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 53: New Mexico High Wind Events by Magnitude, 1950-2021



Previous Occurrences

The current online NCEI database contains data from January 1996 to December 2022, as entered by NOAA's National Weather Service (NWS). Referencing this online database, NCEI reports a total 3,027 high wind events with 27 injuries, 12 deaths, $31,715,800 in property damage, and $3,500 in crop damage between 1996 and December 2022.

Table 49 describes significant events that have occurred in New Mexico.

Table 49: Significant Past Occurrence - High Wind

Date	Location	Significant Event
December 2021	Taos County, NM (Preparedness Area 3)	The weather station at Taos Ski Valley measured about twelve hours of wind speeds in excess of 58 mph with a peak wind gust of 103 mph. These high winds resulted in significant tree damage across Taos Ski Valley with numerous trees downed and splintered. Taos County declared a State of Emergency due to the widespread wind damage. This event resulted in a total of $2.5M property damage.
July 26, 2013	Bernalillo County (Preparedness Area 5)	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.
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.
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 areas. 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 50 provides a cumulative overview of significant high wind events that have occurred in all Preparedness Areas. Column “Mag” is “Maximum Magnitude.” Note the information in the table below only includes data presented by county and does not include data presented by National Weather Service Forecast Zones.

Table 50:Preparedness Areas 3 - 5 High Wind History (January 1996 - December 2017)

Preparedness Area 3
UNM-Los Alamos Branch and UNM-Taos Branch

Hazard Type	# of Events	Mag	Deaths	Injuries	Property Damage	Crop Damage
High Wind	309	35-82 kts	0	0	$274,000	$500
Strong Wind	7	35-48 kts	0	0	$35,100	$0
Dust Storm	0	-	0	0	$0	$0
Total	316	35-82 kts	0	0	$309,100	$500

Preparedness Area 4
UNM-Gallup Branch

Hazard Type	# of Events	Mag	Deaths	Injuries	Property Damage	Crop Damage
High Wind	66	35-65 kts	0	0	$479,000	$0
Strong Wind	1	45 kts	0	0	$2,500	$0
Dust Storm	0	0	0	0	$0	$0
Total	67	35-65 kts	0	0	$481,500	$0

Preparedness Area 5
UNM Albuquerque Campus, UNM Health Sciences Rio Rancho Campus UNM Sandoval Regional Medical Center, UNM Sevilleta Long Term Ecological Research (LTER) Field Station, and UNM-Valencia Branch

Hazard Type	# of Events	Mag	Deaths	Injuries	Property Damage	Crop Damage
High Wind	485	35-96 kts	0	0	$6,006,200	$2,500
Strong Wind	19	35-48kts	3	3	$133,600	$0
Dust Storm	2	0	0	0	$0	$0
Total	506	35-96 kts	3	3	$6,139,800	$2500

Past Frequency
The State of New Mexico experiences high wind events annually, based on seasonal meteorological patterns and local topographical conditions. The north/southeast section of the State is susceptible to high wind events. 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.

Every Preparedness Area experiences some type of wind event as illustrated in Table 50. A study conducted by the National Weather Service – Albuquerque dated May 2010 conducted a study titled, “A Climatology of High Wind Warning Events for Northern and Central New Mexico: 1976-2005.” The study assessed climatological wind data across northern and central New Mexico in an effort that would benefit forecasters by providing 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 30 years of record from 1976 to 2005. Locations included Albuquerque – Preparedness Area 5 and Gallup – Preparedness Area 4. 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.

As the past occurrences show, each Preparedness Area in New Mexico experiences high wind events every year based on the climate, topography of the land and due to the annual spring and monsoon season weather patterns. Preparedness Area 1 shows the highest probability of experiencing a high wind event. There are no properties utilized by UNM in Preparedness Area 1.

Climate Change Impacts
Ongoing research compiled in the recent climate assessment has resulted in different conclusions on the effect of climate change on wind regimes. The August 2021 IPCC report argues that in most places, wind speeds will be drastically reduced because of climate change, whereas in 2019, Scientific American reported that winds across the world were speeding up. Unusual wind patterns combined with other climate change issues, such as hotter water temperatures, can also cause problems. At this time,

these changing factors are not well understood and are still being incorporated into state and regional research and risk analysis (Garrison 2022).

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 not far behind.

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 in the NCEI database from a period of January 1996 – December 2022 (324 months/27 years) and from local emergency management officials. Probability was determined by dividing the number of events observed by the number of years (27 years) and multiplying by 100. This gives the percent chance of the event happening in any given year. Table 51 provides the probability of occurrence in each Preparedness Area.

Table 51: Probability of Occurrence - High Winds

Preparedness Area	High Wind	Strong Wind	Dust Storm
PA 3	100%	26%	0%
PA 4	100%	4%	0%
PA 5	100%	70%	7%

Strong winds can damage buildings and uproot trees but can also produce areas of blowing dust that can reduce visibility 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's 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 between 7,500 and 10,000 feet above the surface. The rising air mixes with stronger winds aloft, resulting in stronger and more 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.

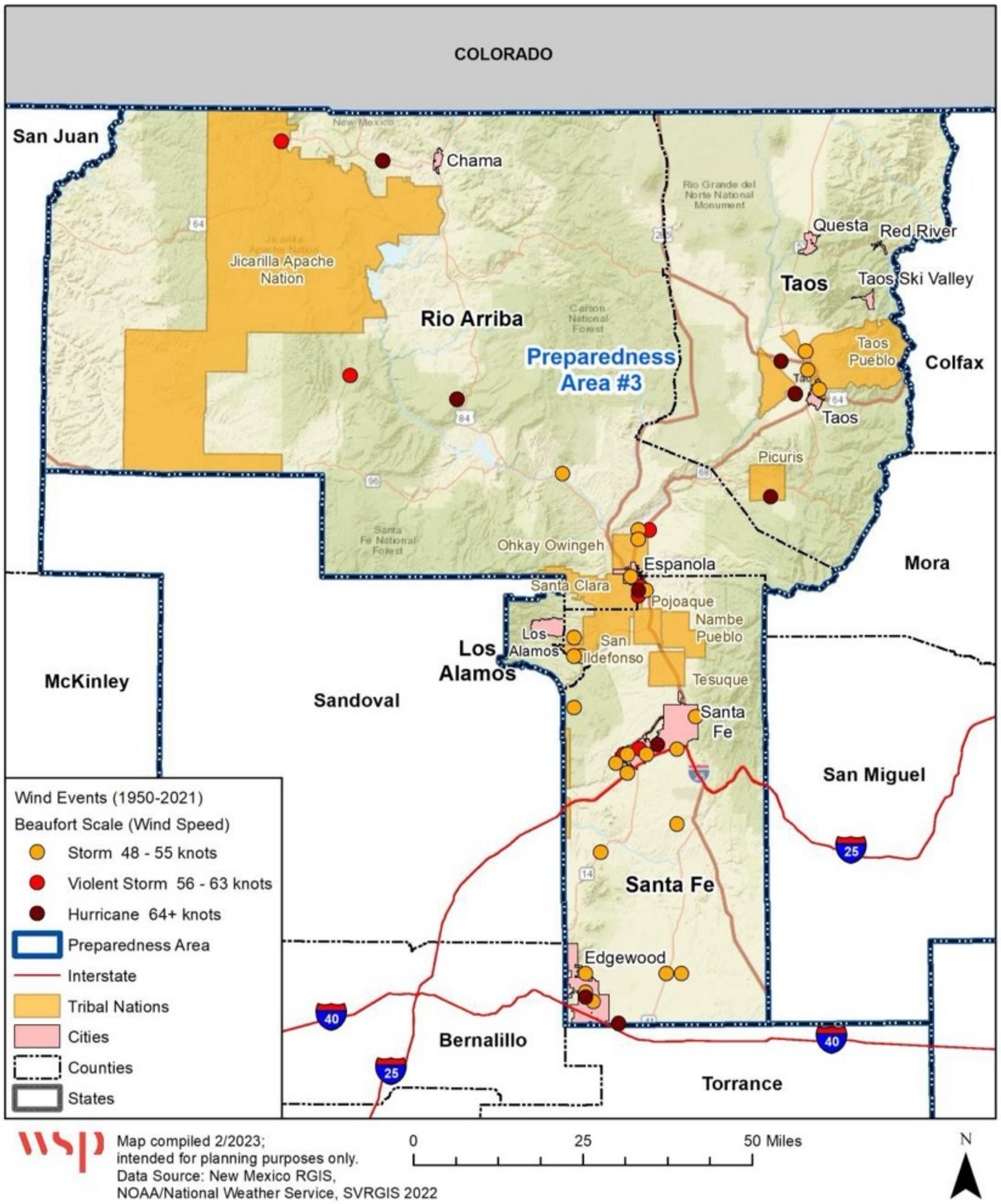
Thunderstorm activity in New Mexico is consistent due to seasonal meteorological patterns and local topographical conditions. The entire State is susceptible to a full range of weather conditions, including thunderstorms, lightning, and hail. All areas of the State are susceptible to thunderstorm conditions, although local topography, such as elevation and land contours, plays a significant part in how weather affects a particular area. Extreme variations in damages due to thunderstorm events across the Preparedness Areas can be attributed to differences in the concentration of population and infrastructure.

Preparedness Area 3 – UNM Taos Branch Campus and UNM Los Alamos Branch Campus

The NCEI database has recorded over $309,000 in property damages and $500 in crop damages in Preparedness Area 3. In total, 316 high wind, strong wind, and dust storm-related events were recorded in this area from 1955-2022. Preparedness Area 3 has the lowest amount of property damages due to high wind events in the State. This area is located in the northern portion of the state, damaging where events are less frequent.

Figure 54 below shows wind events by magnitude from the year 1950 to 2021 in Preparedness Area 3.

Figure 54: New Mexico Preparedness Area 3 - Wind Events by Magnitude (1950 – 2021)

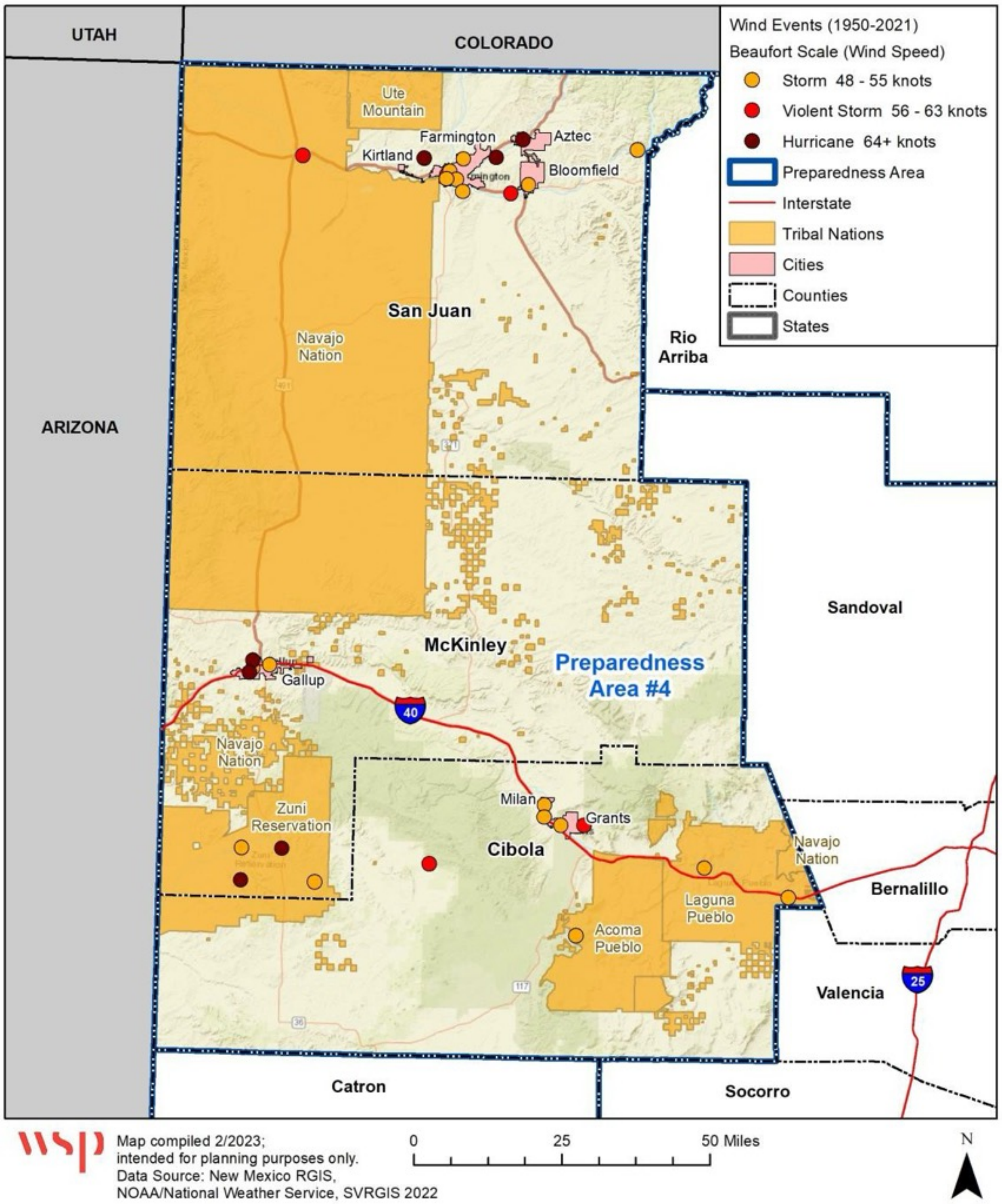


Preparedness Area 4 – UNM Gallup Branch Campus

The NCEI database has recorded over $481,000 in property damages in Preparedness Area 4. In total, 67 high wind, strong wind and dust storm-related events were recorded in this area from 1955-2022. Preparedness Area 4 has a relatively low amount of property damages due to high wind events in the State and the least amount of total documented events. This is mainly due to the location of the area in the northwest portion of the state where events are less frequent.

Figure 55 below shows wind events by magnitude from the year 1950 to 2021 in Preparedness Area 4.

Figure 55: New Mexico Preparedness Area 4 – Wind Events by Magnitude (1950 – 2021)

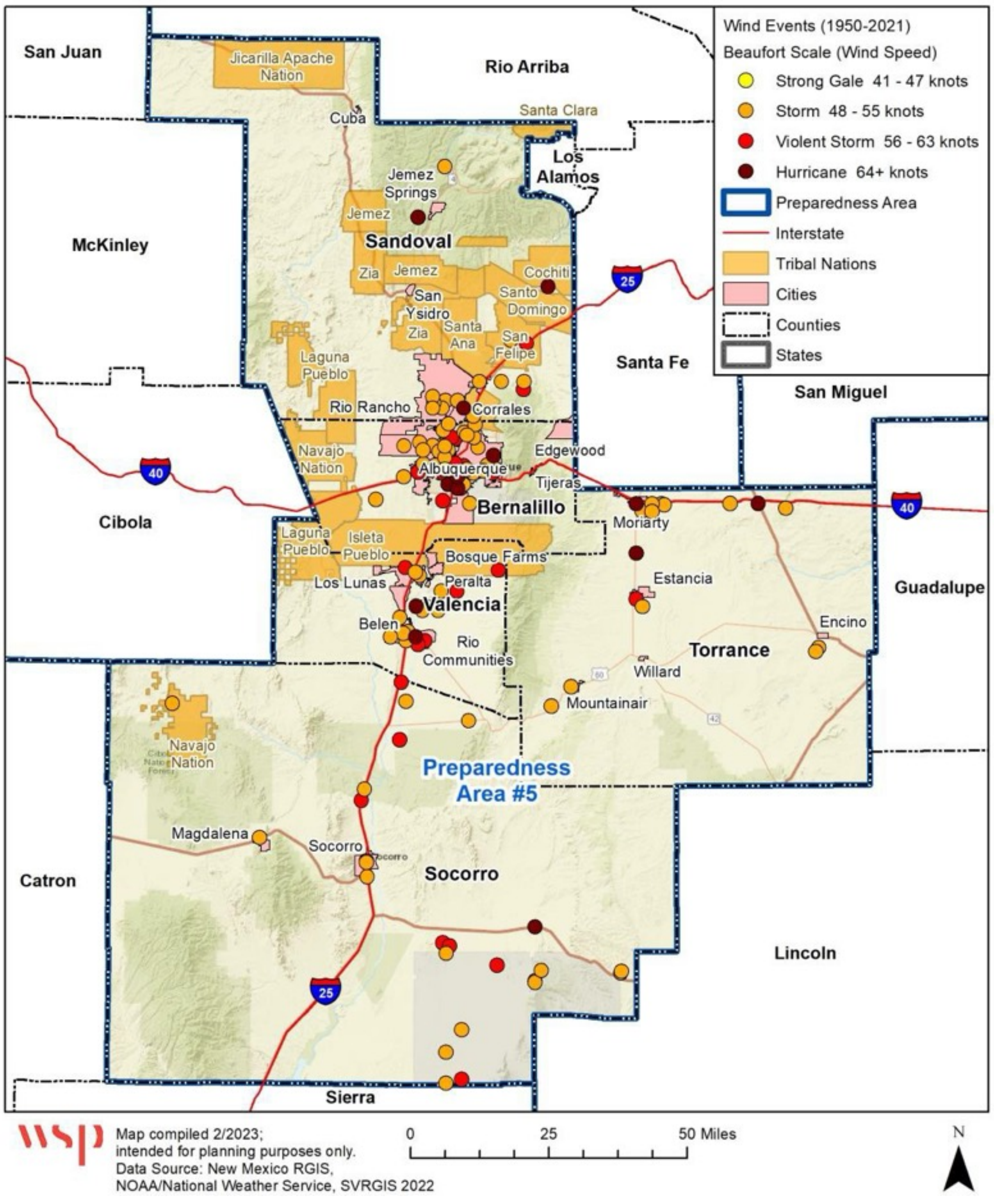


Preparedness Area 5 – UNM, UNMH, UNM Valencia Branch Campus, UNM HSC Rio Rancho, Sevilleta LTER, and SRMC

The NCEI database has recorded 3 fatalities, 3 injuries, almost $6.14 million in property damages, and $2,500 in crop damages in Preparedness Area 5. In total, 506 high wind, strong wind, and dust storm-related events were recorded in this area from 1955-2022. Preparedness Area 5 has the largest population in the state, concentrated in Bernalillo County. Due to this dense concentration of infrastructure and people, the damages reported in this Preparedness Area are the second most significant in the State, despite the lower number of event occurrences. This also makes the people living in this area more vulnerable to injury and death from these events, as indicated by the high number of injuries during past events.

Figure 56 below shows wind events by magnitude from the year 1950 to 2021 in Preparedness Area 5.

Figure 56: New Mexico Preparedness Area 5 – Wind Events by Magnitude (1950 – 2021)



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 the collapse of outdoor structures have occurred. These incidents can result in injuries and possible death. Structures that are not adequately anchored, such as portable buildings, are also vulnerable to 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.

What Can Be Mitigated?

One important part of mitigating high wind hazards is the regular maintenance and upkeep of utilities to help prevent wind damage. Two mitigation activities UNM already does and will continue to do are the inspection and management of hazardous trees and tree pruning to protect power lines and infrastructure.

Another important part of mitigating high wind hazards is forecasting and warning so that people can prepare. Communities can prepare for disruptions of utilities and transportation due to high wind events by advising people to stay home or to use caution if they must go out, and by recommending that people stock up on food, water, batteries, and other supplies. The National Weather Service, combined with local television stations, has an effective strategy for notifying residents about impending wind events. LoboAlerts, the University's emergency text messaging system, can be used to provide high wind and weather alerts to the University community if needed.

Other mitigation activities include adoption and enforcement of building codes, retrofitting of existing structures, construction of safe rooms and shelters, hardening of power lines and other utilities, and public education of the risk.

Summary of Risk to UNM

All UNM campuses can be affected by 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. UNM Albuquerque Campus identifies high winds as being medium based on past occurrences recorded. UNM Branch Campuses and the Sevilleta LTER identified winds as being a low risk.

Table 52 identifies impacts related to high wind events.

Table 52: Impacts from High Wind Events

Subject	Impacts
Health and Safety of the Public	The public can face severe injuries and even death because of highwind 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.
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.

Landslide

Hazard Characteristics

Landslides are the downward and outward movement of rock or soil on slopes. Although generally associated with mountainous regions, sometimes they can occur in low-relief areas. Human activity can potentially promote landslide activity. These activities include steep slopes created during excavations or road cuts, unstable mine waste dumps or tailings piles, or saturation of slopes (e.g., due to irrigation or irrigation ditches). The USGS has produced an informative, short publication regarding landslide types and processes that serves as a valuable reference, from which much of the summary material presented below was derived.

Landslides include a wide range of ground movement, such as rock falls, rock topple, deep failure of slopes, and shallow failure of slopes (the latter of which may become debris flows if saturated). Although gravity is an essential driving force, landslides are often prompted by the occurrence of other phenomena such as seismic activity or heavy rainfall. Other contributing factors include the following:

- Over-steepened slopes created by erosion associated with rivers, glaciers, or waves.
- Over-steepened slopes caused by construction activity, such as excavations or road cuts.
- Rock and soil slopes weakened through saturation by snowmelt or heavy rains.
- Earthquakes waves creating forces contributing to slope failure.
- Volcanic eruptions producing loose ash deposits, heavy rain, and debris flows.
- Excess weight from accumulation of rain or snow, stockpiling of rock or ore or 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.
- Moist clay on slopes that deform, slide, and flow easily.

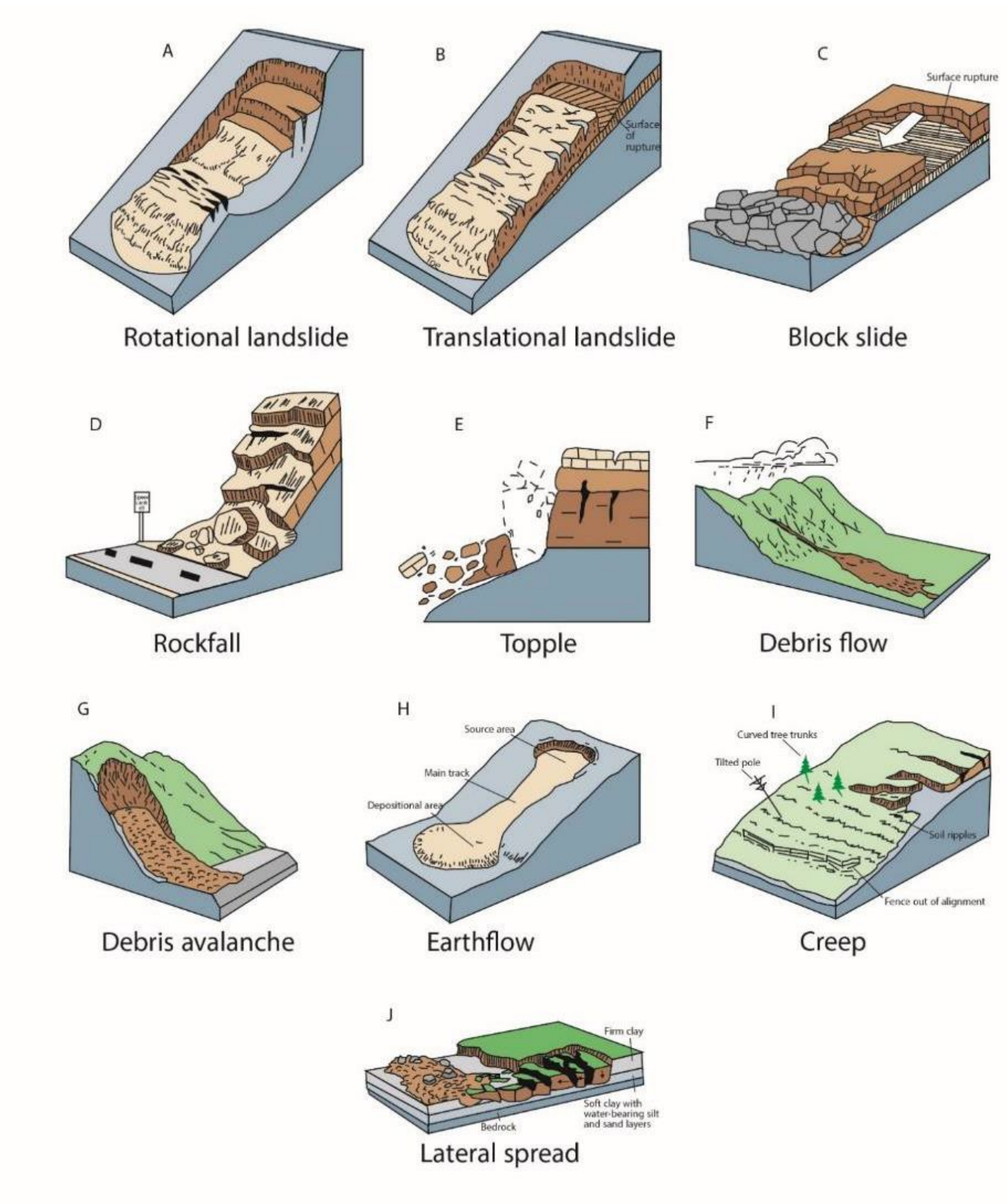
During heavy or sustained precipitation (including snow melt), slope material can become saturated with water and, if it fails, a debris or mudflow may develop. In this saturated state, the water weakens the soil and rock by reducing cohesion and friction between particles. Cohesion, which is the tendency 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; clays also prevent water from percolating downward and may promote local saturation of soils. Saturation 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 buttressing mass at the base of the slope. Alternating cycles of freeze and thaw can result in a slow, virtually imperceptible fracturing of rock, thereby weakening it and increasing susceptibility to slope failure or rockfall. Slopewash associated with intense precipitation may wash small stones off of steep cliffs, causing rockfall events. Intense precipitation also may promote shallow failure of weakly consolidated material, resulting in a debris flow. The resulting slurry of rock and mud causes flooding along its path and can pick up trees, houses, and cars; this slurry can also block or weaken bridges and damage roads. Additionally, the removal of vegetation can leave a slope much more susceptible to superficial landslides because of the loss of the stabilizing root systems.

Geologists attempt to 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

Landslides are commonly categorized according to the material involved and the type of movement. The material can be either bedrock or unconsolidated. The type of movement can be classified as follows: slides, falls+topples, flows, lateral spreads, or combinations of these processes. The Figure 58 below presents the types of landslides, followed by text briefly summarizing them.

Figure 58:Main Types of Landslides



Rotational landslides – a landslide (A in Figure 58 above) consisting of a mass of material moving down slope as a unit along a concave-up, curved plane of failure. Slide movement is approximately rotational about an axis that is parallel to the ground surface and orientated transverse across the landslide. The sliding mass of soil and rock leave an abrupt drop-off at the top of the landslide, known as a main scarp or head scarp. Over much of its length, the moving mass of material is back-tilted towards this head scarp. Repeated movements can often result in terracing, or series of scarps, as secondary failures occur within the landslide mass.

Translational landslides – a landslide (B in Figure 58 above) where the mass moves (translates) along an approximately planar surface with little rotation or back-tilting. A translational slide involving bedrock is also referred to as a rockslide, which generally moves along a plane of weakness, such as a bedding plane or joint. If the bedrock mass breaks apart as it moves, then the slide can be termed a block slide (C in figure above). In general, translational slides occur on steep mountain faces, but have been known to occur on slopes as low as 15 degrees.

Rockfall and rock topple – these types of landslides involve freefall of hard blocks (rock or boulders) from a steep slope or cliff (D and E in Figure 58 above), eventually coming to rest at a shallower slope. Rockfall involves abrupt downward detachment along a surface (D in in Figure 58 above). Rock topple, on the other hand, is when the rock body has forward rotation (out from the slope) about a semi-horizontal axis below the center of gravity of the displaced mass (E in Figure 58 above). During its transport, the moving block may remain intact or shatter into smaller pieces (depending on the degree of acceleration and the strength of the falling rock). The blocks typically accumulate at the base of the cliff in the form of talus (loose rock). Separation from a cliff occurs along discontinuities such as joints, fractures, or bedding planes. Potential driving forces for rockfalls + rock topples include freeze/thaw weathering or segregation ice growth, expansion of clays in cracks, solar heating of rocks that can form cracks, earthquakes, and precipitation. Rockfalls + rock topples are influenced by bedrock type -- especially its hardness, orientation of bedding planes (if any), or fracture density.

Debris flow – a mixture of rock fragments, soil, vegetation, water and, in some cases, entrained air that flows downhill as a fluid (F in Figure 58 above). Debris flows include <50% fines (clat+silt+sand) and are commonly caused by intense surface-water flow associated with heavy precipitation or rapid snowmelt. This runoff erodes weakly consolidated material accumulated in gullies or from steep slopes (the latter facilitated by wildfire denudation of vegetation). Shallow landslides on steep slopes that involve saturated, weakly consolidated material can also evolve into debris flows.

Debris avalanche – a debris flow that is emplaced very rapidly due to slope failure (G in in Figure 58 above), commonly from collapse of an unstable, steep slope (such as a steep flank of a volcano).

Earthflow and mudflow – These landslide types generally involve fine-grained material that behaves in a liquefied manner. The flow is elongate, commonly having an "hourglass" shape, and leaves a bowl or depression near its head (H in Figure 58 above). A mudflow is an earthflow that is sufficiently wet to flow rapidly and contains at least 50% sand-, silt-, or clay-sized particles.

Creep – steady, downward movement of material along a slope involving rates that are imperceptibly slow. This phenomenon is evidenced by curved tree trunks, bent fences or retaining walls, or tilted poles (I in Figure 58 above). It is common in New Mexico on slopes underlain by shale.

Lateral spread – slides involving lateral extension of material, either weakly consolidated or solid, that occurs in or over liquefied, fine-grained material (J in Figure 58 above). Failure is often triggered by rapid ground motions, such as that experienced during an earthquake.

Landslides can be classified by using the Alexander Scale (Table 53). The Alexander Scale provides descriptions of landslide damage and the different levels and type of damage.

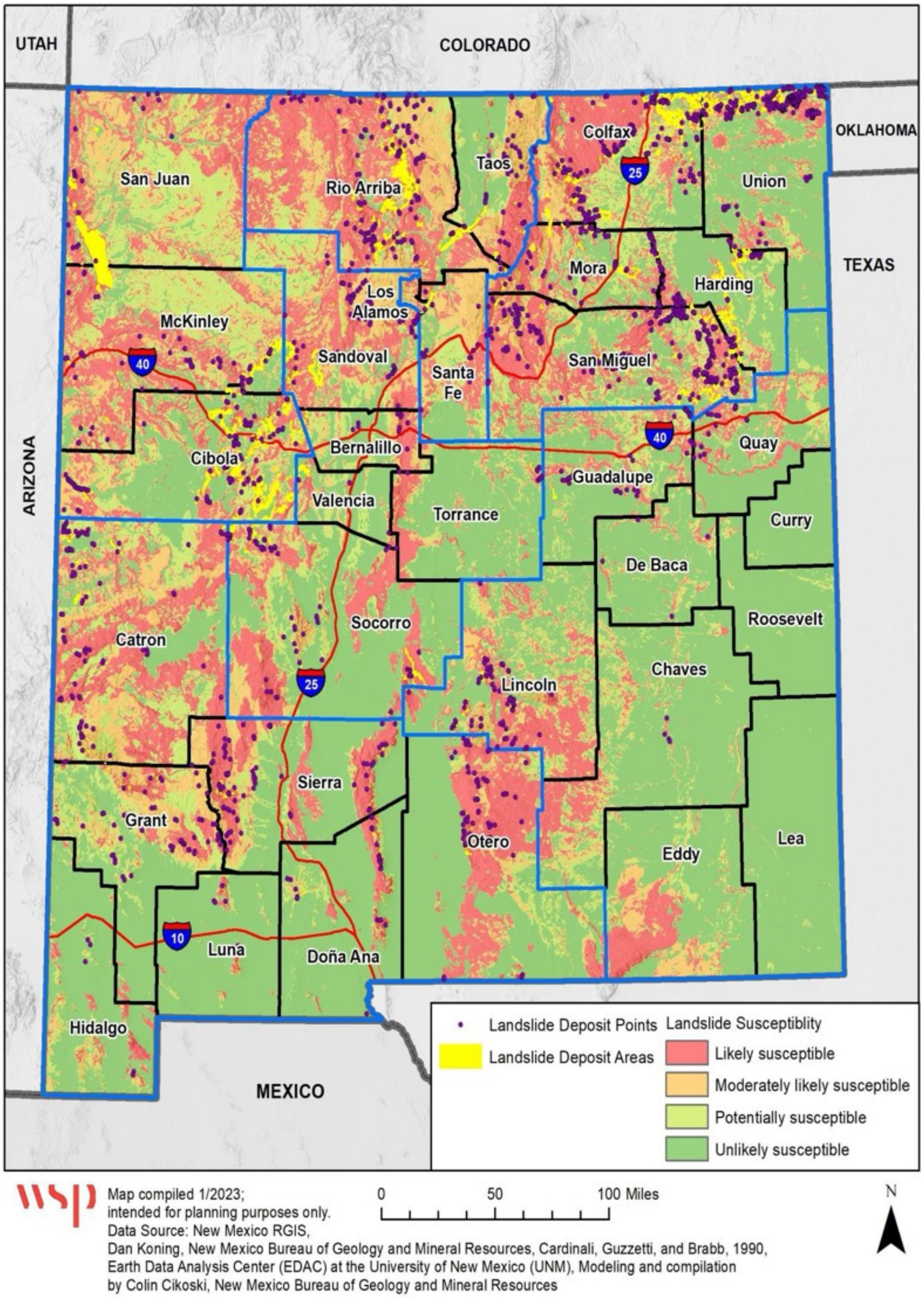
Table 53: Alexander Scale for Landslide Damage

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 notsufficient 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.
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. Of the various landslide phenomena, debris flows and rockfalls pose the greatest hazards to New Mexico. Although they still have the potential to be a modern-day threat (given the right slope conditions and driving forces), most deep-seated landslides observed on the landscape probably happened in cooler or wetter climates before 10,000 years ago.

The New Mexico Bureau of Geology has provided GIS data utilized to produce Statewide susceptibility maps for landslides and rockfalls. Susceptibility is used to describe the natural propensity of the landscape to produce a given hazard (in this case, landslides and rockfall). In other words, these maps depict the likelihood that a landslide or rockfall event will occur in a specified area based on local terrain conditions, given adequate driving forces or destabilizing phenomena. Landslide susceptibility is mapped in Figure 59.

Figure 59: New Mexico Landslide Susceptibility Classes



Previous Occurrence

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 54, which briefly explains those significant events that have occurred. This information was provided by local jurisdictions and NMDHSEM.

Table 54: Significant Past Occurrence - Landslide

Date	Location	Significant Event
July 8, 2015	Highway 38, west of Red River (Taos County) (PA 3)	A mudslide covered State Highway 38 after heavy rain and hail ripped through the area. The New Mexico Department of Transportation closed the road for cleanup crews to clear the mud and boulders.
September 9, 2013	Chaves, Guadalupe, and Eddy County (PA 1) Colfax, San Miguel, and Mora County (PA 2) Los Alamos and Santa Fe County (PA 3) Cibola County, McKinley County (PA 4) Sandoval, Socorro, and Torrance County (PA 5) Catron and Sierra County (PA 6)	A Major Disaster Declaration was issued on October 29, 2013 for DR-4152, New Mexico Severe Storms, Flooding, and Mudslides. The Severe Storms, Flooding, and Mudslides took place September 9 through September 13, 2013, damaging public facilities and roads in 14 New Mexico counties.
January 15, 2013	Guadalupe Mesa (Sandoval County) (PA 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 15, 2008	Gallup, NM (PA 4)	A rockslide crushed three 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.
September 1998	Taos, NM (Taos County) (PA 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.

Date	Location	Significant Event
June 1977	Taos, NM (Taos County) (PA 3)	A landslide event caused $50,000 in property damage.

Declared Disasters from Landslide

There has been one State and one Federally declared disaster for Landslide between 2012 and 2017 (Table 55) According to FEMA, DR-4152 was declared on October 29, 2013 for the New Mexico Severe Storms, Flooding, and Mudslides that occurred between September 09, 2013 and September 22, 2013. The Public Assistance Dollars Approved and Obligated was $41,435,522.02 which was split between Emergency Work (Categories A-B) of $13,096,232.75, and Permanent Work (Categories C-G) of $27,002,216.27. The Executive Order in support of DR 4152 is Executive Order 016-034. Executive Order 07-021 is for a State 2007 landslide disaster in the amount of $291,137.

Table 55: New Mexico Landslide Disaster Declarations (2003 – 2022)

Event Type	Disaster Declaration	Dollar Loss
Mudslide	DR-4152	$41,435,522.02
Landslide	016-034	$225,000.00
Landslide	07-021	$291,137.00
Total		**$41,951,659.02**

Another source of landslide damage information is from the NCEI. Below is a tally of landslide damage as reported by NCEI broken out by Preparedness Area. According to NCEI from 1997 through December 2017, Statewide property damage from landslide damage was $388,408 and no crop damage was reported. Table 56 provides a cumulative overview of all landslide events that have occurred in all Preparedness Areas.

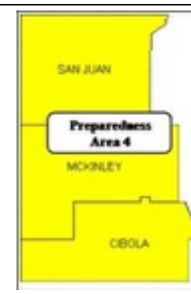
Table 56: Preparedness Areas 3 - 5 Landslide History (1997 – 2022)

Preparedness Area 3
UNM-Los Alamos Branch and UNM-Taos Branch

Hazard Type	# of Events	Mag	Deaths	Injuries	Property Damage	Crop Damage
Landslide	2	0	0	0	$125,000	$0
Total	2	0	0	0	$125,000	$0

Preparedness Area 4
UNM-Gallup Branch

Hazard Type	# of Events	Mag	Deaths	Injuries	Property Damage	Crop Damage
Landslide	3	0	3	0	$263,408	$0
Total	3	0	3	0	$263,408	$0



Preparedness Area 5
UNM Albuquerque Campus, UNM Health Sciences Rio Rancho Campus UNM Sandoval Regional Medical Center, UNM Sevilleta Long Term Ecological Research (LTER) Field Station, and UNM-Valencia Branch

Hazard Type	# of Events	Mag	Deaths	Injuries	Property Damage	Crop Damage
Landslide	1	0	0	0	$0	$0
Total	1	0	0	0	$0	$0

Past Frequency
The frequency of landslides in New Mexico is low based on previous occurrences.

Climate Change Impacts
Climate projections across the United States have shown that while total annual precipitation will likely decrease in the Southwest region, the heaviest annual rainfall events will become more intense. More frequent high-magnitude precipitation events would cause more frequent debris flows and landslides across the State. Also, the severity of debris flows would correlate to the intensity of these precipitation

events. Sustained periods of higher-than-normal moisture could possibly result in more rockfall and deep-seated landslide events according to the 2018 state plan.

Although uncertainty exists in the evaluation of the impacts of climate change on landslides and the stability of natural and engineered slopes, an increase in the frequency and intensity of severe rainfall events -- a primary trigger of rapid-moving landslides that can cause fatalities -- will result in more people and property exposed to landslide risk.

According to a 2012 special report by the IPCC, “There is high confidence that changes in heat waves, glacial retreat, and/or permafrost degradation will affect slope instabilities in high mountains and medium confidence that temperature-related changes will influence bedrock stability. There is also high confidence that changes in heavy precipitation will affect landslides in some regions.”

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

Table 57: Probability of Annual Occurrence of Landslide

Preparedness Area	Landslide
PA 3	7%
PA 4	7%
PA 5	3%

One concern 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 that may be accompanied by debris flows and flash floods.

Risk Assessment

Landslides have occurred in New Mexico, specifically in Preparedness Areas 3 and 4. UNM properties have not been affected by these landslides.

Though the data for previous occurrences is minimal, based on previous occurrences, Taos County (Preparedness Area 3) would be considered to have a high risk of a landslide occurrence.

Data Limitations

USGS produced a statewide landslide map approximately 20 years ago based on an interpretation of aerial photography (USGS Open-file Report 90-293). These are now available in GIS format, but the spatial accuracy of these maps is variable (100-1200 m). Also, mapping the debris flow run-out zones would help in understanding the potential impact of landslides.

What Can Be Mitigated?
Mitigation activities can include erosion control measures, removing infrastructure from at-risk areas, and public education.

Summary of Risk to UNM
Landslides have occurred in New Mexico, specifically in Preparedness Areas 3 and 4 but UNM properties have not been affected by these landslides. Based on previous occurrences, Taos County (Preparedness Area 3) would be considered to have a high risk of a landslide occurrence. UNM-Taos Branch Campus is not considered to be at direct risk. However, road and highway closures caused by landslides could temporarily affect UNM-Taos students, staff, and visitors.

Table 58: 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.

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.

The following two maps (Figure 60 and Figure 61) depict Statewide snowfall distributions by average inches and average numbers of days with snowfall over one inch. Figure 62 shows the 30-year snow climatology from 1981-2010 for the State.

Figure 60: Average Annual Snowfall in Inches

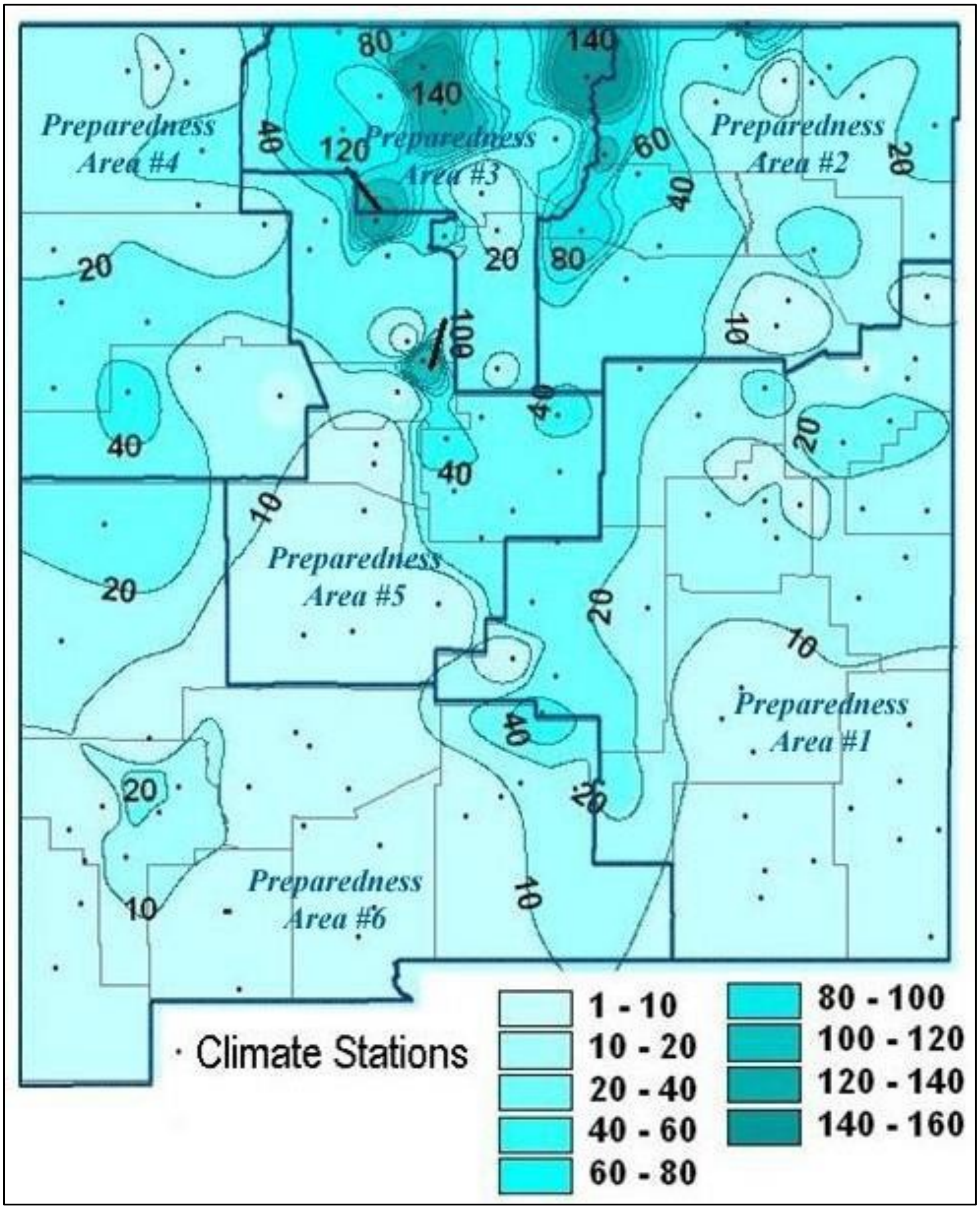


Figure 61: Average Annual Number of Days with Snowfall 1 Inch or Greater

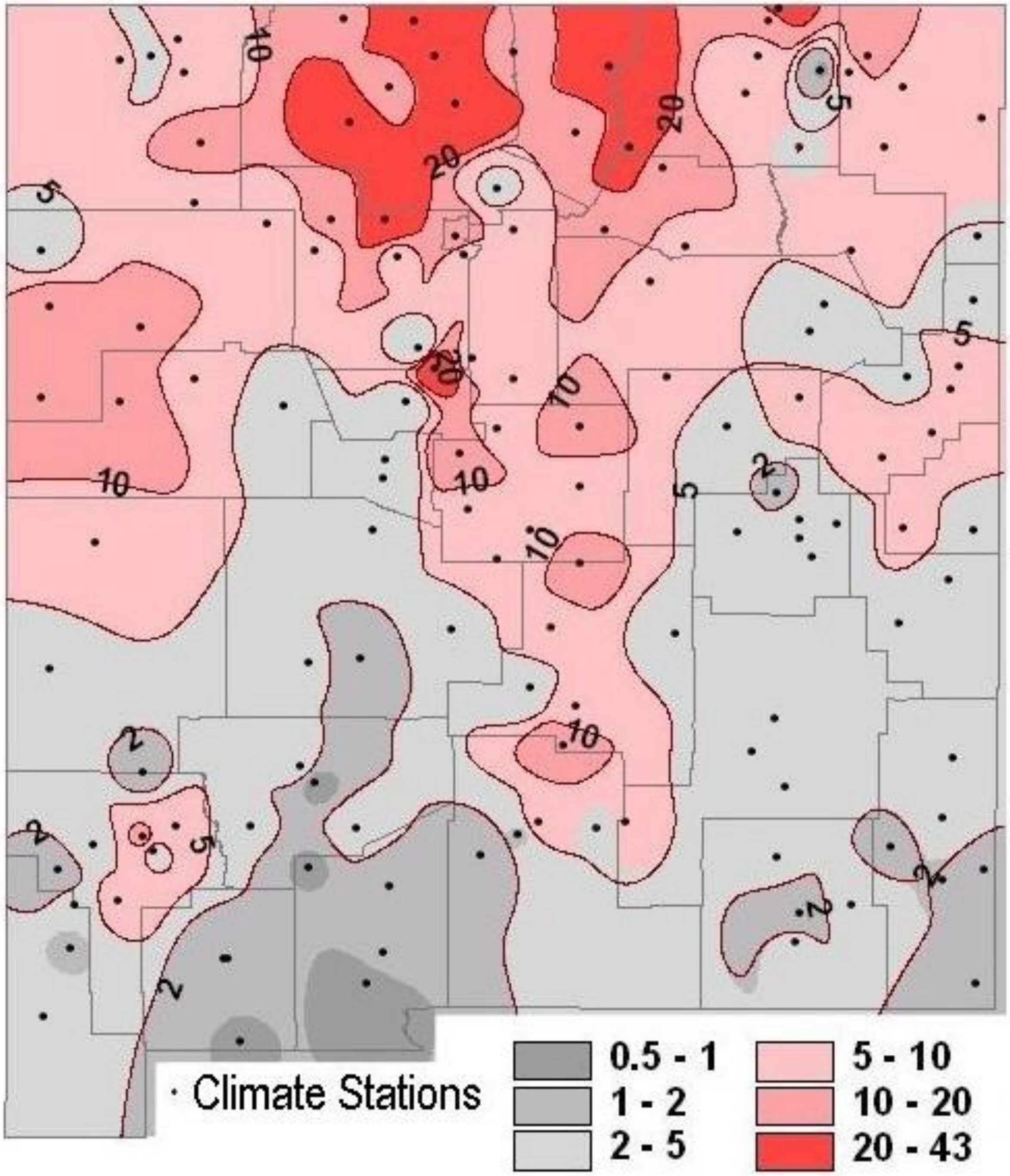
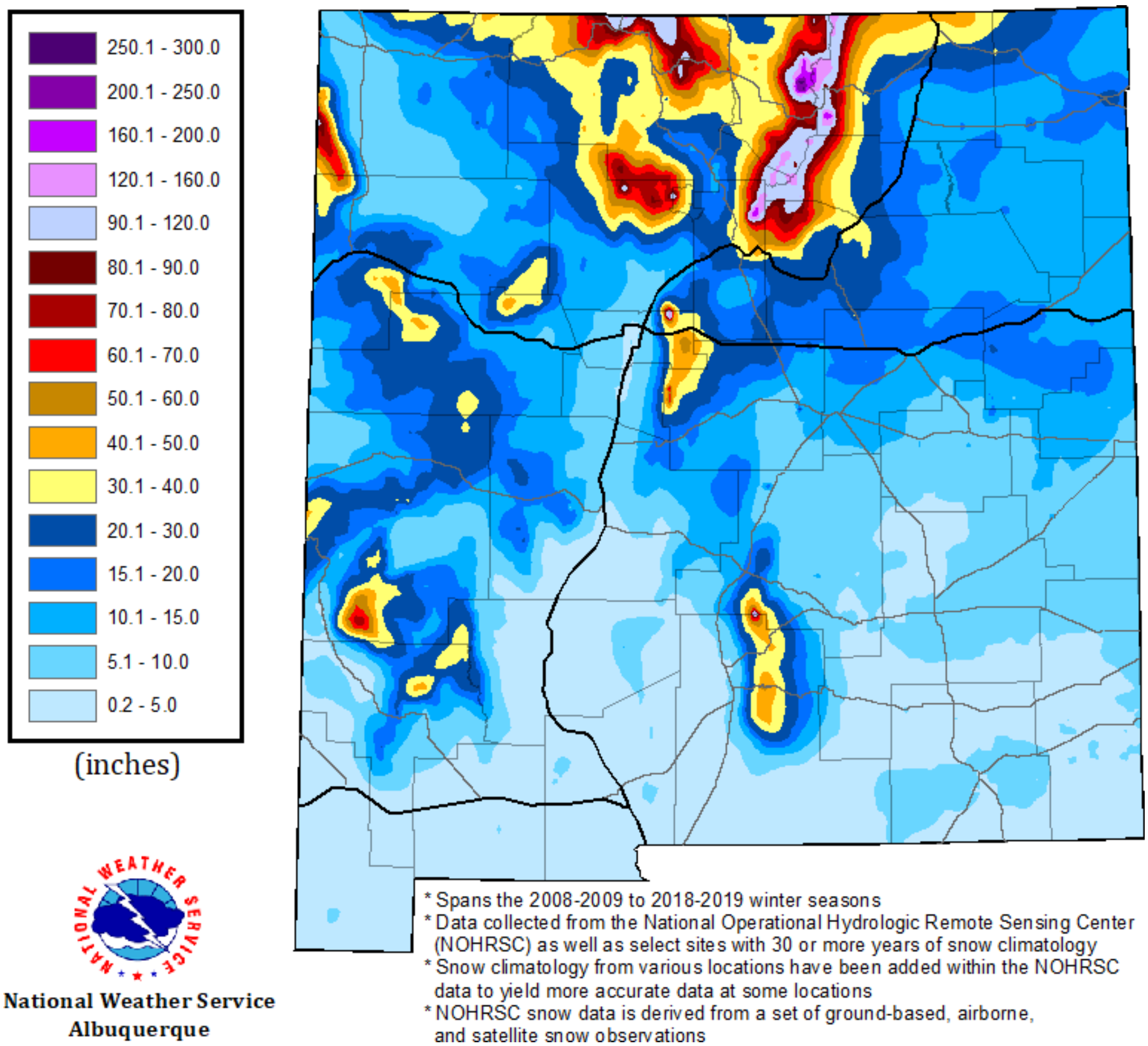


Figure 62: 30-year Snow Climatology from 1981-2010 for the State of New Mexico

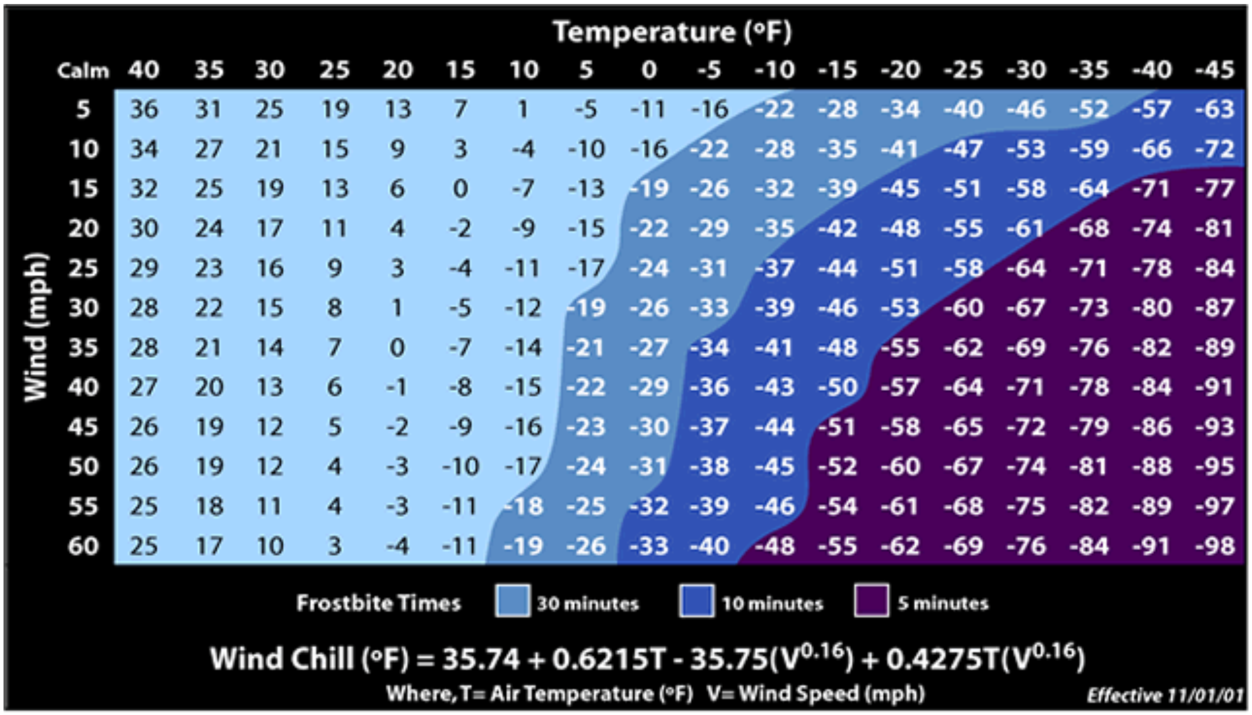


Severe winter storms can vary in size and strength and include heavy snowstorms, blizzards, ice storms, freezing drizzle or rain, sleet, and blowing and drifting snow. Extremely cold temperatures accompanied by strong winds result in potentially lethal wind chills.

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 63) shows the difference between actual air temperature and perceived temperature, and the amount of time until frostbite occurs.

Figure 63: Wind Chill Chart



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. The lowest temperature ever officially recorded was -50 degrees at Gavilan on February 1, 1951. An unofficial low temperature of negative 57 degrees at Ciniza was reported by the press on January 13, 1963.

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 how 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, 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 NCEI, New Mexico experienced a total of 410 winter storm events between January 1997 and December 2022, resulting in five deaths, 11 injuries, $5.28 million in property damage, and $5.27 in crop damage. For the same time period, NCEI reports 61 extreme cold/wind chill events resulting in one death and $1.175 million in property damage. In addition, there have been a total of 15 freezing fog events resulting in three deaths, one injury, and $50,000 in property damage.

Table 59 shows State winter storm disaster information. One of the 11 State severe winter storm disasters was also a federally declared disaster (Table 60).

Table 59 State Disaster Event Information 2003 through 2022

Event Type	State Executive Order	Dollar Loss
Severe Winter Storm	2004-031	$176,513
Snowstorm	2005-012	$384,269
Snowstorm	2005-016	$906,396
Snowstorm	2006-070	$2,013,953
Snowstorm	2008-005	$1,386,815
Snowstorm	2009-001	$71,427
Snow/Windstorm	2009-048	$54,040
Snowstorm	2010-005	$209,456
Severe Cold	2011-014	$750,000
Navajo Freeze	2013-004	$100,000
Severe Winter Storm	2013-034	$100,000
Severe Winter Storm	2015-021	$750,000
Severe Winter Storm	2016-035	$2,000,000
Severe Winter Storm	2019-008	$5,150,000
Snow Squall	2022-002	$450,000
Snow Squall	2022-014	$350,000
Severe Winter Weather	2022-148	$200,000
Total		**$15,052,869**

Table 60: Federal Disaster Event Information 2003 through 2022

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 from the NCEI. Below is a tally of severe winter storm damage as reported by NCEI broken out by Preparedness Area (Table 61). According to NCEI, Statewide property damage from winter storm damage was $2,870,000 from 1997 through December 2022. Note the information in the table below only includes data presented by county, and does not include data presented by National Weather Service Forecast Zones.

Table 61: Severe Winter Storm Events by Preparedness Area, 1997 - December 2022

Preparedness Area 3 UNM-Los Alamos Branch and UNM-Taos Branch						
Hazard Type	**# of Events**	**Mag**	**Deaths**	**Injuries**	**Property Damage**	**Crop Damage**
Extreme Cold/Wind Chill	11	-	0	0	$0	$0
Freezing Fog	2	-	2	0	$0	$0
Heavy Snow	583	-	0	0	$150,000	$0
Ice Storm	0	-	0	0	$0	$0
Winter Storm	24	-	0	0	$0	$0
Winter Weather	19	-	0	1	$30,000	$0
Total	639	-	2	1	$180,000	$0
Preparedness Area 4 UNM-Gallup Branch						
Hazard Type	**# of Events**	**Mag**	**Deaths**	**Injuries**	**Property Damage**	**Crop Damage**
Extreme Cold/Wind Chill	5	0	0	0	$0	$0
Freezing Fog	1	0	1	1	$50,000	$0
Heavy Snow	160	0	0	0	$50,000	$0
Ice Storm	0	0	0	0	0	0
Winter Storm	3	0	0	0	$0	$0
Winter Weather	0	0	0	0	$0	$0
Total	169	0	1	1	$100,000	$0
Preparedness Area 5 UNM Albuquerque Campus, UNM Health Sciences Rio Rancho Campus UNM Sandoval Regional Medical Center, UNM Sevilleta Long Term Ecological Research (LTER) Field Station, and UNM-Valencia Branch						
Hazard Type	**# of Events**	**Mag**	**Deaths**	**Injuries**	**Property Damage**	**Crop Damage**

Extreme Cold/Wind Chill	8	0	0	0	$0	$0
Freezing Fog	2	0	2	0	$0	$0
Heavy Snow	320	0	2	0	$130,000	$0
Ice Storm	3	-	0	0	$200,000	$0
Winter Storm	9	0	0	0	$0	$0
Winter Weather	12	0	0	1	$120,000	$0
Total	354	0	4	1	$450,000	$0

Past 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.

Climate Change Impacts
As the atmosphere holds more moisture, winter storms may become more intense, producing heavier than normal precipitation, including heavier snowfall. But winter has become increasingly unpredictable in recent decades due to climate change, scientists and ski industry experts say. As mid-winter temperatures increase, warmer oceans may fuel stronger winter storms, but snow cover may not stay around as long. Shorter winters are sure to have significant impacts for the local economy and snow sports industry, including resorts, hotels, restaurants and ski shops and the individuals they employ.

According to recent findings published by Environmental Defense Fund (EDF), more periodic and high- intensity snowfall and rain events during winter storms is an expected outcome of climate change, because a warmer planet is evaporating more water into the atmosphere. The added moisture means more precipitation in the form of heavy snowfall or precipitation in the form of rain rather than snow due to warmer temperatures. Moreover, climate change may be expected to lead to more frequent extreme weather conditions in the future. A recent article published on Union of Concerned Scientists on February 1, 2023 also agrees with EDF's conclusion. More evaporation provides more moisture for storms, resulting in more frequent heavy precipitation events, which in turn increases the intensity of the impacts of winter storms.

While climate researchers cannot determine if climate change caused a specific extreme winter storm or even a specific seasonal change, climate warming will continue to decrease annual snowfall amounts overall and shorten the snow season. However, when severe winter storms do occur, there may be added moisture in the air to generate more intense rates of snowfall.

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 NCEI database from a period of December 2022 (324 months/27 years) and from local emergency management officials. Probability was determined by dividing the number of events observed by the number of years (27 years) and multiplying by 100. This gives the percent chance of the event happening in any given year.

Table 62 provides the probability of occurrence in each Preparedness Area based on the probability formula.

Table 62: Probability of Occurrence - Severe Winter Storms

Preparedness Area	Extreme Cold/Wind Chill	Freezing Fog	Heavy Snow	Winter Storm
PA 3	41%	7%	100%	0%
PA 4	19%	4%	100%	0%
PA 5	30%	7%	100%	11%

Vulnerability Assessment

As discussed in the sections above, severe winter storm activity in New Mexico is consistent. The entire State is susceptible to a full range of winter weather conditions, including extreme cold/wind chill, freezing fog, heavy snow, ice storm, and winter storm. All areas of State are susceptible to winter weather conditions, although local topography, such as elevation and land contours, plays a significant part in how weather affects a particular area. Extreme variations in damages due to thunderstorm events across the Preparedness Areas can be attributed to differences in the concentration of population and infrastructure.

Preparedness Area 3

The NCEI database has recorded 2 fatalities, 1 injury, and $180,000 in property damages in Preparedness Area 3. In total, 639 severe winter weather related events were recorded in this area from 1955-2022. Preparedness Area 3 has the lowest reported property damage within the state but the highest number of winter weather events in the state. This area is located in the northern portion of the state, where damaging events are less frequent. Most of the damages recorded in this area occurred in the Jemez Mountains Area as well as Santa Fe County due to its dense concentration of population and infrastructure.

Preparedness Area 4

The NCEI database has recorded 1 fatality, 1 injury and $100,000 in property damages in Preparedness Area 4. In total, 169 severe winter weather related events were recorded in this area from 1955-2022. Preparedness Area 4 has the second lowest amount of property damages due to severe winter weather events in the State and also the second lowest amount of total documented events. This is mainly due to the location of the area in the northwest portion of the state where events and especially damaging events are less frequent.

Preparedness Area 5

The NCEI database has recorded 4 fatalities, 1 injury, and $450,000 in property damages in Preparedness Area 5. In total, 354 severe winter weather related events were recorded in this area from 1955-2022. Preparedness Area 5 has the largest population in the state, concentrated in Bernalillo County. Due to this dense concentration of infrastructure and people, the damages reported in this Preparedness Area are the third most significant in the State. Preparedness Area 5 also has the third highest number of event occurrences. This also makes the people living in this area more vulnerable to injury and death from these events, as indicated by the fact that Preparedness Area 5 has the highest number of fatalities during past events.

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.

What Can Be Mitigated?

One important part of mitigating severe winter storm hazards is forecasting and warning so that people can prepare. Communities can prepare for disruptions of utilities and transportation due to severe winter storm by advising people to stay home or to use caution if they must go out, and by recommending that people stock up on food, water, batteries, and other supplies. The National Weather Service, combined with local television stations, have an effective strategy for notifying residents about impending storms. LoboAlerts, the University's emergency text messaging system, can be used to provide severe winter weather alerts to the University community if needed.

To lessen roadway impacts, planting rows of trees, or “living snow fences”, can limit blowing and drifting of snow over critical UNM roadways.

Other mitigation activities can include protecting utilities from the impacts of winter storms by pruning trees around power lines, insulating water lines, ensuring backup power at critical facilities, hardening other infrastructure, and public education.

Summary of Risk 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.

Severe winter weather is likely to have a serious impact on major population centers and transportation routes, most of which are not located in the high mountains. This occurred on December 24, 2011 during a severe snowstorm when motorists traveling through the Albuquerque, NM (Preparedness Area 5) Interstate system were stranded for up to 18 hours. If a severe winter storm were to cause a power failure, as would be likely with an ice storm, the effect could be very serious 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, which can strand motorists.

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 rural Branch Campuses (Gallup, Los Alamos, Taos), access in and out can be limited due to roads becoming risky and or closed.

Table 63: 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.

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

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. Nation-wide, 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:

- Electrocution or severe shock of humans and animals;
- Vaporization of materials along the path of the lightning strike;
- Fire caused by the high temperatures (10,000-60,000°F); and
- 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. Vaisala reported that in 2022, the state of New Mexico ranked 17th in the nation for total lighting count and 30th in the nation for lightning density (event per km2). Jal was reported to be the lightning capital of New Mexico.

The Lightning Activity Level is a scale from one to six, which describes the frequency and character of cloud-to-ground (cg) lightning (Table 64).

Table 64: Lightning Activity Level Scale

	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 experience storms of LAL5 or higher, specifically during the monsoon seasons. The North American Monsoon System

(NAMS) 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 comprised of "bursts" and "breaks," or periods of rainy and dry weather. The average onset occurs around July 3rd for the southwest corner of the State (Preparedness Area 6, around July 9th for the Middle Rio Grande valley (Preparedness Area 5), and around July 12th for the Four Corners region (Preparedness Area 4).

Hail

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 degrees 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 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.

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 65 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.

Table 65: Combined NOAA/TORRO Hailstorm Intensity Scale

	Intensity Category	Typical Hail Diameter (mm)	Probable Kinetic Energy, J-m2	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		Tennis ball > cricket ball	Severe roof damage, risk of serious injuries
H8	Destructive	60-90		Large orange > Softball	(Severest recorded in the British Isles) Severe damage to aircraft bodywork
H9	Super Hailstorms	75-100		Grapefruit	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open
H10	Super Hailstorms	>100		Melon	Extensive structural

Previous Occurrences

Thunderstorm events characterized by high wind/hail events are common throughout New Mexico and occur hundreds of times each year. Analysis of the number of reported occurrences for Preparedness Areas from May 1955 to December 2022 by the NCEI shows Preparedness Area 5 has a high concentration of thunderstorm activity. Conversely, concentrated areas of low thunderstorm occurrence were found in Preparedness Areas 3 and 4.

The current online NCEI database is limited in past events and contains data from May 1955 to December 2022, as entered by NOAA's National Weather Service (NWS). According to the NCEI database 6,968 total thunderstorm events (including hail, heavy rain, lightning, and thunderstorm wind events) have occurred in the State of New Mexico since 1955. These events have resulted in a total of 18 fatalities, 161 injuries, over $173.5 million in property damages, and over $12.6 million in crop losses across the State. Table 66 displays a summary of losses recorded by the NCEI dataset by Preparedness Area.

Table 66: Thunderstorm History by Preparedness Area, 1955 –2022

Preparedness Area 3
UNM-Los Alamos Branch and UNM-Taos Branch

Hazard Type	# of Events	Mag	Deaths	Injuries	Property Damage	Crop Damage
Hail	224	.75 – 2.5”	0	0	$1,410,000	$500
Heavy Rain	3	0	0	0	$0	$0
Lightning	20	-	3	9	$216,000	$100
Thunderstorm Wind	82	0 to 73 kts	0	3	$7,484,500	$0
Total	**329**	**-**	**3**	**12**	**$9,110,500**	**$600**

Preparedness Area 4
UNM-Gallup Branch

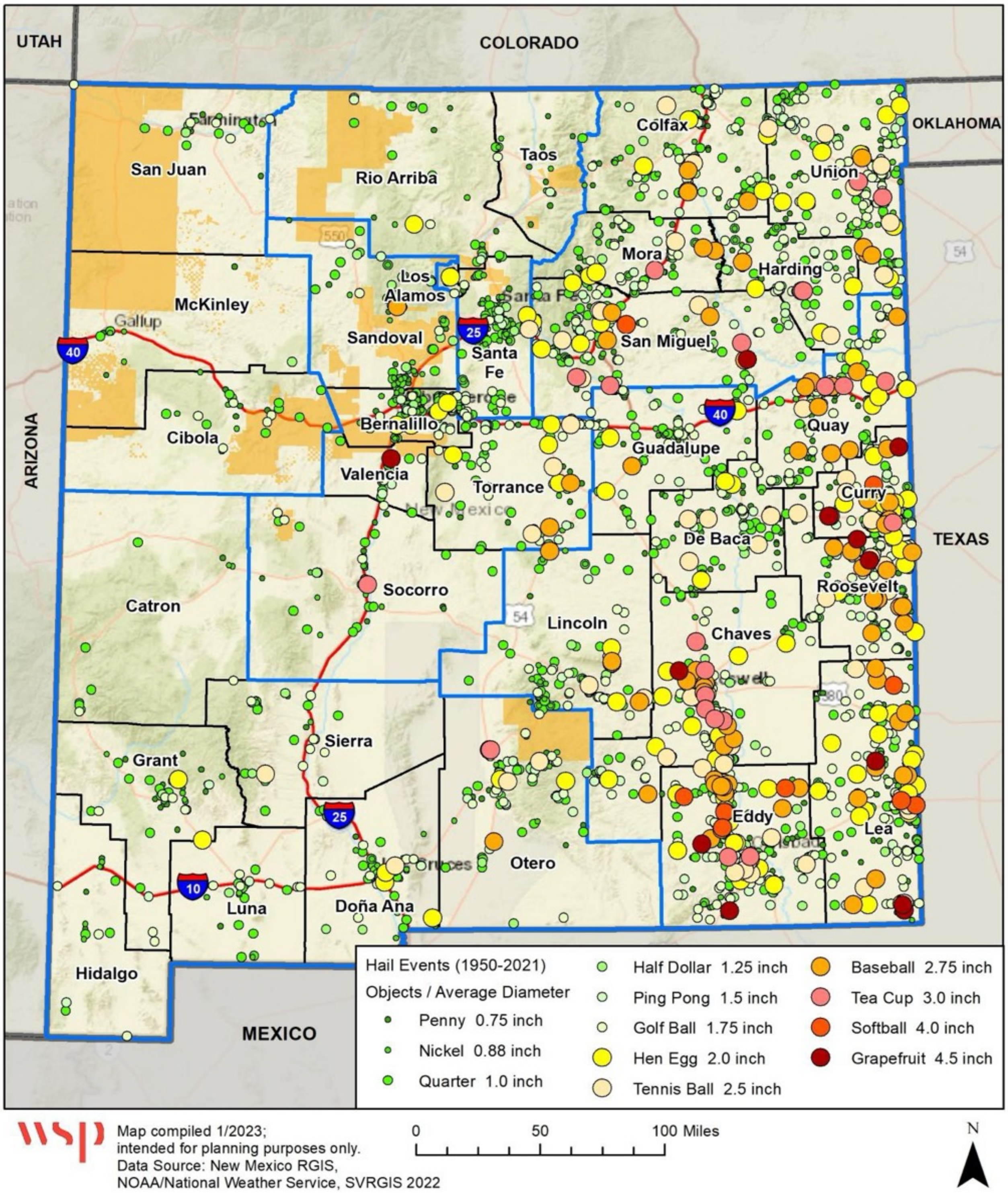
Hazard Type	# of Events	Mag	Deaths	Injuries	Property Damage	Crop Damage
Hail	65	.75 – 1.75”	0	3	$1,000	$0
Heavy Rain	8	0	1	5	$215,000	$0
Lightning	6	-	1	4	$70,000	$0
Thunderstorm Wind	70	0 to 90 kts	0	1	$793,000	$1,000
Total	**149**	**-**	**2**	**13**	**$1,079,000**	**$1,000**

Preparedness Area 5
UNM Albuquerque Campus, UNM Health Sciences Rio Rancho Campus UNM Sandoval Regional Medical Center, UNM Sevilleta Long Term Ecological Research (LTER) Field Station, and UNM-Valencia Branch

Hazard Type	# of Events	Mag	Deaths	Injuries	Property Damage	Crop Damage
Hail	435	75-4.5“	0	21	$56,905,500	$375,000
Heavy Rain	23	0	1	9	$1,529,000	$0
Lightning	21	-	2	22	$232,000	$500
Thunderstorm Wind	244	0 to 87 kts	0	6	$3,726,000	$101,000
Total	**723**	**-**	**3**	**58**	**$62,392,500**	**$476,500**

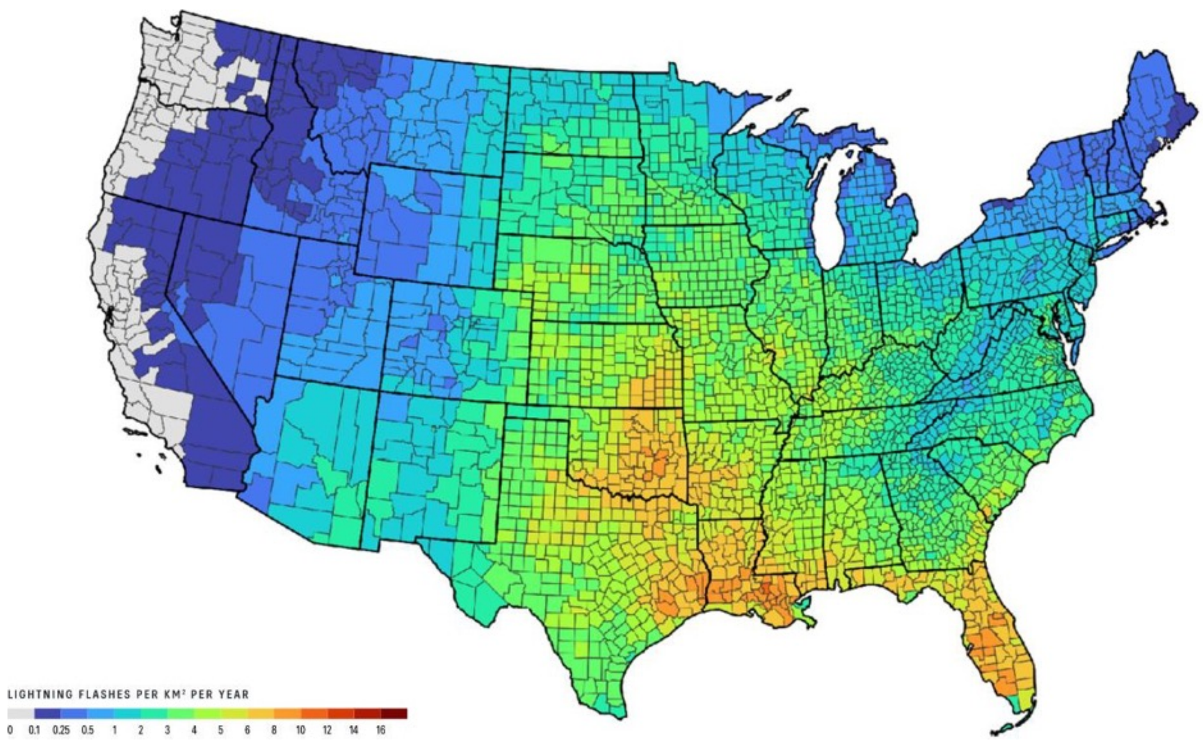
Figure 63 displays a map of past hail events by magnitude in the State of New Mexico. The map indicates that counties in Preparedness Areas 1 and 2 experience the greatest frequency and magnitude of hail events. However, most property damages from hail events occurred in Preparedness Areas 1 and 5.

Figure 57: New Mexico Hail Events by Magnitude 1950-2021



The NCEI reported that lightning has caused 11 fatalities and 50 injuries in the State since 1996. As mentioned above, all Preparedness Areas consistently experience storms of LAL5 or higher. While the entire State is at risk for lightning events, some areas of the State have higher concentrations of them. The two most damaging lightning events occurred in Preparedness Area 1 and 5, both of which resulted in an estimated $100,000 in property damage. The NCEI database reported that on August 8th, 2015, in Curry County, fire crews responded to lightning caused blaze at a duplex home that resulted in significant damage to the property. A lightning event on August 3rd, 2001, in Sandoval County caused significant damages to an entire pumping system on the Rio Rancho city water reservoir. The 7.5-million-gallon reservoir dropped to less than 600 thousand gallons before the pump system was restored. The lightning event that caused the greatest number of injuries in one strike was recorded in Preparedness Area 6 in Dona Ana County on August 19, 2014, when six people, including several middle school football players were injured from the initial lightning strike from a nearby thunderstorm. No fatalities occurred, but one student was in the hospital with injuries for over a week.

Figure 65: Cloud-to-Ground Lightning Flash Density 2016-2021



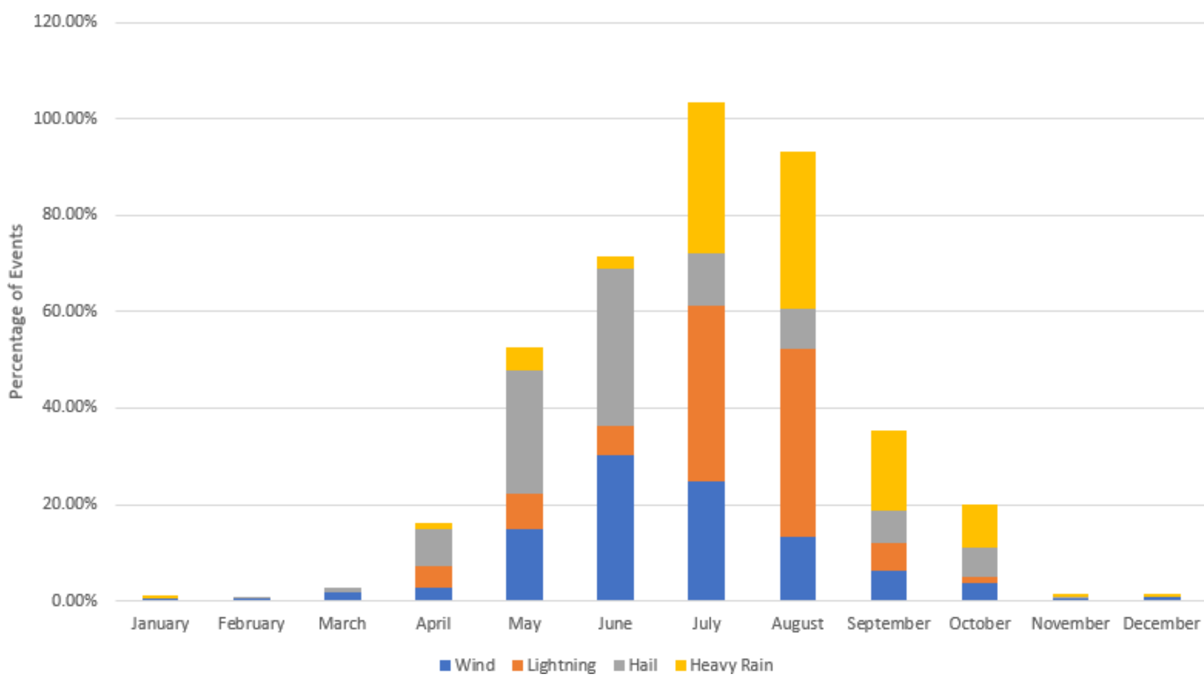
Past Frequency

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 26 years New Mexico has experienced 119 reported events 75 mph or higher associated with thunderstorms, with a single occurrence of 104 mph winds. This means that in New Mexico winds similar to a Category One Hurricane (Saffir-Simpson Scale) are experienced on average about 5 days somewhere in the state every year.

The NCEI database reported 4,785 hail and 1,967 thunderstorm wind events in the State since 1955. Additionally, 147 heavy rain events and 69 damaging lightning events have been reported since 1996. This totals to 6,968 events over the past 67 years, some of which occur simultaneously. The NCEI reported that most events occurred in the month of July, followed by the months of August then June. Figure 58 below displays the distribution of events by month in the State of New Mexico.

According to the NCEI, oversized and severe hailstorms occur most frequently in May and June. Most counties across the eastern half of the State will see large hail ranging from golf ball to softball at least six to eight times during the spring and 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. Lightning and heavy rain events occur most frequently in the months of July and August. These events are most likely to occur in the afternoon and evenings. Thunderstorm winds peak in the month of June, followed by July.

Figure 58: Percentage of Thunderstorm Events by Month



Climate Change Impacts

As the atmosphere warms further due to climate change, the increased heat in the atmosphere provides more energy for severe storms. The frequency of severe weather events has increased steadily over the last century. The number of weather- related disasters during the 1990s was four times that of the 1950s, and cost 14 times as much in economic losses. Historical data shows that the probability for severe weather events increases in a warmer climate. The changing hydrograph caused by climate change could have a significant impact on the intensity, duration, and frequency of storm events. A study published in the Journal of Science in November of 2014 showed the possibility of a 12% increase of lightning events for every degree of warming. All of these impacts could have significant economic consequences.

Probability of Future Occurrence

All Preparedness Areas in New Mexico experience severe thunderstorms producing high winds, large hail, deadly lightning, and heavy rains at some time during the year. 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 places where the population is concentrated, and buildings have not been updated to meet current building code standards.

To determine the probability of New Mexico experiencing thunderstorm occurrences, the probability or chance of occurrence was calculated based on historical data identified the NCEI database from a period of 1955 to 2022 (67 years) for hail and thunderstorm wind, and a period of 1996 to 2022 (26 years) for heavy rain and lightning. Probability was determined by using the Poisson Model to analyze the rate of exceedance. The Poisson model is the most commonly used model for the occurrence of random point events in time. 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 67. It is important to note that all Preparedness Areas are likely to experience these events on an annual basis, but these percentages reflect the frequency of damaging or fatal thunderstorm events.

Table 67: Probability of Occurrence (Thunderstorm Events)

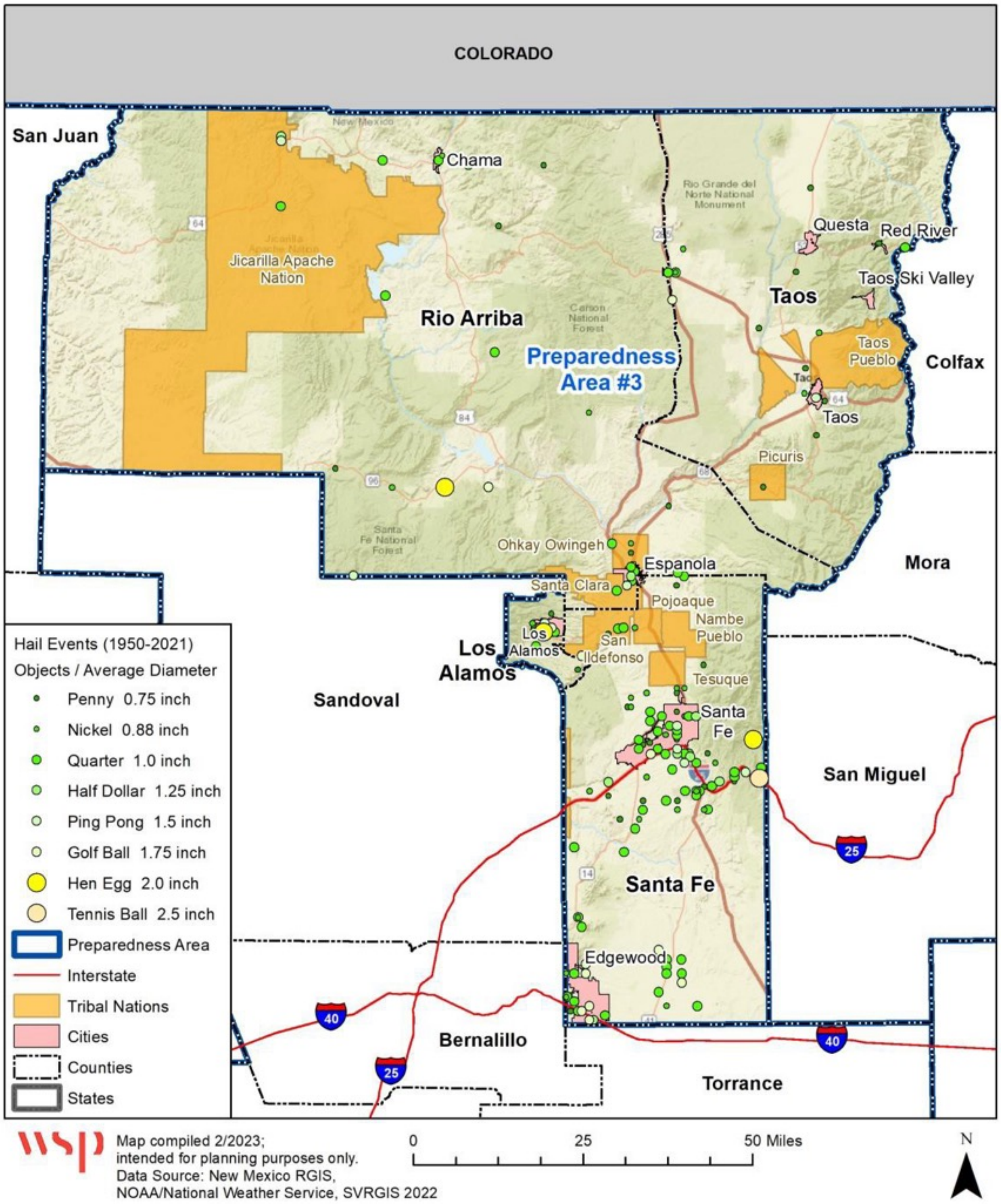
Preparedness Area	Hail	Heavy Rain	Lightning	Thunderstorm Wind
PA 3	100%	11.5%	76.9%	100%
PA 4	97%	30.8%	23.1%	100%
PA 5	100%	88.5%	80.8%	100%

Vulnerability Assessment

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 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. Extreme variations in damages due to thunderstorm events across the Preparedness Areas can be attributed to differences in the concentration of population and infrastructure.

The NCEI database has recorded 3 fatalities, 12 injuries, over $9.1 million in property damages, and $600 in crop damages in Preparedness Area 3. In total, 329 thunderstorm related events were recorded in this area from 1955-2022. Preparedness Area 3 has a relatively low number of reported damages and injuries in comparison to other areas in the state. This area is located in the northern portion of the state, damaging where events are less frequent. Most of the damages recorded in this area occurred in Santa Fe County due to its dense concentration of population and infrastructure. The figure below displays the location of documented hail events in Preparedness Area 3.

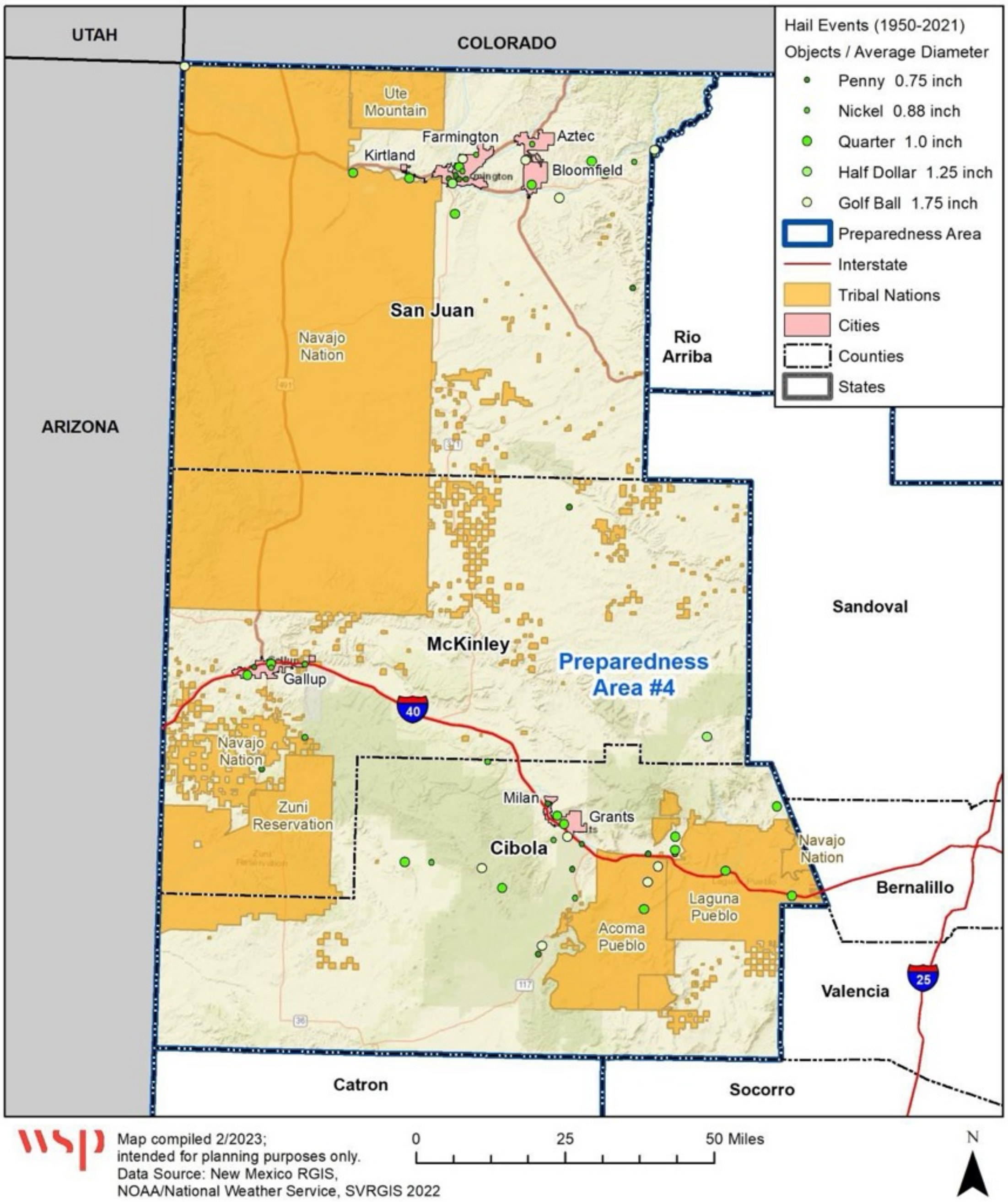
Figure 59: Preparedness Area 3 Historic Hail Events (1950-2021)



Preparedness Area 4

The NCEI database has recorded 2 fatalities, 13 injuries, over $1.0 million in property damages, and $1,000 in crop damages in Preparedness Area 4. In total, 149 thunderstorm related events were recorded in this area from 1955-2022. Preparedness Area 4 has the least amount of property damages due to thunderstorm wind events in the State and the least amount of total documented events. This is mainly due to the location of the area in the northwest portion of the state where events are less frequent. The figure below displays the location of documented hail events in Preparedness Area 4

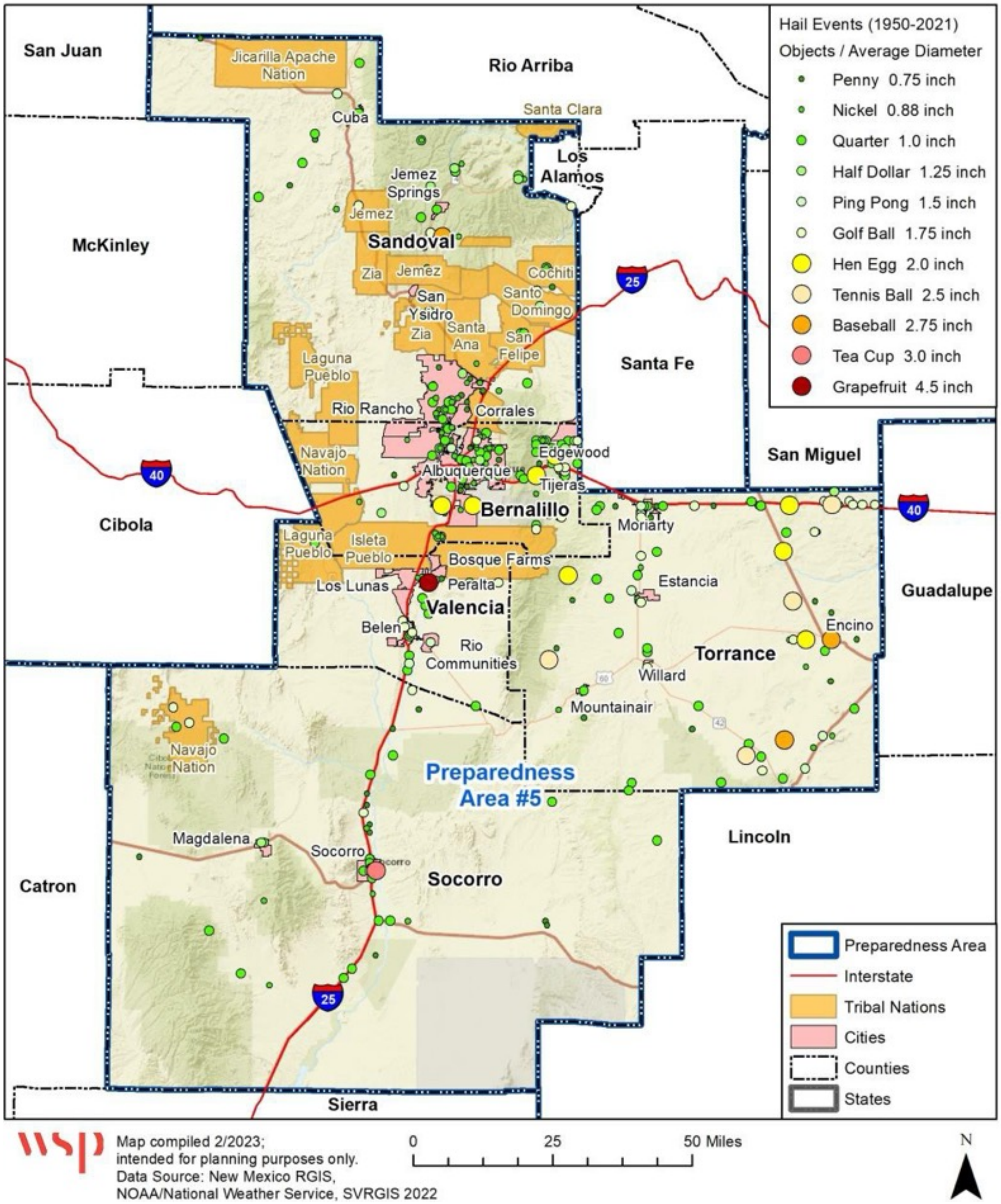
Figure 60: Preparedness Area 4 Historic Hail Events (1950-2021)



Preparedness Area 5

The NCEI database has recorded 3 fatalities, 58 injuries, over $62.3 million in property damages, and $476,500 in crop damages in Preparedness Area 5. In total, 723 thunderstorm related events were recorded in this area from 1955-2022. Preparedness Area 5 has the largest population in the state, concentrated in Bernalillo County. Due to this dense concentration of infrastructure and people, the damages reported in this Preparedness Area are the second most significant in the State, despite the lower number of event occurrences. This also makes the people living in this area more vulnerable to injury and death from these events, as indicated by the high number of injuries during past events. The figure below displays the location of documented hail events in Preparedness Area 5.

Figure 61:Preparedness Area 5 Historic Hail Events (1950-2021)



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.

What Can Be Mitigated?
One important part of mitigating thunderstorm hazards is forecasting and warning so that people can prepare. UNM can prepare for disruptions of utilities and transportation by advising people to stay home or to use caution if they must go out, and by recommending that people stock up on food, water, batteries, and other supplies. The National Weather Service, combined with local television stations, have an effective strategy for notifying residents about impending storms. LoboAlerts, the University's emergency text messaging system, can be used to provide severe thunderstorm alerts to the University community if needed.

Installation of a lightning prediction system to protect UNM Albuquerque Campus students, faculty, staff, and visitors from the effects of a severe storm is a high priority for the University. UNM previously requested state/federal mitigation funding to install a lightning prediction system to warn the public of a pending electrical storm. The University did not receive the funding so it is still considered a priority future mitigation action.

Other mitigation activities can include hardening of power lines and other utilities, insulating water lines, establishing safe rooms and shelters, ensuring backup power at critical facilities, and public education.

Summary of Risk to UNM
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 68 identifies the potential impacts of thunderstorms.

Table 68: 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 durinmajor 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.

Tornado

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 69 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 69: Fujita Tornado Damage Scale

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; pushesover shallow-rooted trees; damages signboards.
F1	Moderate tornado	73-112 mph	The lower limit is the beginning of hurricane wind speed; peelssurface 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 snappedor uprooted; light object missiles generated.
F3	Severe tornado	158-206 mph	Roof and some walls torn off well-constructed houses; trainsoverturned; 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	Inconceivabl etornado	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 theF6 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 onlybe found in some manner of ground swirl pattern, for it may never be identifiable through engineering studies

On February 1, 2007, the Fujita scale was decommissioned in favor of the more accurate Enhanced Fujita Scale, shown in Table 70, 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.

Table 70: 103 Enhanced Fujita (EF) Scale

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; branchesbroken 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 largebuildings 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; carsthrown, 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 willoccur.

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.

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.

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 71 describes the risks associated with tornadoes for determining shelter requirements.

Table 71: Tornado Risk Table

		Wind Zone			
		I	**II**	**III**	**IV**
Tornadoes per 3,700 SquareMiles	**<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 area matter of homeowner preference		Shelter should be considered for protection from high winds		Shelter is the preferred method of protection from high winds

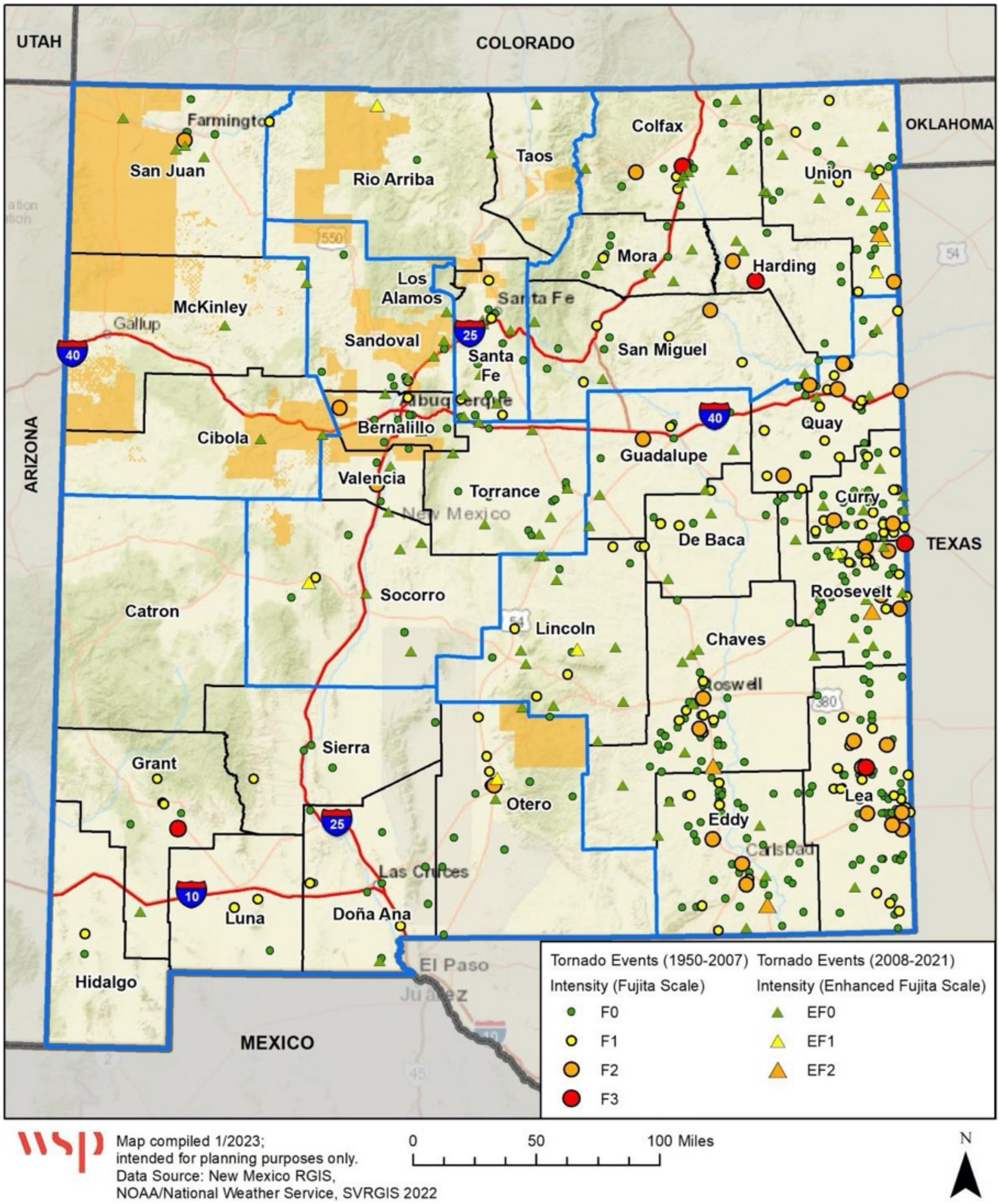
New Mexico's complex terrain favors the formation of numerous small landspouts, a weak and short-lived variation of the tornado similar to a dust devil. Landspouts may form without the presence of a strong thunderstorm.

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. Seventy-five (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, one 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, at both low and high elevations. No fatalities have occurred since the previous plan update, however, two tornado events in 2019 resulted in injury.

Figure 62: Illustrates past tornado activity in New Mexico as provided by the National Weather Service.



The NCEI database reports a total 644 tornado events in New Mexico from 1950 through 2022. These events resulted in five deaths, 163 injuries, $65,501,180 million in property damage, and $260,000 thousand in crop damage.

Table 72 briefly explains the most significant tornado events that have occurred in the State of New Mexico. The location of the event is identified by both the city and county and the Preparedness Area. Source information is from the NCEI and data provided by local authorities.

Table 72: Significant Tornado Occurrences in New Mexico

Date	Location	Significant Event
May 09, 2017	Torrance County, Santa Fe County, Lincoln County, Mora County (PAs 1, 2, 3, 5	A potent upper-level low pressure system moving slowly east across the desert southwest for several days combined with abundant moisture and instability on the 9th to generate a widespread, significant severe weather outbreak over central and eastern New Mexico. Isolated thunderstorms developed shortly after midnight in the area from Santa Fe to Farmington and produced quarter size hail with heavy rain and strong winds. A large area of showers and thunderstorms developed shortly after sunrise over central New Mexico and moved north across the Albuquerque and Santa Fe metro areas through the early afternoon. Several funnel clouds and large hail were reported around the Estancia Valley. A brief tornado develops near the Santa Fe airport shortly after noon with minor damage reported. A major hailstorm struck the Interstate 25 corridor near Kewa Pueblo, resulting in damage to homes and vehicles. The next wave of storms that developed over central New Mexico produced tornadoes near Carrizozo, Clines Corners, and Wagon Mound. Large hail up to the size of golf balls was also reported with these storms. More storms firing up around the Albuquerque metro area produced nickel to quarter size hail from Rio Rancho north into the Jemez Mountains. Severe thunderstorms continued to pound eastern New Mexico well into the evening hours with golf ball to hen egg size hail producing damage in areas around Roswell and Tucumcari.
July 07, 2015	Rio Arriba County, Sante Fe County, San Juan County, Torrance County (PAs 3, 4, and 5)	Monsoon moisture firmly in place over New Mexico focused another round of very heavy rainfall and severe thunderstorms. Storms with torrential rainfall and strong winds erupted over the State. A storm that developed around Shiprock moved northeast over La Plata and produced flash flooding along U.S. 170. Law enforcement reported that 12 inches of water was flowing over the roadway. A thunderstorm that moved southeast along two colliding outflow boundaries near Edgewood produced a brief tornado. A metal barn for storing hay was tossed a quarter mile and slammed into a house where a woman was injured by flying glass. This same storm also produced quarter size hail.
October 11, 2009	Stanley, NM (Santa Fe County) (PA 3)	Two miles east of Stanley a tornado touched down (Santa Fe County) causing $12K in damage it registered as a F0. There were no injuries or deaths.
July 13, 2009	Tres Piedras, NM (Taos County) (PA 3)	Two miles south of Tres Piedras a tornado touched down (Taos County) causing $10K in damage; it registered as a F0. There were no injuries or deaths.

New Mexico has not had a Federal Disaster Declaration for tornadoes. The Governor issued a State Disaster Declaration for the March 23, 2007, Clovis tornado described above.

The table totals the impacts of past tornado events in New Mexico by Preparedness Area. The magnitude has been updated to represent the Enhanced Fujita Scale.

Table 73: Tornado History by Preparedness Area, July 1950 to December 2022

Preparedness Area	# of Events	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
3	31	EFO - EF1	0	1	$552,280	$0
4	16	EF0 - EF2	1	3	$275,000	$0
5	56	EF0 - EF2	1	8	$831,930	$0

Past Frequency

The complex terrain in New Mexico 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.

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' 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.

Climate Change Impacts

Ongoing research compiled in the recent climate assessment has resulted in different conclusions on the effect of climate change on wind regimes. The August 2021 IPCC report argues that in most places, wind speeds will be drastically reduced because of climate change, whereas in 2019, Scientific American reported that winds across the world were speeding up. Unusual wind patterns combined with other climate change issues, such as hotter water temperatures, can also cause problems. At this time, these changing factors are not well understood and are still being incorporated into state and regional research and risk analysis (Garrison 2022).

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 NCEI from a period of July 1950 to December 2022 (72 years). 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 74 provides the probability of each Preparedness Area experiencing a tornado event in any given year.

Table 74: Probability of Tornado Occurrences

Preparedness Area	Tornado
PA 3	42.5%
PA 4	21.9%
PA 5	76.7%

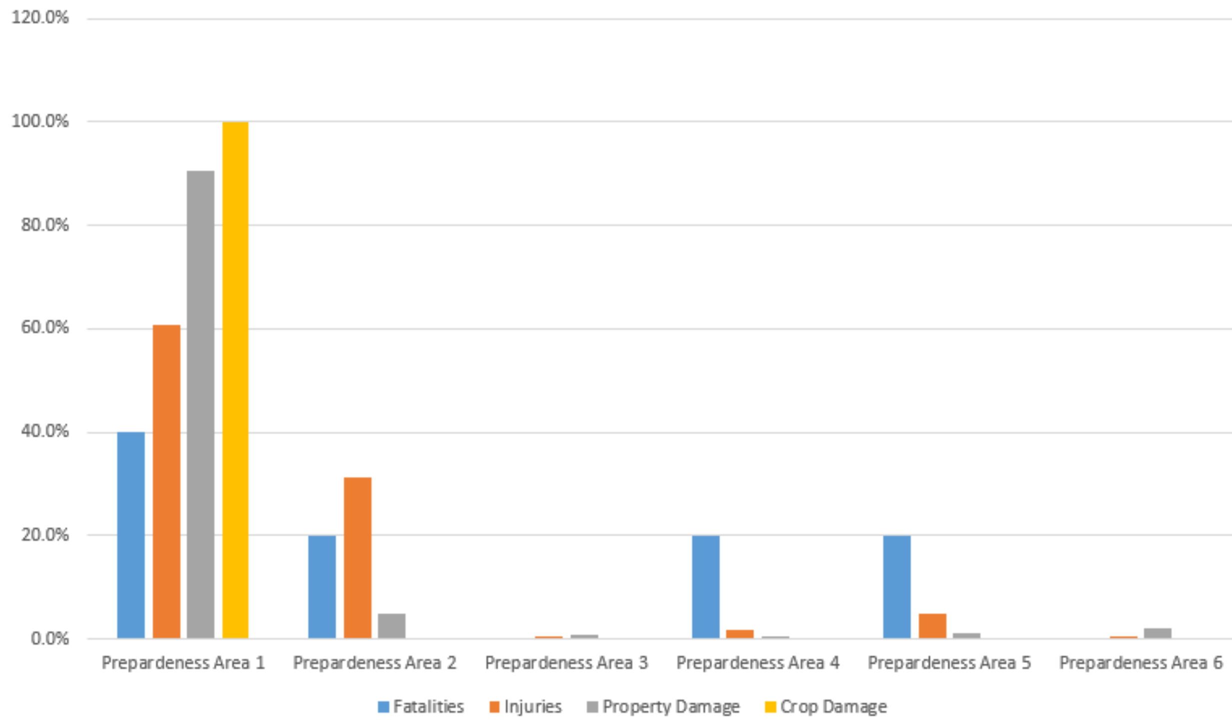
Vulnerability Assessment
Based on the assessment from data collected in Table 74 above, Preparedness Area 5's risk of experiencing a tornado event in any given year is greater than those in Preparedness Areas 3 and 4. For those Preparedness Areas with the greatest risk, assessments should be taken in consideration and determine what mitigation actions are appropriate for that location. Risks for consideration include:

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.

The figure below displays the percentage of losses by Preparedness Area in the state. Vulnerability by Preparedness area is described below.

Figure 63: Percentage of Losses from Tornados by Category and Preparedness Area



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.

What Can Be Mitigated?

One important part of mitigating tornado hazards is forecasting and warning so that people can prepare. The National Weather Service, combined with local television stations, has an effective strategy for notifying residents about impending tornado events. LoboAlerts, the University's emergency text messaging system, can be used to provide tornado and weather alerts to the University community if needed.

Other mitigation activities can include the adoption and enforcement of building codes, retrofitting of existing structures, surge protectors and lightning protection, construction of safe rooms and shelters, hardening power lines and other utilities, and public education of the risk.

Summary of Risk to UNM

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

Table 75: 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.

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, and moisture content all affect 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 wildfires 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.

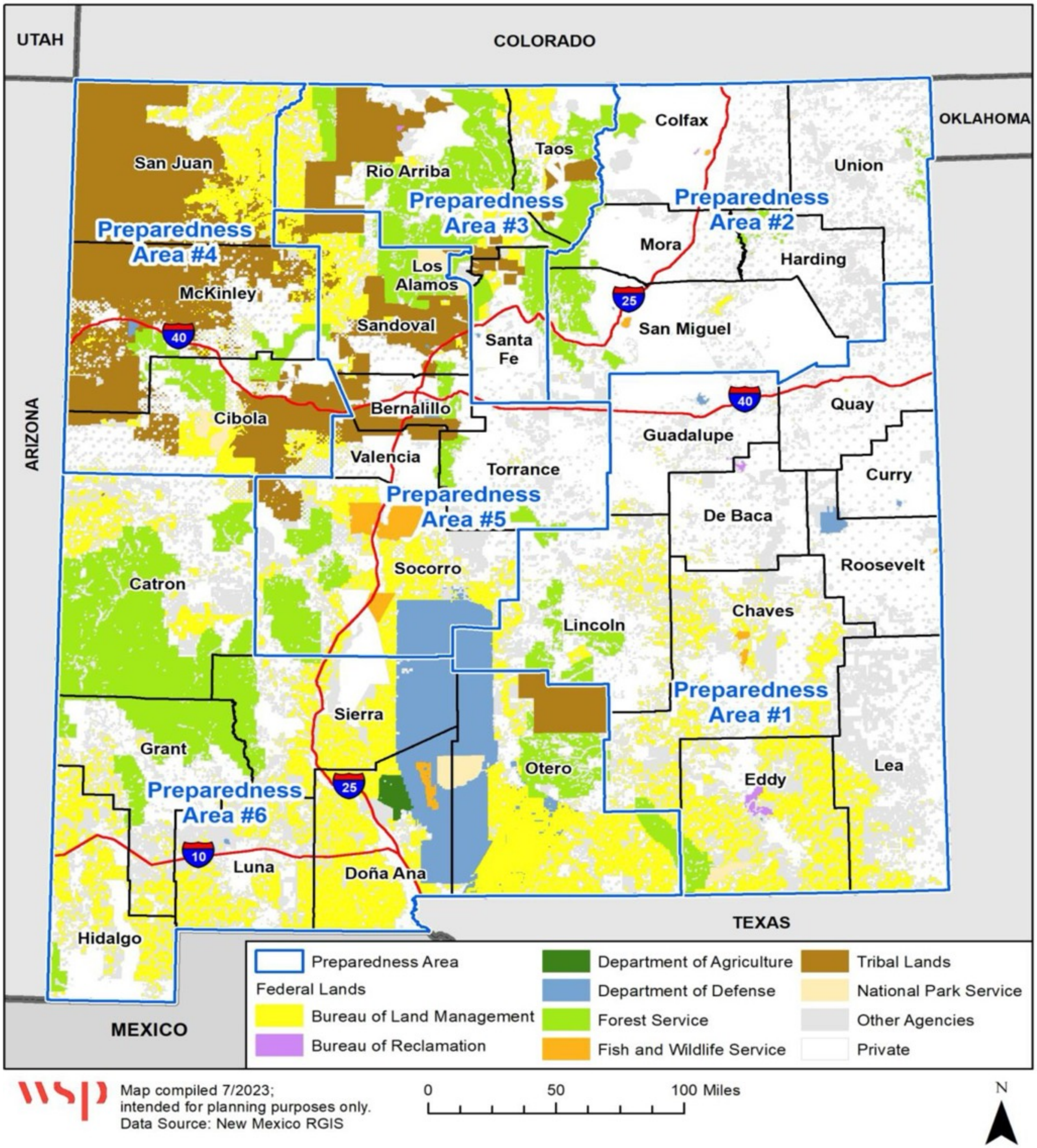
Along the Rio Grande and other major rivers in the state occurs what is known as the “Bosque,” which is a riparian forest ecosystem consisting largely of cottonwoods, willows, salt cedar, and other native and invasive species. When these areas are stressed by drought, as has happened in recent years, 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 publicly owned (55.9%). Approximately 34% of the land is Federally owned. Privately owned forest land covers 10.7 million acres, or 43% of New Mexico’s total forest land area. About 32% of New Mexico’s total forest land area, or 7.9 million acres, is administered by the USDA Forest Service. Approximately 9% of forest and woodlands are under state ownership, while Native American tribes own 15%.

Figure 64: Land Ownership in New Mexico



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. New Mexico's forest land area totals 24.7 million acres. Forest lands comprise 32% of the State's land area. New Mexico's forests blanket a wide variety of environments from the mesquite and juniper woodlands in the southern deserts and steppes, to the timber forests in the southern Rocky Mountains.

The State Forestry Division does not own and manage forest 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 Forestry Division provides technical and financial assistance to State, private, non- Federal public and Tribal landowners and land managers. In recent years, State Forestry has also partnered with the US Forest Service and other agencies to enhance forest management in important watersheds located on Federal lands through the Division's Watershed Restoration Initiative.

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. RH 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 readings 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 the 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: is computed from the morning (12Zulu) soundings from Radiosonde Observation (RAOB) stations across North America. It is used to indicate the potential for wildfire growth by measuring the stability and dryness of the air over a fire. It is calculated by combining the stability and moisture content of the lower atmosphere into a number that correlates well with large fire growth. The stability term is determined by the temperature difference between two atmospheric layers; the moisture term is determined by the temperature and dew point difference. 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 two to six for indicating potential for large fire growth:

1. Very Low Potential (Moist Stable Lower Atmosphere)
2. Very Low Potential
3. Low Potential
4. Moderate Potential
5. 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 zero being saturated). The index, as shown in Table 6-119, describes the top eight inches of soil profile. Therefore, the maximum

KBDI value is 800 (eight 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.

Figure 65: Keetch-Byram Drought Index Fire Rating System

KBDI Index (hundredths of an inch)	Conditions
0 – 200	Soil and fuel moisture are high. Most fuels will not readily ignite or burn. However, with sufficient sunlight and wind, cured grasses and some light surface fuels will burn in spots and patches.
200 – 400	Fires more readily burn and will carry across an area with no gaps. Heavier fuels will still not readily ignite and burn. Also, expect smoldering and the resulting smoke to carry into and possible through the night.
400 – 600	Fire Intensity begins to significantly increase. Fires will readily burn in all directions exposing mineral soils in some locations. Larger fuels may burn or smolder for several days creating possible smoke and control problems.
600-800	Fires will burn to mineral soils. Stumps will burn to the end of underground roots and spotting will be a major problem. Fires will burn through the night and heavier fuels will actively burn and contribute to fire intensity.

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. Another is the International Fire Code Institute susceptibility index (Figure 66), which combines slope and fuel levels:

Figure 66: 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									

All these indicators are considered when determining the fire danger for a specific area. These indicators can change daily, which is why the Fire Danger Rating System (Table 76) was created. It is a method of conveying in a simple way the relative danger level to the public. Note that the National Wildfire Coordinating Group announced that the National Fire Danger Rating System 2016 (NFDRS2016) replaced the existing 1978 and 1988 NFDRS models in May 2020. Additional information can be found at https://www.nwcg.gov/sites/default/files/memos/eb-m-18-001.pdf.

Table 76: 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.

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 only have 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.
- ERC-5 day average is consistently at or above 80.

Previous Occurrences

Data from the National Interagency Fire Center (NFIC) reports a total of 2,758 wildfires in New Mexico from 1950 through May 2023. Table 77 displays those fires by size class. Class A fires (0.25 acres or smaller) have been excluded from this analysis due to inconsistent reporting.

Table 77: New Mexico Wildfire History by Size Class, 1950 – May 2023[18]

Fire Size Class	Size in Acres	# of Fires	Total Acres Burned
B	0.26 to 9.9	191	871
C	10.0 to 99.9	952	33,888
D	100 to 299	317	57,766
E	300 to 999	339	203,413
F	1,000 to 4,999	636	1,433,916
G	5,000 to 9,999	150	1,051,165
H	10,000 to 49,999	148	2,889,188
I	50,000 to 99,999	20	1,408,388
J	100,000 to 499,999	5	1,260,123
Total		**2,758**	**8,338,718**

Table 78 and Figure 67 show previous occurrences of wildland and WUI fires in New Mexico from 2000 through May of 2023.

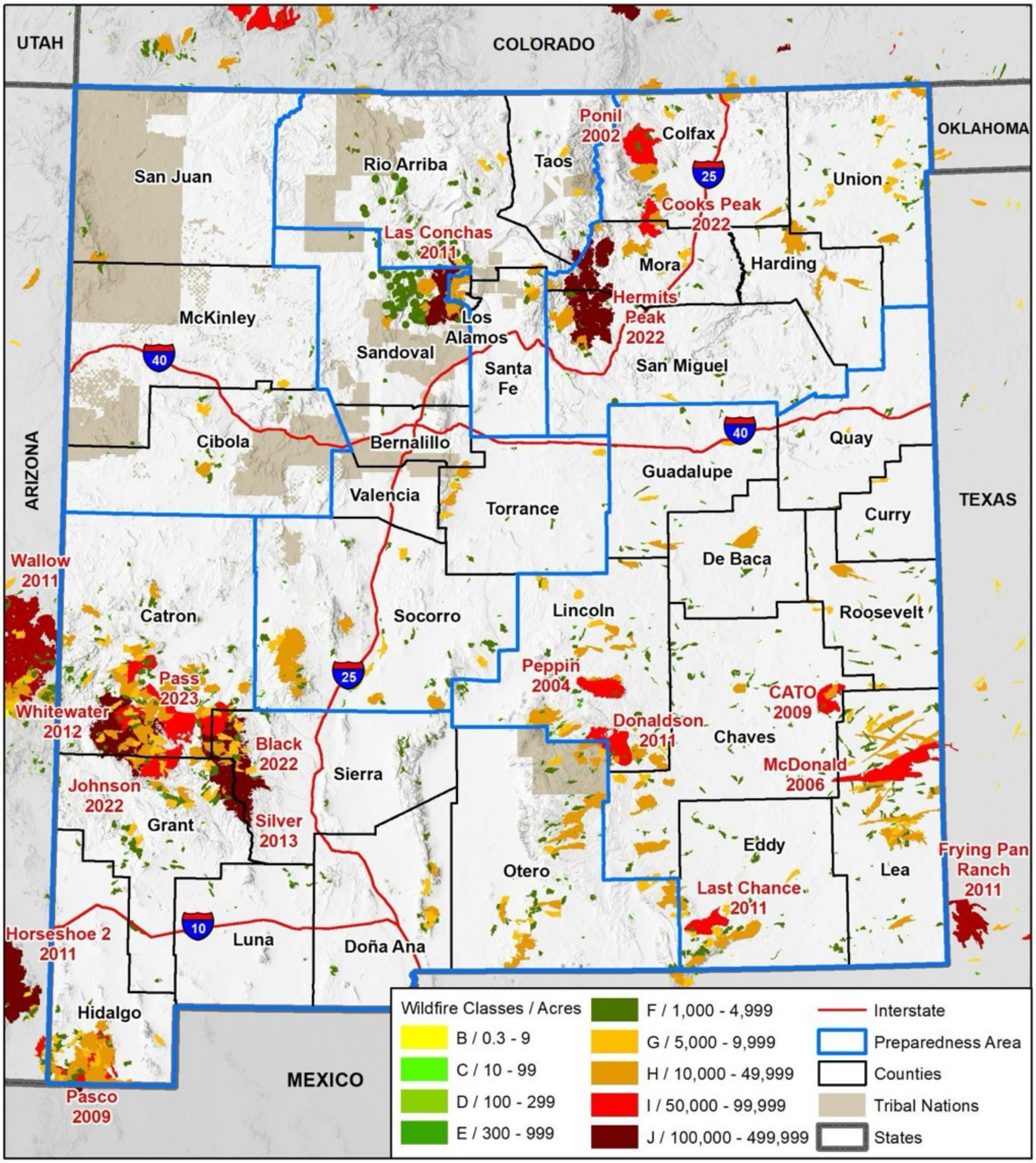
Table 78: Historical Fire Data (2000 – May 2023)

Fire Year	# of Fires	Acres Burned
2023	48	100,449
2022	141	1,010,030
2021	62	116,500
2020	24	18,718
2019	42	65,900
2018	55	241,544
2017	40	103,212
2016	53	111,940
2015	22	42,740
2014	26	36,175
2013	29	187,027
2012	45	384,829

Fire Year	# of Fires	Acres Burned
2011	210	811,227
2010	121	140,137
2009	131	457,057
2008	106	339,232
2007	50	88,344
2006	95	561,490
2005	57	244,220
2004	36	141,829
2003	84	351,534
2002	62	310,119
2001	60	96,859
2000	150	452,415
Total	**1,749**	**6,413,527**

[18] Source: National Interagency Fire Center NIFC

Figure 67: New Mexico Wildfire History, 1950 – May 2023



Map compiled 6/2023;
intended for planning purposes only.
Data Source: New Mexico RGIS,
National Interagency Fire Center (NIFC)

0 50 100 Miles

N

Declared Disasters from Wildfire

There have been 57 Federal Fire Management Assistance Grants from 2000 through 2022. Table 79 summarizes the number of wildfires and acreage for each Preparedness Area. The second largest wildfire burned was the Las Conchas in Preparedness Areas 3 and 5, burning 156,593 acres.

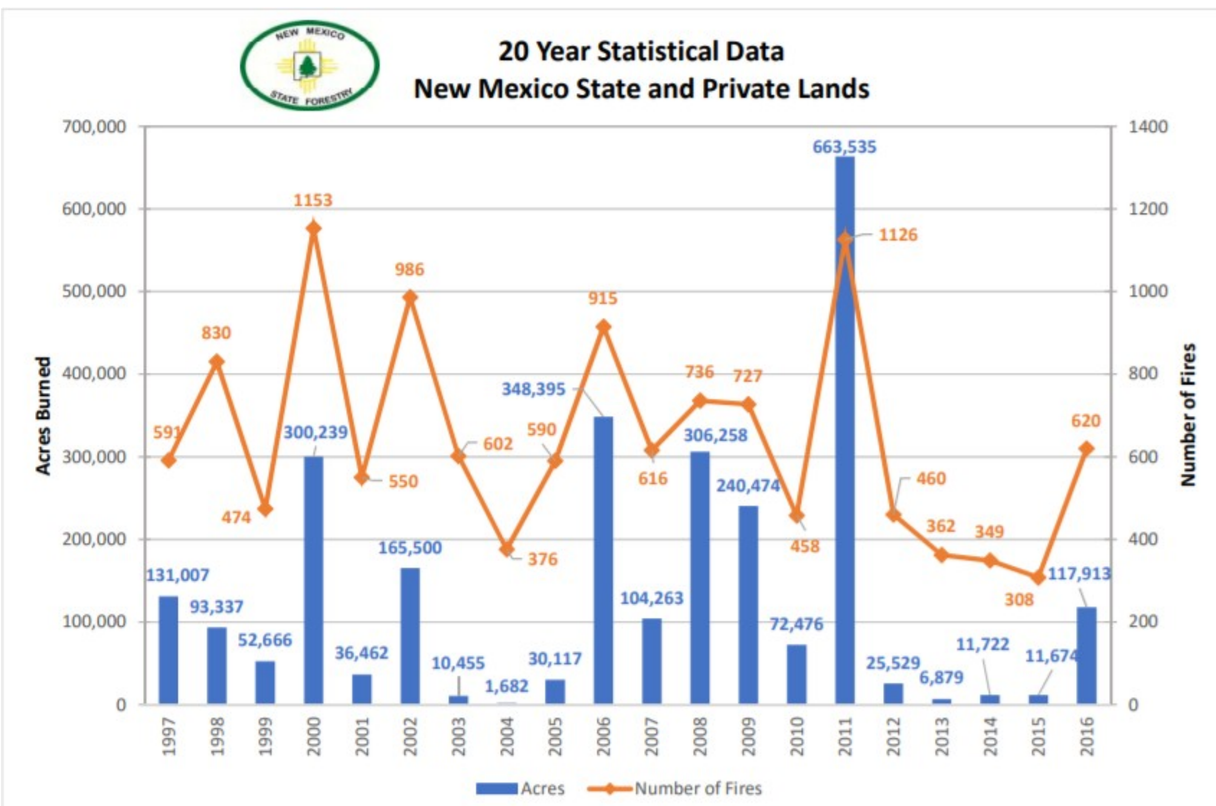
Table 79: Summary of Wildfires and Acreage by Preparedness Area, 2000-2022

Preparedness Area	Number of Fires	Number of Acres
PA 3	140	208,107
PA 4	101	88,393
PA 5	**203**	**498,904**

Past Frequency

Figure 68 shows 20+ years of statistical data for the number of fires and acres burned Statewide. From 1997 to 2016, 12,829 fires have burned 2,730,583 acres Statewide. The average results in 641 wildland fires each year that burn an average of 136,529 acres per year. The number of wildland fires and acres burned vary widely from year to year depending on fuel and weather conditions.

Figure 68:20-Year New Mexico Fire History

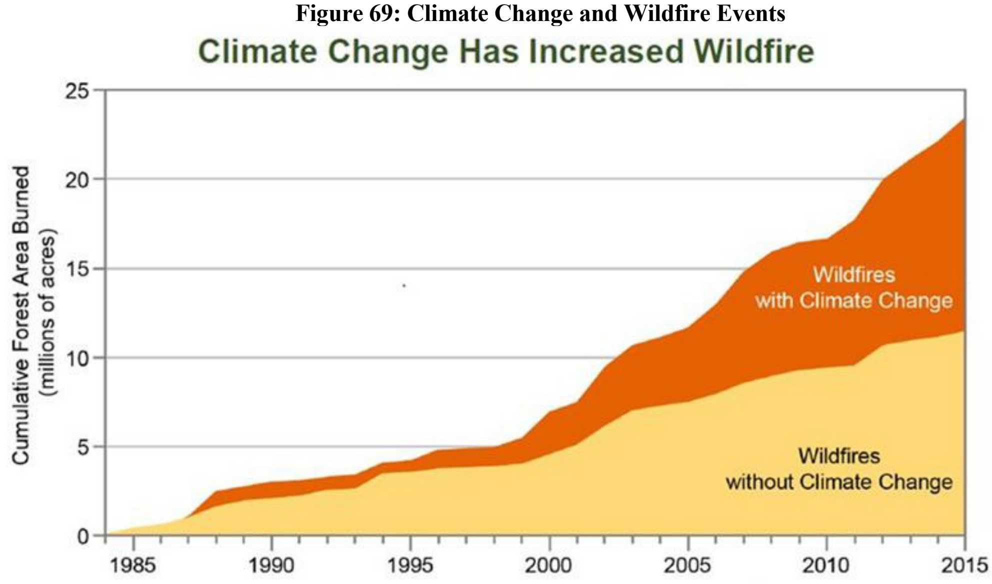


Climate Change Impacts
The effects of climate change can already be seen in the Southwest Region of the United States; including rising temperatures, intensified drought events, and increased susceptibility to invasive species. According to the Fourth National Climate Assessment (2018), wildfires have burned twice as many acres across the western United States between 1985 and 2015 than would have burned had climate change not been occurring. Climate change is also creating a year-round wildfire season.

The climate is a major determinant of wildland fire through its control of the weather, as well as through its interaction with fuel availability, fuel distribution, and flammability at the global, regional, and local levels. With hotter temperatures, drier soil, and worsening drought conditions in the entire Western US, wildland fires have the potential to become more extreme. Currently humans are the main cause of fire ignition globally, although lightning has been predominantly responsible for large fires nearby in the Front Range. Western states have seen significant increases in forest area burned in recent years, and the risk of wildland fires in the future are expected to increase due to a lengthening fire season and drier conditions.

According to a report from the Intergovernmental Panel on Climate Change, fire season has already lengthened by 18.7% globally between 1979 and 2013, with statistically significant increases across 25.3% but decreases only across 10.7% of Earth’s land surface covered with vegetation; with even sharper changes being observed during the second half of this period. Correspondingly, the global area experiencing long fire weather season has increased by 3.1% per annum or 108.1% during 1979–2013. Fire frequencies under 2050 conditions are projected to increase by approximately 27% globally, relative to the 2000 levels, with changes in future fire meteorology playing the most important role in enhancing global wildland fires, followed by land cover changes, lightning activities and land use, while changes in population density exhibit the opposite effects.

Figure 69: Climate Change and Wildfire Events

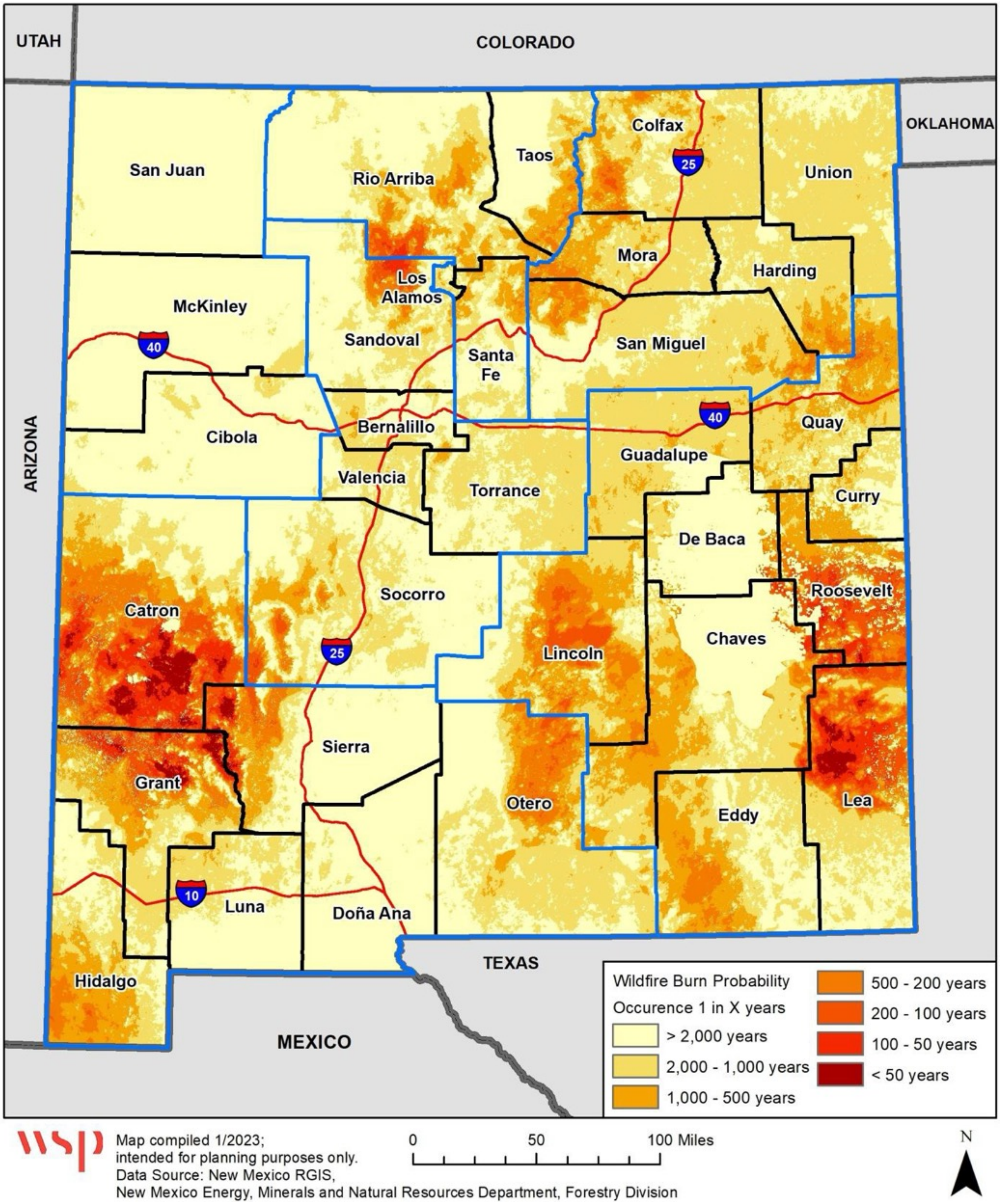


Land use, vegetation, available fuels, and weather conditions (including wind, low humidity, and lack of precipitation) are chief factors in determining the number and size of fires each year. Generally, fires are more likely when vegetation is dry from a winter with little snow and/or a spring and summer with sparse rainfall. As a result, climate-induced hazards (specifically, a pattern of extended drought conditions) have contributed to increased concern about wildland fire across the Southwest.

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 or surrounded by flammable vegetation or have their major routes of egress surrounded by flammable vegetation. 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 wildland-urban interface, it seems inevitable that all Preparedness Areas will become more susceptible to fires occurring with increased consequences to the population, property, and natural resources.

Figure 70:New Mexico Wildfire Burn Probability



Vulnerability Assessment

Wildland fire poses a significant threat to the citizens, structures, infrastructure, and natural resources within New Mexico. Figure 71 shows the Wildland Urban Interface (WUI) Statewide in New Mexico on a map.

Figure 71: Statewide WUI in New Mexico

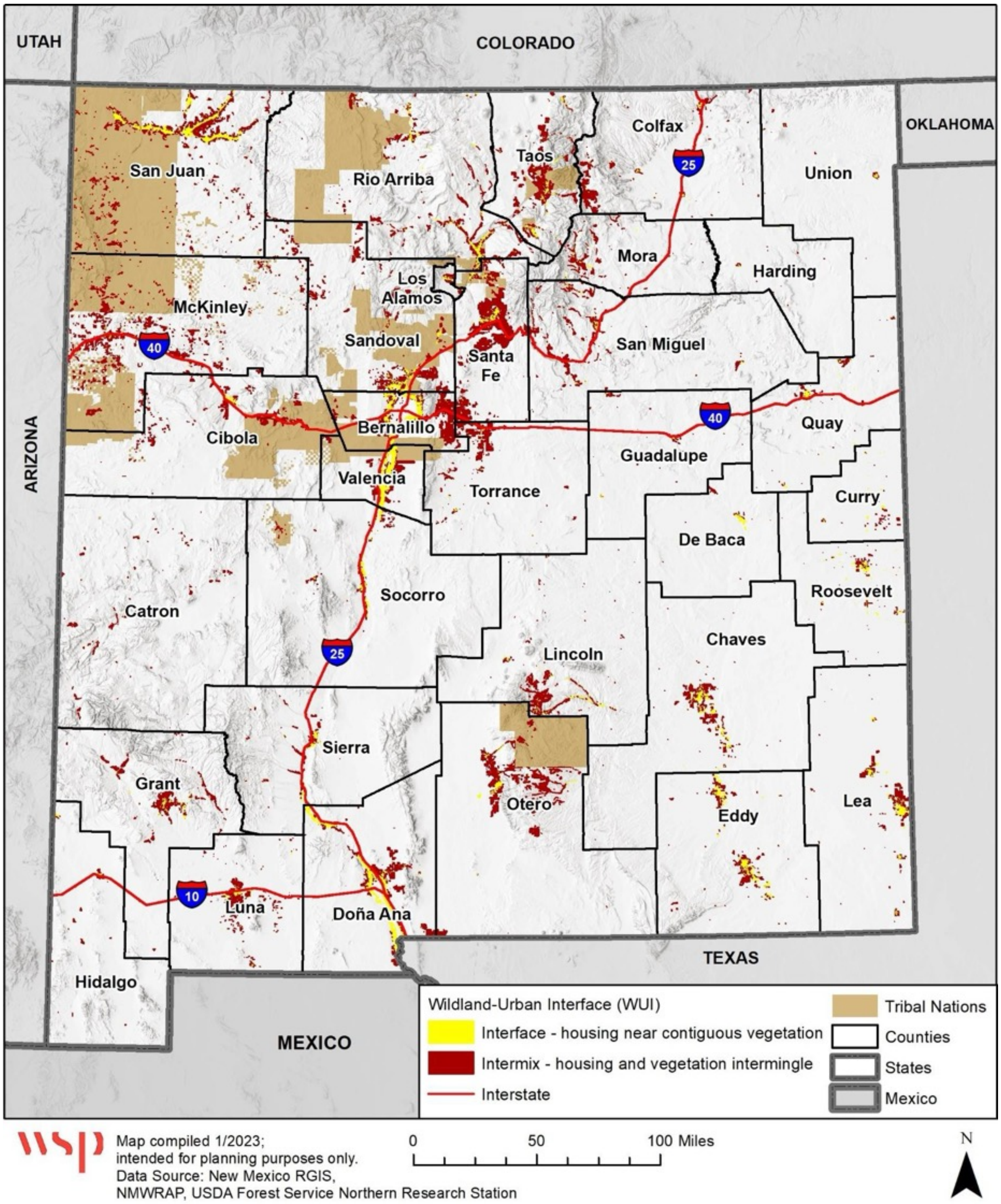
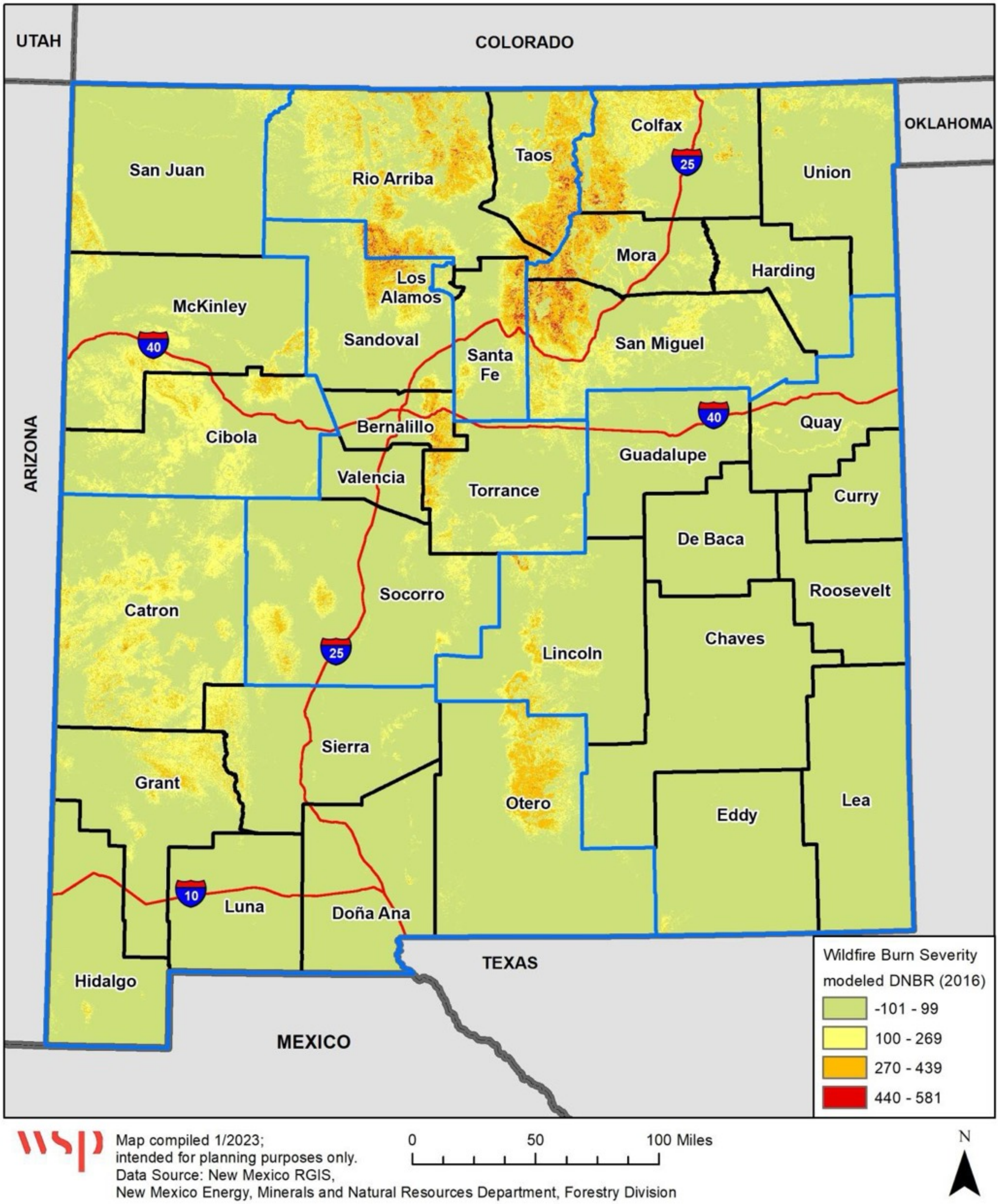


Figure 72:New Mexico Wildfire Burn Severity



In 2021, 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 interfacefires.

The vulnerability criteria used to rank the communities include:

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

Currently, there are 69 Community Wildfire Protection Plans (CWPPs) in the State. These 69 CWPPs identify 847 communities at risk from wildland fire. Of the 847 communities, 405 are listed as high risk, 290 are listed as moderate risk and 152 are listed as low risk from wildland fire. Figure 73 below shows the communities at risk throughout the state by their risk level, and Figure 74 illustrates the CWPP coverage of communities in the state.

The New Mexico Fire Planning Task Force requires that CWPPs be updated within five years of adoption. In 2021, the Fire Planning Task Force adopted new guidelines for updating Community Wildfire Protection Plans. The guidelines outline the process, requirements, and recommendations for updating a CWPP in New Mexico.

Figure 73: Communities at Risk to Wildfire

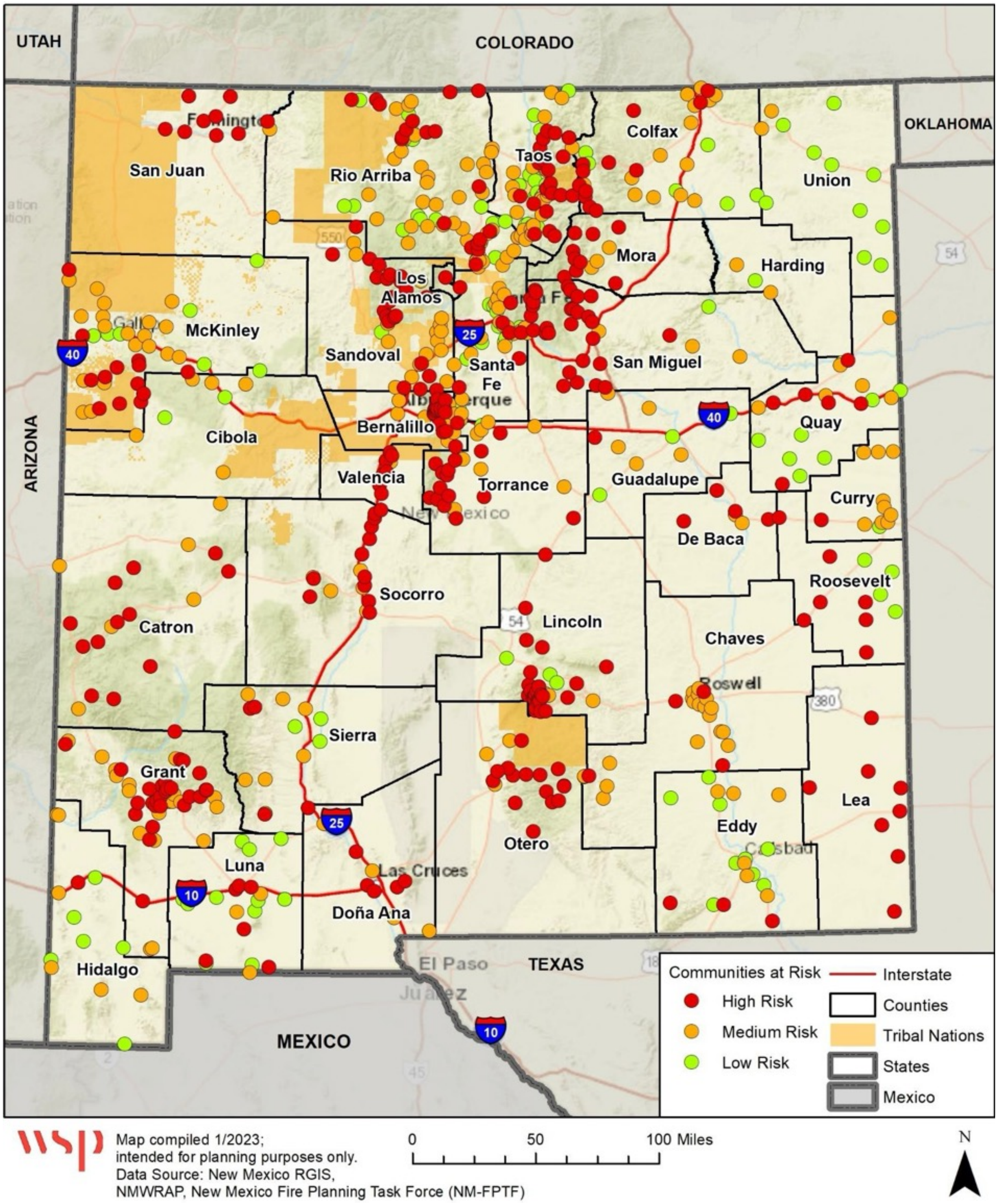
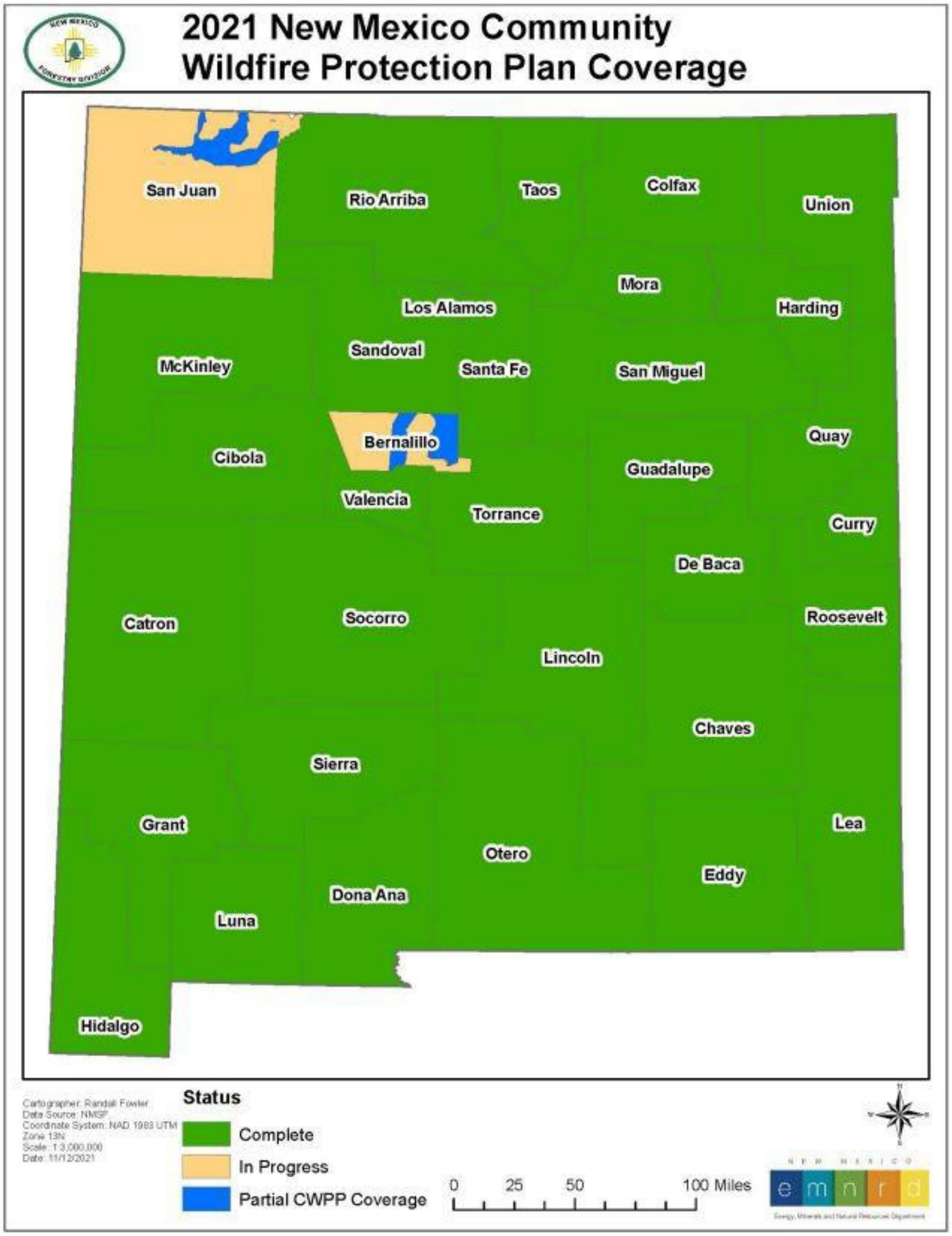
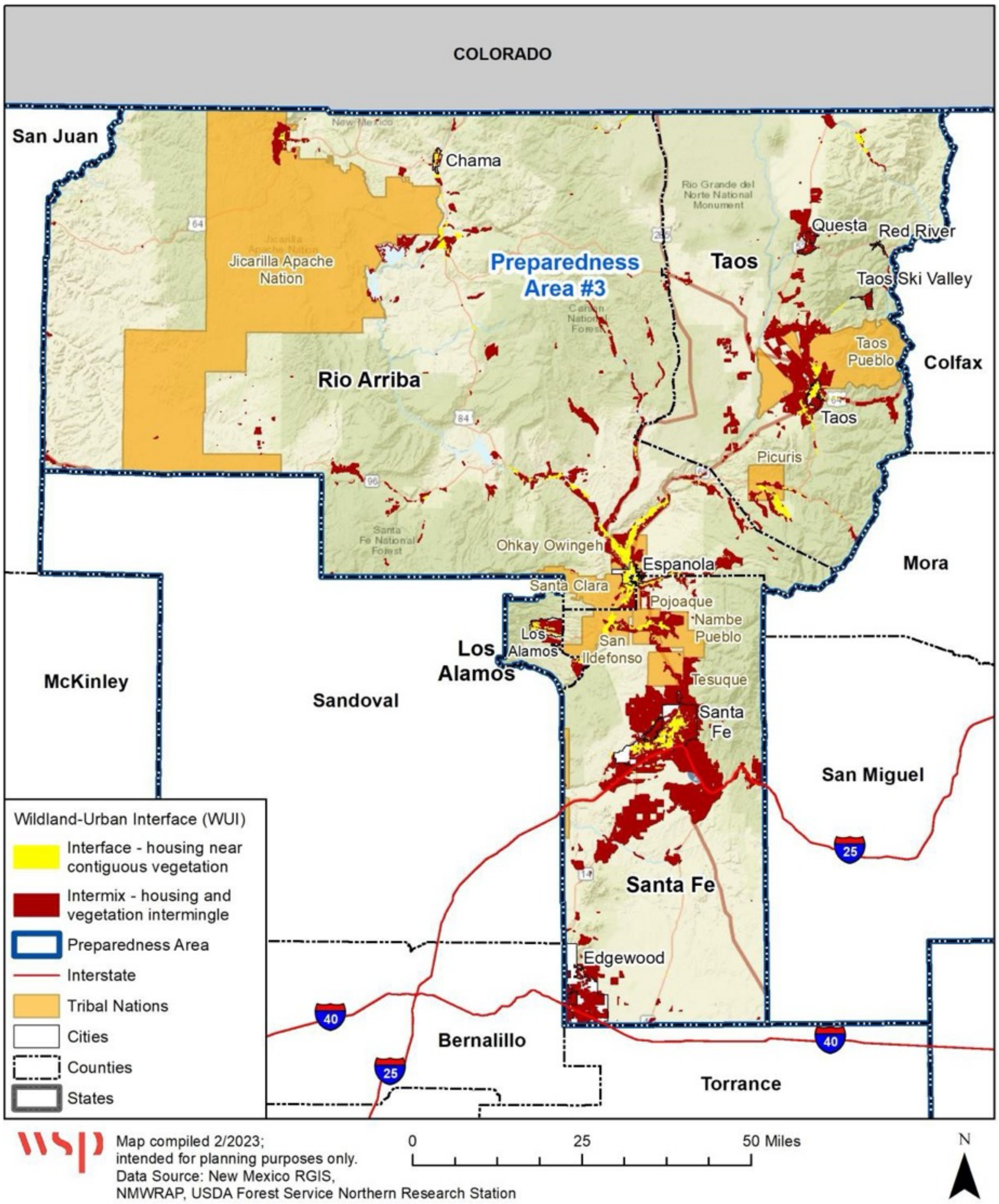


Figure 74: Community Wildfire Protection Plan Communities



Preparedness Area 3
Figure 75 below shows the WUI areas in Preparedness Area 3.

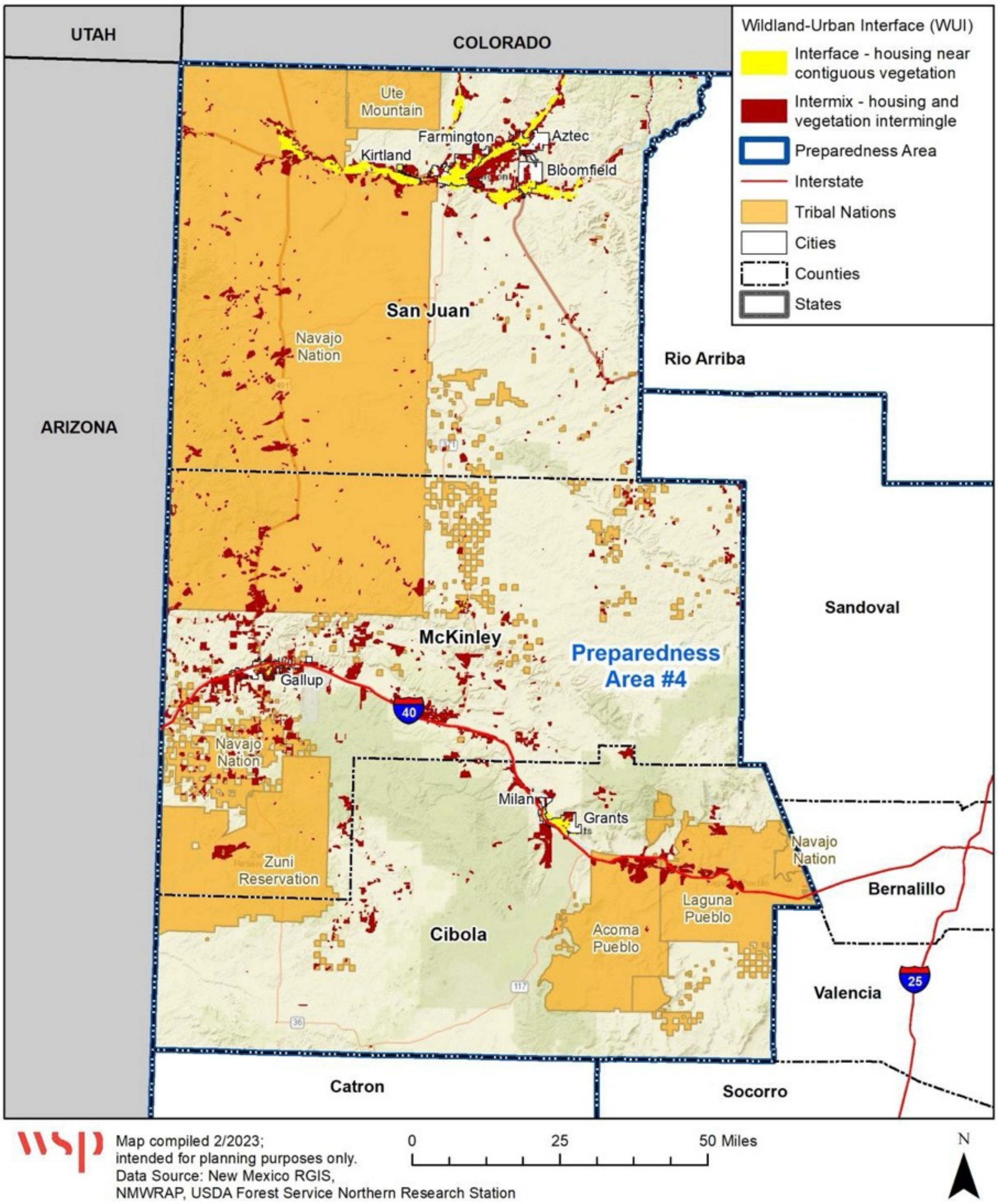
Figure 75: Preparedness Area 3 WUI



Based on local mitigation plans, wildfire was ranked as the top priority hazard in PA 3. Every jurisdiction ranked wildfire as a high priority hazard. PA 3 is highly vulnerable to wildfire due to multiple factors including rapid development near forested areas, prolonged drought, and high fuel loads due to pine beetle kill. Currently, drought conditions in PA 3 can be described as severe to extreme. Large numbers of people are exposed to wildfire risks, especially populations living or working in close proximity to forested areas, residents with asthma or other respiratory sensitivity, and very young and elderly residents.

Preparedness Area 4
Figure 76 below shows the WUI areas in Preparedness Area 4.

Figure 76: Preparedness Area 4 WUI

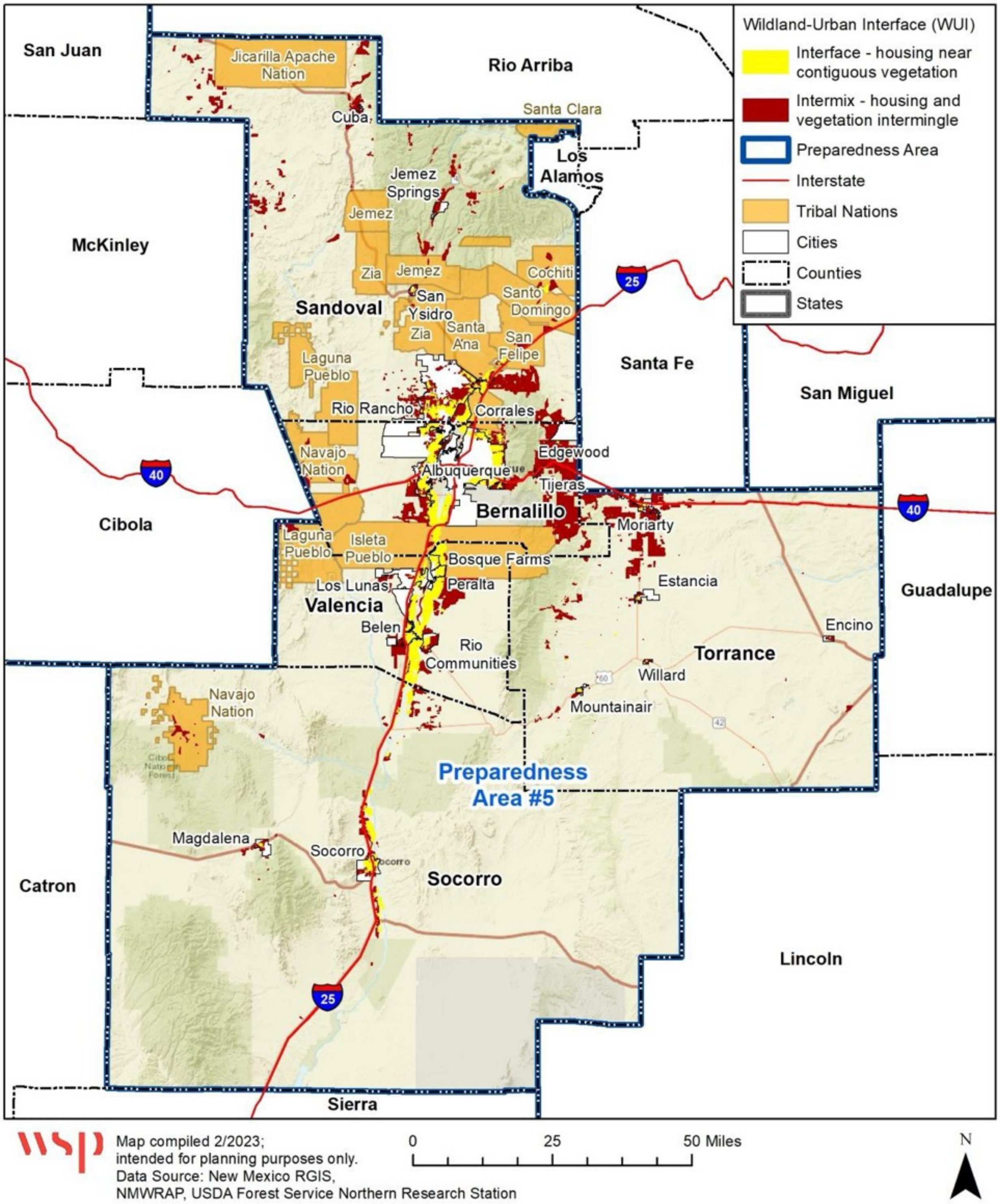


Wildfire was ranked equally with drought as the second top priority hazard in Preparedness Area 4. PA 4 is in a medium to high priority wildfire risk zone, and is highly vulnerable to wildfire due to multiple factors including development near forested areas, prolonged drought conditions, and high fuel loads due to pine beetle kill. However, vegetation treatments have been ongoing and are planned to continue to mitigate the high fuel loads in PA 4.

Preparedness Area 5

Figure 77 below shows the WUI areas in Preparedness Area 5.

Figure 77: Preparedness Area 5 WUI



Preparedness Area 5 is highly vulnerable to wildfire due to multiple factors including rapid development near forested areas, prolonged drought, and high fuel loads due to pine beetle kill. The local plans created by jurisdictions within PA 5 focus their mitigation efforts on education and outreach as well as on existing property protection and wildfire prevention strategies. However, vegetation treatments have been ongoing and are planned to continue to mitigate the high fuel loads in PA 5.

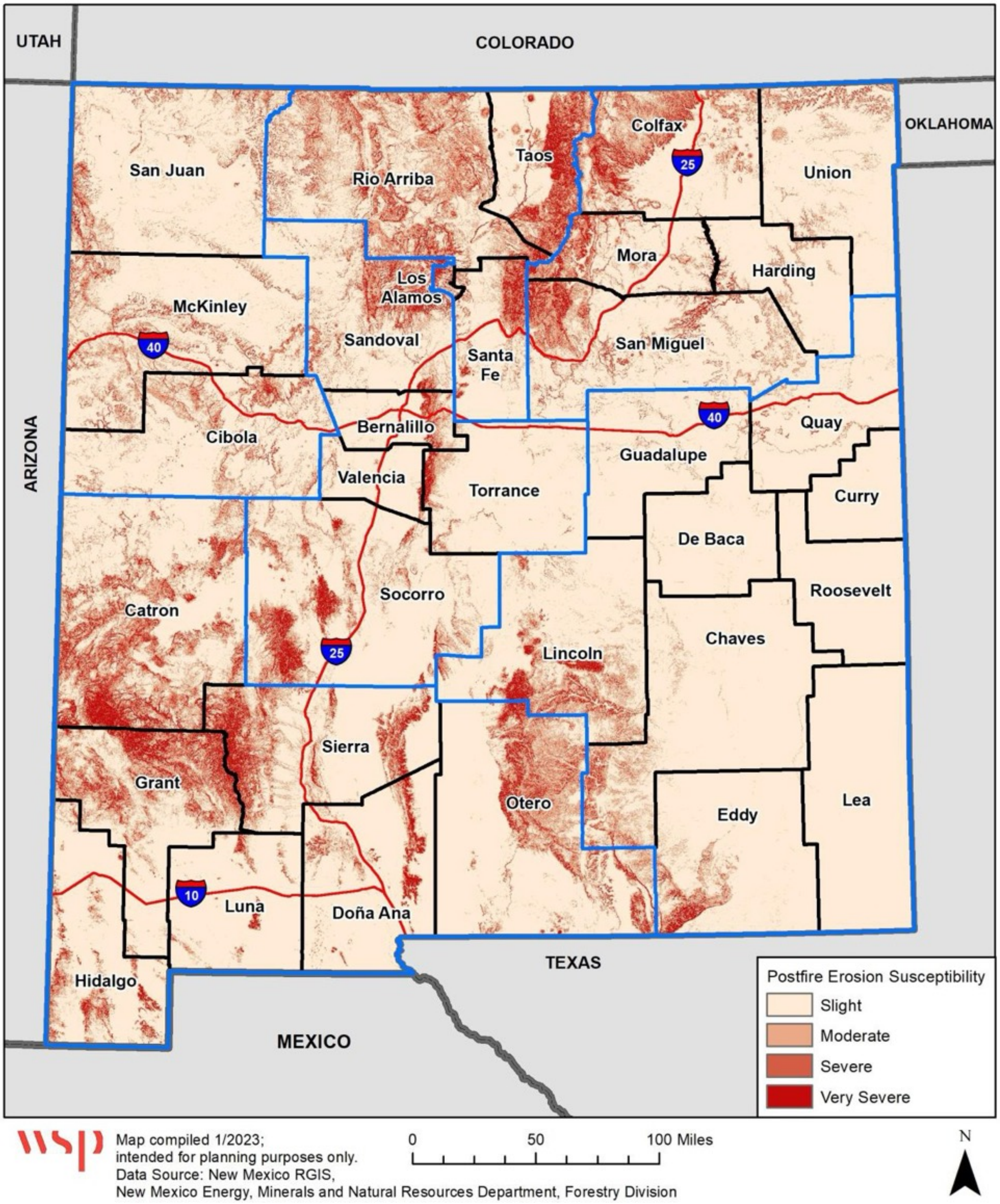
Post-Fire Erosion

The drought – wildfire – flood cycle, and how wildfires can lead to an increase in soil erosion has been discussed. Extreme soil damage also occurs in watersheds that experience a wildfire. In some areas there is a four- to hundred-fold increase in runoff and debris flow. In these burned areas, large floods result from average monsoon rainstorms. In combination with the damaged soil, the destruction of vegetation by wildfires 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.

In addition to the increased long-term risk of flooding years after a watershed has experienced a burn, these watersheds are also at risk to destructive flows of sediment and water (debris flows). The US Geologic Survey created a series of studies on the probability and volume of debris flows stemming from the worst extreme fires in New Mexico. Dramatic changes in runoff, erosion, and deposition have been documented by the USACE in watersheds affected by wildfire. These changes have led to loss of life, damage to property, and significant impacts on infrastructure. 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. Life safety concerns are higher in those communities located downstream of burned watersheds.

Figure 78 displays areas at elevated risk of post-fire erosion in New Mexico.

Figure 78: Post-Fire Erosion Susceptibility



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.

What Can Be Mitigated?
Wildfires can be a significant threat to the citizens, structures, infrastructure, and natural resources within New Mexico, including all UNM properties. Mitigation options for wildland fires include creating defensible spaces or buffer zones and clearing combustible materials around UNM properties and infrastructure, using fire-resistant construction techniques and biomass plants, and public education and outreach.

Summary of Risk 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 Albuquerque Campus), Los Alamos (Los Alamos Branch Campus), Sandoval (UNM Health Sciences Rio Rancho Campus and UNM Sandoval Regional Medical Center), and Taos (Taos Branch Campus).

UNM Albuquerque Campus lies within Bernalillo County. Bernalillo County is at risk for wildland/urban interface fire annually. However, UNM Albuquerque Campus is at a low risk for experiencing this hazard directly. Poor air quality causing respiratory issues could be a possibility. The UNM Albuquerque 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, is vulnerable 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 several major wildfires within LAC and the immediate vicinity.

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.

Table 80 identifies the potential impacts of wildfires.

Table 80: 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.
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.

Section 6: Mitigation Strategy

The mitigation strategy section consists of the following components: mitigation goals, mitigation actions completed, changes in mitigation priorities, mitigation actions, and an 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 mitigation concept and may directly support identified mitigation actions.

Mitigation Actions Completed

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

1. In 2023, UNM joined the National Intercollegiate Mutual Aid Agreement (NIMAA). This partnership allows UNM to utilize resources and knowledge available from other member colleges and universities in the Southwest Region, as well as other institutions nationally, in the event of a natural disaster, civil emergency, or in preparedness for other emergencies.
2. In 2023, UNM established branch campus hazard mitigation planning teams at UNM-Gallup Branch Campus, UNM-Los Alamos Branch Campus, UNM-Taos Branch Campus, and UNM-Valencia Branch Campus. The teams consisted of a variety of stakeholders from each location who served as subject matter experts for their branch. They also assisted with the broad community notification process and public outreach.
3. In 2022, UNM Utility Services Department began a new Backup Power Program that utilizes gas turbine generators to provide electricity to critical University facilities during a prolonged PNM outage. The program is funded by the University and includes two tests each year conducted by UNM Utility Services and UNM Residential Life and Student Housing.
4. UNM Museum of Southwestern Biology Division of Genomic Resources added six cryogenic freezers in the UNM Center for Environmental Research, Informatics, & the Arts (CERIA) building, room 326. Three additional tanks have been delivered, are on campus, and are waiting to be installed. Additionally, the Museum added two safety cabinets for storing the five, ten-gallon flammable ethanol and isopropyl carboys in a shared laboratory space. These safety cabinets allow the Fish and Herps Department to dispense right from the cabinet. This equipment minimizes the fire risks associated with the storage of flammable substances and protects the cabinet's contents and the property they are stored in from the impacts of wildfires and earthquakes.
5. UNM hosts an annual Campus Safety Week as part of National Campus Safety Awareness Month in September of each year. This annual week of events, primarily held in person, is a collaboration between UNM Police, the Office of Compliance, Ethics and Equal Opportunity (CEEO), and other campus partners. A variety of hands-on workshops are offered to bring awareness and tools for students, faculty, and staff in order to ensure a safe campus community. Events include a presentation on emergency response on campus, fire extinguisher training, a test of the UNM Emergency Notification System, and more.

6. The UNM Center for Advanced Research Computing (CARC) made a number of improvements to data center power facilities, storage systems, network infrastructure, and software services. The Center completed critical maintenance on one of the uninterruptible power supply (UPS) units that protect the machine room, including Wheeler, Xena, Taos, and Gibbs, in addition to the Chama and RSC storage systems. The UPS assures that CARC systems stay online without service interruption during a power outage. If the power outage lasts longer than the UPS can handle, CARC systems will also automatically shut down safely. Chama adds many features to help UNM researchers, one of which is off-site disaster recovery backups.
7. Continued implementation of evacuation videos for athletic venues—The UNM Athletics Department brought in a professional videographer who created two 2-minute videos explaining the emergency procedures for the University Stadium and The Pit. These videos are standard and shown prior to each home game.
8. 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.
9. Continued use of the campussafety.unm.edu website – The Student Affairs Office, along with the Dean of Students, 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.
10. LoboGuardian, a safety initiative between the Dean of Students, Campus Safety, the UNM Police Department, and Information Technologies. The app enhances safety on campus through a virtual safety network of friends, family, and the UNM Police Department, enabling smartphones to function as virtual blue-light phones.
11. UNM-Taos added new paved parking lots and other parking lot improvements, to increase accessibility and make snow and ice removal easier. New native landscaping was also planted throughout the campus. Seventy-five percent of the roughly $4 million cost came from capital outlay funding and 25% from UNM-Taos.
12. UNM received federal mitigation funds from FEMA for earthquake bars for specimen collections at the UNM Museum of Southwestern Biology. This project was funded and implemented and provided additional protection for valuable fish, amphibians, and reptile research and collections in the event of an earthquake.
13. Continued implementation of the University Healthcare Emergency Response Team (UHERT) state-wide medical response team volunteer program. This primarily UNMH and UNM volunteer program is led by the Emergency Managers for 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.

Changes in Priorities

UNM's original 2010 Mitigation Strategy was a broad-based, action-oriented plan to identify and address 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 and delays in progress due to the COVID-19 pandemic**.

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 the 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 review and consensus-building approach 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 Section 5. 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 based on 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 differentsocial 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 HMAC 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 the analysis does not provide a complete picture of how vulnerable the UNM infrastructure may be to the hazards identified, UNM will evaluate its infrastructure needs and vulnerabilities while 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:	UNM Utilities, UNM FM, UNM-IT, UNMH
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:	UNM OEM, UNM Utilities, UNM FM, UNMH, UNM-Gallup, UNM-Los Alamos, UNM-Taos, UNM-Valencia, UNM Health Sciences Rio Rancho Campus
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:	UNM FM, UNM EHS, UNM RS, UNM 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:	UNM 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 compromising the UNM infrastructure would adversely affect personnel, the UNM business economy, and the UNM natural environment, construction improvements and technology additions will be implemented.

Mitigation Actions:

Improve Stormwater Drainage Capacity at the UNM Valencia Campus	
Project Description/Comments:	Increase drainage and absorption capacities through the creation of earthen stormwater diversion channels and ponding areas on the south and southeast areas of the campus property (where the large arroyo exists east of the campus) to prevent water from intruding into the campus building footprint.
Hazard(s) Addressed:	Flood
Mitigation Action Type:	Structural and Infrastructure Projects
Responsible Organization:	UNM-Valencia Campus FM, Business Operations, and Chancellor
Estimated Costs:	Medium
Possible Funding Sources:	FEMA, UNM, State and Local Bond
Timeline for Implementation:	Within four to five years from Plan adoption
Cost-Benefit Review	High Benefit, Medium Cost
STAPLEE Review	No concerns raised
Priority	**Medium**

Improve Stormwater Drainage Capacity at the UNM Valencia Campus	
Project Description/Comments:	Increase drainage and absorption capacities through the creation of earthen stormwater diversion channels and ponding areas on the south and southeast areas of the campus property (where the large arroyo exists east of the campus) to prevent water from intruding into the campus building footprint.
Hazard(s) Addressed:	Flood
Mitigation Action Type:	Structural and Infrastructure Projects
Responsible Organization:	UNM-Valencia Branch Campus FM, Business Operations, and Chancellor
Estimated Costs:	Medium
Possible Funding Sources:	FEMA, UNM, State and Local Bond
Timeline for Implementation:	Within four to five years from Plan adoption
Cost-Benefit Review	High Benefit, Medium Cost
STAPLEE Review	No concerns raised
Priority	**Medium**

UNM- Valencia Branch Campus Fire Protection

Project Description/Comments:	Install a new wet fire suppression systems in the 5 buildings on UNM Valencia Branch Campus (where they are currently absent). This includes utility work to provide high-volume water to buildings, the installation of risers and control systems and overhead fire sprinkler systems. This mitigation action would give the campus 100% fire suppression coverage.
Hazard(s) Addressed:	High Wind, Thunderstorm, Wildland/Urban Interface Fire
Mitigation Action Type:	Structural Infrastructure Project
Responsible Organization:	UNM-Valencia Branch Campus FM, Business Operations, and Chancellor
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**

UNM Branch Campus Fire Protection

Project Description/Comments:	Purchase and install external, water hydration systems with dedicated power sources to protect all Branch Campuses from fire hazard.
Hazard(s) Addressed:	Wildland/Urban Interface Fire, Extreme Heat, High Wind, Thunderstorm
Mitigation Action Type:	Structural Infrastructure Project
Responsible Organization:	FM, Business Operations, and Chancellors for UNM-Gallup, UNM-Los Alamos, UNM-Taos, UNM-Valencia, and UNM Health Sciences Rio Rancho Campuses
Estimated Costs:	High
Possible Funding Sources:	FEMA, UNM
Timeline for Implementation:	Within two-three years from Plan adoption
Cost-Benefit Review:	High benefit, High cost
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:	UNM OEM, UNM Utilities, UNM FM, UNMH, UNM-Gallup, UNM-Los Alamos, UNM-Taos, UNM-Valencia, UNM Health Sciences Rio Rancho Campus
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:	UNM FM, UNM EHS, UNM 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:	UNM 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:	Install automatic fire suppression systems throughout the facilities at the Sevilleta LTER Field Station as wildfire mitigation measure.
Hazard(s) Addressed:	High Winds, Severe Winter Weather, Thunderstorm, and Tornado
Mitigation Action Type:	Structural and Infrastructure Projects
Responsible Organization:	UNM IT, UNM 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)

Install a Lightning Prediction System	
Project Description/Comments:	Install a lightning prediction system as thunderstorm mitigation measure to warn the public of a pending electrical storm.
Hazard(s) Addressed:	Thunderstorm
Mitigation Action Type:	Structural and Infrastructure Projects
Responsible Organization:	UNM OEM, UNM FM, UNM Utilities
Estimated Costs:	Medium
Possible Funding Sources:	FEMA, UNM
Timeline for Implementation:	Within three-five years from Plan adoption
Cost-Benefit Review	High benefit, Medium-cost strategy
STAPLEE Review	No concerns raised
Priority	**High**

Plant Living Snow Fences	
Project Description/Comments:	Plant living snow fences (e.g., rows of trees, bushes) or wind breaks to limit blowing and drifting of snow over critical UNM roadways.
Hazard(s) Addressed:	Severe Winter Weather
Mitigation Action Type:	Structural and Infrastructure Projects
Responsible Organization:	UNM-Gallup, UNM-Los Alamos, UNM-Taos,
Estimated Costs:	Low-Medium
Possible Funding Sources:	FEMA, UNM
Timeline for Implementation:	Within three-five years from Plan adoption
Cost-Benefit Review	Relatively low cost for the benefit (provides additional benefits beyond snow control)
STAPLEE Review	No concerns raised
Priority	**Low**

Objective #4: Remove barriers to effective communication regarding the hazards that could impact the campus and people. This will serve the university's broad mission of providing educational opportunities at all academic levels and serving a wide and diverse community.

Mitigation Actions:

Create Multi-Lingual, Mufti-Cultural, and Multi-Media Crisis Communication and Education Material

Project Description/Comments:	Create and disseminate multi-lingual, multi-cultural and multi-media crisis communication and education materials designed to reduce hazardrisk in formats readily accessible and available to all members of the UNM community, including all branch campus locations.
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, UNM OEM, UNM EHS, UNM RS, UNMH, UNM-Gallup, UNM-Los Alamos, UNM-Taos, UNM-Valencia, UNM Health Sciences Rio Rancho Campus
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, UNM EHS, UNM RS, UNM 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 preparednessfor 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:	UNM 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**

Section 7: Plan Implementation and 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, schedule, and evaluation processes are discussed.

Method and Schedule

The UNM Office of Emergency Management (OEM) will be the lead agency for coordinating and monitoring the plan. OEM and HMAC will work together to review and monitor the UNM HMP at least 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 HMAC, 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 HMAC
9. Hold an annual meeting with the NMDHSEM Mitigation Officer (at a minimum)
10. Hold meetings with the HMAC 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 HMAC and NMDHSEM over the next three years. Ad hoc meetings to address critical issues will be held in the interim as needed. At the annual HMAC 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 HMAC 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 2028, OEM will reconvene monthly meetings with the HMAC to ramp up mitigation planning activities in preparation for the 2029 mitigation plan update.

Public Participation

Public participation in plan maintenance will be accomplished by utilizing the UCAM, Branch Campus Hazard Mitigation Teams, and the mitigation website. UCAM provides news, social media, and media relations services. UCAM staff participate in the HMAC 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. Branch Campus Hazard Mitigation Teams will help obtain local stakeholder and community feedback through public outreach to interest groups, subject matter experts, campus representatives, and members of the public. 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 the effectiveness of the plan, mitigation goals, and action items. OEM will convene an annual meeting with HMAC to review the plan. HMAC will assist OEM in reviewing and evaluating the mitigation goals and objectives with respect to continuing relevance and will consider priorities. The HMAC 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, 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 comments as necessary.

Appendix A: Local Mitigation Review Tool

(See next page)

Local Mitigation Plan Review Tool

Cover Page

The Local Mitigation Plan Review Tool (PRT) 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 local governments, including special districts.

1. The Multi-Jurisdictional Summary Sheet is a worksheet that is used to document how each jurisdiction met the requirements of the plan elements (Planning Process; Risk Assessment; Mitigation Strategy; Plan Maintenance; Plan Update; and Plan Adoption).
2. The Plan Review Checklist summarizes FEMA's evaluation of whether the plan has addressed all requirements.

For greater clarification of the elements in the Plan Review Checklist, please see Section 4 of the 2022 Local Mitigation Planning Policy Guide. Definitions of the terms and phrases used in the PRT can be found in Appendix E of the guide.

Plan Information	
Jurisdiction(s)	
Title of Plan	
New Plan or Update	
Single- or Multi-Jurisdiction	
Date of Plan	
Local Point of Contact	
Title	
Agency	
Address	
Phone Number	
Email	

Additional Point of Contact	
Title	
Agency	
Address	
Phone Number	
Email	

Review Information	
State Review	
State Reviewer(s) and Title	
State Review Date	
FEMA Review	
FEMA Reviewer(s) and Title	
Date Received in FEMA Region	
Plan Not Approved	
Plan Approvable Pending Adoption	
Plan Approved	

Multi-Jurisdictional Summary Sheet

In the boxes for each element, mark if the element is met (Y) or not met (N).

#	Jurisdiction Name	A. Planning Process	B. Risk Assessment	C. Mitigation Strategy	D. Plan Maintenance	E. Plan Update	F. Plan Adoption	G. HHPD Requirements	H. State Requirements
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									

Plan Review Checklist

The Plan Review Checklist is completed by FEMA. States and local governments are encouraged, but not required, to use the PRT as a checklist to ensure all requirements have been met prior to submitting the plan for review and approval. 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." FEMA completes the "required revisions" summary at the bottom of each element to clearly explain the revisions that are required for plan approval. Required revisions must be explained for each plan sub-element that is "not met." Sub-elements in each summary should be referenced using the appropriate numbers (A1, B3, etc.), where applicable.
Requirements for each element and sub-element are described in detail in Section 4: Local Plan Requirements of this guide.

Plan updates must include information from the current planning process.

If some elements of the plan do not require an update, due to minimal or no changes between updates, the plan must document the reasons for that.

Multi-jurisdictional elements must cover information unique to all participating jurisdictions.

Element A: Planning Process

Element A Requirements	Location in Plan (section and/or page number)	Met / Not Met
A1. Does the plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement 44 CFR § 201.6(c)(1))		
A1-a. Does the plan document how the plan was prepared, including the schedule or time frame and activities that made up the plan's development, as well as who was involved?		
A1-b. Does the plan list the jurisdiction(s) participating in the plan that seek approval, and describe how they participated in the planning process?		
A2. Does the plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development as well as businesses, academia, and other private and non-profit interests to be involved in the planning process? (Requirement 44 CFR § 201.6(b)(2))		
A2-a. Does the plan identify all stakeholders involved or given an opportunity to be involved in the planning process, and how each stakeholder was presented with this opportunity?		

Element A Requirements (section and/or page	Location in Plan Not Met number)	Met /
A3. Does the plan document how the public was involved in the planning process during the drafting stage and prior to plan approval? (Requirement 44 CFR § 201.6(b)(1))		
A3-a. Does the plan document how the public was given the opportunity to be involved in the planning process and how their feedback was included in the plan?		
A4. Does the plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement 44 CFR § 201.6(b)(3))		
A4-a. Does the plan document what existing plans, studies, reports and technical information were reviewed for the development of the plan, as well as how they were incorporated into the document?		
ELEMENT A REQUIRED REVISIONS		
Required Revision:		

Element B: Risk Assessment

Element B Requirements	Location in Plan (section and/or page number)	Met / Not Met
B1. Does the plan include a description of the type, location, and extent of all natural hazards that can affect the jurisdiction? Does the plan also include information on previous occurrences of hazard events and on the probability of future hazard events? (Requirement 44 CFR § 201.6(c)(2)(i))		
B1-a. Does the plan describe all natural hazards that can affect the jurisdiction(s) in the planning area, and does it provide the rationale if omitting any natural hazards that are commonly recognized to affect the jurisdiction(s) in the planning area?		
B1-b. Does the plan include information on the location of each identified hazard?		
B1-c. Does the plan describe the extent for each identified hazard?		
B1-d. Does the plan include the history of previous hazard events for each identified hazard?		

Element B Requirements	Location in Plan (section and/or page number)	Met / Not Met
B1-e. Does the plan include the probability of future events for each identified hazard? Does the plan describe the effects of future conditions, including climate change (e.g., long-term weather patterns, average temperature and sea levels), on the type, location and range of anticipated intensities of identified hazards?		
B1-f. For participating jurisdictions in a multi-jurisdictional plan, does the plan describe any hazards that are unique to and/or vary from those affecting the overall planning area?		
B2. Does the plan include a summary of the jurisdiction's vulnerability and the impacts on the community from the identified hazards? Does this summary also address NFIP-insured structures that have been repetitively damaged by floods? (Requirement 44 CFR § 201.6(c)(2)(ii))		
B2-a. Does the plan provide an overall summary of each jurisdiction's vulnerability to the identified hazards?		
B2-b. For each participating jurisdiction, does the plan describe the potential impacts of each of the identified hazards on each participating jurisdiction?		
B2-c. Does the plan address NFIP-insured structures within each jurisdiction that have been repetitively damaged by floods?		
ELEMENT B REQUIRED REVISIONS		
Required Revision:		

Element C: Mitigation Strategy

Element C Requirements	Location in Plan (section and/or page number)	Met / Not Met
C1. Does the plan document each participant's existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs? (Requirement 44 CFR § 201.6(c)(3))		
C1-a. Does the plan describe how the existing capabilities of each participant are available to support the mitigation strategy? Does this include a discussion of the existing building codes and land use and development ordinances or regulations?		
C1-b. Does the plan describe each participant's ability to expand and improve the identified capabilities to achieve mitigation?		
C2. Does the plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement 44 CFR § 201.6(c)(3)(ii))		
C2-a. Does the plan contain a narrative description or a table/list of their participation activities?		
C3. Does the plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement 44 CFR § 201.6(c)(3)(i))		
C3-a. Does the plan include goals to reduce the risk from the hazards identified in the plan?		
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 44 CFR § 201.6(c)(3)(ii))		
C4-a. Does the plan include an analysis of a comprehensive range of actions/projects that each jurisdiction considered to reduce the impacts of hazards identified in the risk assessment?		
C4-b. Does the plan include one or more action(s) per jurisdiction for each of the hazards as identified within the plan's risk assessment?		

Element C Requirements (section and/or page	Location in Plan Not Met number)	Met /
C5. Does the plan contain an action plan that describes how the actions identified will be prioritized (including a cost- benefit review), implemented, and administered by each jurisdiction? (Requirement 44 CFR § 201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii))		
C5-a. Does the plan describe the criteria used for prioritizing actions?		
C5-b. Does the plan provide the position, office, department or agency responsible for implementing/administrating the identified mitigation actions, as well as potential funding sources and expected time frame?		
ELEMENT C REQUIRED REVISIONS		
Required Revision:		

Element D: Plan Maintenance

Element D Requirements	Location in Plan (section and/or page number)	Met / Not Met
D1. Is there discussion of how each community will continue public participation in the plan maintenance process? (Requirement 44 CFR § 201.6(c)(4)(iii))		
D1-a. Does the plan describe how communities will continue to seek future public participation after the plan has been approved?		
D2. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a five-year cycle)? (Requirement 44 CFR § 201.6(c)(4)(i))		
D2-a. Does the plan describe the process that will be followed to track the progress/status of the mitigation actions identified within the Mitigation Strategy, along with when this process will occur and who will be responsible for the process?		
D2-b. Does the plan describe the process that will be followed to evaluate the plan for effectiveness? This process must identify the criteria that will be used to evaluate the information in the plan, along with when this process will occur and who will be responsible.		

Element D Requirements (section and/or page	Location in Plan Not Met number)	Met /
D2-c. Does the plan describe the process that will be followed to update the plan, along with when this process will occur and who will be responsible for the process?		
D3. Does the plan describe a process by which each community will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement 44 CFR § 201.6(c)(4)(ii))		
D3-a. Does the plan describe the process the community will follow to integrate the ideas, information and strategy of the mitigation plan into other planning mechanisms?		
D3-b. Does the plan identify the planning mechanisms for each plan participant into which the ideas, information and strategy from the mitigation plan may be integrated?		
D3-c. For multi-jurisdictional plans, does the plan describe each participant's individual process for integrating information from the mitigation strategy into their identified planning mechanisms?		
ELEMENT D REQUIRED REVISIONS		
Required Revision:		

Element E: Plan Update

Element E Requirements	Location in Plan (section and/or page number)	Met / Not Met
E1. Was the plan revised to reflect changes in development? (Requirement 44 CFR § 201.6(d)(3))		
E1-a. Does the plan describe the changes in development that have occurred in hazard-prone areas that have increased or decreased each community's vulnerability since the previous plan was approved?		
E2. Was the plan revised to reflect changes in priorities and progress in local mitigation efforts? (Requirement 44 CFR § 201.6(d)(3))		
E2-a. Does the plan describe how it was revised due to changes in community priorities?		

Element E Requirements (section and/or page	Location in Plan Not Met number)	Met /
E2-b. Does the plan include a status update for all mitigation actions identified in the previous mitigation plan?		
E2-c. Does the plan describe how jurisdictions integrated the mitigation plan, when appropriate, into other planning mechanisms?		
ELEMENT E REQUIRED REVISIONS		
Required Revision:		

Element F: Plan Adoption

Element F Requirements	Location in Plan (section and/or page number)	Met / Not Met
F1. For single-jurisdictional plans, has the governing body of the jurisdiction formally adopted the plan to be eligible for certain FEMA assistance? (Requirement 44 CFR § 201.6(c)(5))		
F1-a. Does the participant include documentation of adoption?		
F2. For multi-jurisdictional plans, has the governing body of each jurisdiction officially adopted the plan to be eligible for certain FEMA assistance? (Requirement 44 CFR § 201.6(c)(5))		
F2-a. Did each participant adopt the plan and provide documentation of that adoption?		
ELEMENT F REQUIRED REVISIONS		
Required Revision:		

Element G: High Hazard Potential Dams (Optional)

HHPD Requirements	Location in Plan (section and/or page number)	Met / Not Met
HHPD1. Did the plan describe the incorporation of existing plans, studies, reports and technical information for HHPDs?		
HHPD1-a. Does the plan describe how the local government worked with local dam owners and/or the state dam safety agency?		
HHPD1-b. Does the plan incorporate information shared by the state and/or local dam owners?		
HHPD2. Did the plan address HHPDs in the risk assessment?		
HHPD2-a. Does the plan describe the risks and vulnerabilities to and from HHPDs?		
HHPD2-b. Does the plan document the limitations and describe how to address deficiencies?		
HHPD3. Did the plan include mitigation goals to reduce long-term vulnerabilities from HHPDs?		
HHPD3-a. Does the plan address how to reduce vulnerabilities to and from HHPDs as part of its own goals or with other long-term strategies?		
HHPD3-b. Does the plan link proposed actions to reducing long-term vulnerabilities that are consistent with its goals?		
HHPD4. Did the plan include actions that address HHPDs and prioritize mitigation actions to reduce vulnerabilities from HHPDs?		
HHPD4-a. Does the plan describe specific actions to address HHPDs?		
HHPD4-b. Does the plan describe the criteria used to prioritize actions related to HHPDs?		
HHPD4-c. Does the plan identify the position, office, department or agency responsible for implementing and administering the action to mitigate hazards to or from HHPDs?		
HHPD Required Revisions		
Required Revision:		

Element H: Additional State Requirements (Optional)

Element H Requirements	Location in Plan (section and/or page number)	Met / Not Met
This space is for the State to include additional requirements.		
		hoose an item.

Plan Assessment

These comments can be used to help guide your annual/regularly scheduled updates and the next plan update.

Element A. Planning Process

Strengths

-

Opportunities for Improvement

-

Element B. Risk Assessment

Strengths

-

Opportunities for Improvement

-

Element C. Mitigation Strategy

Strengths

-

Opportunities for Improvement

-

Element D. Plan Maintenance

Strengths

-

Opportunities for Improvement

-

Element E. Plan Update

Strengths

-

Opportunities for Improvement

-

Element G. HHPD Requirements (Optional)

Strengths

-

Opportunities for Improvement

-

Element H. Additional State Requirements (Optional)

Strengths

-

Opportunities for Improvement

-

Appendix B: Committee Attachments