# MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN UPDATE

Lincoln County, Village of Ruidoso,
City of Ruidoso Downs, Town of Carrizozo,
Village of Capitan, and Village of Corona

June 2023

PREPARED BY
SWCA Environmental Consultants

Photo Source: Sierra Blanca, DiscoverRuidoso.com

# EXECUTIVE SUMMARY

Throughout the United States, natural and human-caused disasters have led to increasing levels of death, injury, property damage, and interruption of business and government services. Families and individuals can be immensely affected and businesses that are damaged cannot contribute to the economy. The money, time, and effort to respond to and recover from these emergencies or disasters divert public resources and attention from other important programs and problems. The five jurisdictions contained within Lincoln County, New Mexico, participating in this planning effort recognize the consequences of disasters and the need to reduce the impacts of natural and human-caused hazards. The County and participating jurisdictions also know that with careful selection, mitigation actions in the form of projects and programs can become long-term, cost-effective means for reducing the impact of natural and human-caused hazards.

The planning process for the Lincoln County Multi-Jurisdictional Hazard Mitigation Plan Update assists each participating jurisdiction to identify the natural hazards that impact the community, analyzes the risks, and prioritizes actions that can be taken to reduce that risk. Having the approved Hazard Mitigation Plan provides each participating jurisdiction with a federal government–approved and locally adopted plan which will support grant applications to implement natural hazard risk reduction projects. The approved plan is a requirement for Federal Emergency Management Agency (FEMA) hazard mitigation grant funding and may meet the plan requirements for other federal grants, such as the U.S. Forest Service Community Wildfire Defense Grant.

The elected and appointed officials of Lincoln County (herein called the County) demonstrated their commitment to hazard mitigation in 2012 by preparing the first Lincoln County All Hazard Mitigation Plan (2012 HMP). At that time, only the County adopted the HMP. In order to remain compliant with federal regulations, the HMP must be updated and approved by FEMA every 5 years.

The County, the Village of Ruidoso, City of Ruidoso Downs, Town of Carrizozo, Village of Capitan, and Village of Corona prepared and received FEMA approval of the 5-year update for the Lincoln County Multi-Jurisdictional Hazard Mitigation Plan in 2018 (2018 HMP). As the FEMA guidance had changed, each participating jurisdiction's hazards needed to be analyzed independently, actions needed to be community-specific, and adoption had to occur for each entity.

The HMP has been prepared in compliance with Section 322 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act or the Act), 42 United States Code 5165, enacted under Section 104 the Disaster Mitigation Act of 2000 (DMA 2000), Public Law 106-390 of October 30, 2000, as implemented at Title 44 Code of Federal Regulations (CFR) 201.6 and 201.7 dated October, 2007. The HMP includes risk assessments for multiple natural hazards, a public outreach effort, and development of a mitigation strategy that incorporates measures intended to reduce the impacts of natural hazard events.

The 2023 update of the various HMP elements was accomplished through the multi-jurisdictional Planning Team which included representatives from each of the participating jurisdictions and other agencies that expressed interest. Subject Matter Experts, stakeholders, and the general public were also involved with and contributed to the 2023 HMP update. The Planning Team met monthly from February through May, 2023, were consulted on final edits through the fall of 2023, and ensured the adoption resolutions were approved. The 2023 HMP update will continue to guide the County and participating jurisdictions toward greater disaster resilience.

For the 2023 HMP update, funding was provided through a FEMA Building Resilient Infrastructure and Communities (BRIC) planning sub-grant obtained by the Village of Ruidoso through the New Mexico Department of Homeland Security and Emergency Management (DHSEM). SWCA Environmental Consultants was hired by the Village of Ruidoso to facilitate the planning process and update the HMP. The Village of Ruidoso served as the lead agency and primary point of contact for the planning effort.

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# SECTION 1: JURISDICTIONAL ADOPTION AND FEMA APPROVAL

## 1.1 Hazard Mitigation Plan Update Requirements

The Federal Emergency Management Agency (FEMA) released an update to the Local Mitigation Planning Policy Guide on April 19, 2022. The guidance became effective April 19, 2023. This 2023 Lincoln County Multi-Jurisdictional Hazard Mitigation Plan (HMP) meets the requirements as described in the 2022 FEMA Guide.

Title 44 Code of Federal Regulations (CFR) §201.6 requires that existing plans be updated every 5 years, with each plan cycle requiring a complete review, revision, and re-approval of the plan at both the state and FEMA level. The 2018 Lincoln County Multi-Jurisdictional Hazard Mitigation Plan (2018 HMP) includes Lincoln County (the County), Village of Ruidoso, City of Ruidoso Downs, Town of Carrizozo, Village of Capitan, and Village of Corona. The 2018 HMP expired on July 24, 2023. The 2023 HMP is the result of an update process performed by the six participating jurisdictions.

## 1.2 Official Record of Adoption

Promulgation of the HMP is accomplished through formal adoption of official resolutions by the governing body for each participating jurisdiction in accordance with the authority and powers granted to those jurisdictions by the State of New Mexico. Adoption Resolutions for each of the participating communities are found in Appendix J.

## 1.3 FEMA Approval Letter

The HMP was submitted to the New Mexico Department of Homeland Security and Emergency Management (DHSEM), the authorized state agency, and FEMA, for review and approval. FEMA's approval letter is provided on the following page. The Approved Plan Review Tool is found in Appendix K.

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# SECTION 2: INTRODUCTION

## 2.1 HMP Authority

This 2023 update of the Lincoln County Multi-Jurisdictional HMP has been prepared in compliance with Section 322 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1988 (Stafford Act), 42 United States Code 5165, as amended by Section 104 of the Disaster Mitigation Act of 2000 (DMA 2000) Public Law 106-390 enacted October 30, 2000. The regulations governing the mitigation planning requirements for local mitigation plans are published under CFR Title 44, Section 201.6 (44 CFR §201.6).

44 CFR §201.6 explains the requirements for local governments to undertake a risk-based approach to reducing risks to impacts of natural hazards through mitigation planning. The local mitigation plan is the representation of the participating jurisdiction's commitment to reduce risks from natural hazards, serving as a guide for decision makers as they commit resources to reducing the impacts of natural hazards. Under 44 CFR §201.6 and §201.7, local and tribal governments must have a FEMA-approved local natural HMP in order to apply for and/or receive funding from the following Hazard Mitigation Assistance (HMA) programs. Mitigation actions are required to be identified in the HMP to meet the planning requirement for eligibility.

- Hazard Mitigation Grant Program (HMGP)
- Hazard Mitigation Grant Program – Post Fire (HMGP- Post Fire)
- Building Resilient Infrastructure and Communities (BRIC)
- Flood Mitigation Assistance (FMA)
- Pre-Disaster Mitigation (PDM)

## 2.2 Hazard Mitigation Plan Purpose

The planning process for the Lincoln County Multi-Jurisdictional Hazard Mitigation Plan Update assists each participating jurisdiction in identifying the natural hazards that impact the community, analyzes the risks, and prioritizes actions that can be taken to reduce that risk. Having the approved HMP provides each participating jurisdiction with a federal government–approved and locally adopted plan which will support grant applications to implement natural hazard risk reduction projects. The approved plan is a requirement for FEMA hazard mitigation grant funding and may meet the plan requirements for other federal grants, such as the U.S. Forest Service Community Wildfire Defense Grant.

## 2.3 Funding for the Hazard Mitigation Plan

Funding for the development of the HMP was provided through a FEMA BRIC planning sub-grant obtained by the Village of Ruidoso through the New Mexico DHSEM. FEMA serves as the grantor, New Mexico DHSEM serves as the grantee, and the Village of Ruidoso serves as the sub-grantee. Each participating jurisdiction contributed matching funds for the sub-grant. SWCA Environmental Consultants was hired by the Village of Ruidoso to facilitate the planning process and update the HMP.

## 2.4 General Hazard Mitigation Plan Description

The HMP is generally arranged and formatted to be consistent with the 2018 HMP and is composed of the following sections:

**Planning Process (Section 3) –** This section summarizes the planning process used to update the HMP, describes Planning Team participation, explains the content of the Planning Team meetings, and summarizes outreach to both stakeholders and the public.

**Community Description (Section 4) –** This section provides a general description of the participating jurisdictions and Lincoln County as a whole.

**Hazard Identification and Risk Assessment (Section 5) –** This section summarizes the identification and description of natural hazards that impact each of the participating jurisdictions. For each community, hazard maps and narrative explain the previous occurrence, location, extent (magnitude/severity), probability, and potential climate change effects. This section also includes the vulnerability assessment for each community for each hazard with consideration for critical infrastructure vulnerability, damage to the built environment, changes in development, and social vulnerability. The section ends with the Priority Risk Index (PRI) ratings for each community for each hazard, serving as a way to compare relative importance of perceived risk.

**Mitigation Strategy (Section 6) –** This section presents a capability assessment for each participating jurisdiction. It also summarizes mitigation goals, objectives, and community-specific actions. The description for each action includes the hazard(s) being mitigated, cost effectiveness, duration, responsible entity, potential funding sources, and a status for all actions identified in the 2018 HMP.

**Plan Maintenance Procedures (Section 7) –** This section outlines the procedures that will be implemented for evaluating and monitoring the HMP, updating the HMP in the next 5 years, incorporating plan elements into existing planning mechanisms, and continued public involvement.

# SECTION 3: PLANNING PROCESS

**§201.6(b):** [The plan must include the following:] Planning process. An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:

(1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;

(2) 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; and

(3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

**§201.6(c)(1)**: [The plan must include the following:] Documentation of the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.

This section includes the delineation of various 44 CFR 201.6 regulatory requirements, as well as the identification of key stakeholders and Planning Team Members within Lincoln County. In addition, the necessary public involvement meetings and actions that were applied during this process are also detailed.

## 3.1 Update Process Description

Village of Ruidoso applied for and received a FEMA BRIC sub-grant through the New Mexico DHSEM to fund a multi-jurisdictional update to the 2018 HMP. Letters from the participating jurisdictions were received to be included in the BRIC grant application. Once the sub-grant was received, the Village of Ruidoso went through a formal procurement process to hire a contractor to facilitate the update process. SWCA Environmental Consultants was hired to work with the participating jurisdictions and guide the HMP update process.

Analysis of the 2018 planning process and changes implemented for the 2023 process are described below. Details regarding updated contact information, Planning Team activities, stakeholder involvement, and public involvement are discussed in the following sections.

## 3.2 Previous Planning Process Assessment

The first task of preparation for the 2023 Plan was to evaluate the process used to develop the 2018 HMP. This was initially discussed in the February 28, 2023, Planning Team Meeting #1 with the goal of establishing the framework for the planning effort ahead. The 2018 planning process included a Mitigation Planning Team to represent respective communities. Local Planning Teams were composed of jurisdiction-specific staff and subject matter experts (SMEs). Six Mitigation Planning Team planning meetings and five Local Planning Team meetings were held over the course of a 9-month period. The Mitigation Planning Teams were responsible for attending meetings, conveying information and assignments from meetings, providing insight on the planning context, and reviewing the HMP. Each Local Planning Team was involved in research and making planning decisions and reviewed the draft HMP before public comment. The Mitigation Planning Team representative for the Village of Corona was unable to attend in-person meetings due to short staffing, but email, phone, and Local Planning Team participation was deemed sufficient. The consulting team posted drafts of the HMP on the Village of Ruidoso's website to allow stakeholder and public comment, with public notices posted on jurisdictional websites. No comments were received.

The 2018 HMP noted the lack of mitigation planning experience in the County's first HMP which was approved in 2012. The 2018 HMP had a much higher level of engagement and input from knowledgeable local sources as evidenced by the local specific Planning Teams. This approach resulted in a multi-jurisdictional planning approach that provided representation for all involved communities where concepts were presented and discussed, and each participating jurisdiction was assigned tasks to ensure all relevant information was included.

## 3.3 Planning Team

### *3.3.1 General*

For the 2023 HMP, one, multi-jurisdictional Planning Team was convened. Each participating jurisdiction assigned one liaison who served as the primary point of contact for their jurisdiction and was responsible for ensuring all assignments and intracommunity communication was passed along and completed on time. It was the responsibility of the primary point of contact to participate in the Planning Team meetings and to delegate data requests and other task assignments. Communication was maintained via email, phone calls, and meetings with the primary community contact. The primary contact was responsible for the following:

- Coordinate input and feedback from the community
- Delegate and ensure completion of assigned tasks or data requests
- Coordinate elected official meetings

The role of the Planning Team was to perform the coordination, research, and planning element activities required to update the 2018 HMP. Planning Team meetings were held monthly from February to May 2023. At the beginning of the planning process, each liaison was provided with a copy of the 2018 HMP in addition to the copy posted on the Village of Ruidoso's website.

The Planning Team meetings were designed and scheduled to guide the Planning Team through the update process by establishing baseline understandings of the process and build on previous meetings. Each meeting focused on a specific section of the HMP, beginning with an overview and assessment of the previous planning process. In addition to this cumulative meeting process where jurisdictional representatives participated in each progressive step, monthly assignments were delegated based on the planning stage. Assignments ensured that the most up-to-date information was used in the planning process and that all efforts were made to fill recognized data deficiencies. Subject matter experts and stakeholders were also consulted to provide input on specific topics.

Dates of the Planning Team meetings and specific topics covered are shown in Figure 3-2.

### *3.3.2 Planning Team Assembly*

At the beginning of the 2023 HMP update planning process, the Village of Ruidoso updated the 2018 Planning Team contact list to reflect the current contacts that held the appropriate position within each participating jurisdiction. Representatives were the emergency managers or primary point of contact from the 2018 HMP or other community staff with an aim of one to three representatives per jurisdiction. In February 2023, an introductory email was sent to the identified Planning Team Members announcing the start of the planning effort. Throughout the first several weeks of the planning process, the Planning Team list was modified by each participating jurisdiction to ensure that the appropriate contacts were included. The Planning Team representatives are summarized in Figure 3-1. Returning Planning Team Members from the 2018 HMP are identified with an asterisk (*).

**Figure 3-1: Mitigation Planning Team**

| Name | | Agency/Organization | Title |
|---|---|---|---|
| Kevin | Kennedy | Village of Capitan | Fire Chief/Emergency Management |
| Ron | Lowrance | Village of Capitan | Mayor |
| Ray | Dean | Town of Carrizozo | Mayor |
| Lisa | Maue | Town of Carrizozo | Administrative Assistant |
| Leann | Weibrecht | Town of Carrizozo | Town Clerk |
| Brad | Gage | Village of Corona | Fire Chief |
| Terri | Racher* | Village of Corona | Village Clerk |
| Samuel | Seely | Village of Corona | Mayor |
| Joe (JP) | Kenmore* | Lincoln County | Emergency Management Director |
| Ira | Pearson* | Lincoln County | County Manager |
| Roy | Burkham | City of Ruidoso Downs | Fire Chief/Emergency Manager |
| Joe | Commander | City of Ruidoso Downs | Police Chief |
| Dean | Holman | City of Ruidoso Downs | Mayor |
| Robert | Knight | City of Ruidoso Downs | Deputy Police Chief |
| Christella | Armijo | Village of Ruidoso | Water Resources Director |
| Lawrence | Chavez | Village of Ruidoso | Police Chief |
| Ross | Coleman | Village of Ruidoso | Assistant Fire Chief/Fire Marshal |
| Dick | Cooke | Village of Ruidoso | Village Forestry Director |
| Joe | Kasuboski* | Village of Ruidoso | Fire Chief |
| Steven | Minner | Village of Ruidoso | Deputy Police Chief |
| Adam | Sanchez | Village of Ruidoso | Public Utilities Director |
| Ron | Sena* | Village of Ruidoso | Village Manager |
| Samantha | Serna* | Village of Ruidoso | Community Development Director |
| J.W. | McCoy | U.S. Forest Service, Lincoln National Forest | Fire Management Officer |
| Jennifer | Thomas | U.S. Forest Service, Lincoln National Forest | |

### *3.3.3 Planning Team Activities*

Figure 3-2 summarizes the Planning Team meetings convened, along with a brief list of the agenda items discussed. The detailed agendas, presentations, and meeting notes for the Planning Team meetings are provided in Appendix F.

**Figure 3-2: Summary of Planning Team Meetings**

| Meeting Type, Date, and Location | Topics |
|---|---|
| Planning Team Meeting # 1<br>February 28, 2023<br>Village of Ruidoso Village Hall<br>Ruidoso, NM | • Introduction<br>• Plan update process and overview<br>  ○ General process overview and timeline<br>  ○ FEMA guidance changes<br>• Roles and responsibilities<br>  ○ Planning Team Members<br>  ○ Stakeholders<br>  ○ Subject matter experts<br>  ○ Members of the public<br>• Planning process updates<br>  ○ Overview of 2018 process<br>  ○ Recommended changes for 2023 update<br>  ○ Confirmation on direction from Planning Team<br>• Hazard identification and risk assessment<br>  ○ Overview of 2018 hazards and recommendations<br>  ○ Overview of research to be conducted for 2023<br>• Next steps |
| Planning Team Meeting # 2<br>March 22, 2023<br>Via Zoom | • Introduction<br>• Planning process for 2023 Update<br>  ○ Confirmation on planning process<br>  ○ Community involvement<br>• Hazard identification and risk assessment<br>  ○ Finalize hazard screening process<br>  ○ Hazard profile example<br>  ○ Changes in land development<br>  ○ Critical infrastructure and asset mapping<br>  ○ PRI overview<br>  ○ Loss and exposure estimates<br>  ○ Recommended changes<br>  ○ Confirmation on direction from Planning Team<br>• Next steps |
| Planning Team Meeting # 3<br>April 19, 2023<br>Via Zoom | • Introduction<br>• Planning process<br>  ○ Format review and comments/feedback<br>• Hazard identification and risk assessment<br>  ○ Format review and comments/feedback<br>  ○ Hazard profile and vulnerability example<br>  ○ Updated PRI review<br>○ Mitigation strategy<br>  ○ Overview of 2018 strategy<br>  ○ Recommended changes for 2023 update<br>  ○ Technical assistance meetings to be held week of May 1 for each community<br>• Next steps |

| Meeting Type, Date, and Location | Topics |
|---|---|
| Planning Team Meeting # 4<br>May 25, 2023<br>Via Zoom | • Introduction<br>• PRI results<br>• Review of Sections 1–5 and capabilities<br>• Mitigation strategy<br>  ○ Finalize goals and objectives<br>  ○ Review 2018 HMP action status<br>  ○ Finalize approach for 2023<br>  ○ Finalize prioritization process<br>• Plan maintenance<br>  ○ Review status of 2018 through 2023 commitments<br>  ○ Plan maintenance for 2024 through 2028<br>• Formatting<br>  ○ Next steps |
| Planning Team Meeting #5 | • *If Meeting #5 is needed, topics will be added* |

In addition to the Planning Team meetings, the consultant provided a Mitigation Strategy Technical Assistance session for each participating jurisdiction. Five of the sessions were conducted the week of May 1, and the sixth was the week of May 15. Topics below were addressed in the session. The following participants were encouraged to participate: primary contact from Planning Team; Emergency Manager; wildfire, flood, climate, dam, or other hazard subject matter expert; public utility, public works, or other infrastructure subject matter expert; community planner; and elected/appointed officials.

- Review goals and objectives in context of individual participating jurisdiction perspective
- Review each participating jurisdiction's 2018 HMP actions and describe example of how status must be documented
- Discuss example of how updates need to be described for actions that will be included in the 2023 HMP Update
- Discuss example of how actions are to be added so new guidance is met
- Brainstorm action ideas
- Explain the prioritization process options

### *3.3.4 Subject Matter Experts*

Subject matter experts (SMEs) were identified by the Planning Team to provide input and feedback on specific topics. SMEs provided edits and feedback on specific topics or hazards, and provided reference materials or website links. Some SMEs assisted with the integration of other planning mechanisms into this HMP Update and will assist with integrating relevant portions of this HMP into other planning mechanisms over the coming 5-year approval cycle. In addition, some SMEs provided support, logistics coordination, and other resources to accomplish the HMP Update. Figure 3-3 identifies the SMEs, their agency or organization affiliation, and subject area of expertise.

**Figure 3-3: Subject Matter Expert List**

| Name | | Agency/Organization | Title | SME Topic |
|---|---|---|---|---|
| Angela | Autrey | Village of Capitan | Deputy Clerk | Board of Trustees meeting logistics |
| Lisa | Maue | Carrizozo Works, Inc. | Director | Economic development and quality of life |
| Walter | Hill | Lincoln County | Assessor's Office Cartographer | Assessor data and assistance |
| Amanda | Vega-Trujillo | Lincoln County | Assessor's Office Cartographer | Assessor data |
| Brianna | Ventura | Lincoln County | HR Director, County Admin Assistant | County Commission agenda |
| LeeRoy | Zamora, Jr. | Lincoln County | Chief Deputy Assessor | Assessor data and assistance |
| Ally | Giron | City of Ruidoso Downs | City Clerk, Treasurer, Admin Assistant | City Council meeting logistics |
| | | City of Ruidoso Downs | Planning and Zoning Services Director | Permits, floodplain management |
| Ashlie | Carabajal | Village of Ruidoso | Water Resource Manager | Water asset geographic information system (GIS) and risk assessment |
| Kerry | Gladden | Village of Ruidoso | Public Information Officer (on contract) | Ruidoso Public Information Officer on contract |
| Randy | Koehn | Village of Ruidoso | Water Production Manager | Alto and Grindstone Dams |
| Austin | Nelson | Village of Ruidoso | Airport Manager | Airport |
| Frank | Potter | Village of Ruidoso | Judge | the human "Farmer's Almanac" |
| Bill | Powers | Village of Ruidoso | Building Official, Floodplain Manager | Permitting, floodplain |
| Stephanie | Warren | Village of Ruidoso | GIS Coordinator/Planner | GIS parcel data and addressing |
| Michael | Anand | National Weather Service | Meteorologist | Weather data |

### *3.3.5 Stakeholders Participation*

According to the Planning Team, a "stakeholder" refers to a group or organization that may have an interest in the HMP Update but is not a representative of one of the six participating jurisdictions or an individual member of the public. Some stakeholders were specifically targeted for inclusion based on their role in the community, proximity to assessed communities, or understanding of the specific planning context. Outreach to these stakeholders was conducted via email and phone correspondence and was in line

with FEMA's requirement to provide opportunity for neighboring communities, agencies, businesses, and non-profits to provide input on the HMP Update.

Similar to the development of a stakeholder list that occurred during the 2018 HMP, throughout the initial weeks of the planning process, the Planning Team modified the listing, updated contact information and added any new stakeholders. Figure 3-4 represents stakeholders that were emailed and encouraged to participate in the 2023 update. Stakeholders were sent the introductory press release and were invited to participate in the community meeting. Some stakeholders were called to discuss outreach specific to their interest area, such as climate change, and to solicit input on extending outreach to vulnerable populations.

Telephone interviews were conducted with representatives from the South Central Mountain Resource Conservation and Development Council, Community Foundation of Lincoln County, Upper Hondo Soil and Water Conservation District (Salado Dam owner), City of Alamogordo (Bonito Dam owner), Mescalero Apache Tribe (Mescalero Lake Dam owner contact for Bureau of Indian Affairs), New Mexico Workforce Solutions, Eastern New Mexico University, neighboring community emergency management contacts, U.S. Army Corps of Engineers (USACE), and the insurance industry.

**Figure 3-4: Stakeholder List**

| Name | | Agency/Organization | Title | Category |
|---|---|---|---|---|
| J. Vance | Lee | Capitan School District | Superintendent | academia |
| Cody | Patterson | Carrizozo School District | Superintendent | academia |
| Travis | Lightfoot | Corona School District | Superintendent | academia |
| Robin | DeMott | Eastern New Mexico University | Chief External Affairs Officer | academia |
| Ryan | Trosper | Eastern New Mexico University | President | academia |
| Marvin | Martin | Hondo School District | Superintendent | academia |
| George | Bickert | Ruidoso Municipal Schools | Superintendent | academia |
| | | New Mexico Construction Industries Division | Las Cruces Office | agencies that regulate development |
| Justin | Riggs | U.S. Army Corps of Engineers | | agencies that regulate development |
| Diedre | Tarr | Claunch Pinto Soil and Water Conservation District | District Manager | local and regional agencies |
| Nick | Smokovich | New Mexico State Forestry Division | District Forester | local and regional agencies |
| Luis | De La Cruz | New Mexico Workforce Solutions | Workforce Development Director | local and regional agencies |
| Dora | Batista | Southern New Mexico Economic Development District | Executive Director | local and regional agencies |

| Name | | Agency/Organization | Title | Category |
|---|---|---|---|---|
| Wanda | Schmidt | Upper Hondo Soil and Water Conservation District | | local and regional agencies |
| Richard | Adler | City of Alamogordo | Fire Chief and Emergency Manager | neighboring communities |
| Brian | Caesar | City of Alamogordo | City Manager | neighboring communities |
| David | Nunnelley | City of Alamogordo | Utilities Department Director | neighboring communities |
| Karen | Sanders | Chaves County | Emergency Manager | neighboring communities |
| Bill | Williams | Chaves County | County Manager | neighboring communities |
| Linda | Boyd | De Baca County | Director/Emergency Manager | neighboring communities |
| Ben | Rael | Guadalupe County | Emergency Manager | neighboring communities |
| Diana | Urban | Guadalupe County | County Manager | neighboring communities |
| Loren | Gallerito | Mescalero Apache Tribe | Emergency Manager | neighboring communities |
| Clyde | Jenkins | Mescalero Apache Tribe | Fire Chief | neighboring communities |
| Thomas | LaPaz | Mescalero Apache Tribe | Emergency Management Assistant | neighboring communities |
| Matt | Clark | Otero County | Emergency Services | neighboring communities |
| Pamela | Heltner | Otero County | County Manager | neighboring communities |
| Amber | Vaughn | Sierra County | County Manager | neighboring communities |
| Ryan | Williams | Sierra County | Emergency Services Administrator | neighboring communities |
| Michael | Hawkes | Socorro County | County Manager | neighboring communities |
| Gail | Tripp | Socorro County | Emergency Manager | neighboring communities |
| Janice | Barela | Torrance County | County Manager | neighboring communities |

| Name | | Agency/Organization | Title | Category |
|---|---|---|---|---|
| Samantha | O'Dell | Torrance County | Emergency Manager | neighboring communities |
| Cynthia | Davis | Community Foundation of Lincoln County | Shelter Fund Advisor | other private/non-profit interests |
| Riker | Davis | Community Foundation of Lincoln County | President | other private/non-profit interests |
| Ashley | Dalton | Farmers Insurance | Insurance Agent | other private/non-profit interests |
| Robert | Barber | Lincoln County – Community Emergency Response Team | Program Manager | other private/non-profit interests |
| Laura | Doth | South Central Mountain Resource Conservation and Development Council | Executive Director | other private/non-profit interests |
| Todd | Oberheu | Lincoln County Medical Center | Chief Executive Officer | other private/non-profit interests |
| Sandralynn | Nunnally | Lincoln County Medical Center | Emergency Medical Services Director | other private/non-profit interests |

**Figure 3-5: Joe Kenmore, Lincoln County Emergency Management Director, showing Lincoln County is Storm Ready, certified by National Weather Service.**

An integral part of the planning process included coordination with agencies and organizations outside of the participating jurisdiction's governance to obtain information and data for inclusion into the HMP or to provide more public exposure for the planning process. Some of the information and data used in the risk assessment are developed by agencies or organizations other than the participating jurisdictions. In some cases, the jurisdictions may be members of a larger organization that has jointly conducted a study or planning effort, like the development of the 2019 Community Wildfire Protection Plan (CWPP) prepared by the South-Central Mountain Resource Conservation and Development Council. Examples of data sets include FEMA floodplain mapping, severe weather statistics, hazard incident reports, and regional comprehensive plans. The resources obtained, reviewed, and compiled into the risk assessment are summarized in Section 3.6 Integration of Other Planning Mechanisms, and at the end of each subsection of Section 5.4, Vulnerability Analysis. Data sets were obtained by requesting them directly from the host agency or organization, downloading information posted to website locations, and researching geographic information system (GIS) platforms.

## 3.4 Public Involvement

### *3.4.1 Previous Plan Assessment*

The public involvement strategy for the 2018 HMP used mainly web-based engagement, including posting public notices on all participating jurisdictions websites. These notified residents of the ongoing planning process, directed them to the 2018 HMP for review, and included instructions to provide feedback. Notices were posted at the onset of the planning process and when a draft plan was ready for public comment. The Village of Ruidoso's website hosted both a summary mitigation plan section and the 2018 HMP. Social media was also used to reach a broader audience and solicit feedback. No public comments were received during either the initial outreach or following the release of the draft plan.

### *3.4.2 Plan Update*

For the 2023 HMP, the Planning Team defines the "public" as the communities of Lincoln County, residents, local homeowners, second homeowners, renters, businesses, and organizations outside of government.

Based on direction from the Planning Team, presentation was made to each participating jurisdiction's elected and appointed officials providing an overview of hazard mitigation and a review of the 2023 planning process. The presentation slides are provided in Appendix G. Presentations were made on the following dates:

- Ruidoso Village Council – March 14, 2023
- Capitan Board of Trustees – March 14, 2023
- Corona Village Council – March 17, 2023
- Ruidoso Downs City Council – March 27, 2023
- Carrizozo Board of Trustees – April 11, 2023
- Lincoln County Commission – April 18, 2023

An introductory press release was distributed by the Village of Ruidoso and the Town of Carrizozo. The press release provided information on the purpose and timeline for the HMP Update, identified the key personnel, and encouraged the public to be engaged with the planning process.

The public comment period was from June 26 to July 9, 2023. On June 26, 2023, the draft 2023 HMP was uploaded to the Village of Ruidoso website. In addition, a webinar and feedback survey were also posted. The webinar provided an overview of the HMP, introduced the key components, and encouraged feedback through a survey. An in-person community meeting was hosted on June 27, 2023, at the Ruidoso Convention Center. All Planning Team Members, public officials, stakeholders, and community members were encouraged to attend the meeting, which provided time for questions regarding the planning process and an opportunity for public comment on the draft. Announcement of the community meeting was accomplished through a hard-copy community flyer and social media postings. The flyer was included in: the Village of Ruidoso's June newsletter that gets mailed to all utility customers and posted online; the Village of Capitan's monthly utility billing mailing; and the Town of Carrizozo's online newsletter that is posted by Carrizozo Works twice a week. At the beginning of the meeting an overview of the HMP was provided to introduce the key components of the update and encourage feedback from community members through a survey. Feedback received by July 9, 2023, was incorporated into the HMP final draft after consultation with the Planning Team.

A second opportunity for the community to comment on the HMP Update was provided at the adoption public hearing at each participating jurisdiction after FEMA provided the Approval Pending Adoption letter. Dates of the public hearings were:

- *To be added*

## 3.5 Reference Documents and Technical Resources

Over the course of the update planning process, numerous other plans, studies, reports, and technical information were obtained and reviewed for incorporation or reference purposes. The majority of sources referenced and researched pertain to the risk assessment and the capabilities assessment. To a lesser extent, the community descriptions and mitigation strategy also included some document or technical information research. Figure 3-6 provides a reference listing of the primary state, federal, and national documents and technical resources reviewed and used in the Plan. Local plans integrated into the HMP Update are listed in Figures 3-8-1 through 3-8-6.

**Figure 3-6: List of State, Federal, and National Resource Documents and References**

| Referenced Document or Technical Source | Resource Type | Description of Reference and Its Use |
|---|---|---|
| State of New Mexico Hazard Mitigation Plan (2018) | Hazard Data, Mitigation Data | Some of the hazard data and mitigation information published in the State Plan are incorporated into the HMP Update. |
| New Mexico Forestry Division | Hazard Data | Source for wildfire data associated with State Land. |
| Living with Fire (2018) | A Guide for the New Mexico Homeowner by State Forestry, Bureau of Land Management, USFS | Concepts to mitigate fire risk have been incorporated into the HMP Update. |

| Referenced Document or Technical Source | Resource Type | Description of Reference and Its Use |
|---|---|---|
| FEMA | Technical and Planning Resource | Local Mitigation Planning and Policy Guide (2022), Local Mitigation Plan Handbook (2013), floodplain- and flooding-related National Flood Insurance Program (NFIP) data (mapping, repetitive loss, NFIP statistics), and historic hazard incidents. Used in the risk assessment and mitigation strategy. |
| U.S. Global Change Research Program | Technical and Data Resource | Source for National Climate Assessment reports and documentation with discussions on climate change. |
| U.S. Census Bureau | Data Resource | Source for demographic information |
| National Climatic Data Center | Technical Resource | Online resource for weather-related data and historic hazard event data. Used in the risk assessment. |
| National Response Center | Technical Resource | Source for traffic-related hazardous materials incidents and rail accidents. Used in the risk assessment. |
| National Weather Service | Technical Resource | Source for hazard information, data sets, and historic event records. |
| U.S. Census Bureau | Technical Data | County census block data were used to obtain block boundaries, population, and housing units. |
| U.S. Forest Service | Technical Data | Source for local wildfire data. |
| U.S. Geological Survey | Technical Data | Source for geological hazard data and incident data. |

Figure 3-7 depicts the 2018 HMP Planning Team simulating wildfire and flood hazard scenarios as part of this process.

**Figure 3-7: 2018 Planning Team using the Lincoln County Simulation Table**

## 3.6 Integration of Other Planning Mechanisms into the HMP Update

Integration and/or incorporation of existing planning mechanisms into the HMP Update serves as a force multiplier to present interrelated concepts, goals, and actions that will enhance the ability for each participating jurisdiction to maximize natural hazard risk reduction activities.

### *3.6.1 2018 Plan Incorporation/Integration Examples*

Below is a description of how the participating jurisdictions incorporated the 2018 HMP into updates and revisions of existing planning mechanisms (see Section 3.6.2). Bulleted descriptions go into more detail on four directly related planning documents for four participating jurisdictions.

- The County integrated the 2018 HMP into the CWPP. As this is a county-wide document, all incorporated jurisdictions benefited from the incorporation of the relevant information. The CWPP evaluates current conditions and identifies opportunities, strategies, and resources for wildfire mitigation. Additionally, the CWPP proposes important actions and recommendations to prevent wildfire risk. Concepts from the risk assessment, capabilities, and mitigation strategy of the 2018 HMP are integrated into the 2019 County CWPP.
- The Village of Ruidoso incorporated the 2018 HMP into its 2019 Comprehensive Plan. Section 13, Hazard Mitigation, describes the Village's current conditions; capacity to address hazards; existing plans, policies, and programs; accomplishments; planned improvements; and future goals and objectives. In the Comprehensive Plan, the Village commits to adopting additional hazard mitigation rules and regulations, enforcing fuels management standards on private property, and collaborates with surrounding jurisdictions on hazard mitigation and response efforts. Concepts

from the 2018 HMP were integrated into the capacity, existing conditions, and goals narrative of the Village's 2019 Comprehensive Plan.

- The City of Ruidoso Downs integrated the 2018 HMP into its 2021 Comprehensive Plan. The Comprehensive Plan identifies approaches and strategies adopted by the City to reduce both short-term and long-term risk from various hazards. It prioritizes improving the community's ability to prepare for, respond to, and recover from hazards, reducing the risk of wildfire, and minimizing the City's vulnerability to flooding and dam failure. Concepts from the risk assessment and mitigation strategy of the 2018 HMP are integrated into the City's 2021 Comprehensive Plan.
- The Town of Carrizozo integrated the 2018 HMP into its 2021 Comprehensive Plan. The Comprehensive Plan includes a discussion on hazard mitigation and the Town's mitigation efforts. There is a summary of existing plans and policies, recommendations to improve mitigation strategies, and the Town's planned goals, policies, and actions for the coming years. Concepts from the 2018 HMP were integrated into the capacity, goals, and actions narrative of the Town's 2021 Comprehensive Plan.

### *3.6.2 Other Planning Mechanisms Incorporated into the 2023 HMP Update*

Numerous existing planning mechanisms were used for reference in the 2023 HMP Update. Figures 3-8-1 through 3-8-6 list those planning mechanisms for each jurisdiction and a brief description of the concepts integrated.

**Figure 3-8-1: Lincoln County—Planning Mechanisms Integrated into 2023 HMP Update**

| Planning Mechanism | Description of Planning Mechanism Opportunity |
|---|---|
| County Community Wildfire Protection Plan (CWPP) | The 2019 CWPP describes at-risk communities within or near the wildland urban interface throughout the county. Concepts from the following sections were included in the HMP Update: hazard assessments, action recommendations, schedule for implementation, and evaluation approach. |
| Lincoln County Emergency Operations Plan (EOP) | The 2014 EOP identifies response and recovery actions in Lincoln County. Concepts from the following sections were consistent with the narrative in the HMP Update: Emergency Management and Mitigation, Vulnerable Critical Facilities, and Annex M on Special Needs Population. |
| Infrastructure Capital Improvement Plan (ICIP) | Current ICIP project listing covers 2024 through 2028, and was used for reference when the County prepared the actions listing for the 2023 HMP. |
| County Comprehensive Plan | The County Comprehensive Plan is from 2007. General industry and community profile information was used for reference. |
| Upper Hondo (Salado) Dam Emergency Action Plan (EAP) | The Upper Hondo Soil and Water Conservation District owns and operates the Upper Hondo Dam. Portions of the unincorporated county fall within the dam inundation area. Information from this 2018 EAP including potentially impacted areas has been added to the HMP Update in the dam failure and vulnerability sections. |

| Planning Mechanism | Description of Planning Mechanism Opportunity |
|---|---|
| Mescalero Lake EAP | The Mescalero Apache Tribe owns and operates the Mescalero Lake Dam. Portions of the unincorporated county fall within the dam inundation area. Information from this 2014 EAP including potentially impacted areas has been added to the HMP Update in the dam failure and vulnerability sections. |

**Figure 3-8-2: Village of Ruidoso—Planning Mechanisms Integrated into 2023 HMP Update**

| Planning Mechanism | Description of Planning Mechanism Opportunity |
|---|---|
| Village of Ruidoso Emergency Operations Plan (EOP) | The 2018 EOP references the hazard profiles and risk assessments in the HMP. Concepts from the following sections were consistent with the narrative in the HMP Update: Emergency Management and Mitigation, Administration and Logistics, and in the recovery phase portion of the Annexes. |
| Infrastructure Capital Improvement Plan (ICIP) | Current ICIP project listing covers 2024 through 2028, and was used for refence when the Village prepared the actions listing for the 2023 HMP. |
| Village of Ruidoso Comprehensive Plan | Key hazard mitigation data and resources outlined in the 2019 Comprehensive Plan have been integrated into the HMP Update. In particular, see Section 13, Hazard Mitigation. |
| County Community Wildfire Protection Plan (CWPP) | The 2019 CWPP describes at-risk communities within or near the wildland urban interface throughout the county. Concepts from the following sections were included in the HMP Update: hazard assessments, action recommendations, schedule for implementation, and evaluation approach. |
| Grindstone Canyon Dam Emergency Action Plan (EAP) | The Village owns and operates this dam. Information from this 2016 EAP including potentially impacted areas has been added to the HMP Update in the dam failure and vulnerability sections. |
| Alto Lake Dam EAP | The Village owns and operates this dam. Information from this 2017 EAP including potentially impacted areas has been added to the HMP Update in the dam failure and vulnerability sections. |

**Figure 3-8-3: City of Ruidoso Downs—Planning Mechanisms Integrated into 2023 HMP Update**

| Planning Mechanism | Description of Planning Mechanism Opportunity |
|---|---|
| Infrastructure Capital Improvement Plan (ICIP) | Current ICIP project listing covers 2024 through 2028, and was used for refence when the City prepared the actions listing for the 2023 HMP. |
| City of Ruidoso Downs Comprehensive Plan | Key hazard mitigation data and resources outlined in the 2021 Comprehensive Plan have been integrated into the HMP Update. In particular, strategies were reviewed for incorporation into the actions section of the HMP Update. |

| Planning Mechanism | Description of Planning Mechanism Opportunity |
|---|---|
| County Community Wildfire Protection Plan (CWPP) | The 2019 CWPP describes at-risk communities within or near the wildland urban interface throughout the county. Concepts from the following sections were included in the HMP Update: hazard assessments, action recommendations, schedule for implementation, and evaluation approach. |

**Figure 3-8-4: Town of Carrizozo—Planning Mechanisms Integrated into 2023 HMP Update**

| Planning Mechanism | Description of Planning Mechanism Opportunity |
|---|---|
| Town of Carrizozo Comprehensive Plan | Key hazard mitigation data and resources outlined in the 2021 Comprehensive Plan have been integrated into the current version of the HMP. In particular goals, policies, and actions were included in the strategy section of the HMP Update. |
| Infrastructure Capital Improvement Plan (ICIP) | Current ICIP project listing covers 2024 through 2028, and was used for refence when the Town prepared the actions listing for the 2023 HMP Update. |
| Water Contingency Plan | The Water Contingency Plan outlines water management practices during drought and severe drought conditions within the town of Carrizozo. The Plan's emphasis on water conservation and well redundancy to address drought has been incorporated into the HMP Update, particularly in the actions section. |
| County Community Wildfire Protection Plan (CWPP) | The 2019 CWPP describes at-risk communities within or near the wildland urban interface throughout the county. Concepts from the following sections were included in the HMP Update: hazard assessments, action recommendations, schedule for implementation, and evaluation approach. |

**Figure 3-8-5: Village of Capitan—Planning Mechanisms Integrated into 2023 HMP Update**

| Planning Mechanism | Description of Planning Mechanism Opportunity |
|---|---|
| Village Comprehensive Plan | Key hazard mitigation data and resources outlined in the 2013 Comprehensive Plan are consistent with the HMP Update. Section 8 of the Comprehensive Plan is specific to hazard mitigation. |
| Drinking Water Bureau Emergency Response Plan (2015) | This emergency response plan is related to drinking water. Actions related to water quality were deemed not relevant to the HMP Update and not included. |
| County Community Wildfire Protection Plan (CWPP) | The 2019 CWPP describes at-risk communities within or near the wildland urban interface throughout the county. Concepts from the following sections were included in the HMP Update: hazard assessments, action recommendations, schedule for implementation, and evaluation approach. |

**Figure 3-8-6: Village of Corona—Planning Mechanisms Integrated into 2023 HMP Update**

| Planning Mechanism | Description of Planning Mechanism Opportunity |
|---|---|
| Village Comprehensive Plan | Key hazard mitigation data and resources outlined in the 2013 Comprehensive Plan are consistent with the HMP Update. Section 7 of the Comprehensive Plan is specific to hazard mitigation. |
| County Community Wildfire Protection Plan (CWPP) | The 2019 CWPP describes at-risk communities within or near the wildland urban interface throughout the county. Concepts from the following sections were included in the HMP Update: hazard assessments, action recommendations, schedule for implementation, and evaluation approach. |

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# SECTION 4: COMMUNITY DESCRIPTIONS

## 4.1 General

The purpose of this section is to provide updated basic background information on Lincoln County as a whole and includes information on geography, climate, population, and economy. Abbreviated details and descriptions are also provided for each participating jurisdiction. Additional demographic information is presented in Section 5.4.4, Social Vulnerability.

## 4.2 County Overview

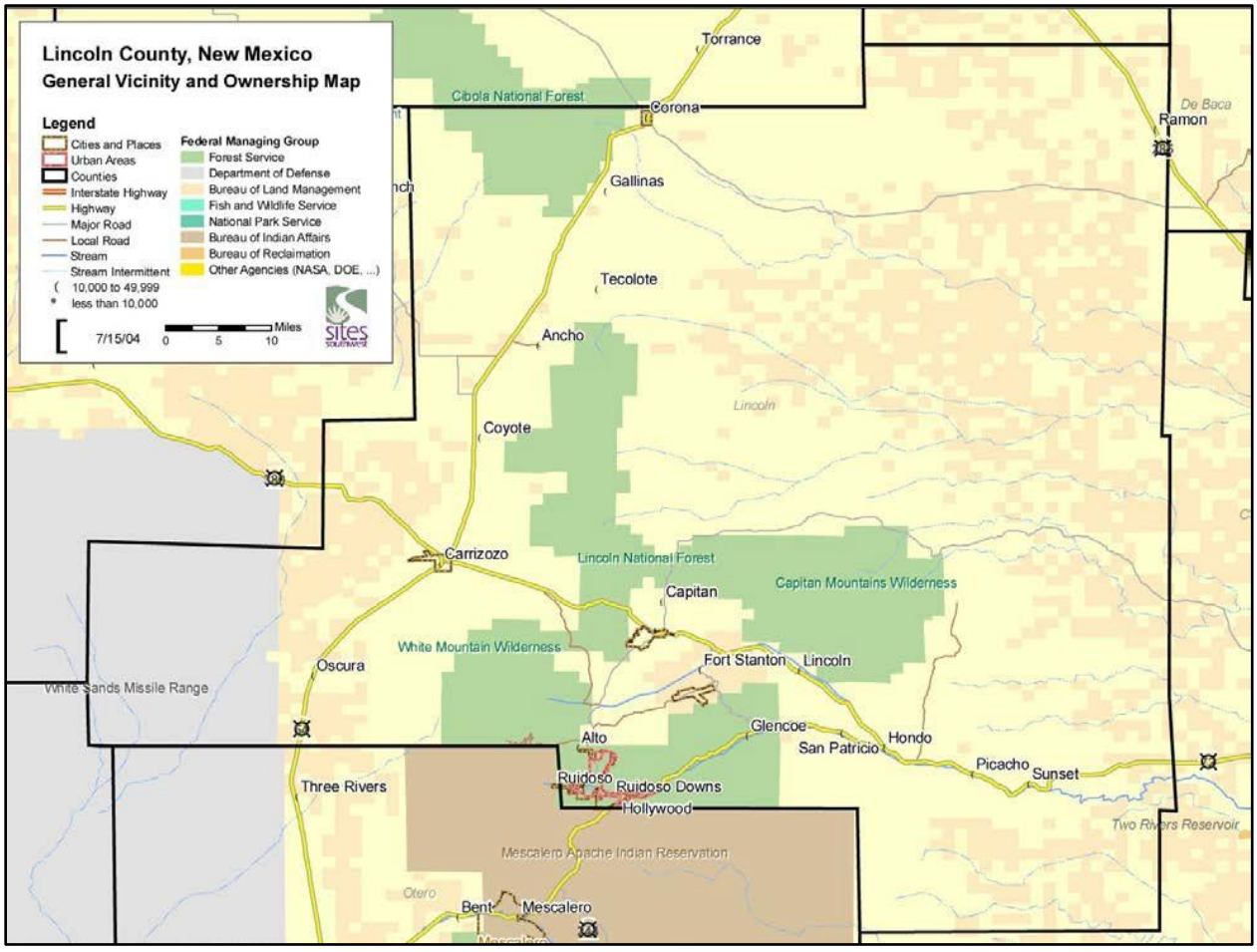
### *4.2.1 Location and Geography*

Lincoln County is located in south-central New Mexico, and is bordered by Torrance and Guadalupe Counties to the north, De Baca County to the northeast, Chaves County to the east, Otero County to the south, Sierra County to the southwest, and Socorro County to the west (Figure 4-1). Named after Abraham Lincoln, the county was established in 1869. At that time, it made up nearly one fourth of the entire state and was the largest county in the United States. Today the county, including its incorporated jurisdictions, comprises 4,828 square miles. Unincorporated Lincoln County spans 4,798 square miles, which ranges from sprawling ranchlands to mountain settings. Important natural features in Lincoln County include the Lincoln National Forest, Sacramento Mountains, Capitan Mountains, Bonito Lake, and the Valley of Fires lava fields.

Lincoln County also has a rich history. It lays claim to some of the most well-known figures of the West, including Billy the Kid and Smokey Bear. The county is also dotted with ghost towns and artists' enclaves, as well as the resort town of Ruidoso.

There are three primary roadways that serve Lincoln County: U.S. Routes 380, 70, and 54. Route 380 bisects the county, running east-west. It connects Interstate 25 to Carrizozo, through Hondo, and eventually goes to Roswell and Texas. Route 70 runs southwest-northeast, connecting Las Cruces, Alamogordo, and Tularosa to Ruidoso before joining Route 380 in Hondo. Route 54 is a north-south roadway, which runs from El Paso, Texas, through Carrizozo, north to Corona, and continues northeast through several states. There are several small airports throughout the county, including the Carrizozo and Ruidoso Municipal Airports. From Carrizozo, the nearest metropolitan center is Las Cruces, which lies 124 miles to the southwest. Albuquerque is 152 miles to the northwest, and Santa Fe, the state capital, is about 162 miles to the north (Lincoln County 2007). The terrain in Lincoln County varies from relatively flat prairie lands and rolling foothills to high mountain peaks. It is a rugged region in the Basin and Range Province, with green hills and large plains surrounding and separating high mountain ranges. The plains are eroded, with canyons and the beds of dry streams; the tree-covered mountains include the Sierra Blanca, Sierra Oscura, Gallinas (with 8,615-foot Gallinas Peak), Jicarilla (with 9,650-foot Carrizo Mountain), and Capitan (with 10,083-foot Capitan Peak). Much of southwestern Lincoln County is covered by the Malpais, a region of lava beds that originated from Little Black Peak.

**Figure 4-1: Map of Lincoln County, New Mexico.**




Source: Britannica (2023).

### *4.2.2 Climate*

Summertime high temperatures range in the 80s (degrees Fahrenheit [°F]) with lows in the 40s and 50s °F. Winter temperatures vary from highs in the upper 40s and low 50s °F to lows in the 20s °F. The assessment area has over 300 days of sunshine per year. Average annual precipitation is 22 inches around Ruidoso and 17 inches around Corona. The majority of precipitation is received during summer months. Annual average snowfall in Ruidoso is 26.2 inches, Capitan 27.3 inches, and Corona 27.9 inches (National Oceanic and Atmospheric Administration [NOAA] 2021).

### *4.2.3 Population*

According to the 2021 U.S. Census American Community Survey, there were 7,283 people comprising 3,212 households within unincorporated Lincoln County. The population density was 1.5 inhabitants per square mile. The racial makeup of unincorporated Lincoln County was 84.4% white alone, 0.3% black or African American alone, 4.8% American Indian and Alaska Native alone, 2.0% some other race alone, and 8.6% from two or more races. Hispanic or Latino of any race were 21.9% of the population. Additionally, the percentage of residents within the county 18 years of age or younger was 16.2% and the percentage of the population 65 years of age or older was 34.6% (U.S. Census Bureau 2021).

### *4.2.4 Economy*

Important economic values are year-round recreational resort facilities, tourism, historical communities and buildings, the Ruidoso Downs Race Track and Casino, sightseeing, nearby Mescalero Apache Reservation, and retirement communities. Ecological values include such resources as watersheds, wildlife and aquatic habitats, rangeland grazing, forest products, and viewsheds. Important infrastructure includes U.S. Routes 54, 70, 285, and 380, county roads, a railroad, communication towers, watersheds, a ski area, and historical communities.

Services, retail trade, and construction have historically provided the greatest number of jobs in Lincoln County. Currently, major employment sectors include the hospitality and recreation industry, the health care sector, construction, and local government.

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

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

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

In Capitan, visitors can learn about Smokey Bear, the national mascot for preventing forest fires, at the Smokey Bear Museum, the Smokey Bear Historical Park and its corresponding visitor center, and during the annual Smokey Bear Stampede, held every July (Lincoln County 2007).

## 4.3 Jurisdictional Overviews

The following are brief overviews for each of the participating jurisdictions in the HMP Update.

### *4.3.1 Village of Ruidoso*

The Village of Ruidoso is a unique community located at approximately 6,000 feet in elevation, tucked into Sierra Blanca and surrounded by the Sacramento Mountains and Lincoln National Forest (Figure 4-2 and Figure 4-3). The village is a tourist destination with a permanent population of approximately 8,000 people. In the summer and during peak holiday times, that number can swell to over

30,000. Because of the physical location of the village, as well as its seasonal tourist orientation, Ruidoso must proactively address a number of specific issues in order to better control its own fate and enhance its sustainability over the long term. These issues include land development, infrastructure improvement needs, economic development and diversification, environmental protection, and retaining affordability of the community for all its citizens. The Village of Ruidoso provides many services, including some not normally found in a small community, such as an airport, library, and convention center.

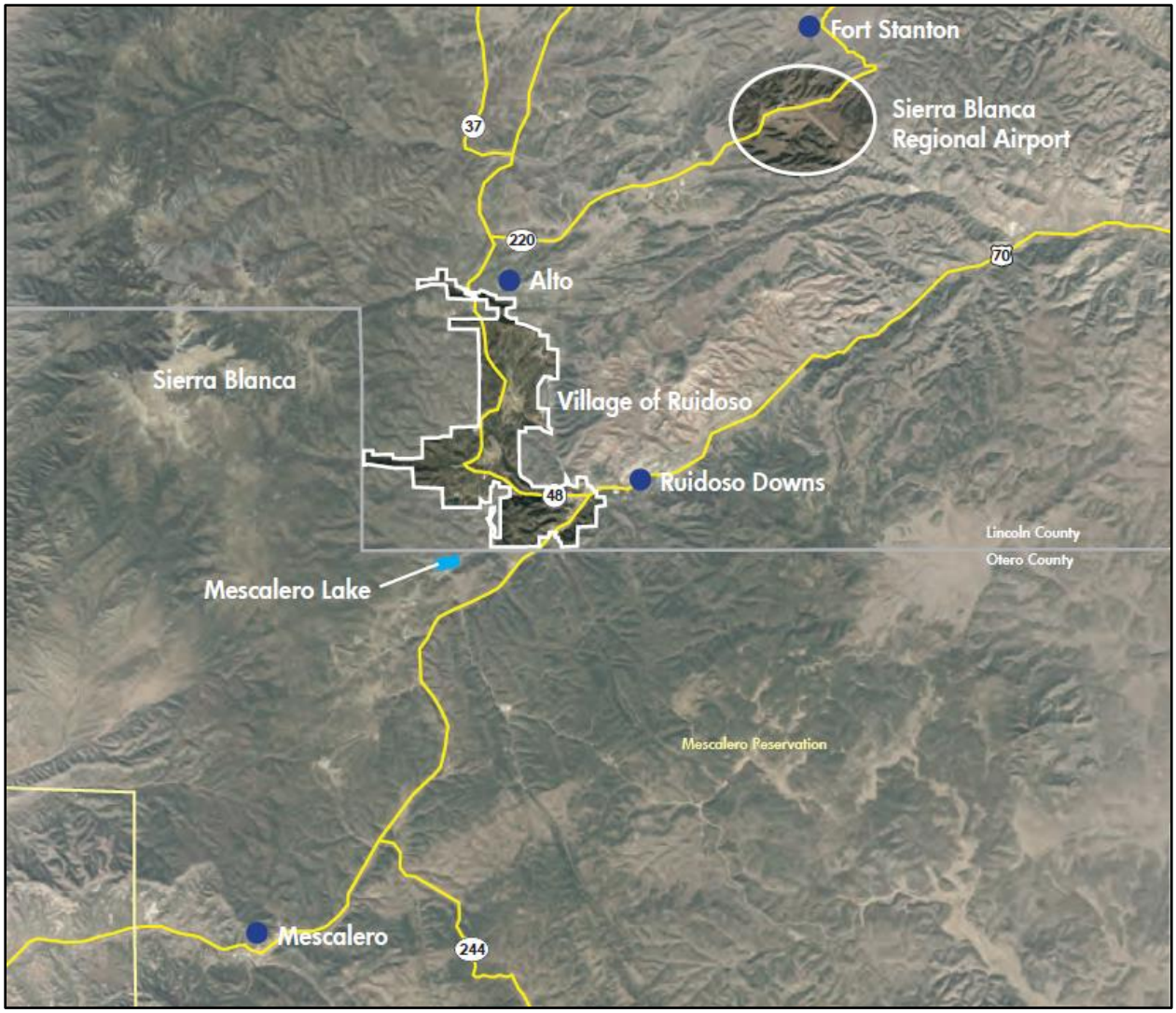
The large number of part-time residents presents challenges for providing and funding infrastructure improvements and general governmental services. The reliance on seasonal tourists for much of the revenue that supports the community means that Ruidoso must be constantly vigilant to identify and make improvements necessary to continue to attract those people to the community. The Village has worked to protect and enhance quality of life through its emphasis on hazard mitigation efforts, and resources as outlined in the Village of Ruidoso Comprehensive Plan (Village of Ruidoso 2019).

**Figure 4-2: View of Ruidoso Businesses.**


Source: Village of Ruidoso (2019).

According to the 2021 U.S. Census American Community Survey, there were 7,629 people comprising 3,508 households within the Village of Ruidoso. The population density was 562.6 inhabitants per square mile. The percentage of residents within the village 18 years of age or younger was 19.5% and the percentage of the population 65 years of age or older was 27.9% (U.S. Census Bureau 2021).

**Figure 4-3: Map of Village of Ruidoso and Surrounding Areas.**




Source: Village of Ruidoso Comprehensive Plan (2019).

### *4.3.2 Village of Capitan*

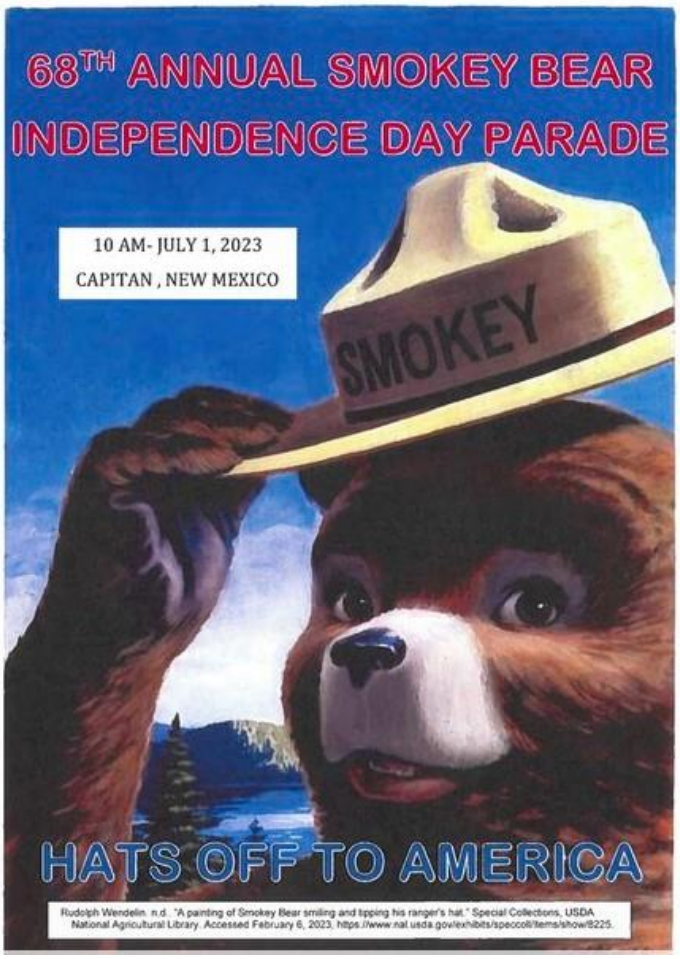
The Village of Capitan is a growing residential community surrounded by cattle ranches, between the Capitan and Sacramento Mountains at an elevation of 6,530 feet. Founded in the 1890s and incorporated in 1937, Capitan retains its small-town country flavor to this day. Modern Capitan is a quiet village with less than 1,500 residents and a motel, three restaurants, grocery store, bank, health clinic, art galleries, two museums, a gift shop, and full-service library. The village and surrounding area support an excellent school system.

In spring of 1950, a badly burned black bear cub was rescued from a large forest fire at Capitan Gap in the Capitan Mountains. First called Hotfoot Teddy, he was later renamed Smokey and became the real-life version of the United States Forest Service mascot Smokey Bear (Figure 4-4). Smokey was later sent to the National Zoo in Washington, D.C., where he lived for 26 years. Upon his death on November 9,

1976, Smokey's remains were returned to Capitan and buried at what is now the Smokey Bear Historical Park (Village of Capitan 2013).

According to the 2021 U.S. Census American Community Survey, there were 1,354 people comprising 561 households within the Village of Capitan. The population density was 415.3 inhabitants per square mile. The percentage of residents within the village 18 years of age or younger was 30.2% and the percentage of the population 65 years of age or older was 25.5% (U.S. Census Bureau 2021).

**Figure 4-4: 68th Annual Smokey Bear Independence Day Parade.**




Source: Village of Capitan website (2023).

### *4.3.3 City of Ruidoso Downs*

The City of Ruidoso Downs is located in the Sierra Blanca and Sacramento Mountains at an elevation of 6,420 feet. The city boasts a mix of long-term residents and seasonal visitors, with retail, services, and attractions providing a unique small-town experience for locals and guests. The city takes its name from the Ruidoso Downs Racetrack, which opened in 1946, becoming an instant attraction for Texans who were cashing in on the oil boom.

The first home in the area of what would be present-day Ruidoso Downs was built in the 1880s by Lowery Hale. Mr. Hale owned most of the land in the area and acquired over 800 acres. The early 1900s saw the construction of the two-story White Mountain Inn on the banks of Rio Ruidoso, which further

spurred the establishment of the City's first general store, post office, dance hall, tavern, and saloon in the 1930s. By the late 1930s, the community was home to approximately 500 residents. Timber played an important part of the City's development until heavy cutting decimated the area's timber resources. Today, the City of Ruidoso Downs' economy is largely supported by the tourism and hospitality industries related to the racetrack (Figure 4-5) and its associated Billy the Kid Casino (City of Ruidoso Downs 2021).

According to the 2021 U.S. Census American Community Survey, there were 2,618 people comprising 936 households within the City of Ruidoso Downs. The population density was 690.8 inhabitants per square mile. The percentage of residents within the city 18 years of age or younger was 19.5% and the percentage of the population 65 years of age or older was 22.1% (U.S. Census Bureau 2021).

**Figure 4-5: Ruidoso Downs Racetrack.**

Source: Discover Ruidoso (2023).

### *4.3.4 Town of Carrizozo*

Carrizozo is a small town near the geographic center of New Mexico, located at the crossroads of Routes 54 and 380, about 50 miles north of Alamogordo, and is the county seat of Lincoln County. Founded in 1899, the town provided the main railroad access for Lincoln County, and the town experienced significant population growth in the early decades of the 1900s. However, with declining relevance of the railroad, the population of the town has gradually declined.

Modern Carrizozo is a scenic small town of less than 1,000 people—half the population it had at its peak. It rests at an elevation of 5,400 feet on the northern lip of the Tularosa basin, in a region where the ecology changes very rapidly, transitioning from desert basin to high plains grassland to the north. To the west of the town is the Carrizozo Malpais Lava Flow (one of the largest young lava flows in the world) and the Valley of Fires Recreation Area (4 miles west of town; Figure 4-6). To the northeast is Carrizo Peak and to the southeast are the Sierra Blanca Mountains. The town is a short drive from many hiking and outdoor recreation opportunities in the Lincoln National Forest and 90 minutes from the recently established White Sands National Park. The town is 30 miles northwest of Ruidoso, 15 miles northeast of Oscuro, 12 miles west of Nogal, and 65 miles east of San Antonio and Interstate I-25 (Town of Carrizozo 2021).

According to the 2021 U.S. Census American Community Survey, there were 904 people comprising 444 households within the Town of Carrizozo. The population density was 108.1 inhabitants per square mile. The percentage of residents within the town 18 years of age or younger was 16.3% and the percentage of the population 65 years of age or older was 21.5% (U.S. Census Bureau 2021).

**Figure 4-6: Valley of Fire State Park.**


Source: Wikimedia Commons (2021).

### *4.3.5 Village of Corona*

Corona is a village in the northern part of Lincoln County, along the U.S. Route 54 corridor at an altitude of 6,724 feet. Corona was established as a railroad town in 1903 with the building of El Paso and Southwestern Railroad from Carrizozo to Santa Rosa where it connected to the Rock Island Line. This brought many homesteaders and farmers to the area and initiated the growth of Corona as a trade center, enabling farmers and ranchers to ship their products to market.

In the 1940s, the village experienced outward migration as residents left to look for war-related jobs. This, as well as several droughts, logging of ponderosa pines, and overgrazing, led to a near abandonment of farming. In the 1950s, natural gas transmission lines were laid through the area, company housing was built, and some 30 families were employed. Recognized as one of the best in the state, the school has long been the focal point of the community. The Corona Municipal School District encompasses parts of three counties and serves an area of 2,061 square miles. Today, Corona is a ranching community and continues to rely on trade and the school district as the core of its economic vitality (Figure 4-7; Village of Corona 2013).

According to the 2021 U.S. Census American Community Survey, there were 104 people comprising 62 households within the Village of Corona. The population density was 100.0 inhabitants per square mile. The percentage of residents within the village 18 years of age or younger was 7.7% and the percentage of the population 65 years of age or older was 34.6% (U.S. Census Bureau 2021).

**Figure 4-7: View of Downtown Village of Corona.**

Source: Village of Corona (2013).

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# SECTION 5: HAZARD IDENTIFICATION AND RISK ASSESSMENT

**§201.6(c)(2):** [The plan must include the following: a] **risk assessment** that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards. The risk assessment shall include:

i. A description of the type, location, and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

ii. A description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community. All plans approved after October 1, 2008 must also address NFIP insured structures that have been repetitively damaged by floods. The plan should describe vulnerability in terms of:
   A. The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas;
   B. An estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(i)(A) of this section and a description of the methodology used to prepare the estimate;
   C. Providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

iii. For multi-jurisdictional plans, the risk assessment section must assess each jurisdiction's risks where they vary from the risks facing the entire planning area.

The hazard profile and risk assessment provide the primary information for the hazard mitigation planning process. When performing a risk assessment, the following questions need to be determined: "what" can happen, "when" it is likely to happen, and "how bad" the effects can be. The primary elements of a risk assessment that answer those questions are generally described as:

- Hazard Identification and Screening
- Hazard Profiling
- Assessing Vulnerability to Hazards

The risk assessment for Lincoln County and participating jurisdictions was performed using a county-wide, multi-jurisdictional perspective. This approach was incorporated because many hazard events would likely affect numerous jurisdictions within consolidated urban areas and are rarely relegated to a single jurisdictional boundary. The vulnerability analysis was performed such that the results reflect vulnerability at an individual jurisdictional level, and at a county-wide level.

## 5.1 Hazard Identification and Screening

Hazard identification and screening is the process of analyzing what hazards occur and have the potential to occur in a jurisdiction. For the 2023 HMP update, the Planning Team reviewed the list of hazards identified in the 2018 HMP. To ensure compatibility with the State HMP, the Planning Team also compared the 2018 HMP hazard list to the comprehensive hazard list summarized in the 2018 State HMP (Figure 5-1).

**Figure 5-1: Summary of Initial Hazard Identification Lists, 2018**

| 2018 County HMP Hazard List | 2018 State HMP Hazard List |
|---|---|
| • Wildfire<br>• Flood<br>• Drought<br>• Thunderstorms (Lightning and Hail)<br>• Winter Storms<br>• Dam Failure | • Dam Failure<br>• Drought<br>• Earthquake<br>• Extreme Heat<br>• Expansive Soils<br>• Flood/ Flash Flood<br>• High Wind<br>• Landslides<br>• Land Subsidence<br>• Severe Winter Storms<br>• Thunderstorms (Lightning and Hail)<br>• Tornadoes<br>• Volcanoes<br>• Wildland/Wildland-Urban Interface Fire |

One tool used in the initial screening process was the historic hazard database referenced in the 2018 HMP. For the 2023 HMP Update, the data were reviewed and updated to include declared disaster events and significant non-declared events that have occurred since 2016, when data collection ended for the 2018 HMP. Declared event sources included New Mexico DHSEM, FEMA, the National Weather Service (NWS), NOAA, National Climatic Data Center (NCDC), United States Geological Survey (USGS), and United States Forest Service (USFS). Figure 5-2 summarizes the federal major disaster declarations that included Lincoln County.

**Figure 5-2: Federal Major Disaster Declarations that included Lincoln County.**

| Declaration Date | DR Number | Hazard | Description |
|---|---|---|---|
| May 4, 2022 | 4652 | Wildfires, Flooding, Mudflows, Straight-line winds | Wildfires and straight-line winds resulted in flooding, mudflows, and debris flows, which all caused damages from April to July 2022. The County was approved for Public and Individual Assistance. Hazard Mitigation Grant Program (HMGP) was made available state-wide. |
| April 5, 2020 | 4529 | Coronavirus Disease 2019 (COVID-19) Pandemic | The COVID-19 Pandemic resulted in emergency conditions from January 2020 to May 2023. The County was approved for Public and Individual Assistance. HMGP was made available state-wide. |
| October 29, 2014 | 4199 | Severe storms, Flooding | Severe storms and flooding resulted in damages in September 2014. The County was approved for Public Assistance. HMGP was made available state-wide. |

| Declaration Date | DR Number | Hazard | Description |
|---|---|---|---|
| October 6, 2014 | 4197 | Severe storms, Flooding | Severe storms and flooding resulted in damages in late July to early August of 2014. The County was approved for Public Assistance for this disaster. HMGP was made available state-wide. |
| October 29, 2013 | 4152 | Severe storms, Flooding, Mudslides | Severe storms, flooding, and mudslides resulted in damages in September 2013. Thn County was approved for Public Assistance for this disaster. HMGP was made available state-wide. |
| August 24, 2012 | 4079 | Flooding | Flooding resulted in damages in mid-June to Mid-July of 2012. The County was approved for Public Assistance. HMGP was made available state-wide. |
| March 24, 2011 | 1962 | Severe winter storm, Extreme cold temperatures | Severe winter storms and extreme cold tempertures resulting in damages in early February 2011. The County was approved for Public Assistance. HMGP was made available state-wide. |
| August 14, 2008 | 1783 | Severe storms, Flooding | Severe storms and flooding in resulting in damages in late July to mid-August of 2008. The County was approved for Public Assistance. HMGP was made available state-wide. |
| August 30, 2006 | 1659 | Severe storms, Flooding | Heavy rainfall in August of 2006 caused rivers to rise. The County was approved for Public Assistance. HMGP was made available state-wide. |
| May 13, 2000 | 1329 | Wildfire | For the Cerro Gordo Fire, the County was approved for Individual Assistance. Counties closer to the burn area were approved for Public Assistance (Los Alamos, Bernalillo, Otero). |

Source: https://www.fema.gov/disaster/declarations and State Mitigation Program.

**Figure 5-3** summarizes the Fire Management Assistance Grant (FMAG) declarations that included Lincoln County.

| Declaration Date | FMAG Number | Fire | Description |
|---|---|---|---|
| April 12, 2022 | 5432 | McBride Fire | Lincoln County was approved for fire suppression cost reimbursement. Hazard Mitigation Grant Program - Post Fire (HMGP-PF) was made available. |
| April 12, 2022 | 5433 | Nogal Canyon Fire | Lincoln County was approved for fire suppression cost reimbursement. HMGP-PF was made available. |
| April 27, 2021 | 5386 | Three Rivers Fire | Lincoln County was approved for fire suppression cost reimbursement. HMGP-PF was made available. |
| June 9, 2012 | 2979 | Little Bear Fire | Lincoln County was approved for fire suppression cost reimbursement. |
| June 30, 2011 | 2935 | Donaldson Fire | Lincoln County was approved for fire suppression cost reimbursement. |
| April 3, 2011 | 2880 | White Fire | Lincoln County was approved for fire suppression cost reimbursement. |
| May 25, 2004 | 2518 | Peppin Fire | Lincoln County was approved for fire suppression cost reimbursement. |

Source: https://www.fema.gov/disaster/declarations and State Mitigation Program.

The previous occurrence hazard database presented in this 2023 HMP Update primarily represents the period of January 2017 to December 2022. **Figure 5-4** summarizes Lincoln County hazard events that meet the following selection criteria:

- 1 or more fatalities
- 1 or more injuries
- Significant event, as expressed in historical records or according to defined criteria above

**Figure 5-4: Past Occurrences of Profiled Hazards per Participating Jurisdiction between 2017 and 2022**

| | Number of Events between January 1, 2017, and December 31, 2022 | | | | | | |
|---|---|---|---|---|---|---|---|
| **Jurisdiction** | **Wildfire** | **Flood** | **Thunderstorm/ Lightning** | **Hail** | **Winter Storms** | **High Wind** | **Drought** |
| Lincoln County | 5 | 23 | 8 | 22 | 10 | 44 | 4 |
| Village of Ruidoso | 10 | 20 | 1 | 3 | 4 | 27 | 3 |
| City of Ruidoso Downs | 6 | 17 | 0 | 2 | 3 | 27 | 3 |
| Town of Carrizozo | 0 | 0 | 1 | 2 | 1 | 7 | 3 |
| Village of Capitan | 5 | 3 | 0 | 4 | 4 | 27 | 3 |
| Village of Corona | 0 | 2 | 0 | 3 | 1 | 15 | 3 |

Source: These counts include Previous Occurrence mapped data from National Centers for Environmental Information (NOAA 2023), and input from the Planning Team on additional wildfires.

Figure 5-5 shows the number of events in the NCDC recorded history. There is variation in the year of the first record of each hazard and it is important to note the year a hazard was initially recorded. Drought records begin in 2011; flood and flash flood records begin in 1996; high wind and severe winter storms each begin in 2009; thunderstorm event records start in 1989; the first hail record is from 1962; tornados were first recorded in 1957; and the first wildfire was recorded in 1996.

**Figure 5-5: Lincoln County Hazard Recorded Events – NCDC Recorded History**

| Hazard (year of first recorded event) | Number of Records | Recorded Losses | | |
|---|---|---|---|---|
| | | Fatalities | Injuries | Damage Costs |
| Wildfire (1984)* | 45* | 0 | 0 | $31,031,000 |
| Flood (1996) | 61 | 3 | 1 | $27,425,500 |
| Thunderstorms/ Lightning (1989) | 27 | 1 | 3 | $1,000,000 |
| Hail (1962) | 84 | 0 | 0 | $76,000 |
| Severe Winter Storms (2009) | 50 | 0 | 0 | $6,627,000† |
| High Wind (2009) | 134 | 0 | 1 | $294,000 |
| Tornado (1957) | 4 | 0 | 0 | $101,050 |
| Drought (2011) | 164 | 0 | 0 | $0 |

Source: NOAA (2023).

Notes: Most hazards do not have records prior to 2000. Costs are as reported and not adjusted to current value.

* This includes Previous Occurrence mapped data, data from NCDC, and input from the Planning Team on additional wildfires.

† A severe winter storm that was not listed in the NCDC records was included in this total. The storm occurred in 1997 and was the most impactful winter storm on county record, with direct damage totals over $6 million.

The culmination of the review and screening process by the Planning Team resulted in a decision to revise the hazard list. The following changes were made based on their number of events and impacts.

- **High Winds –** Over the last 6 years, there have been significant impacts from high winds; therefore, each Planning Team Member deemed it necessary to add this hazard back. Since the last HMP update in 2018, the interconnection and cascading impact of hazards has also been recognized, resulting in a need to discuss high wind in the context of other hazards such as wildfire.
- **Winter Storms –** For the 2018 HMP, the Village of Ruidoso chose to exclude winter storms due to few occurrences and limited impact. Over the last 6 years, winter storms have had significant impacts on the community, and their Planning Team representatives determined that inclusion of these hazards was necessary to properly mitigate in the coming years.

During the update process, each participating jurisdiction only addressed the hazards that are significant to their community. Updated definitions for each hazard are provided in Section 5.3, and Figure 5-6 presents the specific hazards chosen by each participating jurisdiction.

**Figure 5-6: Hazards Identified and Profiled for Each Participating Jurisdiction**

| Hazard Matrix | Lincoln County | Village of Ruidoso | City of Ruidoso Downs | Town of Carrizozo | Village of Capitan | Village of Corona |
|---|---|---|---|---|---|---|
| Wildfire | X | X | X | X | X | X |
| Flood | X | X | X | X | X | not profiled |
| Thunderstorms | X | X | X | X | X | X |
| Winter Storms | X | X | X | X | X | X |
| High Wind | X | X | X | X | X | X |
| Drought | X | X | X | X | X | X |
| Dam Failure | X | X | X | not profiled | not profiled | not profiled |

## 5.2 Climate Change

FEMA requires that jurisdictions consider the impact that climate change has on natural hazards. Per FEMA guidance, climate change in and of itself may not be a hazard, but it may change the characteristics of the hazards that currently affect the planning area. Generally, natural hazards are expected to occur more frequently and with more intensity due to climate change conditions. Even if human factors, such as greenhouse gas emissions and deforestation, are reduced or eliminated, climate change will continue to affect our natural systems and impact natural disasters for decades to come. Planning for climate change is inextricably linked to natural hazard planning and can provide a better understanding of how risk may change in the future.

The impacts of climate change can be difficult to predict; they are dependent on many global factors and vary based on geography. For example, coastal regions will be more heavily impacted sooner due to rising sea levels and the impact on coastal storms. Similarly, more northern regions will experience warming effects more harshly as high-latitude species are less resilient to rising temperatures and reduced precipitation. For the Southwest, research from the United States Global Change Research Program (USGCRP) indicates several climate change trends such as rising annual temperatures, decreasing snowpack, increased evapotranspiration, and increases in severe weather events related to atmospheric and air cycling changes. Community resilience efforts are also an important consideration when assessing a community's ability to mitigate and adapt to the impacts of climate change.

The National Climate Assessment (NCA) was released by the USGCRP and assesses the potential variable impacts of climate change on land, biodiversity, people, and the many systems we rely on for our wellbeing. The NCA report is divided into regions, and the Southwest region includes the states of Arizona, California, Colorado, Nevada, New Mexico, and Utah. According to the NCA, the anticipated climate change impacts for the Southwest include increased heat, drought, and insect outbreaks that result in more wildfires, declining water supplies, reduced agricultural yields, health impacts in cities due to heat, and increased flooding and erosion. The NCA released the following "6 Key Messages" for the Southwest Region:

1. Water Resources:

   The Southwest has seen worsening drought conditions in recent years and this trend is expected to continue. A growing population in southwestern states is placing further pressure on diminishing surface and groundwater supplies.

2. Ecosystems and Ecosystem Services:

   Climate change has worsened drought conditions and led to an increase in wildfires in the Southwest that has reduced habitat, worsened water quality and security, and reduced economic livelihood based around ecosystem services.

3. Indigenous Peoples:

   Traditional natural resource-based livelihoods typical of indigenous communities are at risk due to climate change impacts on resource availability. Drought threatens traditional water sources and aquatic species that rely on consistent, clean water. Traditional foods, medicines, and culturally relevant places are threatened by increasing wildfires and land development.

4. Energy:

   Hydropower energy generation is becoming increasing less reliable due to worsening drought and reservoir sedimentation. Fossil fuels have been shown to contribute to global greenhouse gases and are increasingly noncompetitive with renewable sources. A diverse portfolio of energy generation, centered on renewable sources, is emphasized to ensure livelihoods in the Southwest.

5. Food:

   The impact of climate change on food production is broad and can result in large-scale food insecurity. Climate change has led to inconsistent weather events and unseasonably warm temperatures. This is causing water shortages, heat waves, and milder winter conditions. These factors place stress on crops as well as creating potentially unsafe conditions for agricultural workers.

6. Human Health

   Health issues related to climate change impact people in the Southwest as extreme heat and reduced air quality cause illness and death. Events such as heat stroke and respiratory illness will continue to impact the population, especially vulnerable individuals such as children and the elderly.

A major concern for western states is the impacts to water resources that are often already overburdened by growing populations. Some of the effects are already being felt with reductions in annual snowpacks and runoff occurring earlier in the season. This can be attributed to trends toward earlier spring warming speeding up melting and exacerbating drought conditions. Strain to water resources has also played a role in declining forest health. Large numbers of trees have died as a result of reduced water availability and increased number of pests and diseases such as bark beetles associated with shorter freezing periods. These forest health conditions result in more severe wildfires due to an increase in highly flammable dead and downed fuel loads.

According to multiple climate modeling predictions, including the Intergovernmental Panel on Climate Change (IPCC), USGCRP, and the U.S. Bureau of Reclamation, New Mexico is expected to become hotter and more arid over the next 50 years due to anthropogenic climate change. It is expected that with little to no change in general behavior, the state will experience a temperature increase between 3°F and 7°F by 2070. During the same time period, average annual precipitation is not expected to decrease much. However, reductions in spring precipitation, coupled with rising temperatures, show trends toward aridification in the state.

The 2022 *New Mexico Earth Matters – Climate Change and New Mexico's Water Resources: A 50-Year Outlook* from the New Mexico Bureau of Geology and Mineral Resources (NMBGMR), assessed the potential impacts of climate change on the state's water resources. The assessment breaks the

state into four regions to more precisely account for geography and local conditions. Lincoln County is split between three regions: the western portion of the county falls within the Rio Grande Valley Region; the eastern portion is mostly in the Eastern Plains Region; and a small section of the south-central portion of the county is within the High Mountains Region. The High Mountain Region borders along Ruidoso and Ruidoso Downs while the remaining profiled communities fall within the Rio Grande Valley Region. None of the communities profiled fall within the Eastern Plains Region, although Corona is positioned very closely to the western border of the Eastern Plains Region. Unincorporated Lincoln County covers portions of both the Eastern Plains Region and Rio Grande Valley Region. The dividing line of these zones bisects the county in a mostly north-south orientation, moving along the mountain range and falling to the east of Capitan Mountain.

For the High Mountain Region, the most impactful expected change is a reduction in annual snowpack. There is not significant evidence that points to reductions in winter storm events or cumulative snowfall; however, winter temperatures are expected to increase. Higher average winter temperatures reduce how long snow lasts following a storm and higher elevations are predicted to see higher relative temperatures increase. Higher temperatures correlate with increases in the rate of evaporation, further impacting water supply for communities and reliant ecosystems as subsurface aquifers are denied recharge. This creates a cascading effect for communities that rely on runoff and aquifers for water sources through the summer. Of particular concern is the impact this will have on forest health and susceptibility to wildfire (NMBGMR 2022).

An associated impact of aridification is damage to soil health and loss of topsoil. As water becomes less available, plant communities shift, and soil will become unstable. Areas generally covered in grasses and intermixed forest may see large die offs of these species as they are replaced by drought-tolerant shrubs with much shorter root systems. This community shift is associated with less stable soil that is prone to erosion. Similarly, as plant communities dry, specifically forests, they are prone to high-intensity wildfires. Burned soil becomes extremely water resistant, creating highly erosive landscapes and damaging watersheds as they become filled with transported sediment. Sedimentation is a concern for acequias, and these water systems may require additional attention to clearing and maintenance to ensure water transport can continue efficiently.

In the Rio Grande Valley Region, climate change is also expected to lead to higher rates of evapotranspiration which will reduce base flow in the river basins and reduce aquifer recharge rates. Many communities in the region are dependent on groundwater and reservoirs for municipal use. The NMBGMR estimates that reservoirs could see a 30% increase in the amount of water lost to evaporation within 50 years. As discussed above, climatic changes will alter snowpack, which will shift the timing and magnitude of runoff. Vegetation and ecological impacts for the Rio Grande Valley Region are similar to those expected for the High Mountain Region; reduced water availability will strain vegetation communities and shift them toward drought-tolerant species that do little to stabilize and maintain soil. This shift also reduces water retention across the landscape and reduces resilience to severe weather events.

To adhere to FEMA's planning requirements and ensure communities are aware of potential impacts exacerbated by climate change, the HMP explains how communities can expect the magnitude, frequency, and probability of hazards to change. Each hazard profile explains the best available science on the expected impact of climate change. These descriptions help communities plan for economic, physical, and social resilience. Mitigation recommendations address reducing the impact of natural hazards to strengthen their capacity to further resilience.

### *5.2.1 Cascading Events*

Lincoln County, like many counties in New Mexico, is subject to cascading disaster events associated with drought, wildfire, and flood. The drought-wildfire-flood cascading events are closely tied to ecosystem health and land management practices, including previous wildfire suppression.

The drought-wildfire-flood cycle begins when long-term drought conditions persist over time, acting as a key contributor to declined forest health. Drought, when coupled with human disruption to natural fire and water cycles, climatic variations due to climate change, and unsustainable natural resource use, can leave communities subject to catastrophic wildfires, accelerated erosion, flash-flooding events, decreased water supply, and an overall reduction in watershed health. A decline in forest health will lead to a higher occurrence of standing dead and deadfall trees. This adds to fuel loads which can increase the chances of high-intensity crown fires and catastrophic wildfire events.

Catastrophic wildfires occur when vegetation is consumed at an intense rate, leaving soil denuded, landscapes susceptible to erosion. and excessive post-fire flooding events. Vegetation loss and degraded soil health resulting from catastrophic wildfire events can lead to destructive flood events even under normal precipitation conditions. High-intensity storms can create extreme erosion and flooding conditions, phenomena that are expected to increase under climate change conditions. Flooding and extreme erosion events can result in property damage, impacts to infrastructure such as critical travel routes, and even loss of life. Sediment transport from large-scale erosion or flooding events can degrade water resources on a regional level due to widespread sediment transport. Acequias are particularly vulnerable to sedimentation and can require consistent maintenance when watersheds are highly erosive. Damage from flood events further contributes to the declining health of local ecosystems by limiting the integration of winter and spring precipitation into natural waterways or regional aquifers, intensifying future drought conditions.

While complex, understanding the concept of cascading disaster events will inform how the communities in Lincoln County tailor their mitigation strategies to lessen impacts from future drought, wildfire, and flooding events. Prevention of cascading disaster events requires communities approach hazard mitigation efforts holistically, rather than using a stand-alone approach for each hazard. A focus on overall system health, and an understanding of the interconnection of watersheds, forest health, and downstream impacts, will help communities effectively build natural resilience and capacity to address future needs.

## 5.3 Hazard Risk Profiles

The following sections detail the risk profiles for each of the hazards identified for each community. For each hazard, the following elements are addressed to present the overall risk profile:

- Description
- Previous Occurrences
- Location
- Extent
- Probability, with consideration for the impacts of climate change. The definitions used for Probability are described in Section 5.5., Priority Risk Index Evaluation.
- Climate Change

### *5.3.1 Wildfire*

#### 5.3.1.1 Description

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

According to the USFS, there are three general classes of wildland fires: surface fires, ground fires, and crown fires. A surface fire is the most common of these three classes and burns along the floor of a forest, moving slowly and killing or damaging trees. A ground fire is usually started by lightning or human carelessness and burns on or below the forest floor. Crown fires spread rapidly by wind and move quickly by jumping along the tops of trees. Crown fires are often the most intense and fastest-spreading fires as they burn multiple layers of vegetation, spread quickly and burn very hot, which reduces the potential of tree recovery post-fire.

Wildfires can occur at any time of day and during any month of the year, but the peak fire season in Lincoln County is normally from March through June. The length of the fire season and the peak months vary appreciably from year to year. Land use, vegetation, amount of combustible materials present, and weather conditions such as wind, low humidity, and lack of precipitation are the prevailing factors in the number of fires and acreage burned in a given area. Generally, fires are more frequent when vegetation is dry and brittle from a winter with little snow and/or a spring and summer with sparse rainfall. New Mexico, in general, remains very dry and is often susceptible to wildfire events due to environmental factors.

Wildfires are capable of causing significant injury, death, and damage to property. The potential for property damage from fire increases each year as more recreational properties are developed on forested land and more people use these areas. Fires can extensively affect the economy of an area, especially the logging, recreation, and tourism industries, which many counties rely on. Impacts from wildfires on these key economic industries include immediate danger, disturbance to short- and long-term scenic views, and damage to trails, watersheds, and industry-supporting infrastructure. Major direct costs associated with wildfires are the salvage and removal of downed timber and debris as well as the restoration of the burned area. The cascading 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 natural properties that include the potential absorption of moisture and support life. If burned-out woodlands and grasslands are not quickly revegetated, 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 can cause stabilization issues such as an increase in landslide hazards.

The majority of Lincoln County is dominated by a high desert, with grasslands, piñon-juniper forests, ponderosa pine forests, and dry mixed conifer forests occurring at progressively higher elevations. Currently, forests are too dense, with most stands in the county being overstocked, contributing to a high degree of departure from the historic range of variability. Lincoln County's wildland urban interface (WUI) and areas of high fire risk are a mix of piñon-juniper, ponderosa pine, and mixed conifer forest types. Limited amounts of riparian forests exist along waterways. Stand densities in untreated forest are higher than historical norms. According to the 2019 Lincoln County CWPP, beetle and insect damage are at

epidemic proportions. This combination of insects, disease, drought, and fire-caused stress is responsible for significant mortality in some stands/hillsides and is expected to continue. This mortality increases fire risk while dead trees hold needles, contributing to increased fuel loading as dead trees fall to the forest floor. Treated areas (public and private land) have generally fared better than untreated land but are not immune to insects, disease, or drought. Current conditions around communities have improved largely due to previous fuel reduction projects, with more reduction projects being planned from the Smokey Bear Ranger District within Lincoln County.

Wildfires have been the leading cause of damage to Lincoln County's infrastructure, and often affect them through multiple phases. This usually includes the wildfire destroying the facility or infrastructure first, which the community will repair, followed by burn scar flooding, which usually destroys the facility or infrastructure numerous times and for many years after the fire incident. This is why it is so critical for these communities to conduct mitigation measures such as: fire breaks, maintenance of utilities and their easements, thinning prescriptions, building with fire resistant materials, relocation of utilities into less vulnerable locations, hardening or armoring of utilities, treatment of roads, upsizing culverts and bridges, implementing erosion control mechanisms, installing warning systems to alert the community of a disaster, and providing the community a clear and easy evacuation plan. When assessing risk from wildfire, it is critical to not only mitigate the ignition and spread of wildfire, but also consider the longer-term impacts of fire on the landscape and the functionality of forests and watersheds.

The stakeholders in Lincoln County have been working with one another for over a decade to increase communication and pertinent information regarding fire strategies. Over this time, great strides have been made in reducing the wildfire risk around the community. Firewise USA® is a program administered by the NFPA that provides a framework and guidelines to assist the community get organized and take action to increase ignition resistance of their homes to reduce overall wildfire risks at the local level. Ruidoso became a Firewise community in 2003, and Ranches of Sonterra Subdivision and Black Forest Subdivision became Firewise communities in 2015 (NFPA 2023). The surrounding subdivisions and communities are currently implementing similar strategies. The Sierra Blanca Wildfire Training Academy has been training local and regional firefighters and provides a variety of National Wildfire Coordinating Group classes for municipal, volunteer, state, and federal agency firefighters. The Greater Ruidoso Area working group provides a forum for agency representatives to plan and develop new projects. Local fire departments are implementing interagency cooperative burns.

Much of the county has been treated to reduce hazardous fuel. Strategically located public land has been treated by government agencies, and private land has been treated by landowners, often with the assistance of government grant programs. The desired conditions around structures include defensible space with a minimum cleared area extending 30 feet from the structure. Additional clearance is desirable if appropriate. A variety of fuel treatment strategies are needed to reach the desired conditions. Treatment types include mechanical removal, mastication, bulldozer pushes, piling, handwork, and prescribed burns.

Fire fuels vary greatly, but ultimately, strategic fuels management will create defensible spaces around homes, businesses, and various properties within the county. These fuel reduction projects or treatments have been occurring within the county since the beginning of the decade. In 2018, 60 acres of the Ruidoso airport property was thinned to reduce fuel loads. The Village of Ruidoso has the goal of thinning 530 total acres on the airport property, according to the 2019 CWPP. Within the Lincoln County National Forest, as recently as 2019, tree thinning has been occurring to combat wildfire conditions. The first cycle of tree thinning was completed in 2017. Additionally, as of 2019, the second year of the second cycle was completed. In order to maintain and ensure compliance with fuel management ordinances, the Ruidoso Forestry Department has established a 10-year rotational certification process on all properties

within the Village of Ruidoso. In 2019, the CWPP was updated for the Greater Ruidoso Area and Lincoln County.

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

- **Relative humidity (RH)**. RH is the ratio of the amount of moisture in the air to the amount of moisture necessary to saturate the air at the same temperature and pressure. RH is expressed in percentages. RH is measured directly by automated weather stations or by taking wet and dry bulb readings with a psychrometer and then applying the NWS psychrometric tables applicable to the elevations where the reading was taken. Depending on the RH value, fire fuel moisture can either be dampened (high RH) or dried out (low RH).
- **Fuel moisture.** Fuel moisture is influenced by environmental conditions such as weather, time of day, and local topography. Fuel moistures in live herbaceous (annual and perennial), woody (shrubs, branches, and foliage) fuels, and dry (dead) fuels are calculated and represent approximate moisture content of the fuel. Fuel moisture levels are measured in 1-, 10-, 100-, and 100-hour increments.
- **The Lower Atmosphere Stability Index or Haines Index.** This index is computed from the morning soundings from Radiosonde Observation stations across North America. The index is composed of a stability term and a moisture term. The stability term is derived from the temperature difference at two atmospheric levels. The moisture term is derived from the dew point depression at a single atmospheric level. This index has been shown to correlate with large fire growth on initiating and existing fires where surface winds do not dominate fire behavior. Haines Index values range from 2 to 6 for indicating the potential for large fire growth:

  **Haines Index Level Description**

  2 = Very Low Potential (moist, stable lower atmosphere)

  3 = Very Low Potential

  4 = Low Potential

  5 = Moderate Potential

  6 = High Potential (dry, unstable lower atmosphere)

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

  The KBDI ranges from 0 to 800:

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

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

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

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

- **The Energy Release Component.** This is the estimated available energy released per unit area in the flaming front at the head of a fire. The day-to-day variations of the energy release component are caused by changes in the moisture contents of the various fuel classes, including the 1,000-hour time lag class. The energy release component is derived from predictions of the rate of heat release per unit area during flaming combustion and the duration of flaming. The value of this component can be used as a planning tool for an eventual fire season.
- **The Ignition Component.** The ignition component is a number that relates the probability that a fire will result if a firebrand is introduced into a fine fuel complex. The ignition component can range from zero, when conditions are cool and damp, to 100 on days when the weather is dry and windy. Theoretically, on a day when the ignition component registers a 60, approximately 60% of all firebrands that encounter wildland fuels will require suppression action.
- **The Spread Component.** This is a numerical value derived from a mathematical model that integrates the effects of wind and slope with fuel bed and fuel particle properties to compute the forward rate of spread at the head of the fire. Output is in units of feet per minute. A spread component of 31 indicates a worst-case, forward rate of spread of approximately 31 feet per minute. The inputs required to calculate the spread component are wind speed, slope, fine fuel moisture (including the effects of green herbaceous plants), and the moisture content of the foliage and twigs of living, woody plants. Since the characteristics through which the fire is burning are so basic in determining the forward rate of spread of the fire front, a unique spread component table is required for each fuel type.
- **Slope and Fuel Levels Matrix**. The International Fire Code Institute (2000) combines slope and fuel levels to obtain a susceptibility index (Figure 5-7).

**Figure 5-7: Wildfire Susceptibility Matrix**

| Fuel Class | Critical Fire Weather Frequency | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | <1 Day per Year | | | 2–7 Days per Year | | | 8+ Days per Year | | |
| | Slope Percent | | | Slope Percent | | | Slope Percent | | |
| | <40 | 41–40 | 61+ | <40 | 41–40 | 61+ | <40 | 41–40 | 61+ |
| Light | M | M | M | M | M | M | M | M | H |
| Medium | M | M | H | H | H | H | E | E | E |
| Heavy | H | H | H | H | E | E | E | E | E |

Source: International Fire Code (2000 Edition).

Key: E = Extreme; H = High; M = Medium

Wildfires result from both human and natural causes. According to interFIRE (2023), there are four overarching causes of wildfires: accidental, natural, incendiary, and undetermined (Figure 5-8).

**Figure 5-8: Fire Cause Classification**

| Fire Cause Determination | Description |
|---|---|
| Accidental | This fire cause does not involve the intentional ignition or fire spread through a human act. Although an accidental fire could be human-caused, for example, an individual could start a trash fire which might be spread by a sudden gust of wind. |
| Natural | A fire caused through natural means is a fire that is unplanned that burns without human activity. Some examples of this type of fire cause include lightning, earthquake, and wind that topples power lines that then cause a fire event. |
| Incendiary | This fire is one that is intentionally ignited under circumstances in which the individual(s) knows that the fire should not be ignited. |
| Undetermined | This fire cause is defined as a fire that does not have a proven source of ignition, although the fire might still be under investigation, and the cause may be determined at a later date. Investigators should strive to keep an open, unbiased thought process during an investigation. |

Source: interFIRE (2023)

According to the NOAA, fire weather threat is defined as a high threat to life and property from existing or potential wildfires due to weather and fuel conditions. There are multiple levels to fire weather threats that range from non-threatening to extreme (Figure 5-9).

**Figure 5-9: Fire Weather Threat Level Classification**

| Fire Weather Threat Level | Description |
|---|---|
| Non-Threatening | There is no threat to life and property due to existing or potential wildfires, based on current weather and fuel quantities and conditions. |
| Low | There is a low threat to life and property due to existing or potential wildfires. The fuels do not ignite immediately. For ignition, the fuel would require a more intense heat source, such as lightning. If fire is present at this level, it is of low intensity and spreads very slowly, which makes it easy to control. |
| Moderate | There is a moderate threat to life and property due to existing or potential wildfires. The fire categorized in this threat level are of moderate flame length and moderate rate of spread. These fires are unlikely to become serious and are controlled with relative ease. Short-distant spreading caused by embers may occur, but they are not persistent. |
| High | There is a high threat to life and property due to existing or potential wildfires. Dead fuels in the vicinity ignite easily from most fire causes. Fires under this threat level start rapidly and may become serious due to controllability of flames. Fires are easily controllable when they are smaller. Short-distance spreading occurs more frequently by embers. |

| Fire Weather Threat Level | Description |
|---|---|
| Very High | There is a higher threat to life and property due to existing or potential wildfires. Fires are started more easily immediately after ignition and tend to spread rapidly with an increase in intensity the longer the fire burns. There is short- and long-distance spreading of the fire due to embers, which causes the region to be in constant danger. At this level, fire restrictions may be in effect. |
| Extreme | There is an extreme threat to life and property due to existing or potential wildfires. Fires in this level start almost immediately, spread vigorously, and burn more intensely. Expect the fire to behave more extremely and unpredictably. Fire restrictions are in effect. |

Source: NWS/NOAA – Fire Weather Threat

#### 5.3.1.2 Previous Occurrences

According to historical fire and resource data from the Southwest Coordination Center, from 2016 to 2022 New Mexico averaged 964 wildland fires annually, burning an average of 285,000 acres each year. Figure 5-10 describes the wildfires that occurred per participating jurisdiction within Lincoln County between March 2016 and December 31, 2023, according to the NCDC, New Mexico Fire Information, and Planning Team input. The previous occurrence listing for wildfires prior to March 2016 is found in Appendix B-1; this is the same list that was shown in the 2018 HMP.

**Figure 5-10: Previous Occurrences of Wildfire, March 2016 through December 31, 2022 (Lincoln County)**

| Wildfires | Fire Start Date | Detailed Description |
|---|---|---|
| Village of Ruidoso<br>Ruidoso Downs | 3/28/2016<br>Moon Mountain Fire | The Moon Mountain Fire was detected on March 28, approximately 1 mile east of the Village of Ruidoso. The fire burned timber, tall grass and understory, which engulfed 125 acres within state and private land. There were 0.2 acres burned on Lincoln National Forest land. Additionally, two individuals received minor injuries. Thinning conducted on Village property in 2013 allowed the fire fighters to burn the vegetation prior to the main fire impacting the area (‘backburn’). The thinning contributed to stopping the fire more effectively, causing less damage.* |
| Lincoln County<br>Village of Capitan | 4/12/2018<br>246 Fire | The 246 Fire began on April 12 when high winds caused a prescribed burn near Capitan (east of Highway 246) to burn out of control. Over 3,000 acres were burned and 16 structures, including two homes, were lost during the blaze. The fire burned across both private and USFS land.† |
| Village of Ruidoso | 5/6/2018<br>Mechem Drive Fire | The USFS assisted the Village Fire Department to extinguish this 0.3-acre brush fire. |

| Wildfires | Fire Start Date | Detailed Description |
|---|---|---|
| City of Ruidoso Downs | 4/3/2019<br>Highway 70 near Dipaolo Drive intersection | The City Fire Department extinguished this grass fire which was less than 0.5 acre. |
| Lincoln County | 6/19/2019<br>Pine Lodge Fire | The Pine Lodge Fire began on June 19 when dry grass was ignited by an unknown cause. The blaze quickly spread under windy conditions, burning just over 15,000 acres, mostly within Lincoln National Forest and Pine Lodge Wilderness. At least three homes were burned as the fire spread. |
| Village of Ruidoso | 7/9/2019<br>Hull Road Fire | The Village Fire Department extinguished this 0.1-acre brush fire. |
| City of Ruidoso Downs | 4/23/2020<br>Highway 70 approximately 800 feet northwest of the Solid Waste Authority | The City Fire Department extinguished trees on fire on 0.25 acres. |
| Village of Ruidoso | 5/24/2020<br>Sudderth Drive Fire | The Village Fire Department extinguished this 0.25-acre brush fire. |
| Village of Ruidoso | 6/21/2020<br>Lookout Drive Fire | The Village Fire Department extinguished this 0.5-acre brush fire. |
| Village of Ruidoso | 7/9/2020<br>Lookout Drive Fire | The Village Fire Department extinguished this 0.5-acre brush fire. |
| Village of Ruidoso | 6/21/2020<br>Wiggins Way Fire | The Village Fire Department extinguished this 0.1-acre brush fire. |
| City of Ruidoso Downs | 9/10/2020<br>Highway 70 approximately 2,500 feet northeast of Agua Fria Drive | The City Fire Department extinguished this natural vegetation fire which was less than 0.5 acre. |
| Village of Ruidoso | 10/25/2020<br>Cree Meadows Fire | The Village Fire Department extinguished this 0.25-acre brush fire. |
| Lincoln County | 4/26/2021<br>Three Rivers Fire | This fire was located near the Three Rivers Campground within Lincoln County near Mescalero Apache Tribal lands. The fire is still under investigation with no known cause of ignition. The fire originated 0.5 mile north of the Three Rivers Campground and spread toward Ski Apache and the South Fork/Bonito Area and burned a total of 5,854 acres. No structures were lost and no deaths were reported from the event. |

| Wildfires | Fire Start Date | Detailed Description |
|---|---|---|
| Village of Ruidoso | 6/8/2021<br>Ball Field Fire | The fire started 6/8/21 and was extinguished by 6/14/21. The fire was located off of Ski Run Road and Highway 48 above the ballfields. The cause was a chainsaw that caught fire during thinning work. This fire burned approximately 25 acres and led to mandatory evacuation for High Country Lodge and evacuation notices for: Upper Gavilan, West Gavilan, Alto Village, Alto Alps, and Sun Valley. Slash piles from previous thinning were part of the fuels burned during the fire and caused most of the damage to existing trees. Although this was not a crown fire, a small spot fire jumped Highway 48 but was immediately put out. There were no structures lost nor injuries reported.* |
| Village of Capitan | 10/31/2021<br>Gap Road | This wildfire burned 2 acres of forested land before it was contained by the Capitan Fire Department. It was human caused.‡ |
| Lincoln County<br>Village of Ruidoso | 4/12/2022<br>McBride Fire | This fire was located in Gavilan Canyon within the Village of Ruidoso, which spread to state and Lincoln National Forest. The fire destroyed 207 primary structures as well as multiple outbuildings. There were two citizen fatalities. Strong winds and low humidity increased the severity of the fire. Approximately 6,159 acres have been burned, consisting mainly of timber, brush, and various grasses. |
| Lincoln County<br>Village of Capitan | 04/22/2022<br>Nogal Fire | This fire was located within Nogal Canyon, approximately 12 miles west of Capitan and 8 miles northwest of Ruidoso. The fire destroyed six primary structures and eight outbuildings. Primary fuels of the fire were ponderosa pine, piñon and juniper, and various grasses. Approximately 412 acres were burned. The fire was caused by downed power lines.<br>The Capitan Fire Department assisted in response and the community would have had to evacuate if the fire moved farther down the canyon.‡ |
| City of Ruidoso Downs | 5/1/2022<br>Highway 70 approximately 2,500 feet northeast of Agua Fria Drive | The City Fire Department extinguished this grass fire that was less than 0.5 acre. |
| Village of Ruidoso | 5/8/2022<br>El Paso Road Fire | The Village Fire Department extinguished this 0.1-acre brush fire. |

| Wildfires | Fire Start Date | Detailed Description |
|---|---|---|
| Village of Capitan | 6/15/2022<br>Bogle Road | This wildfire burned approximately 89 acres. It was caused by lightning.‡ |
| City of Ruidoso Downs | 11/15/2022<br>Highway 70 approximately 600 feet west of the Solid Waste Authority | The City Fire Department extinguished this human-caused, 2-acre grass fire. |
| Village of Capitan | 12/02/2022<br>Laughing Horse Trail | This brush fire burned 2.5 acres before it was contained by the Capitan Fire Department. It was human caused.‡ |
| Village of Ruidoso | 12/25/2022<br>Highway 70 Fire | The Village Fire Department extinguished this 0.5-acre brush fire. |

Sources: NCDC; * = Village of Ruidoso Fire Chief and Forestry Director; † = New Mexico Fire Information; ‡ = Capitan Fire Chief

While reviewing the previous occurrences of fire events within Lincoln County between 2017 and 2023, there were no fires that occurred within the boundaries of the Town of Carrizozo and the Village of Corona. Although there are no previous wildfires identified in the NCDC for these jurisdictions, wildfire is always a possible threat with potential ignition stemming from natural events, such as lightning, as well as human ignition from vehicles and other unintentional sources.

A recent impactful wildfire event was the McBride Fire, which started on April 12, 2022, after very powerful straight-line winds had blown a tree into power lines, igniting the surrounding trees and creating a crown fire that destroyed 6,159 acres, 207 structures, and claimed two lives. This fire cut off one of the main thoroughfares for the Village of Ruidoso, Ruidoso Downs, and other parts of Lincoln County. Overall, the fire disrupted power to most of the Village of Ruidoso and portions of the county, which led to the water supply being cut off, burning many structures, and threatening the Sierra Blanca Regional Airport. Multiple evacuations were authorized to protect the different communities within the fire's path. The fire continued on an unpredictable path and burned at a high intensity which resulted in the loss of two lives and a severely burned landscape. The severity of this event can, in part, be attributed to climatic change, which fostered dry and dead forest conditions.

#### 5.3.1.3 Location and Extent per Participating Jurisdiction

**Lincoln County**

The pattern, frequency, and intensity of a fire (or fire regime) within Lincoln County is largely dependent on forest type. Before human settlement, piñon-juniper woodlands and mixed conifer forests experienced infrequent high intensity stand replacing fires, while ponderosa pine forests experienced more frequent lower intensity fires. Fires have been suppressed for about 100 years, since communities in this area have had the capacity to do so. Human efforts combined with climactic conditions have altered fire regimes and fuel conditions. The county has recently experienced several large wildfires costing millions of dollars in property damage and suppression costs.

Fire intensity and size have been increasing due to the increase of fuels, tree density, large area of continuous fuels and a dry weather cycle. Wildfires have occurred in almost every vegetation type within the county, including grasslands, piñon-juniper forests, ponderosa pine forests, and mixed conifer forests. The most common ignition source is lightning. Unintentional human ignition from campfires, cars and machinery, and other interactions follows lightning for the most common ignitions source. The areas where

these fires occur vary greatly from immediate vicinity to a city or residence to rural, undeveloped areas. Most wildfires have been suppressed while still small. But several have grown into large fires. Many of the historic fires have impacted or come very close to impacting communities and population centers within the county.

Figure 5-11 below lists the large wildfires (>1,000 acres) and the number of structures burned in that particular fire event, all within Lincoln County from 2000 – 2023. The Donaldson fire from 2011 was the biggest fire, which was caused by lightning that burned within Lincoln County and consumed approximately 101,563 acres and one structure. The most recent wildfires, Nogal Canyon (west of Capitan) burning 412 acres, and McBride (near Ruidoso) burning 6,159 acres, both of which occurred in April 2022.

**Figure 5-11: Lincoln County Wildfires (>1,000 acres), 2000–2023**

| Name of Fire | Fire Start Date | Size (acres) | Number of Structures Burned |
|---|---|---|---|
| Cree | May, 2000 | 6,500 | 3 |
| Kokopelli | March, 2002 | 1,000 | 29 |
| Lookout | May, 2004 | 5,280 | 5 |
| Peppin | June 2004 | 64,000 | 12 |
| Donaldson | June, 2011 | 101,563 | 1 |
| White | April, 2011 | 10,341 | 12 |
| Little Bear | June, 2012 | 44,330 | 250 |
| 246 | April, 2018 | 3,360 | 16 |
| Pine Lodge | June, 2019 | 15,045 | 3 |
| Three Rivers | April, 2021 | 5,854 | 0 |
| McBride | April, 2022 | 6,159 | 254 |

**Source:** www.nmfireinfo.com

Figure 5-12 below displays the previous fire occurrences for Lincoln County from the years 1984 to 2023. Figure 5-13 below depicts the causes of fires in Lincoln County between the years 1992-2023. Based on the Previous Occurrence listing (Figure 5-10) and the map below, 45 fires have occurred in unincorporated Lincoln County from 1984 to 2023. Figure 5-14 below depicts fire threat in Lincoln County.

**Figure 5-12: Wildfire Previous Occurrences (1984–2023).**

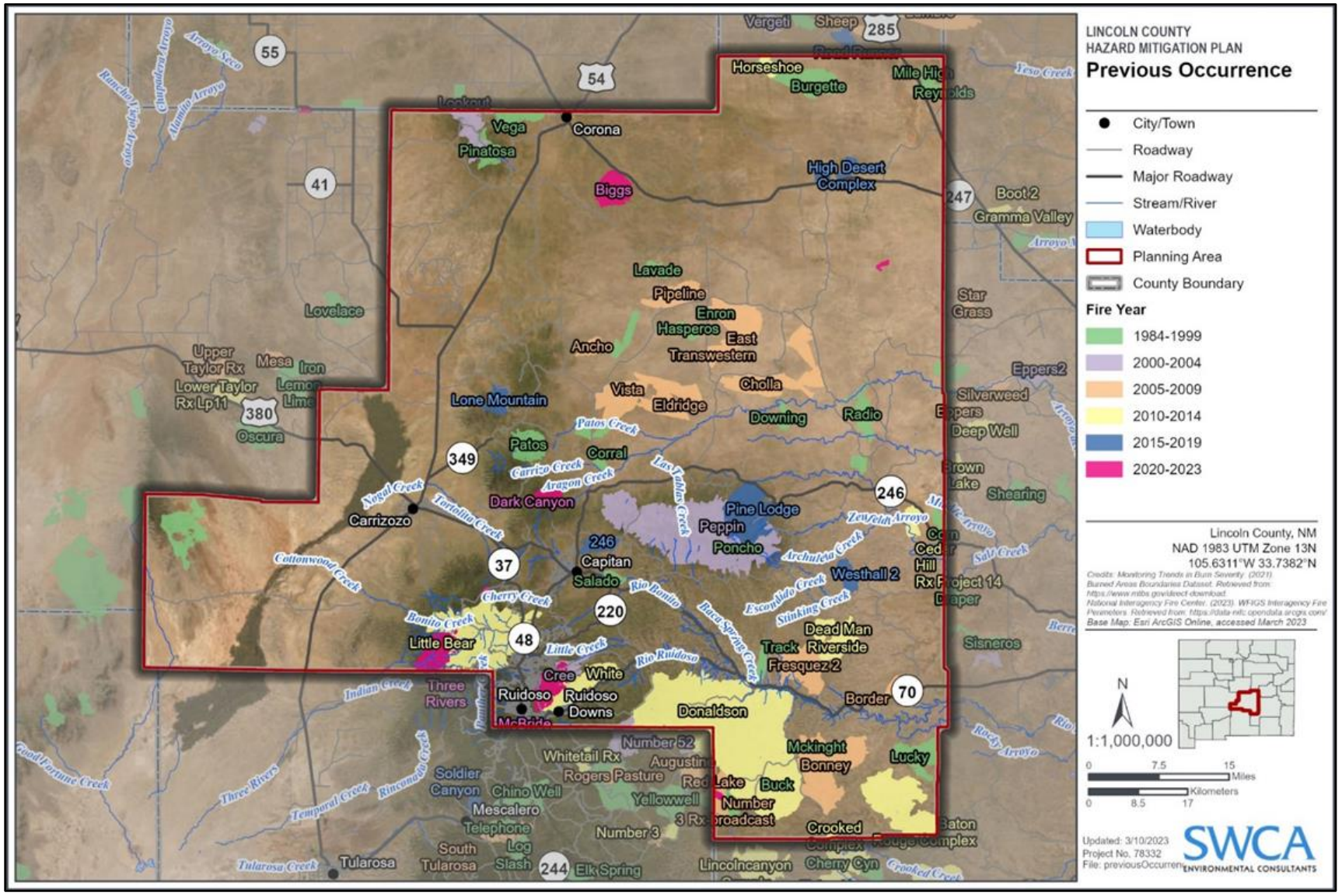


**Figure 5-13: Lincoln County Fire Causes (1992–2023).**

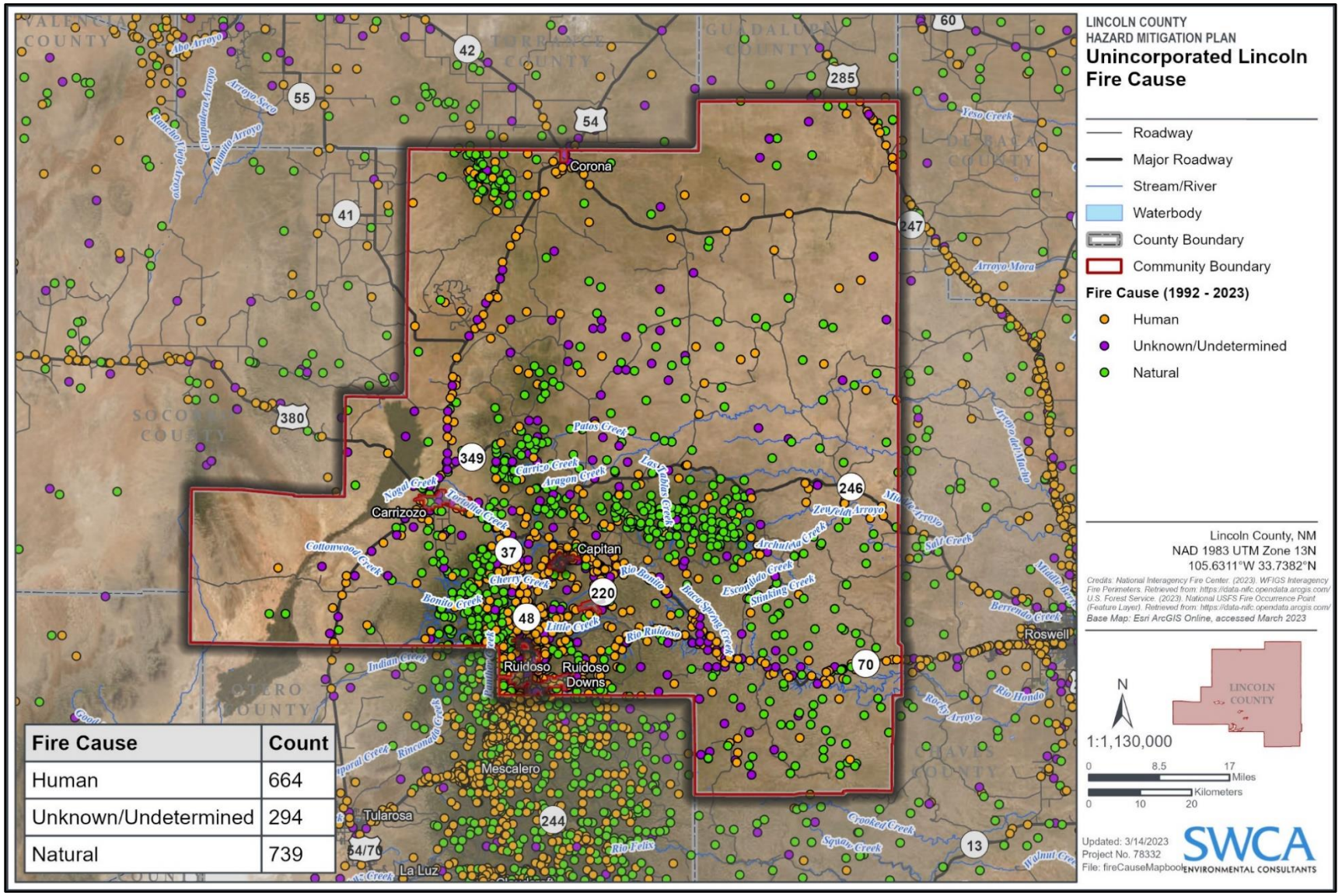
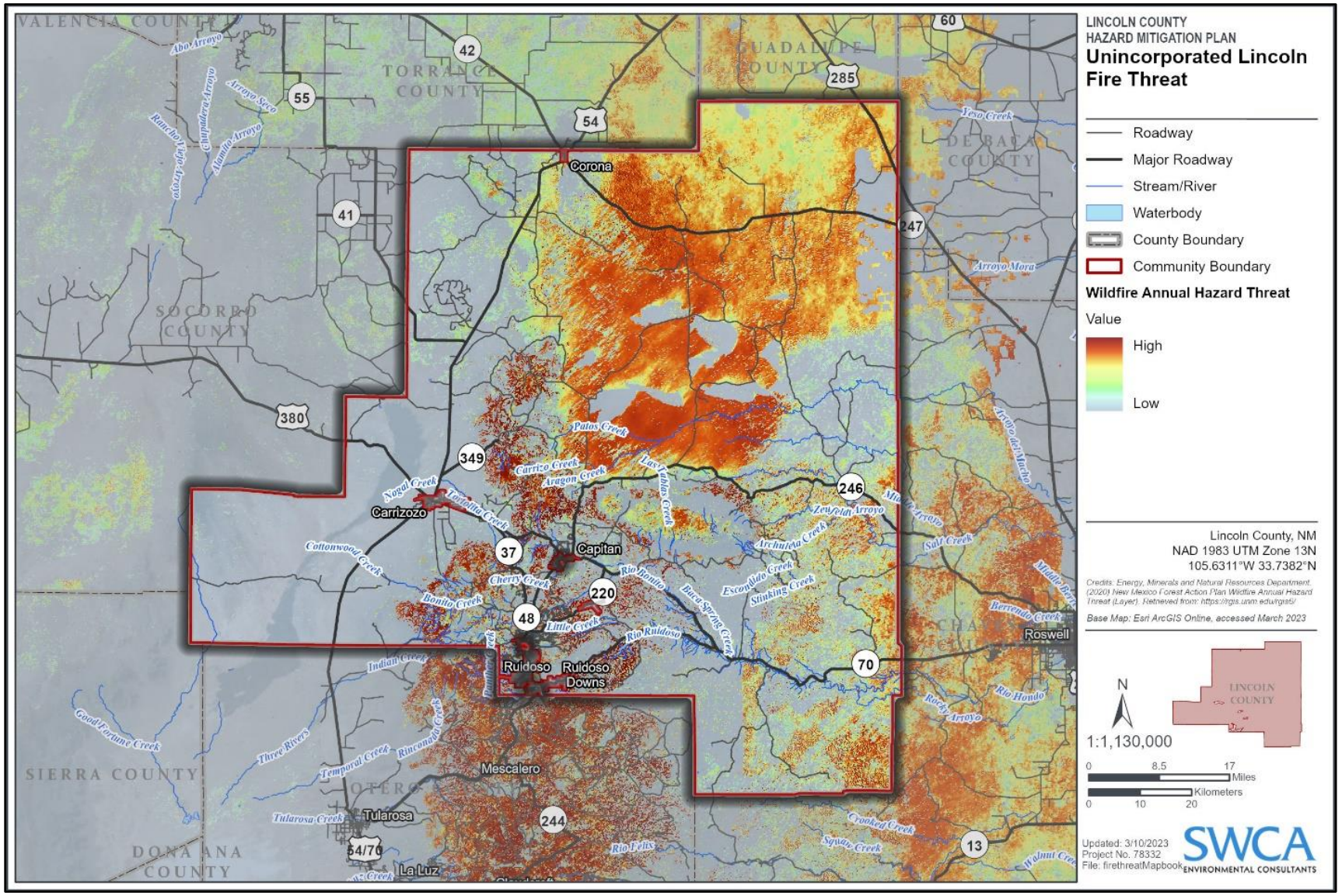


**Figure 5-14: Lincoln County Fire Threat.**



## Village of Ruidoso

The majority of the Village of Ruidoso (VOR) is dominated by, piñon juniper forests, ponderosa pine forests, and mixed conifer forests. Commercial and residential buildings are mixed throughout the forested areas within the Village limits. The urban areas are very congested with dense stands of trees and buildings forming a dense WUI surrounding the VOR. Limited amounts of riparian forests exist along waterways. Beetle and insect damage are at epidemic proportions. This combination of insects, disease, drought, and fire caused stress are responsible for significant mortality in some stands/hillsides and is expected to continue. This mortality increases fire risk while dead trees hold needles and will contribute to increased fuel loading as dead trees fall to the forest floor. Treated areas (public and private land) have generally fared better than untreated land but are not immune to insects, disease, or drought. Current conditions around VOR have improved largely due to thinning efforts, but much work remains to be completed. Vegetation on treated properties quickly grows back underscoring the need for continued maintenance.

The Village is susceptible to wildfire events due to fire fuels and urban congestion. Figure 5-15 displays the previous occurrences of wildfire for the Village of Ruidoso. Wildfires have not occurred in this area before 2010. But as recent as 2022, the McBride Fire burned just east of VOR.

While utilizing the Wildland Fire Interagency Geospatial Services (WFIGS) Fire Perimeters, the fire causes were determined for the Village of Ruidoso. These are classified in Figure 5-16 below. There have been approximately 45 fire events; 27 classified as human causes, 4 classified as natural causes, and 14 were undetermined.

From Figure 5-17, it is visible that most high hazard threats occurred outside the boundary of the Village. Although, there have been pockets of moderate to high level threats occurring directly south and northwest of the Village. From the high-level threats, dead foliage and other dry vegetation are susceptible to ignition. If a fire were to occur, it would spread rapidly and be difficult to control. All fine dead fuels ignite readily, and fires start easily from most causes. The combination of a build-up of dry brush and unattended campfires contributes to fires that escape with the potential to spread rapidly and become destructive.

Ruidoso became a Firewise community in 2003 and in June 2002, the Village of Ruidoso Council passed a mandatory fuels management ordinance to facilitate the creation of defensible space around homes, implementing the VOR Fuels Management Program (see Appendix D). Approximately 13,000 acres within the Village of Ruidoso will be treated to a ground fire standard, which is designed to keep a fire on the ground and reduce the risk of a wildfire spreading into the trees. However, due to the forest density, steep terrain, and the close proximity of buildings, any fire that gets into the Village will be catastrophic. Fire behavior will be unpredictable based on winds at the time, may achieve a crown fire, and would then move very fast through the Village.

The Village of Ruidoso owns and operates the Sierra Blanca Regional Airport located north on Highway 220 (Airport Road). The airport has a current acreage of 1,665 acres that includes two runways and two hangar ports. There have not been recent fire events at the airport. Figure 5-18 displays the previous fire occurrences for the Sierra Blanca Regional Airport.

**Figure 5-15: Village of Ruidoso Previous Fire Occurrences (2000–2023).**

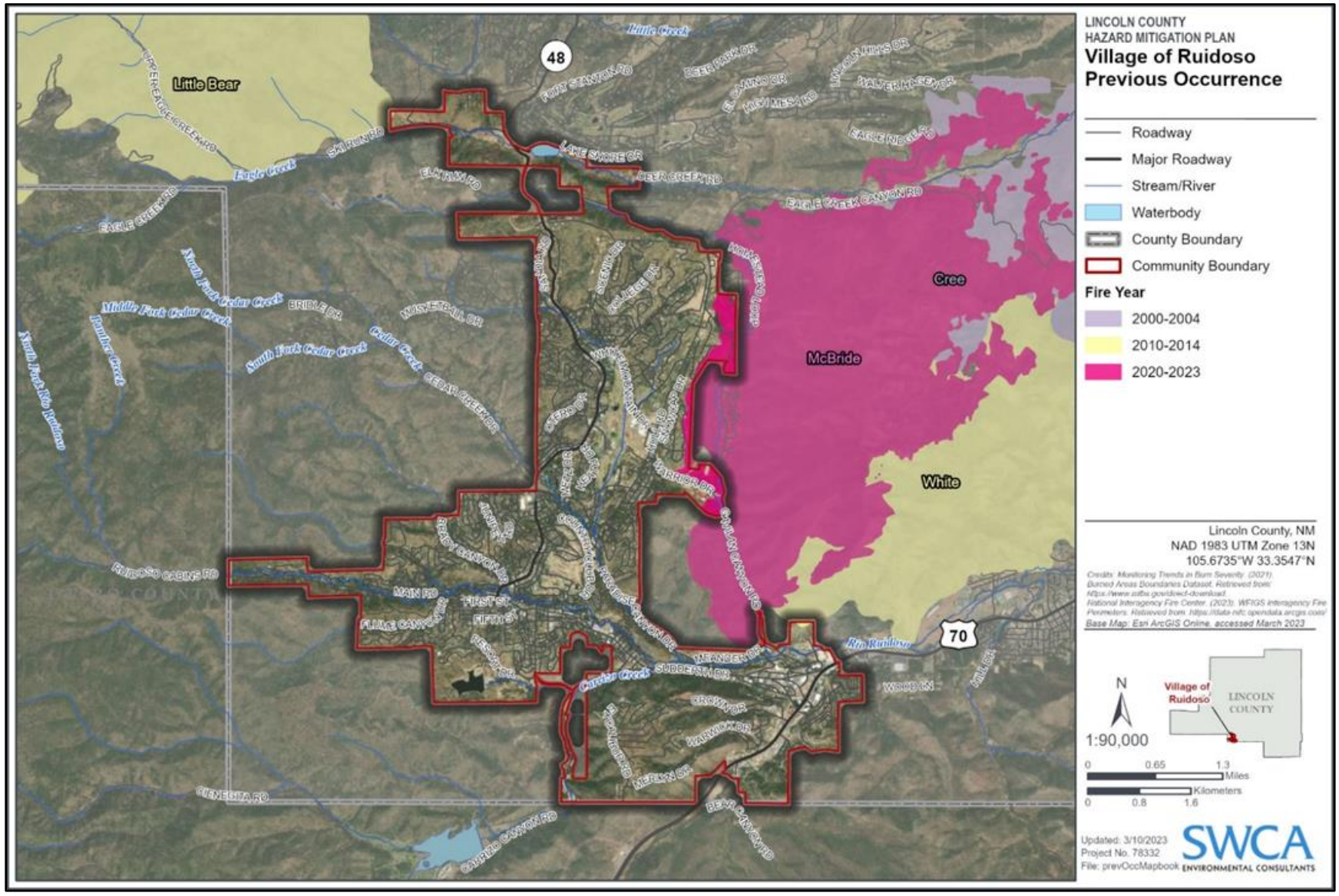


**Figure 5-16: Village of Ruidoso Fire Causes (1992–2023).**

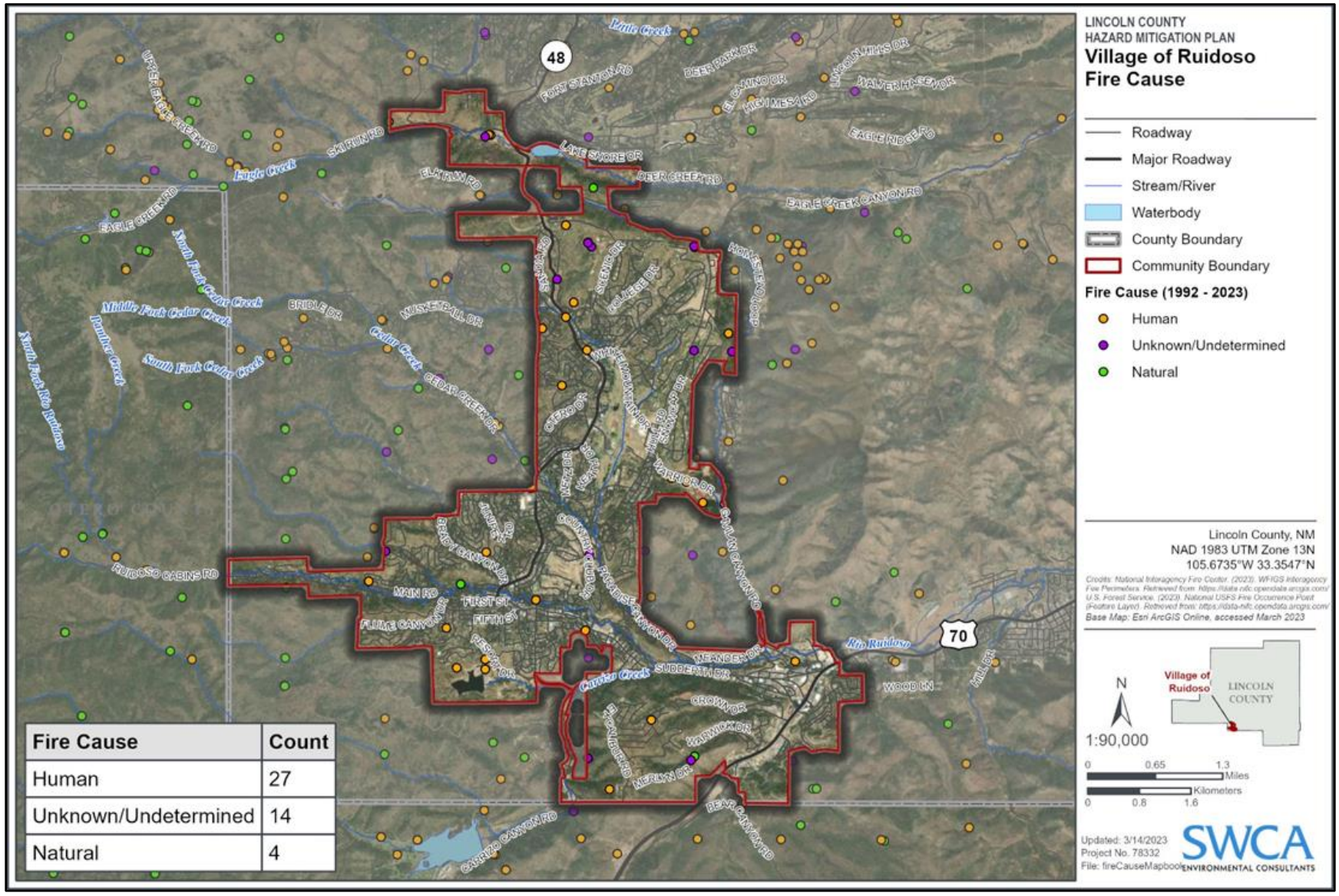


**Figure 5-17: Village of Ruidoso Fire Threat.**

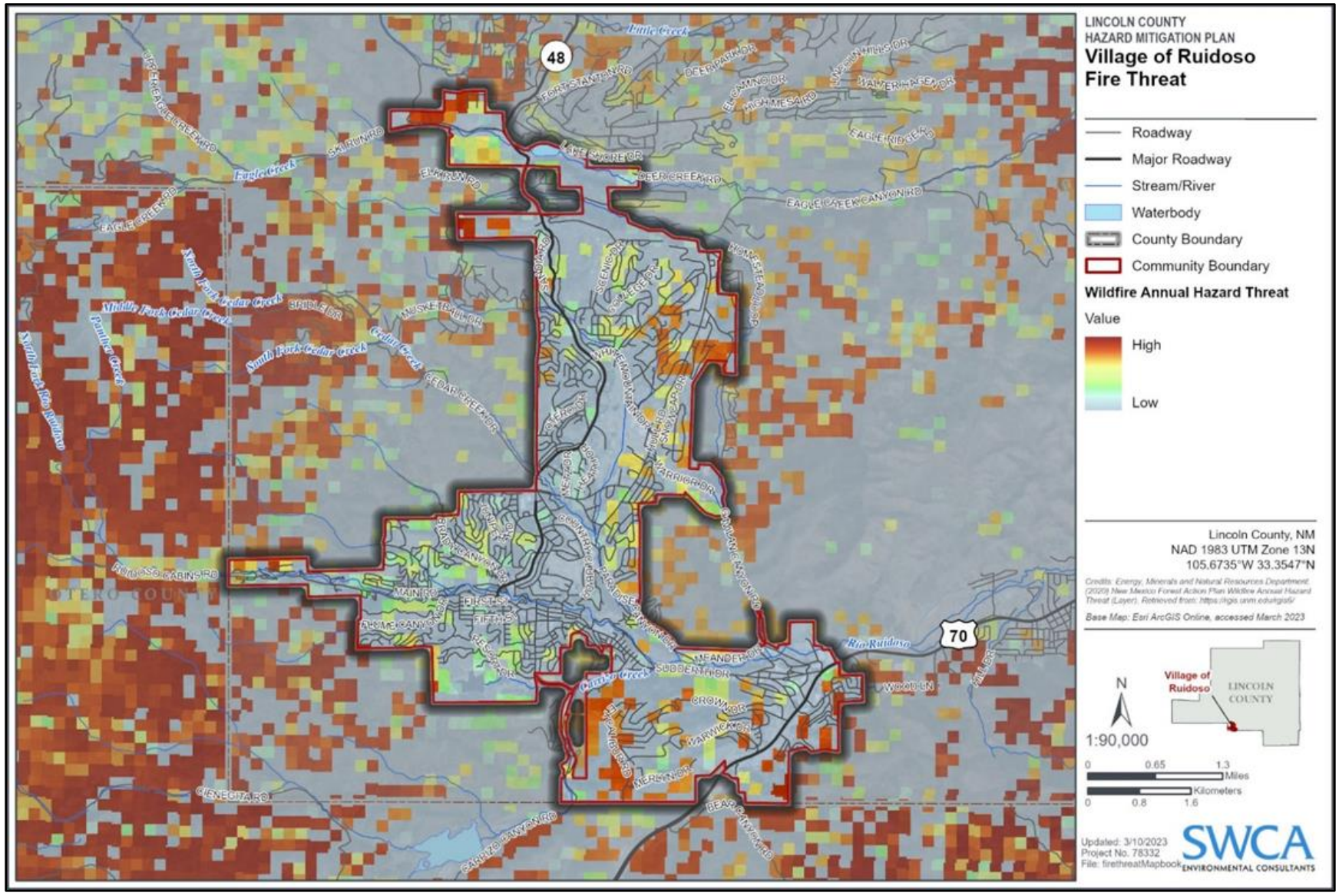
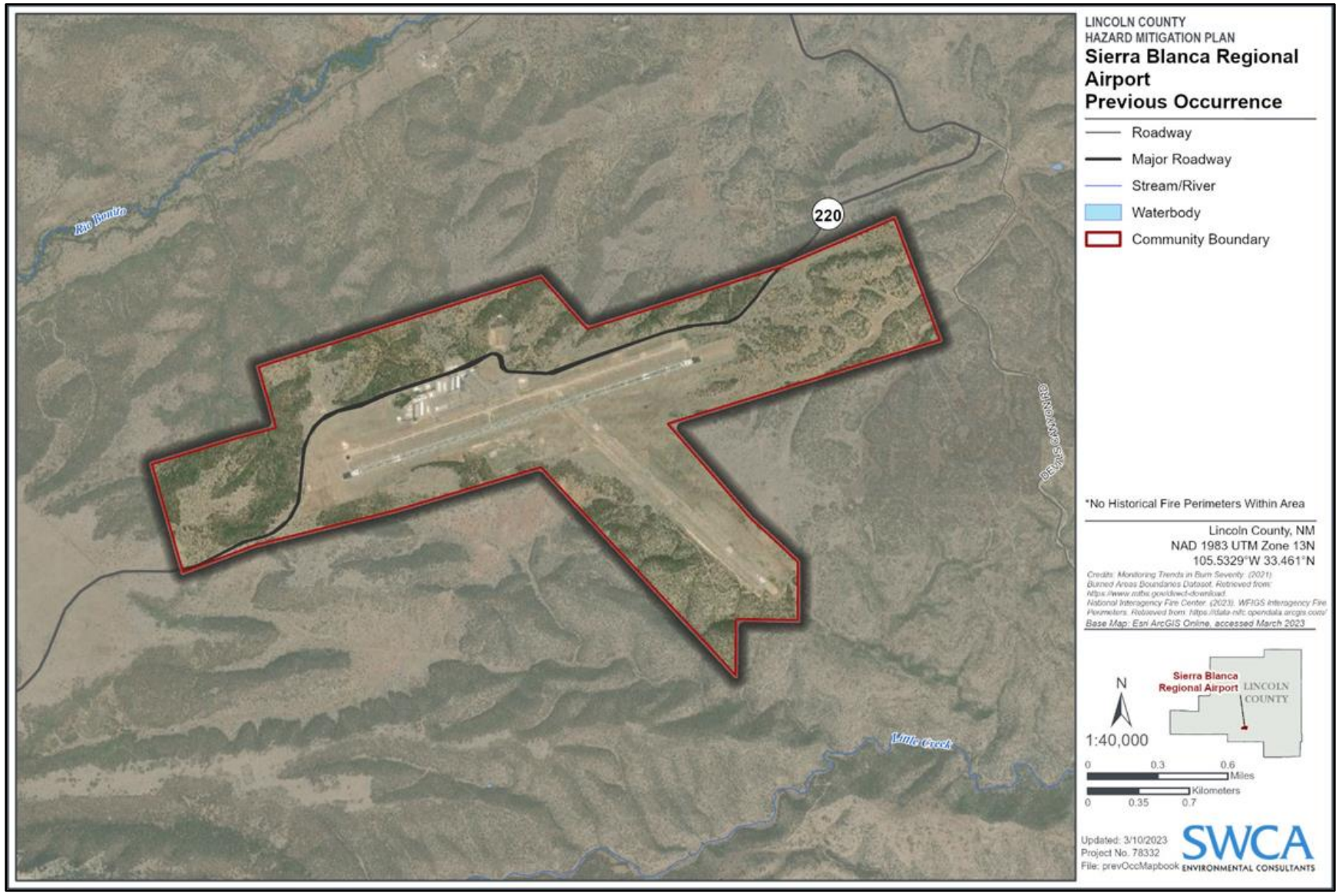


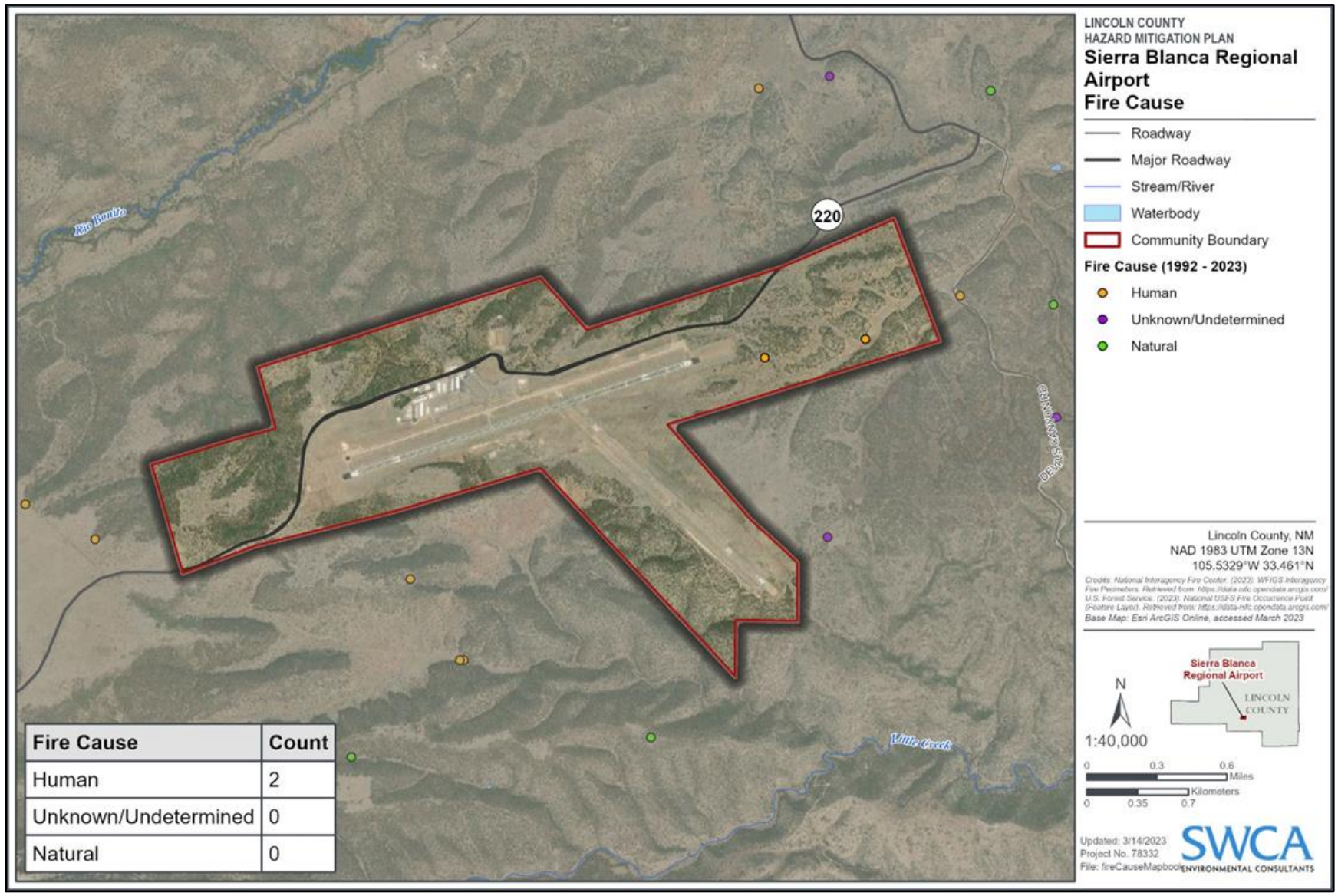
**Figure 5-18: Sierra Blanca Regional Airport Previous Fire Occurrences (2000–2023).**



Utilizing the WFIGS Interagency Fire Perimeters, the fire causes determined for Sierra Blanca Regional Airport are displayed in Figure 5-19 below. There were two fire events (from 1992 – 2023); both classified as human caused.

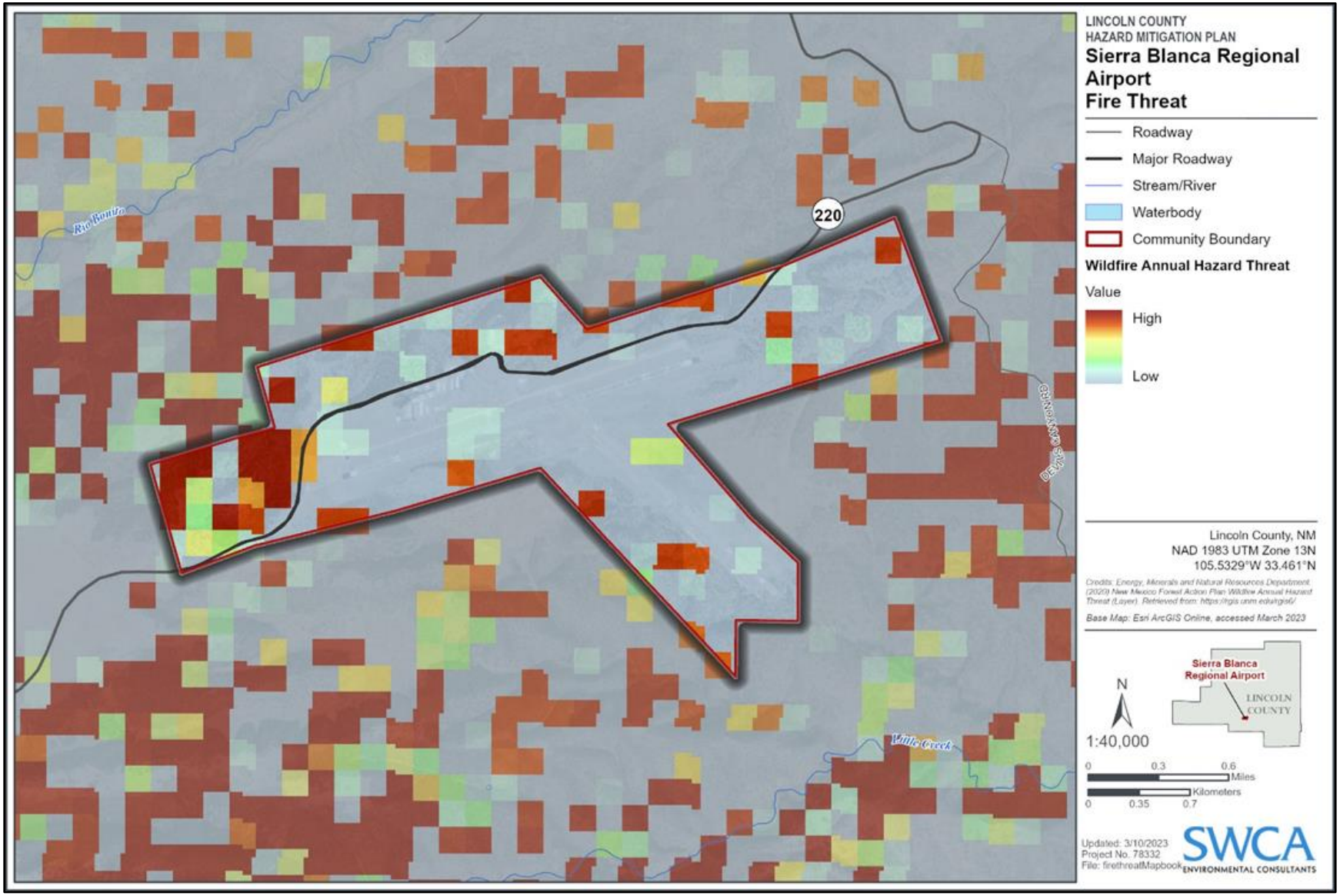
Figure 5-20 displays the fire threat for the Sierra Blanca Regional Airport. The highest hazard threats occurred in the western portion of the jurisdiction. There are areas of low to moderate hazard threats in the central, eastern, and southern portions of the jurisdiction. There is little to no vegetation present within the jurisdiction. Although, the perimeter of the airport boundary is filled with various shrub vegetation that may be susceptible to ignition.

**Figure 5-19: Sierra Blanca Regional Airport Fire Causes (1992–2023).**




| Fire Cause | Count |
|---|---|
| Human | 2 |
| Unknown/Undetermined | 0 |
| Natural | 0 |

**Figure 5-20: Sierra Blanca Regional Airport Fire Threat.**



**City of Ruidoso Downs**

Ruidoso Downs is dominated by piñon-juniper and ponderosa pine forests. Commercial and residential buildings are mixed throughout the forested areas within the City limits. The Rio Ruidoso flows from the west city limit, VOR, to the east city limit. Some riparian forests exist along the river. Ruidoso Downs landscape is from the river valley to steep canyons and ridges on the south around Turkey Canyon. The WUI on the south and east sides of the city are also dominated by piñon juniper and ponderosa forests. The Mescalero Apache reservation and USFS lands border the city on the south. The Mescalero Tribe and the USFS have completed fuels reduction projects reducing fire risk from the WUI.

Similar to the Village of Ruidoso, the City of Ruidoso Downs has congested urban areas that are surrounded by forest, which also acts as fire fuel. Figure 5-21 below displays the previous fire occurrences for the City of Ruidoso Downs. The White Fire has been the only fire to cross into the City of Ruidoso Downs boundary since 2000.

While utilizing the WFIGS Interagency Fire Perimeters, the fire causes were determined for the City of Ruidoso Downs. These are shown in Figure 5-22 below. There have been approximately six fire events: three classified as human causes, two classified as natural causes, and one undetermined. This jurisdiction incorporates more forest landscape and is not as congested as VOR, so natural and human causes are more susceptible.

Based on the descriptions from Figure 5-9, the fire threat levels for the City of Ruidoso Downs are depicted in Figure 5-23. The areas that are of high fire hazard threat is south of Highway 70. There are other areas west of the boundary that exhibit moderate to high fire hazard threat. The higher threats caused by the collection of forest or fuels within the city limits south of Highway 70, could cause a higher fire threat to the area when compared to the land parcels north of Highway 70.

Ruidoso Downs has not yet achieved Firewise status but continues to work on the certification. Due to the steep terrain on the south border of the city and the proximity of buildings to forested areas, any fire that gets into the City will cause significant damage to structures and infrastructure.

**Figure 5-21: City of Ruidoso Downs Previous Fire Occurrences (2000–2023).**

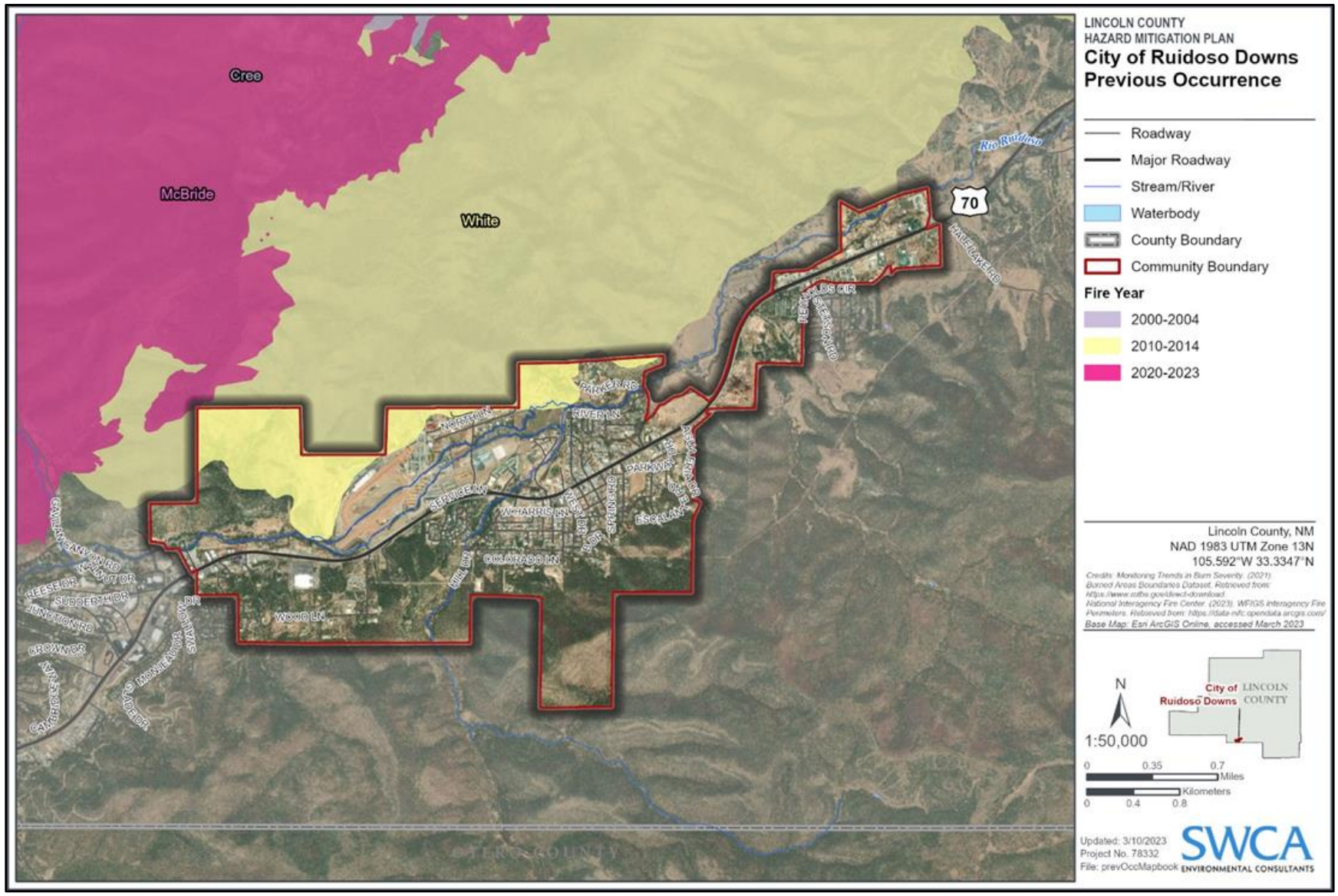


**Figure 5-22: City of Ruidoso Downs Fire Causes (1992–2023).**

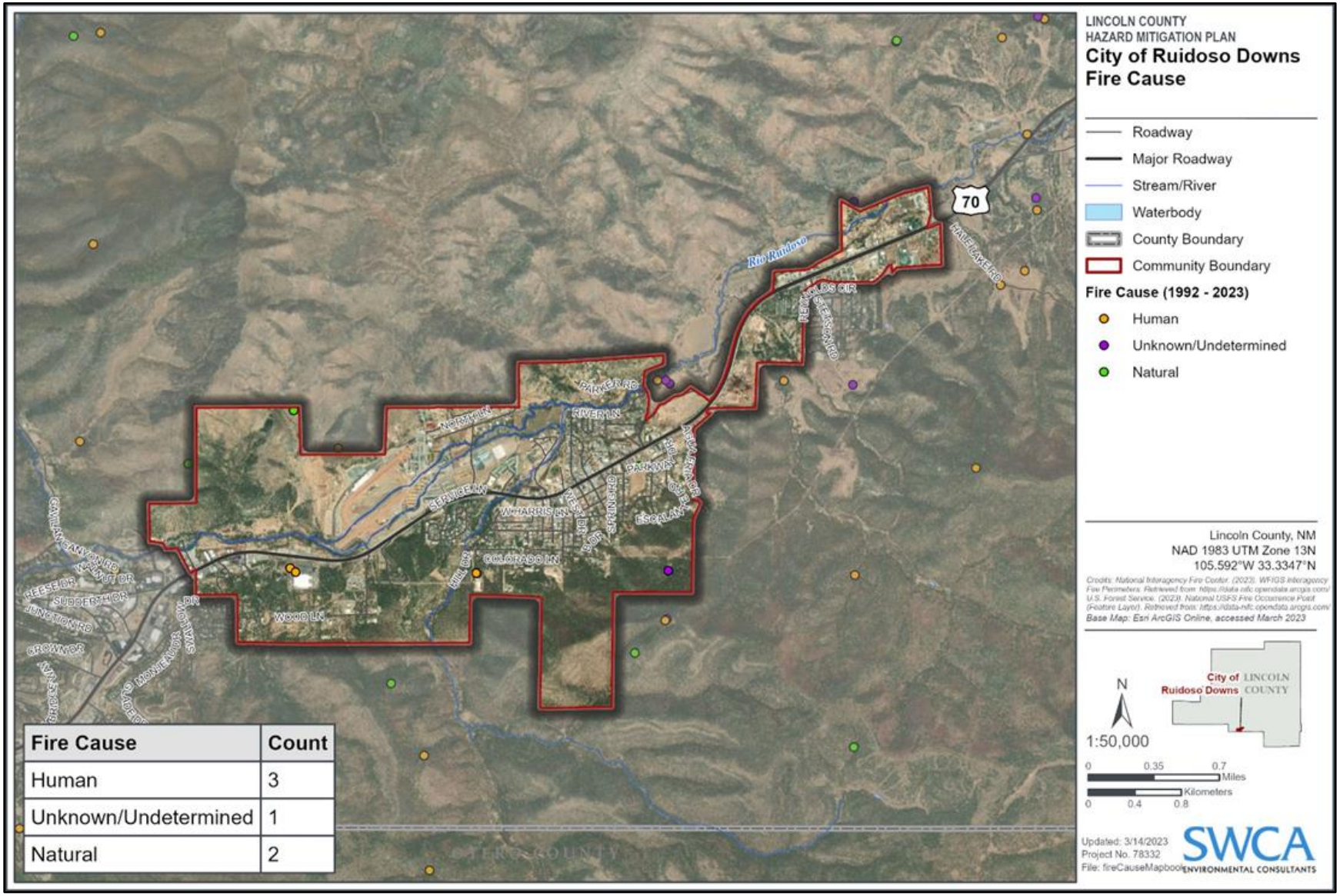
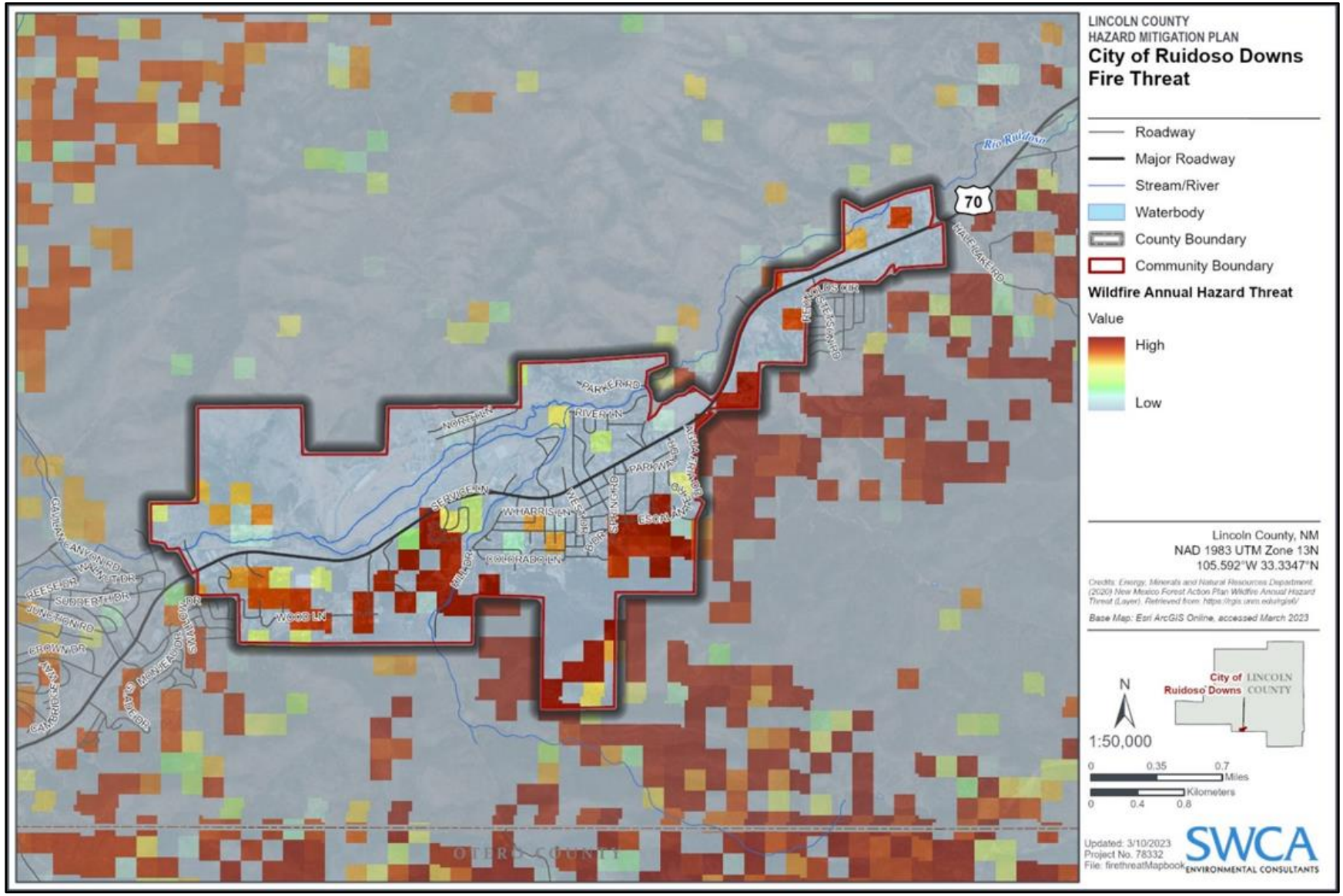


**Figure 5-23: City of Ruidoso Downs Fire Threat.**



## Town of Carrizozo

Carrizozo is located on the northern end of Tularosa Valley where the landscape transitions from desert to prairie grassland. Carrizozo is surrounded by the Sacramento Mountains to the east, the Oscura Mountains and the Valley of Fires lava flow to the west, the Chihuahuan desert to the south and the central highlands to the north. The landscape directly around the Town is prairie grassland. The mountains and highlands are covered with piñon juniper, ponderosa and mixed conifer forests.

Information from the WFIGS Interagency Fire Perimeters was used to determine fire events for the Town of Carrizozo. Figure 5-24 identifies six fire events that occurred in this jurisdiction between 1992 and 2023: two natural, two human-caused, and two undetermined.

From Figure 5-25, it can be determined that the Town of Carrizozo has little to minimal fire threat. The only fire threat that is present occurs south of the town's boundary with a low fire threat. The low fire threat indicates that fuels in the area do not ignite easily. Although storms in the area that cause lightning are the main sources of fires being created.

U.S. Highways 54 and 380 intersect in Carrizozo as well as the Union Pacific railroad. Frequent wildfires are caused by the sparks from the railroad. Local firefighters are always on the lookout for fires along the railroad however, there are times when these fires become wind driven events that threaten the Town. The Valle del Sol subdivision to the east of town is a sparsely populated area where the railroad has ignited grass fires that threaten residences and drinking water wells and water storage tanks as well as other critical facilities. The town does not have adequate firefighting infrastructure fire hydrants, water capacity or adequate water lines to supply the water necessary to protect the Town from wildfire.

**Figure 5-24: Town of Carrizozo Fire Causes (1992–2023).**

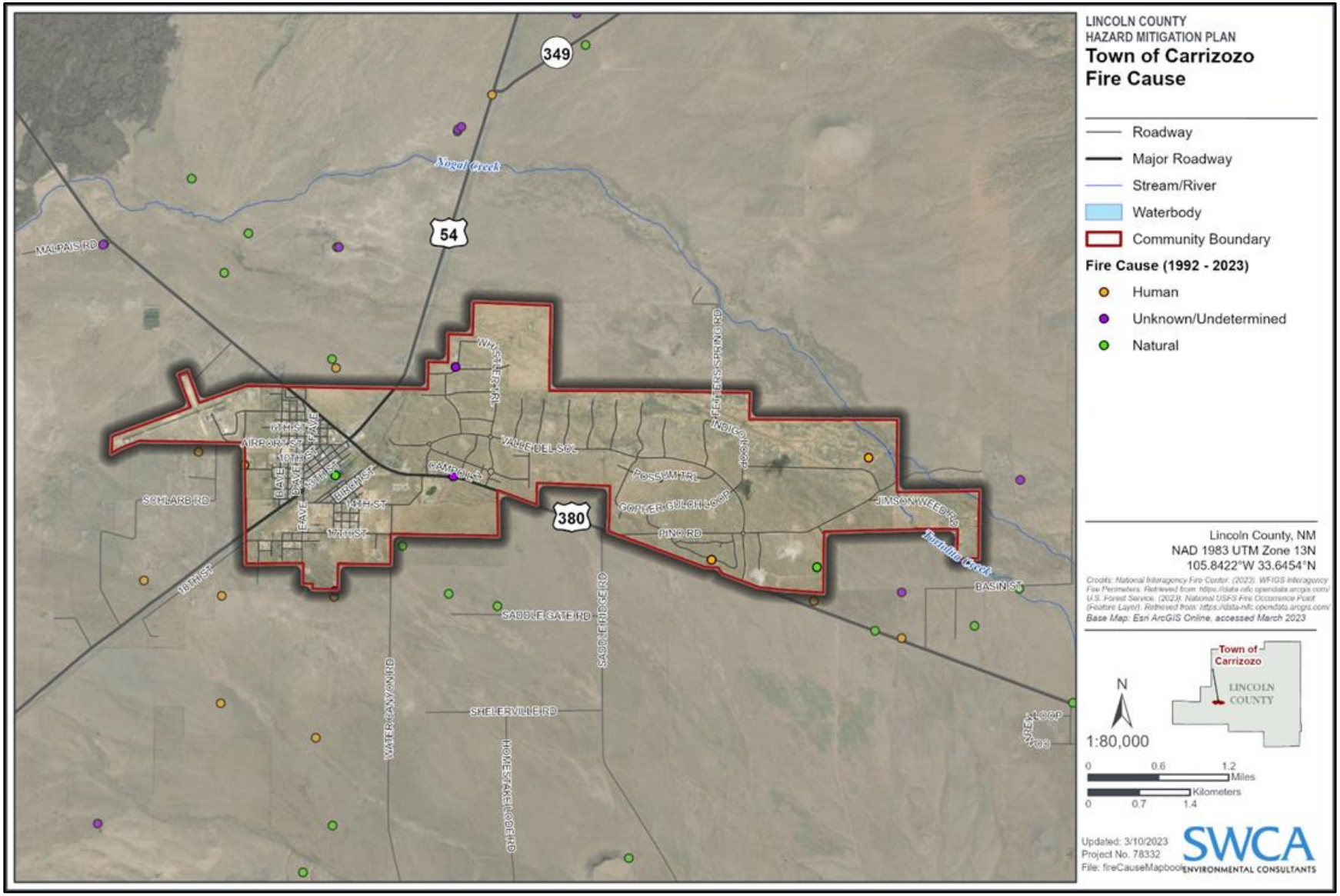
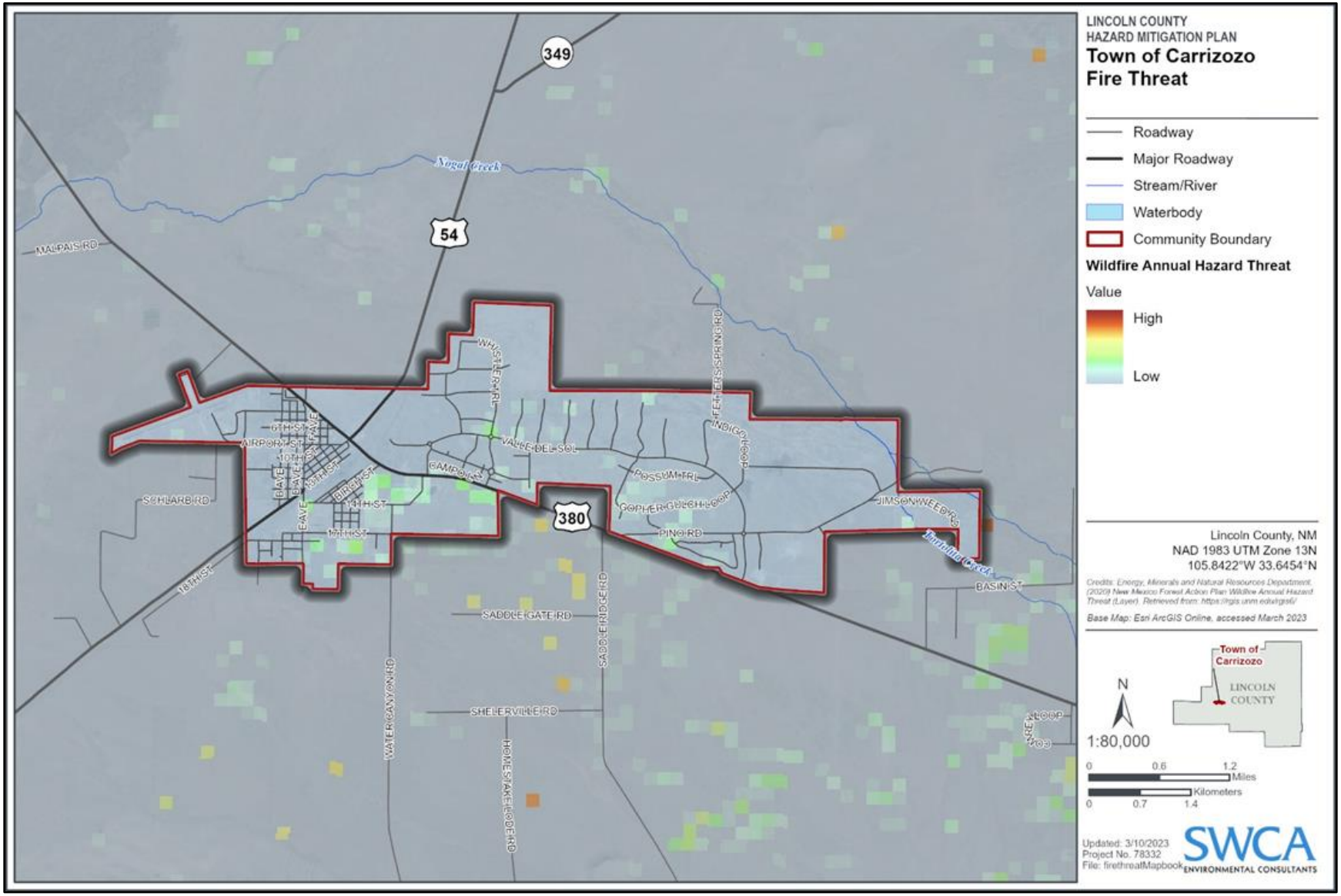


**Figure 5-25: Town of Carrizozo Fire Threat.**



## Village of Capitan

The Village of Capitan is located in the Lincoln County Central Highlands in the valley floor between the Sacramento Mountains and the Capitan Mountains. The Magado Creek and the Salado creek intersect on the eastern edge of Capitan. U.S. Highway 380, New Mexico (NM) 48 and NM 246 also intersect in Capitan. The landscape surrounding the Village as well as throughout the subdivision is piñon juniper.

Utilizing the WFIGS Interagency Fire Perimeters, the fire causes determined for the Village of Capitan are shown in Figure 5-26 below. There were approximately 13 fire cause events (from 1992 – 2023): 6 human-caused and 7 undetermined.

In Figure 5-27, there are only a few portions of the Village of Capitan that are considered moderate to high fire threats. This area is located in the central part of the Village and is an area where a fire could start from an accidental cause. But from this accidental cause, it could also be catastrophic as well, meaning the fire would ignite any dead fuels easily and spread just as quickly.

Power outages occur at times during wildfire events in the area. All electrical power is carried on overhead lines therefore making them susceptible to fire. The Otero County Electric Coop is very good at keeping debris, brush, and trees away from their power lines.

**Figure 5-26: Village of Capitan Fire Causes (1992–2023).**

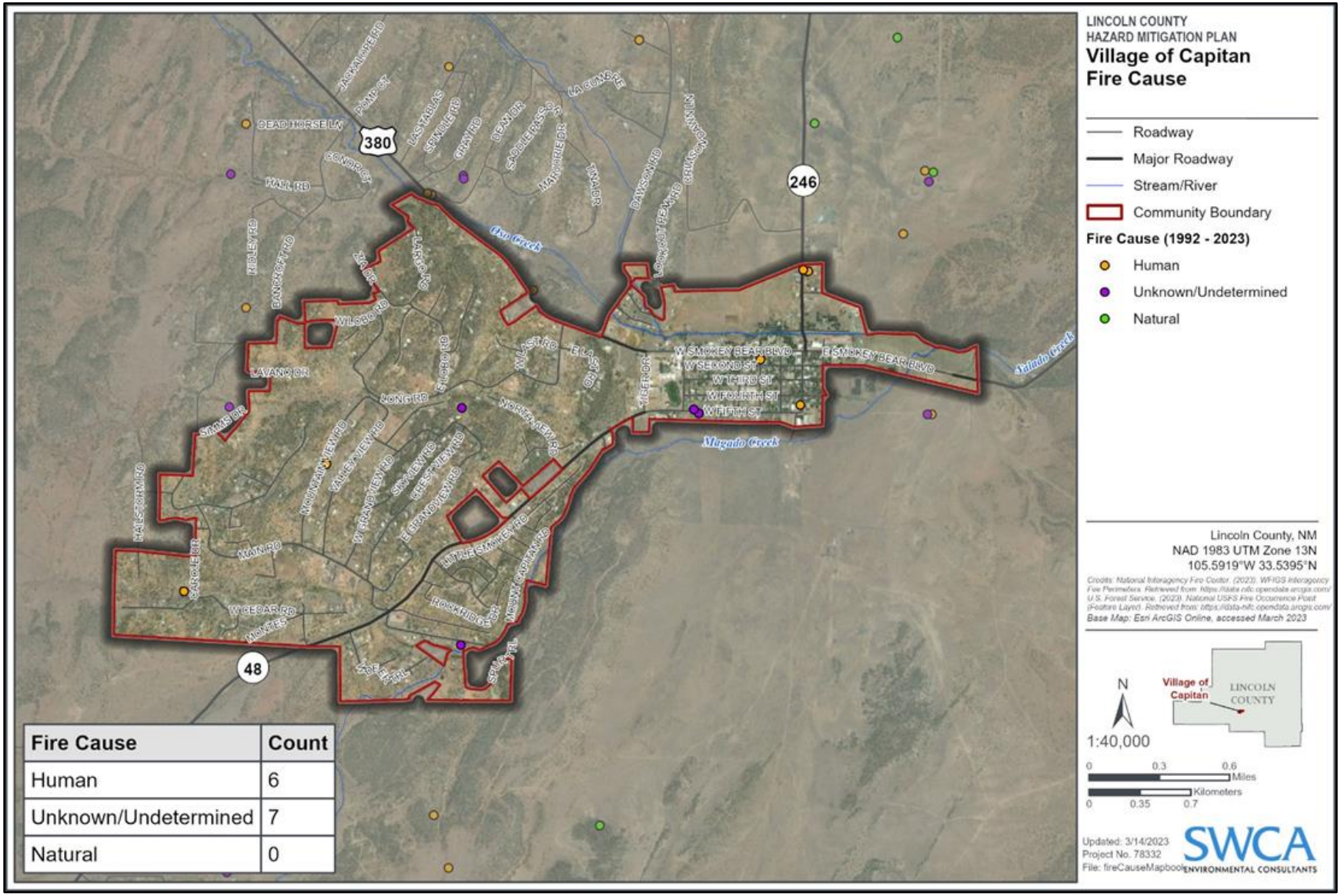
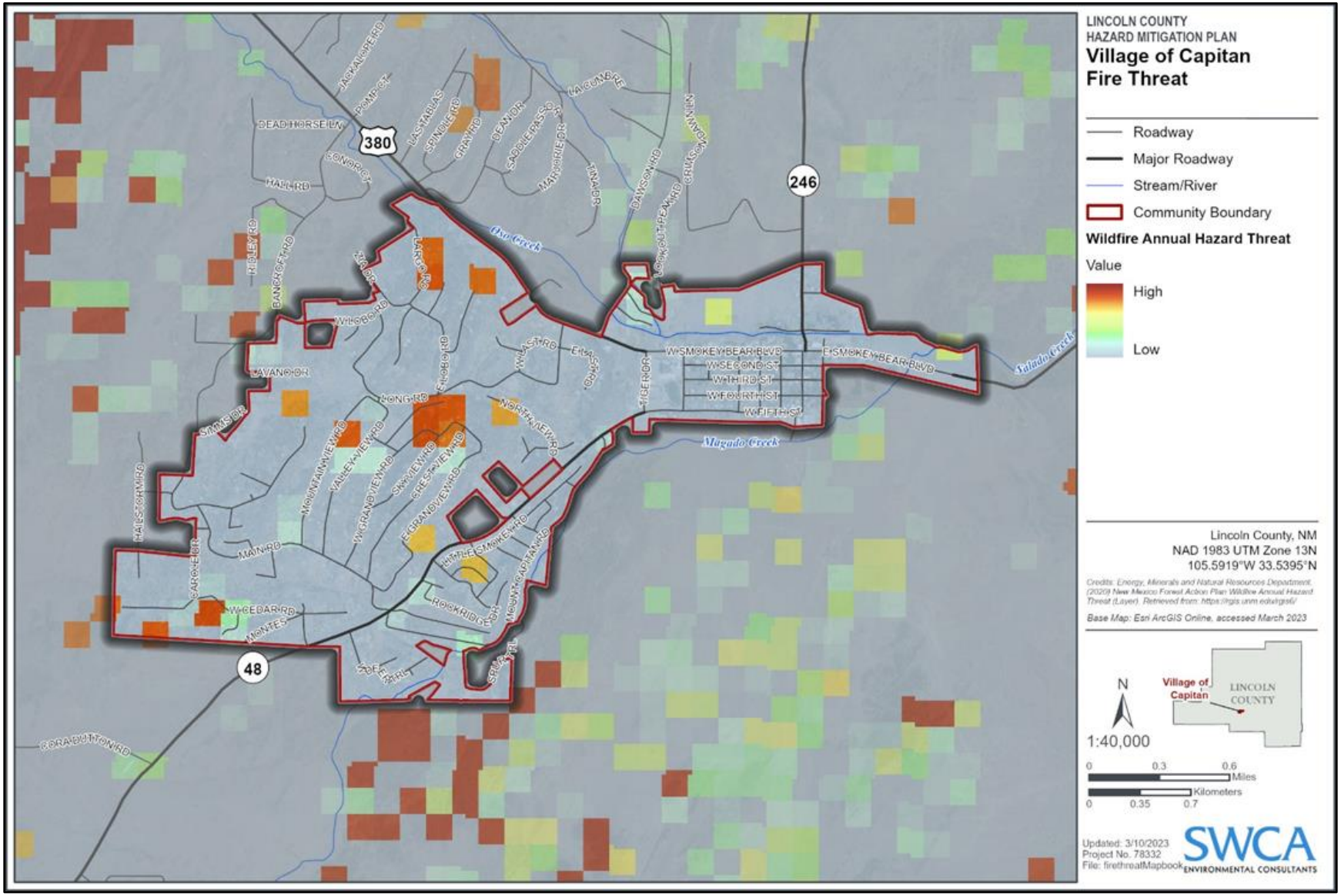


**Figure 5-27: Village of Capitan Fire Threat.**



## Village of Corona

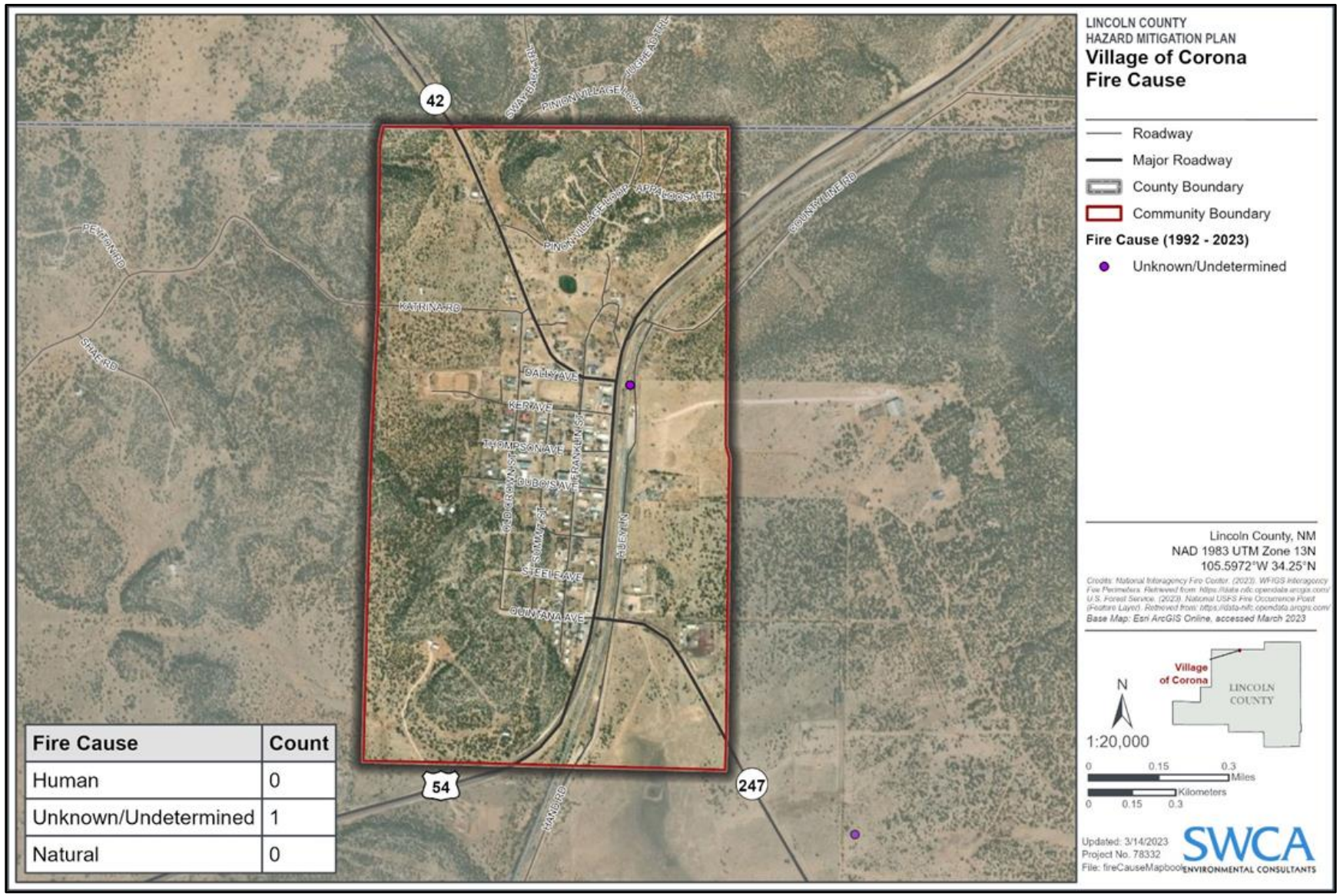
The Village of Corona is located on the northern end of the border of Lincoln County. U.S. Highway 54, NM 42, and NM 247 intersect in Corona. The landscape within Corona is rolling hills covered with piñon juniper forest. The WUI surrounding the Village is also rolling hills covered with piñon juniper. Ranches surround Corona and most ranchers have spent time reducing fuels and therefore reducing the possibility of a catastrophic wildfire. However, the western border of the Village needs additional thinning to reduce wildfire potential. Wildfire behavior potentially could reach the crowns however due to the previous fuel reduction work, fire will most likely stay on the ground.

Utilizing the WFIGS Interagency Fire Perimeters, the fire causes determined for the Village of Corona are shown in Figure 5-28 below. There was one recorded fire event for which the cause was undetermined. The event occurred on the east side of the intersection of NM State Road 42 and U.S. Route 54.

From Figure 5-29, the Village of Corona has experienced low to moderate amounts of fire threats. Fuels from the low and moderate levels do not ignite easily. The ignition for the fire would likely be started from lightning or other unpredictable sources, based on the previous map in Figure 5-28. Fires in this area are not easily spread and are less difficult to control, when executed with reasonable safety.

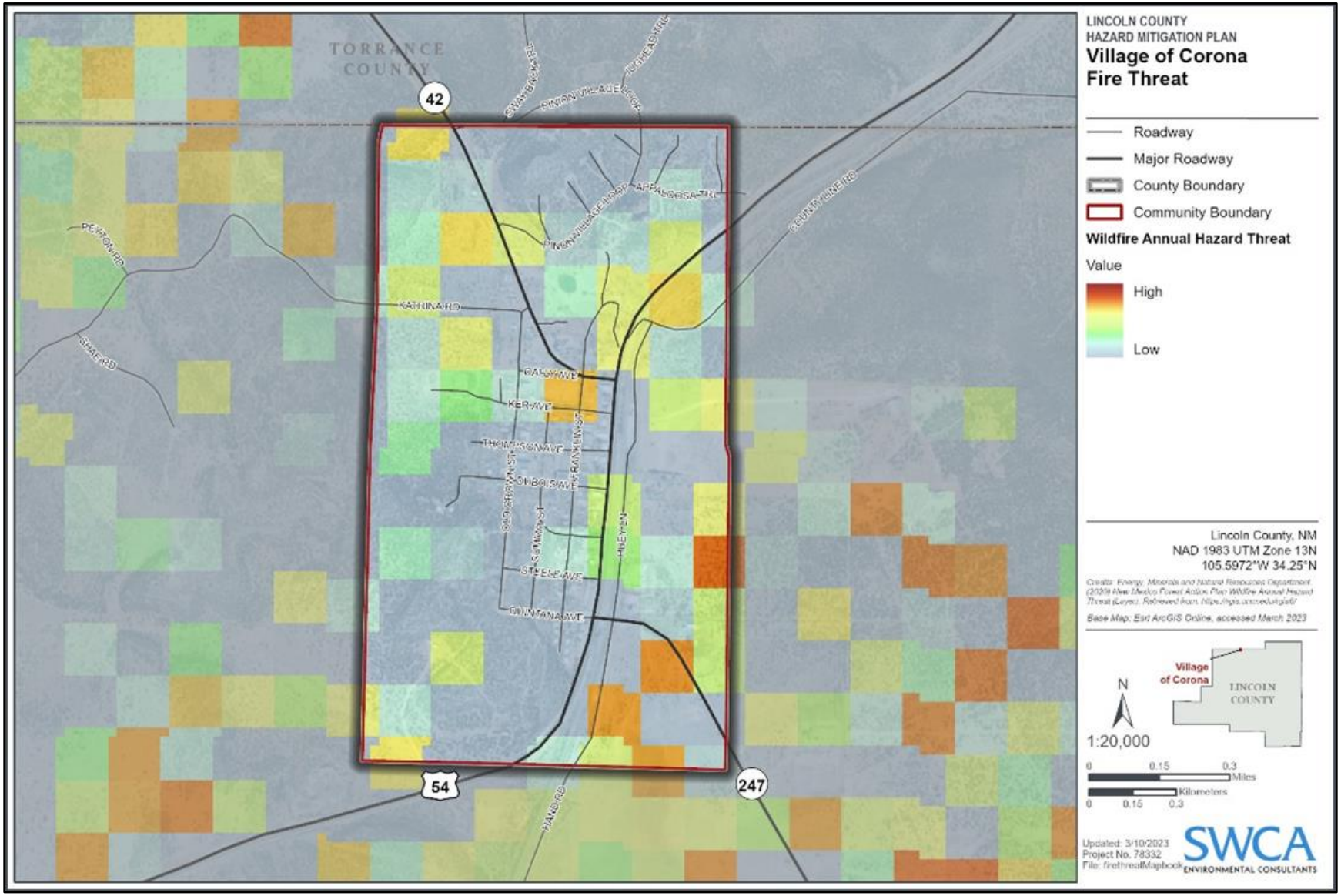
Power outages occur at times during wildfire events in the area. All electrical power is carried on overhead lines therefore making them susceptible to fire. The Central New Mexico Electric Coop has been successful at keeping debris, brush, and trees away from their power lines. The Village is small and has limited resources as far as money and employees. Adequate fire hydrants are lacking in order to protect the Village and its residents from wildfire.

**Figure 5-28: Village of Corona Fire Causes (1992–2023).**




| Fire Cause | Count |
|---|---|
| Human | 0 |
| Unknown/Undetermined | 1 |
| Natural | 0 |

**Figure 5-29: Village of Corona Fire Threat.**



Fire protection support is provided by three fire stations within the Village of Ruidoso. Figure 5-30 shows Station 1 located on 541 Sudderth Drive, Ruidoso, New Mexico.

**Figure 5-30: Village of Ruidoso Fire Department, Station 1.**

Source: Village of Ruidoso website (2023).

Figure 5-31 displays a photo of the McBride Fire from 2022. This fire burned approximately 6,159 acres near the Village of Ruidoso.

**Figure 5-31: McBride Fire (2022) near Village of Ruidoso.**

Source: CNN (April 2022).

Figure 5-32 displays the White Fire, which is the biggest that occurred within Lincoln County at over 10,000 acres near Ruidoso Downs.

**Figure 5-32: The White Fire (2011) near Ruidoso Downs.**


Source: Southwest Fire Science Consortium.

#### 5.3.1.4 Probability of Occurrence

When calculating Wildfire probability, the Planning Team agreed to use the Priority Risk Index (PRI), explained further in Figure 5-110. Probability in Figure 5-33 below is calculated from the following criteria:

- Unlikely means no events were recorded from 2017 through 2022. This results in 0-16.65% annual probability.
- Possible means 1 to 2 events were recorded from 2017 through 2022. This results in between 16.66% and 33.33% annual probability.
- Likely means 3 to 4 events were recorded from 2017 through 2022. This results in between 33.34% and 66.67% annual probability.
- Highly Likely means 5 or more events were recorded from 2017 through 2022. This results in between 66.68% and 100% annual probability.

In addition to the general definitions used for the PRI, the Planning Team analyzed the annual probability for 2017 to 2022 and over time based on available records for each hazard. The total number of occurrences was divided by the number of years of available data; for Wildfire, there was 39 years of data. The annual probability for 2017 to 2022 and over time is shown below. Annual probability is calculated based on the number of occurrences divided by the number of years of data and presented as a percent anticipated to occur in 1 year. By comparing the annual probability from the past 6 years with that of all records over time, the Planning Team can consider potential changes over time, including potential impacts

due to climate change. For example, the analysis revealed that there was an increase in annual probability for Ruidoso, Ruidoso Downs, and Capitan when reviewing the past 6 years of data in comparison to the past 39 years of data. It is understood that record keeping has improved over the years and that Annual Probability over time as presented here may not be an accurate accounting.

**Figure 5-33: Wildfire Probability of Occurrence**

| | Wildfire Probability Based on Previous Occurrence | | | | |
|---|---|---|---|---|---|
| **Jurisdiction** | **Past Occurrences 2017-2022** | **Probability 2017-2022 (Used in PRI)** | **Annual Probability 2017-2022** | **All Recorded Occurrences 1984-2022** | **Annual Probability 1984-2023** |
| Lincoln County | 5 | Highly Likely | 83.3% | 45 | 100% (118%) |
| Village of Ruidoso | 10 | Highly Likely | 100% (166.6%) | 11 | 29% |
| City of Ruidoso Downs | 6 | Highly Likely | 100% | 7 | 18% |
| Town of Carrizozo | 0 | Unlikely | 0% | 0 | 0% |
| Village of Capitan | 5 | Highly Likely | 83.3% | 9 | 23% |
| Village of Corona | 0 | Unlikely | 0% | 0 | 0% |

#### 5.3.1.5 Climate Change Impacts

The NCA report (Garfin et.al. 2014) projects wildfire risk and incidents in the Southwest region will likely be increased due to climate change. This is stated as one of the "Key Messages" due to increased temperatures, reduced precipitation, and more severe periods of drought. This assessment will require additional efforts focused on vegetation management and consideration for participating jurisdictions to implement climate change impacts into their CWPP.

The increased frequency and severity of wildfires resulting from severe periods of drought have long-lasting implications that reduce the capacity of the land to heal. After a wildfire has burned its way through an area, soil properties become deeply affected. The removal of organic matter within the soil causes the land to become easily erodible. With the soil depleted of organic matter, its slick properties and reduced capacity to retain moisture result in more precipitation running off rather than being absorbed by the landscape. Accordingly, storm events easily transition into flood events.

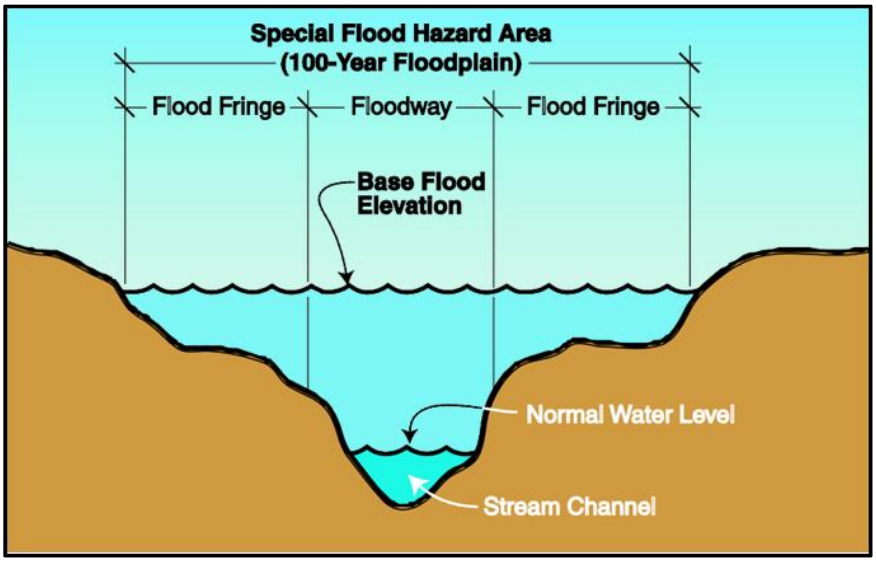
A comparison between the current assessment period and all recorded events shows a slight increase in the number of years with wildfire events for the unincorporated county, Ruidoso, and Ruidoso Downs. This increase may be related to climate change–related impacts to natural systems. Primarily, decreasing forest health related to persistent drought and earlier runoff has increased fuels, which increases the likelihood of ignition and high-intensity wildfire events. It is anticipated that climate change will contribute to increases in average annual temperatures and extended periods of drought, which fuels increases in wildfire events.

### *5.3.2 Flood*

#### 5.3.2.1 Description

Flooding occurs when a river, stream, lake, or other body of water overflows its banks onto normally dry land or there is an excessive pooling of surface water. Floods can amount to be some of the most frequently occurring, costly disasters experienced. They can be caused by a number of different weather events and can cause property damage including structural and landscape, injuries, and loss of life. These events can develop slowly or happen very quickly, depending on various land and climate properties. These overflow areas are floodplains, Figure 5-34.

**Figure 5-34: Flood Definition.**




Riverine floods are described in terms of their extent (including the horizontal area affected and the vertical depth of floodwaters) and the related probability of occurrence. Flood studies use historical records to determine the probability of occurrence for different extents of flooding. Alluvial fans and alluvial fan flood hazards do exist in the state. Alluvial fan flood hazard characteristics include heavy sediment/debris loads and high velocity flows.

Flash floods are usually the result of excessive precipitation generally occurring in a very short period of time but can occur under normal precipitation when soil is very dry, or streams and storm water systems are already at capacity. Flash flooding can occur in riverbeds, streets, and canyons and is usually accompanied by movement of debris and sediment. These events can sometimes be predicted but there is usually not sufficient time to avoid property damage and injury. Flash flooding prone areas such as arroyos and canyons should be avoided during storm events to avoid injury. Flash flooding is the second greatest weather hazard in New Mexico. This hazard stems from several environmental and climactic factors:

- Summertime monsoon rains
- Warm rain on top of snowpack
- Vegetation loss on landscape due to wildfires
- Soil deterioration due to drought

Development and permeable surface alterations can drastically alter the risk of flooding events. This is especially true in floodplains that are expected to be inundated at various intervals. Flood potential is an important aspect to consider when proposing development, alterations to stormwater, and watershed channel migration and bank armoring.

The flood recurrence intervals, shown in Figure 5-35, are expressed as the percentage chance that a flood of a specific extent will occur in any given year. For Lincoln County, there is a 10% chance that a 10-year flood event could occur on a yearly basis. There is an expectation that Lincoln County will experience at least one flood event a year. Based on available data, it is expected that areas within identified floodplains would experience 1 to 10 feet of inundation impacting structures and the ability to navigate flooded transportation routes.

**Figure 5-35: Flood Recurrence Intervals**

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

According to the NWS, the most common cause of flooding is due to rain and/or snowmelt that accumulates faster than soil can absorb it, or rivers can carry it away. The quality of soil also plays a key role in how quickly water runs off the land. In healthy soils, the water has time to absorb into the soil, whereas unhealthy soils are not as porous and do not allow the water to seep in and be absorbed. Due to recent fire events and the burning of mineral-rich soils, the chances of flood events have increased due to the inability of soils to retain moisture. The burn scar areas are more susceptible to experiencing flood events.

When a flood event occurs, there are measurements that could be implemented that define the severity of the event. One of such measurements is the Precipitation Frequency Estimates, which are defined as the depth of precipitation at a specific location for a specific duration that has a certain probability of occurring in any given year. The Hydrometeorological Design Studies Center from NOAA utilizes NOAA Atlas 14. NOAA Atlas 14 provides precipitation frequency estimates for the semiarid Southwest. The precipitation frequency estimates are included for 5-minute through 60-day durations at average recurrence intervals of 1 year through 1,000 years. These estimates are based on the analysis of the annual maximum series and are then converted to partial duration series results. Point precipitation frequency estimates were gathered for an approximate centroid of Lincoln County, specifically at location (33.7849, −105.4211) at an elevation of 6,840 feet. It is important to note that these precipitation frequency estimates may differ for each participating jurisdiction within the county. Figure 5-36 displays the precipitation frequency estimates for a central location within Lincoln County and Figure 5-37 displays the annual accumulated precipitation for Lincoln County.

**Figure 5-36: Precipitation Frequency Estimates for Lincoln County.**

**AMS-based precipitation frequency estimates with 90% confidence intervals (in inches)[1]**

| Duration | Annual exceedance probability (1/years) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1/2 | 1/5 | 1/10 | 1/25 | 1/50 | 1/100 | 1/200 | 1/500 | 1/1000 |
| 5-min | 0.324 (0.281-0.376) | 0.465 (0.403-0.540) | 0.562 (0.485-0.650) | 0.688 (0.591-0.792) | 0.784 (0.670-0.903) | 0.886 (0.753-1.02) | 0.987 (0.835-1.14) | 1.13 (0.945-1.29) | 1.24 (1.03-1.42) |
| 10-min | 0.493 (0.427-0.572) | 0.708 (0.613-0.822) | 0.855 (0.738-0.989) | 1.05 (0.899-1.21) | 1.19 (1.02-1.37) | 1.35 (1.15-1.55) | 1.50 (1.27-1.73) | 1.71 (1.44-1.97) | 1.88 (1.57-2.16) |
| 15-min | 0.611 (0.530-0.710) | 0.879 (0.760-1.02) | 1.06 (0.914-1.23) | 1.30 (1.12-1.49) | 1.48 (1.26-1.70) | 1.67 (1.42-1.92) | 1.86 (1.58-2.14) | 2.12 (1.78-2.44) | 2.33 (1.94-2.68) |
| 30-min | 0.823 (0.713-0.956) | 1.18 (1.02-1.37) | 1.43 (1.23-1.65) | 1.75 (1.50-2.01) | 1.99 (1.70-2.29) | 2.25 (1.91-2.59) | 2.51 (2.12-2.88) | 2.86 (2.40-3.29) | 3.14 (2.62-3.61) |
| 60-min | 1.02 (0.883-1.18) | 1.46 (1.27-1.70) | 1.77 (1.52-2.04) | 2.16 (1.86-2.49) | 2.47 (2.11-2.84) | 2.79 (2.37-3.21) | 3.11 (2.63-3.57) | 3.54 (2.97-4.07) | 3.88 (3.24-4.47) |
| 2-hr | 1.17 (1.02-1.36) | 1.68 (1.46-1.94) | 2.03 (1.75-2.34) | 2.49 (2.15-2.87) | 2.86 (2.45-3.28) | 3.26 (2.77-3.73) | 3.65 (3.09-4.19) | 4.20 (3.51-4.82) | 4.65 (3.85-5.33) |
| 3-hr | 1.23 (1.07-1.42) | 1.74 (1.52-2.01) | 2.10 (1.83-2.42) | 2.59 (2.23-2.97) | 2.97 (2.54-3.40) | 3.38 (2.87-3.86) | 3.79 (3.20-4.34) | 4.37 (3.65-5.00) | 4.84 (4.00-5.54) |
| 6-hr | 1.39 (1.23-1.59) | 1.95 (1.71-2.22) | 2.33 (2.05-2.66) | 2.85 (2.48-3.24) | 3.26 (2.82-3.69) | 3.69 (3.17-4.18) | 4.14 (3.52-4.68) | 4.75 (4.00-5.38) | 5.24 (4.37-5.94) |
| 12-hr | 1.55 (1.37-1.76) | 2.16 (1.90-2.45) | 2.58 (2.26-2.91) | 3.13 (2.73-3.54) | 3.57 (3.10-4.03) | 4.03 (3.48-4.55) | 4.50 (3.85-5.09) | 5.15 (4.36-5.82) | 5.66 (4.75-6.41) |
| 24-hr | 1.61 (1.46-1.79) | 2.22 (2.01-2.47) | 2.65 (2.40-2.94) | 3.22 (2.90-3.57) | 3.67 (3.28-4.07) | 4.15 (3.69-4.60) | 4.64 (4.10-5.14) | 5.32 (4.64-5.91) | 5.86 (5.07-6.53) |
| 2-day | 1.82 (1.65-2.02) | 2.52 (2.28-2.80) | 3.02 (2.72-3.35) | 3.69 (3.31-4.09) | 4.21 (3.76-4.68) | 4.78 (4.23-5.32) | 5.37 (4.71-5.98) | 6.18 (5.35-6.92) | 6.84 (5.86-7.68) |
| 3-day | 1.98 (1.81-2.19) | 2.74 (2.49-3.02) | 3.27 (2.97-3.60) | 3.97 (3.58-4.37) | 4.52 (4.06-4.98) | 5.12 (4.56-5.64) | 5.72 (5.06-6.32) | 6.55 (5.72-7.27) | 7.22 (6.24-8.04) |
| 4-day | 2.15 (1.97-2.36) | 2.96 (2.70-3.24) | 3.52 (3.21-3.85) | 4.26 (3.86-4.66) | 4.83 (4.37-5.29) | 5.45 (4.89-5.97) | 6.07 (5.41-6.66) | 6.92 (6.10-7.62) | 7.60 (6.63-8.40) |
| 7-day | 2.55 (2.34-2.78) | 3.48 (3.19-3.80) | 4.12 (3.77-4.49) | 4.95 (4.51-5.39) | 5.58 (5.06-6.07) | 6.24 (5.64-6.81) | 6.90 (6.19-7.54) | 7.79 (6.91-8.55) | 8.48 (7.47-9.34) |
| 10-day | 2.89 (2.64-3.17) | 3.95 (3.61-4.33) | 4.68 (4.27-5.13) | 5.64 (5.12-6.17) | 6.37 (5.76-6.98) | 7.15 (6.42-7.84) | 7.92 (7.07-8.71) | 8.97 (7.92-9.89) | 9.79 (8.57-10.9) |
| 20-day | 3.82 (3.51-4.16) | 5.15 (4.73-5.60) | 6.01 (5.51-6.54) | 7.07 (6.46-7.69) | 7.84 (7.15-8.54) | 8.63 (7.83-9.41) | 9.37 (8.47-10.2) | 10.3 (9.26-11.3) | 11.0 (9.84-12.1) |
| 30-day | 4.65 (4.29-5.05) | 6.20 (5.72-6.72) | 7.16 (6.60-7.76) | 8.30 (7.64-9.00) | 9.10 (8.37-9.87) | 9.90 (9.07-10.7) | 10.6 (9.70-11.6) | 11.5 (10.5-12.6) | 12.2 (11.0-13.3) |
| 45-day | 5.75 (5.32-6.22) | 7.59 (7.02-8.22) | 8.69 (8.04-9.40) | 9.96 (9.20-10.8) | 10.8 (9.98-11.7) | 11.7 (10.7-12.6) | 12.4 (11.4-13.4) | 13.3 (12.2-14.4) | 13.9 (12.7-15.2) |
| 60-day | 6.69 (6.21-7.20) | 8.78 (8.14-9.44) | 10.0 (9.28-10.7) | 11.4 (10.5-12.2) | 12.3 (11.4-13.3) | 13.2 (12.2-14.2) | 14.0 (12.9-15.1) | 14.9 (13.7-16.1) | 15.5 (14.2-16.8) |

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of annual maxima series (AMS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and annual exceedance probability) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Source: NOAA Atlas 14, Volume 1, Version 5; data retrieved on April 20, 2023.

A few components that serve a significant concern when precipitation is present are: the area precipitation information is gathered for, the time span the precipitation is falling, an estimated precipitation amount, and the effects the precipitation is having on the area. These components are especially true when flooding occurs. During flood events, the amount of precipitation and time span this precipitation is falling is crucial information needed for determining the potential and severity of flooding effects that may occur.

Additionally, the amount of precipitation falling in a wider area may not be as significant as that same amount of precipitation falling in a smaller area. The amount of time the precipitation falls is another crucial component of flooding. Any amount of precipitation has the potential for disaster, depending on how fast or how slow the precipitation falls. For example, if 1 inch of rain falls in a span of 12 hours, the effects from this is minimal; whereas if that same 1 inch of rain falls in a span of 30 minutes, flooding and disastrous events are more likely to occur.

**Figure 5-37: Annual Accumulated Precipitation for Lincoln County**

| Year | Precipitation (inches) |
|---|---|
| 2022 | 13.50 |
| 2021 | 11.62 |
| 2020 | 9.27 |
| 2019 | 13.23 |
| 2018 | 13.85 |
| 2017 | 14.62 |
| 2016 | 12.38 |
| 2015 | 19.37 |
| 2014 | 14.31 |
| 2013 | 12.63 |
| 2012 | 8.67 |
| 2011 | 8.25 |
| 2010 | 14.61 |

During the summer (June through August), thunderstorm frequency in certain parts of New Mexico is among the highest in the nation. Excessive moisture during the summer can lead to large volume runoffs enhanced by the steep and unstable terrain. Although thunderstorms are profiled under severe weather hazard, flood occurrence extend probability and damages are discussed under the flood hazard. The Planning Team made this change for the 2023 HMP so that all flood-related data could be analyzed in one location within the plan.

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

In mid to late summer, the Pacific winds bring humid subtropical air into the state. Solar heating triggers afternoon thunderstorms that can result in devastating flash flooding events. These flash floods generally travel down arroyos (normally dry streambeds) and can produce a rapid rise in water level with high velocities that convey large amounts of debris. This debris-filled high-velocity water can lead to significant damage that includes the uprooting of trees, undermining of buildings and bridges, and scouring of new channels that worsen existing erosion features.

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

Winter flash flood events usually result from unseasonably high-level rain on top of a snow pack. Excessive runoff allows the combined release of the water in the snowpack along with the rain. These can be flash flood events lasting less than a day, or they can evolve into longer-term flooding events lasting from 1 day to a couple of weeks. Winter flooding occurs between November and February and usually affects the southwest portion of the state.

Most spring events occur between April and June. They vary between winter type events where the rain falls over an old 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. Seasonal flooding and flashfloods may impact large portions of Lincoln County.

Seasonal flooding and flashfloods may impact large portions of Lincoln County. The impact of flooding by the 1% chance event is shown on the County's Flood Insurance Rate Maps (FIRMs) as shown for each participating jurisdiction as Figures 5-41, 5-43, 5-45, 5-46, 5-48, 5-49, and 5-51.

In the aftermath of the 2012 Little Bear Fire, it has been noted that areas that were previously not shown in the floodplain are being more severely impacted by flood events, particularly the Rio Bonito and Eagle Creek. Updated inundation mapping was used to account for the changes in these watersheds. Examples of flood events and their extents include the 2008 Ruidoso Flood (discussed below) where the peak flow measured at the Hollywood Station registered 1630 cubic feet per second. In addition to the potential for annual flooding events, data are available from the County Planning Department (provided by FEMA) regarding 100-year flood events in Lincoln County for the following rivers (flood index data are feet above river bed):

- Carrizo Creek: ±12 feet
- Cedar Creek: ±9 feet
- Rio Bonito: ±10 feet
- Rio Ruidoso: ±20 feet
- Rio Hondo: ±20 feet
- Eagle Creek: ±10 feet
- Little Creek: ±10 feet
- Gavilan Creek: ±10 feet

In all areas of the County bridges/crossings are going to be under the base flood elevation according to the 1% flood chart. This will be a severe risk to the County of losing road infrastructure, and necessitating water crossing rescues of County residents that will be stranded. Flood gauges maintained by USGS are located at the following locations:

- Rio Hondo at Diamond A Ranch near Roswell, NM
- Rio Hondo above Chavez Canyon near Hondo, NM
- Rio Ruidoso at Hollywood, NM
- Rio Ruidoso at Ruidoso, NM
- Eagle Creek below South Fork near Alto, NM
- Bonito Lake near Alto, NM

- Rio Bonito at Highway 48 Bridge near Alto, NM

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

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

- Rio Bonito - 10’ above the streambed

  Water in the Rio Bonito canyon would reach 10’ above the streambed and potentially cause severe damage to property and impact 27 homes, the lower portion of the Nazarene Church camp and an RV park, as well as street flooding and low water crossings. The Planning Team agreed that 25% of those structures would be severely damaged or destroyed.

- Rio Hondo - 20’ above the streambed

  Water in the Rio Hondo, below the confluence of the Rio Ruidoso and Rio Bonito would reach 20’ above the streambed. This area is very rural with most of the impact being farmland, street flooding, low water crossings, and acequias. Approximately 6 homes are situated below 20’ of the streambed. The Planning Team agreed that 25% of these homes would be severely damaged or destroyed.

- Salado creek - 10’ above the streambed

  Salado creek runs through all rural areas and would not have any impact on farmland, low water crossings, and acequias or structures.

**National Flood Insurance Program**

In 1968, Congress created the National Flood Insurance Program (NFIP) in response to the rising cost of taxpayer-funded disaster relief for flood victims and the increasing amount of damage caused by floods. The Mitigation Division, a component of FEMA, manages the NFIP and oversees the floodplain management and mapping components of the program.

Nearly 22,000 communities across the United States and its territories participate in the NFIP by adopting and enforcing floodplain management ordinances to reduce future flood damage. In exchange, the NFIP makes federally backed flood insurance available to homeowners, renters, and business owners in these communities. There are 140 NFIP participating communities in New Mexico, with five being in Lincoln County.

The NFIP Community Rating System (CRS) was implemented in 1990 as a program to recognize and encourage community floodplain management activities to go beyond minimum NFIP standards. The National Flood Insurance Reform Act of 1994 codified the CRS in the NFIP. Under the CRS, flood insurance premium rates are adjusted to reflect the reduced flood risk resulting from community activities

that meet the three goals of the CRS: (1) reduce flood losses; (2) facilitate accurate insurance rating; and (3) promote the awareness of flood insurance.

Flood damage is reduced by nearly $1 billion a year through partnerships with NFIP and CRS communities, the insurance industry, and the lending industry. Buildings constructed in compliance with NFIP building standards also suffer approximately 80% less damage annually than those not built in compliance. Further, every $3 paid in flood insurance claims saves $1 in disaster assistance payments. The NFIP is self-supporting for the average historical loss-year, which means that operating expenses and flood insurance claims are not paid for by the taxpayer but through premiums collected for flood insurance policies. The program has borrowing authority from the U.S. Treasury for times when losses are heavy; however, these loans are usually paid back with interest.

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

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

The most widely adopted design and regulatory standard for floods in the United States is the 1% annual flood and this is the standard formally adopted by FEMA. The 1% annual flood event (also known as the base flood elevation) has a 1% chance of occurring in any 1 year.

For Lincoln County and the incorporated communities Figure 5-38 shows NFIP Community Identification, NFIP Entry Date, Number of Policies, amount of coverage and a brief description of NFIP administration. Lincoln County, Village of Ruidoso, City of Ruidoso Downs, Village of Capitan, and Town of Carrizozo all participate in the NFIP. The Village of Corona is not a participating jurisdiction. The Village of Ruidoso has one repetitive loss structure that is residential and is currently outside the mapped special flood hazard area. Lincoln County, City of Ruidoso Downs, Village of Capitan, and Town of Carrizozo do not have repetitive loss structures.

The current NFIP coverage county-wide is $41,459,000 with total claim payouts at $2,288,765. It is interesting to note that the number of NFIP policies has decreased County-wide since the 2018 HMP. There are 135 less policies in place as of March 2023. Reasons for the decreases could be increased premium costs, insufficient payouts compared to damages, or less federally backed mortgages being secured.

**Figure 5-38: NFIP Status and Statistics for Lincoln County and Participating Jurisdictions**

| Jurisdiction | Community ID | NFIP Entry Date | Number of Policies | Amount of Coverage | Claim Payout (rounded to $1) | Floodplain Management Administration |
|---|---|---|---|---|---|---|
| Lincoln County | 350122 | 10/1/2009 | 58 | $12,948,000 | $12,252 | Provides floodplain management for the unincorporated County with a Certified Floodplain Manager (CFM) |
| Village of Ruidoso | 350098 | 3/2/1983 | 106 | $26,406,000 | $2,184,994 | Floodplain management provided by the Village of Ruidoso CFM |
| City of Ruidoso Downs | 350034 | 2/18/1975 | 7 | $1,379,000 | $91,519 | Floodplain management provided by the City of Ruidoso Downs CFM |
| Carrizozo | 350110 | 5/5/2010 | 0 | $0 | $0 | Floodplain management provided by MOU with Lincoln County |
| Capitan | 350098 | 11/19/2008 | 3 | $726,000 | $0 | Floodplain management provided by MOU with Lincoln County |

**Flood Insurance Rate Maps**

FEMA FIRMs identify flood zones and are used to determine flood insurance requirements and policy costs. The current effective FIRMs for Lincoln County are dated 11/16/2011), the Village of Ruidoso (dated 03/02/83), Ruidoso Downs (07/05/82), Carrizozo (08/22/75), and Capitan (06/25/76). The flood zones have been superimposed on the flood hazard maps shown in Section 5.3.2.3.

Throughout Lincoln County, there are varied ‘effective dates’ for the FIRMs. Although individual FIRMs may have differing effective dates, FEMA uses the most recent date as the one community effective date. The one community effective FIRM date for Lincoln County is 11/16/2011, for the Village of Ruidoso is 3/2/83), for Ruidoso Downs is 7/5/82), for Carrizozo is 8/22/75, and for Capitan is 6/25/76. Figure 5-39 shows the FIRM Panel Number, effective date, and jurisdiction.

**Figure 5-39: FIRM Effective Dates per Community**

| FIRM Panel | Effective Date | Jurisdiction (s) |
|---|---|---|
| 35027CIND0B | 11/5/2014 | Index map for all communities |
| 35027C0090D | 11/16/2011 | County (unincorporated) |
| 35027C0100D | 11/16/2011 | County (unincorporated) |
| 35027C0450D | 11/16/2011 | County (unincorporated) |
| 35027C0600D | 11/16/2011 | County (unincorporated) |
| 35027C0625D | 11/16/2011 | County (unincorporated) |
| 35027C0650D | 11/16/2011 | County (unincorporated) |
| 35027C0675D | 11/16/2011 | County (unincorporated) |
| 35027C0725D | 11/16/2011 | County (unincorporated) |
| 35027C0750D | 11/16/2011 | County (unincorporated) |
| 35027C0775D | 11/16/2011 | County (unincorporated) |
| 35027C0800D | 11/16/2011 | County (unincorporated) |
| 35027C0825D | 11/16/2011 | County (unincorporated) |
| 35027C0850D | 11/16/2011 | County (unincorporated) |
| 35027C0875D | 11/16/2011 | County (unincorporated) |
| 35027C0900D | 11/16/2011 | County (unincorporated) |
| 35027C0925D | 11/16/2011 | County (unincorporated) |
| 35027C0950D | 11/16/2011 | County (unincorporated) |
| 35027C0975D | 11/16/2011 | County (unincorporated) |
| 35027C1000D | 11/16/2011 | County (unincorporated) |
| 35027C1025D | 11/16/2011 | County (unincorporated) |
| 35027C1050D | 11/16/2011 | County (unincorporated) |
| 35027C1075D | 11/16/2011 | County (unincorporated) |
| 35027C1100D | 11/16/2011 | County (unincorporated) |
| 35027C1125D | 11/16/2011 | County (unincorporated) |
| 35027C1150D | 11/16/2011 | County (unincorporated) |
| 35027C1250D | 11/16/2011 | County (unincorporated), Carrizozo |
| 35027C1275D | 11/16/2011 | County (unincorporated), Carrizozo |
| 35027C1350D | 11/16/2011 | County (unincorporated) |
| 35027C1375D | 11/16/2011 | County (unincorporated) |
| 35027C1400D | 11/16/2011 | County (unincorporated) |
| 35027C1425D | 11/16/2011 | County (unincorporated) |

| FIRM Panel | Effective Date | Jurisdiction (s) |
|---|---|---|
| 35027C1450D | 11/16/2011 | County (unincorporated) |
| 35027C1525D | 11/16/2011 | County (unincorporated) |
| 35027C1550D | 11/16/2011 | County (unincorporated) |
| 35027C1575D | 11/16/2011 | County (unincorporated) |
| 35027C1600D | 11/16/2011 | County (unincorporated) |
| 35027C1615D | 11/16/2011 | County (unincorporated), Capitan |
| 35027C1625D | 11/16/2011 | County (unincorporated), Capitan |
| 35027C1650D | 11/16/2011 | County (unincorporated) |
| 35027C1675D | 11/16/2011 | County (unincorporated) |
| 35027C1700D | 11/16/2011 | County (unincorporated) |
| 35027C1725D | 11/16/2011 | County (unincorporated) |
| 35027C1750D | 11/16/2011 | County (unincorporated) |
| 35027C1775D | 11/16/2011 | County (unincorporated) |
| 35027C1800D | 11/16/2011 | County (unincorporated) |
| 35027C1825D | 11/16/2011 | County (unincorporated) |
| 35027C1850D | 11/16/2011 | County (unincorporated) |
| 35027C1875D | 11/16/2011 | County (unincorporated) |
| 35027C1880D | 11/16/2011 | County (unincorporated) |
| 35027C1885D | 11/16/2011 | County (unincorporated) |
| 35027C1890D | 11/16/2011 | County (unincorporated), Ruidoso |
| 35027C1895D | 11/16/2011 | County (unincorporated), Ruidoso |
| 35027C1910D | 11/16/2011 | County (unincorporated), Ruidoso |
| 35027C1920E | 11/5/2014 | County (unincorporated) |
| 35027C1925D | 11/16/2011 | County (unincorporated) |
| 35027C1940E | 11/5/2014 | County (unincorporated) |
| 35027C1945E | 11/5/2014 | County (unincorporated) |
| 35027C1950D | 11/16/2011 | County (unincorporated), Ruidoso |
| 35027C1965E | 11/5/2014 | County (unincorporated) |
| 35027C1970E | 11/5/2014 | County (unincorporated) |
| 35027C1975D | 11/16/2011 | County (unincorporated) |
| 35027C2000D | 11/16/2011 | County (unincorporated) |
| 35027C2025D | 11/16/2011 | County (unincorporated) |
| 35027C2050D | 11/16/2011 | County (unincorporated) |

| FIRM Panel | Effective Date | Jurisdiction (s) |
|---|---|---|
| 35027C2052D | 11/16/2011 | County (unincorporated), Ruidoso |
| 35027C2055D | 11/16/2011 | County (unincorporated), Ruidoso |
| 35027C2056D | 11/16/2011 | County (unincorporated), Ruidoso |
| 35027C2057D | 11/16/2011 | County (unincorporated), Ruidoso |
| 35027C2058D | 11/16/2011 | County (unincorporated), Ruidoso |
| 35027C2059E | 11/5/2014 | County (unincorporated), Ruidoso, Ruidoso Downs |
| 35027C2066D | 11/16/2011 | County (unincorporated), Ruidoso |
| 35027C2067D | 11/16/2011 | County (unincorporated), Ruidoso |
| 35027C2080E | 11/5/2014 | County (unincorporated), Ruidoso, Ruidoso Downs |
| 35027C2085E | 11/5/2014 | County (unincorporated), Ruidoso Downs |
| 35027C2150D | 11/16/2011 | County (unincorporated) |
| 35027C2175D | 11/16/2011 | County (unincorporated) |
| 35027C2200D | 11/16/2011 | County (unincorporated) |
| 35027C2225D | 11/16/2011 | County (unincorporated) |
| 35027C2250D | 11/16/2011 | County (unincorporated) |
| 35027C2275D | 11/16/2011 | County (unincorporated) |
| 35027C2300D | 11/16/2011 | County (unincorporated) |
| 35027C2325D | 11/16/2011 | County (unincorporated) |

**Flood zones as identified throughout this plan are defined below:**

**Zone A:** The 1% chance event. These floodplains are mapped by approximate methods; Base Flood Elevations (BFE) are not determined. This is often called an unnumbered A zone or an approximate A zone. Because detailed analyses are not performed for such areas, no depths or base flood elevations are shown within these zones.

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

**Zone AH:** Shallow flooding in base floodplain with an average depth ranging from 1 to 3 feet. BFEs are provided.

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

**Zone X (unshaded):** Area determined to be outside the 500-year flood and protected by levee from 100-year flood.

**Zone D:** Area of undetermined but possible flood hazards. No flood hazard analysis has been conducted.

Base Level Engineering (BLE) is used to create engineering models and flood hazard data by combining information from high-resolution ground level data, automated riverine hydrologic and

hydraulic modeling, plus manual modeling review. The engineering models can be used to create several different non-regulatory products such as water surface elevations and the depth grids shown in Section 5.3.2.3. In addition, the digital BLE files can be used for further refinement by each participating jurisdiction or by the development community. For example, flood risk maps, a flood risk report, and a flood risk data base can be produced using the BLE digital data. Using BLE as a basis to strengthen a community's floodplain ordinance would be considered a higher standard than the minimum federal requirements. The flood risk information can be used for as best available data for permitting and planning.

It is important to note that there are some limitations to using the BLE data. For example, BLE data can be used in some circumstances to provide the Base Flood Elevation for a Letter of Map Amendment (LOMA). However, using the BLE data for a Letter of Map Revision (LOMR) or Physical Map Revision, will require engineering costs to process and finalize the information to meet requirements for these types of map changes. Another important limitation, according to the 2018 State Hazard Mitigation Plan is that the "underlying floodplain modeling does not take into account structures, culverts, channels, bridges, and other associated flood mitigation infrastructure".

The Rio Hondo watershed served as the case study in New Mexico for BLE; the initial discovery phase started in 2014 and included the entire watershed in Lincoln County, Chavez County, and on the Mescalero Apache Tribe lands.

### 5.3.2.2 Previous Occurrences

Information from the NCDC indicated that 45 flood events were reported within Lincoln County between January 2010 and January 2023. Figure 5-40 shows previous occurrences per participating jurisdiction with respect to flood event date and areas affected from January 1, 2017, through December 31, 2022, according to the NOAA Storm Events Database. NOTE: The detailed description column is direct event narrative from the NOAA Storm Events Database, in order to convey the most accurate and correct information for each flood event. The previous occurrence listing for flood events prior to January 1, 2017, is found in Appendix B-2; this is the same list that was shown in the 2018 HMP.

**Figure 5-40: 1/1/2017-12/31/2022 Flood - Previous Occurrences (Lincoln County)**

| Flood | Date | Detailed Description |
|---|---|---|
| **Lincoln County**<br>**Village of Ruidoso**<br>**City of Ruidoso Downs** | 2/16/2018 | According to the NWS, there was approximately 2.5 – 3 inches of rain that fell on the Sacramento Mountains and led through Ruidoso and was measured by the gauge. Approximately 189 cubic feet per second (cfs) of discharge was flowing through the Rio Ruidoso at the point of the gauge. |
| **Lincoln County**<br>**Village of Ruidoso**<br>**City of Ruidoso Downs** | 7/14/2018 | According to the NWS, there was approximately 1.5 – 2 inches of rain that fell on the Sacramento Mountains and led through Ruidoso and was measured by the gauge. Approximately 446 cfs of discharge was flowing through the Rio Ruidoso at the point of the gauge. |
| **Lincoln County**<br>**Village of Ruidoso**<br>**City of Ruidoso Downs** | 7/27/2018 | According to the NWS, there was approximately 3 – 4 inches of rain that fell on the Sacramento Mountains and led through Ruidoso and was measured by the gauge. Approximately 192 cfs of discharge was flowing through the Rio Ruidoso at the point of the gauge. |

| Flood | Date | Detailed Description |
|---|---|---|
| **Lincoln County**<br>**Village of Ruidoso**<br>**City of Ruidoso Downs** | 7/30/2018 | According to the NWS, there was approximately 0.75 – 1 inches of rain that on the Sacramento Mountains and led through Ruidoso and was measured by the gauge. Approximately 882 cfs of discharge was flowing through the Rio Ruidoso at the point of the gauge. |
| **Lincoln County**<br>**Village of Ruidoso**<br>**City of Ruidoso Downs** | 8/21/2018 | According to the NWS, there was approximately 1.5 – 2 inches of rain that fell on the Sacramento Mountains and led through Ruidoso and was measured by the gauge. Approximately 247 cfs of discharge was flowing through the Rio Ruidoso at the point of the gauge. |
| **Lincoln County**<br>**Village of Ruidoso**<br>**City of Ruidoso Downs** | 8/22/2018 | According to the NWS, there was approximately 1 – 1.5 inches of rain that on the Sacramento Mountains and led through Ruidoso and was measured by the gauge. Approximately 212 cfs of discharge was flowing through the Rio Ruidoso at the point of the gauge. |
| **Lincoln County**<br>**Village of Ruidoso**<br>**City of Ruidoso Downs** | 8/28/2019 | According to the NWS, there was approximately 1 – 1.5 inches of rain that fell on the Sacramento Mountains and led through Ruidoso and was measured by the gauge. Approximately 172 cfs of discharge was flowing through the Rio Ruidoso at the point of the gauge. This event is also noted in the thunderstorm section |
| **Lincoln County**<br>**Village of Ruidoso**<br>**City of Ruidoso Downs** | 3/13/2020 | According to the NWS, there was approximately 0.5 – 0.75 inches of rain that fell on the Sacramento Mountains and led through Ruidoso and was measured by the gauge. Approximately 173 cfs of discharge was flowing through the Rio Ruidoso at the point of the gauge. |
| **Lincoln County** | 07/19/2020 | Deeper moisture continued spreading into the state as the center of upper-level high pressure over the Four Corners region weakened further on July 19, 2020. Showers and thunderstorms developed during the mid to late afternoon hours along the central mountain chain before drifting southeast into nearby highlands and plains. Several of these thunderstorms produced a quick 1 to 2 inches of rain with minor flooding observed around Pojoaque, Santa Fe, Logan, and the Caprock region. The strongest thunderstorms generated torrential rainfall rates over 2 inches per hour with localized flash flooding in the high terrain west of Ruidoso and west of Corona. $10K in property damage was reported. |

| Flood | Date | Detailed Description |
|---|---|---|
| **Lincoln County** | 08/05/2020 | A backdoor cold front that moved into eastern New Mexico recharged moisture over the region on August 5, 2020. Thunderstorm coverage increased over the area however most activity was light across were able to impact eastern NM. A nearly stationary storm around Bonito Lake caused flash flooding on the Little Bear burn scar. Radar estimated between 1 to 2 inches of rain fell which washed out old debris in the area. $10K in property damages was reported. |
| **Lincoln County**<br>**Village of Corona** | 05/28/2021 | The NASA Columbia Scientific Balloon Facility southeast of Corona measured 5.77 inches of rainfall is a short period of time which caused flash flooding in the area with unpaved roadways washed out. $100K in property damages were reported in NCDC. However, the Village Clerk and staff have no reports of this damage. This event is also noted in the hail section. |
| **Lincoln County** | 05/30/2021 | Heavy rainfall in the Hondo area caused widespread flooding of roads and low water crossings. The Lincoln County emergency manager estimated that the Rio Ruidoso rose 4 to 6 feet quickly while Alamo Canyon Road south of U.S. Highway 70 was completely inundated. One individual was in their truck at Alamo Canyon Road and became stuck in the low water crossing when the flood waters inundated it. The individual then either tried to escape or the flood waters pulled them out of their truck. Tragically, they drowned, and their body was found the next day. Damages are estimated for the loss of the truck. $60K in property damage was reported. |
| **Lincoln County** | 6/30/21 | Heavy rain in the Picacho area in Lincoln County resulted in the flooding along low water crossings across U.S. Highway 70. An individual did attempt to drive their truck into a flooded low water crossing. Fortunately the driver was not hurt, but the truck was submerged and had to be pulled out of the water. Damages are estimated for the loss of the truck. $15K in property damage was reported. |
| **Lincoln County** | 06/30/2021 | Heavy rain near Arabela forced the closure of New Mexico State Road 368 at mile marker 9. The Lincoln County Emergency Manager reported that water was flooding a substantial bridge at mile marker 9. $20K in property damage was reported. |

| Flood | Date | Detailed Description |
|---|---|---|
| **Lincoln County** | 06/30/2021 | Heavy rain near Arabela forced the closure of New Mexico State Road 246 between mile marker 29 and 31.5. The Lincoln County Emergency Manager reported that the flood waters washed away the pavement. $50K in property damage was reported. |
| **Lincoln County**<br>**Village of Ruidoso**<br>**City of Ruidoso Downs** | 7/2/2021 | According to the NWS, there was approximately 1.5 – 2 inches of rain that fell on the Sacramento Mountains and led through Ruidoso and was measured by the gauge. Approximately 172 cfs of discharge was flowing through the Rio Ruidoso at the point of the gauge. |
| **Lincoln County**<br>**Village of Capitan** | 7/3/2021 | Heavy rain near Capitan in Lincoln County resulted in the rapid rise of the Magado Creek near the Capitan Fairgrounds. The Magado Creek rose an estimated 10 feet which caused the flooding of a low water crossing in the area and temporarily trapping two unoccupied vehicles. No injuries or fatalities were reported. Damages are estimated for the damage to the two vehicles. $30K in property damage was reported. |
| **Lincoln County**<br>**Village of Ruidoso** | 07/06/2021 | Heavy rain along the Rio Ruidoso caused water to overflow its banks which resulted in flash flooding alongside the river. Several bridges, such as the Main Road Bridge, Gavilan Canyon Bridge, and the Eagle Bridge were overtopped and damaged. The McDaniel Bridge in Upper Canyon was completely destroyed. The City of Ruidoso opened a community center for displaced residents and visitors. Damages are estimated for the structural damage done to the bridges. The New Mexico Governor declared a state of emergency for Lincoln County as a result of the significant flooding. $750K in property damage was reported. |
| **Lincoln County**<br>**Village of Ruidoso**<br>**City of Ruidoso Downs** | 7/6/2021 | According to the NWS, there was approximately 3 – 4 inches of rain that fell on the Sacramento Mountains and led through Ruidoso and was measured by the gauge. Approximately 3,240 cfs of discharge was flowing through the Rio Ruidoso at the point of the gauge. |
| **Lincoln County**<br>**Village of Capitan** | 7/25/2021 | Video obtained by KOAT Television (TV) showed flash flooding in Angus with fast moving water rushing against a home and leaking underneath the doorway. No significant damages are known, and damages are estimated for minor home flood damage. $20K in property damage was reported. This event is also noted in the hail section. |

| Flood | Date | Detailed Description |
|---|---|---|
| **Lincoln County** | 07/26/2021 | Strong thunderstorms near Encinoso produced an estimated 1.5 to 2 inches of rainfall. This resulted in severe flooding along New Mexico State Road 246 which forced the closure of the roadway from mile marker 18 to mile marker 36. Damages are estimated for the washed out roadway. $10K in property damage was reported. |
| **Village of Ruidoso**<br>**City of Ruidoso Downs** | 8/27/2021 | According to the NWS, there was approximately 0.25 – 0.5 inches of rain that fell southwest of Ruidoso and was measured by the gauge. Approximately 414 cfs of discharge was flowing through the Rio Ruidoso at the point of the gauge. |
| **Lincoln County**<br>**Village of Ruidoso**<br>**City of Ruidoso Downs** | 6/22/2022 | According to the NWS, there was approximately 1.5 – 2 inches of rain that fell on the Sacramento Mountains and led through Ruidoso and was measured by the gauge. Approximately 186 cfs of discharge was flowing through the Rio Ruidoso at the point of the gauge. |
| **Lincoln County** | 7/7/2022 | The Lincoln County Emergency Manager reported that an estimated 1.5 inches over the McBride burn scar caused flooding of Lower Eagle Creek which is also known as NM State Highway 120. Many 6-18 inch diameter boulders flowed over the road along with large segments of burned timber. $50K property damage was reported. |
| **Lincoln County**<br>**Village of Ruidoso**<br>**City of Ruidoso Downs** | 7/25/2022<br>Hollywood, NM | According to the NWS, there was approximately 0.25 – 0.5 inches of rain that fell southwest of Ruidoso and was measured by the gauge. Approximately 725 cfs of discharge was flowing through the Rio Ruidoso at the point of the gauge. |
| **Lincoln County**<br>**Village of Ruidoso**<br>**City of Ruidoso Downs** | 7/28/2022<br>Hollywood, NM | According to the NWS, there was approximately 0.75 – 1 inches of rain that fell southwest of Ruidoso and was measured by the gauge. Approximately 158 cfs of discharge was flowing through the Rio Ruidoso at the point of the gauge. |
| **Lincoln County**<br>**Village of Ruidoso** | 8/9/2022<br>Alto | Heavy rain on the McBride burn scar caused flash flooding along Gavilan Canyon Road near the intersection of Eagle Creek Canyon Road in Ruidoso. $75K in property damage was reported. |
| **Village of Ruidoso**<br>**City of Ruidoso Downs** | 8/9/2022<br>Hollywood, NM | According to the NWS, there was approximately 0.75 – 1 inches of rain that fell west of Ruidoso and was measured by the gauge. Approximately 1230 cfs of discharge was flowing through the Rio Ruidoso at the point of the gauge. |

| Flood | Date | Detailed Description |
|---|---|---|
| **Village of Ruidoso** | 8/20/2022 Alto | The Lincoln County Emergency Manager reported that hours of light, steady rainfall with totals of 1 to 2.5 inches caused burn scar flash flooding on the McBride burn scar near Ruidoso. All of Gavilan Canyon was flooded. $25K in property damage was reported. |
| **Village of Ruidoso**<br>**City of Ruidoso Downs** | 8/20/2022 Hollywood, NM | According to the NWS, there was approximately 1.5 – 2 inches of rain that fell in Ruidoso and was measured by the gauge. Approximately 666 cfs of discharge was flowing through the Rio Ruidoso at the point of the gauge. |
| **Village of Ruidoso**<br>**City of Ruidoso Downs** | 8/21/2022 Hollywood, NM | According to the NWS, there was approximately 1.5 – 2 inches of rain that fell southwest of Ruidoso and was measured by the gauge. Approximately 161 cfs of discharge was flowing through the Rio Ruidoso at the point of the gauge. |

While reviewing the previous occurrences of flood events within Lincoln County up to 2022, there were no floods that occurred within the boundaries of the Village of Capitan, Town of Carrizozo, and the Village of Corona. Although there are no previous or current floods in these jurisdictions, the 1% annual flood risk is always present. The delineation of this hazard area for all assessed communities is shown and discussed in further detail in the below *location and extent* section.

In April 2022, the McBride Fire impacted the county, burning over 6,000 acres and destroying over 200 structures and killing 2 people. The fire resulted in a burn scar where much of Gavilan Canyon Watersheds' vegetation was stripped away. This vegetation was crucial in the retention of water that replenishes the communities' aquifers and lakes which are the primary sources of drinking water. The high intensity fire also created hydrophobic soil conditions, which act as a large waterproof blanket over the landscape and does not allow water to penetrate the soil. Water therefore moved quickly across the landscape, transporting large quantities of sediment as it moves into the watersheds. This contributed to large concentrations of water run-off and flooding within the different tributaries throughout Gavilan Canyon, which destroyed roads, utilities, and structures. The flooding damages have become more catastrophic and costlier than the fire itself, due to the numerous times it has impacted the community and the volume of debris the flood waters transported from the damaged watersheds. These effects are anticipated to keep happening for the next several years, or until the watersheds are stabilized, either naturally through plant revegetation or through human introduction of erosion control and strategic planting.

In many of the burn scars, communities can assist in the watershed stabilization and help reduce the infrastructure damages through efforts of tree sapling planting, seeding, tree contour felling across burned slopes, debris flow barriers, retention ponds or sediment tanks, and connecting the streams and rivers stay to their respective floodplains, which allows for sediment and debris drop out within designated locations. This can be seen with the sediment and debris catchment project located at Gavilan Canyon Road and Warrior Drive, where a designated location was identified for the retention of water, allowing for debris and sediment to "drop-out" of the flood waters to minimize infrastructure damages further down the Gavilan Canyon Creek, i.e., Gavilan Canyon Road Bridge. Without these mitigation measures being constructed, the Gavilan Canyon Road and Gavilan Canyon Road bridge would be destroyed, trapping community members and placing their lives at risk.

A large number of destructive flooding events also occur outside of burn scar areas and result from long live storm cells depositing large amounts of precipitation, often in a short period of time. This can overwhelm watersheds, particularly those under drought conditions, and pose a large risk to communities with high amounts of impermeable surfaces or outdated storm water systems.

Heavy Precipitation and Flooding Events in 2021 and the 2008 flooding that resulted from remnants of Hurricane Dolly, each caused severe damage to roads, bridges, utilities, communication, and structures. These events were the results of slow-moving weather systems depositing large amounts of precipitation over steep slopes and naturally hydrophobic arid soils, resulting in significant run-off and flooding. During these disasters, the wastewater system was compromised which contaminated drinking water wells and the Rio Ruidoso. Debris flow from these events also destroyed multiple bridges. As a result, the community and the affected stakeholders decided to work with Federal and state agencies to mitigate the bridges to a larger size that is capable of handling larger flooding events, and to armor or relocate the waste waters system out of the Rio Ruidoso. These mitigation measures can be seen throughout the Rio Ruidoso, and on bridge replacements such as McDaniel, Main Road, and Gavilan Canyon Road, and the construction of the wastewater lift stations at Sleep Hallow and Main Road. As a result of these floods and other flooding disasters, additional mitigation measures are being utilized to help mitigate infrastructure damages, such as the relocation of utilities out of rivers and ditches, treatment of roads, upsizing of culverts to handle the larger volumes of water, armoring of riverbanks and side of roads with large rip rap to prevent any erosion, and the reconnecting rivers and tributaries to their respective floodplains where possible.

#### 5.3.2.3 Location and Extent per Participating Jurisdiction

**Lincoln County**

Figure 5-41 displays the flood hazard for Lincoln County. The areas north of Captain have category Zone A, which is a 1% annual chance of a flood event occurring. Areas north of Ruidoso are comprised of FIRM Zone AE, which are areas located in close proximity to floodplains. Areas south of Ruidoso are areas of moderate flooding between 100- year and 500- year floods. The Ruidoso Downs also has a small section part of Zone X.

Figure 5-42 displays the overall flood depth elevation for a 1% chance flood event in Lincoln County, produced with Base Level Engineering as described in Section 5.3.2.1. The four towns identified in the flood depth community boundary are Carrizozo, Capitan, Ruidoso and Ruidoso Downs. The largest area for a combined flood depth of 0–5 feet impacts approximately 10,278 acres which is highlighted in a lighter shade of purple. The smallest area has approximately 37 acres impacted by a 40-70 ft flood depth shown in a darker purple color. Three of the towns will be further analyzed by flood hazard and flood depth. The remaining towns will only be analyzed with flood hazard maps.

**Figure 5-41: Flood Hazard for Lincoln County.**

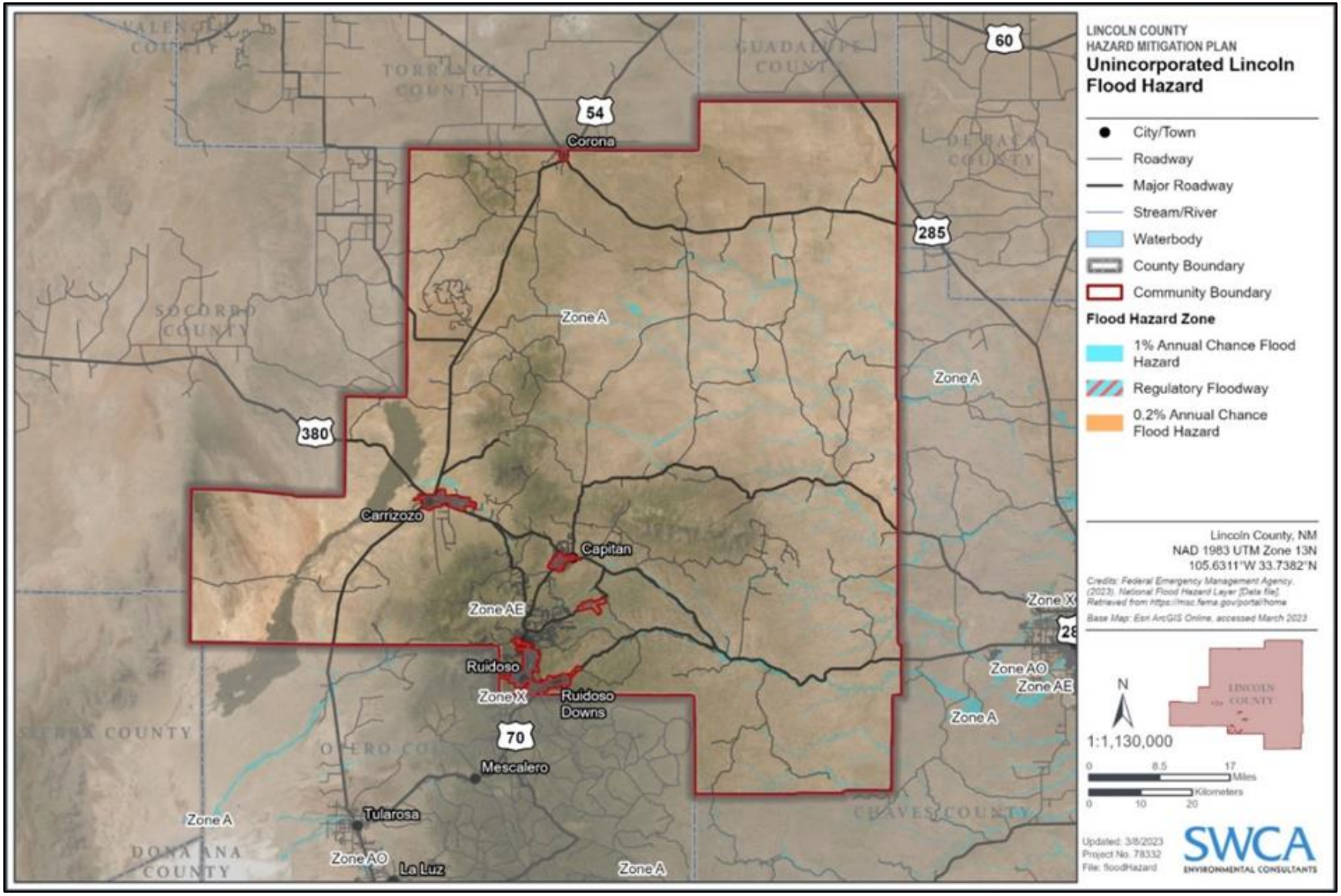
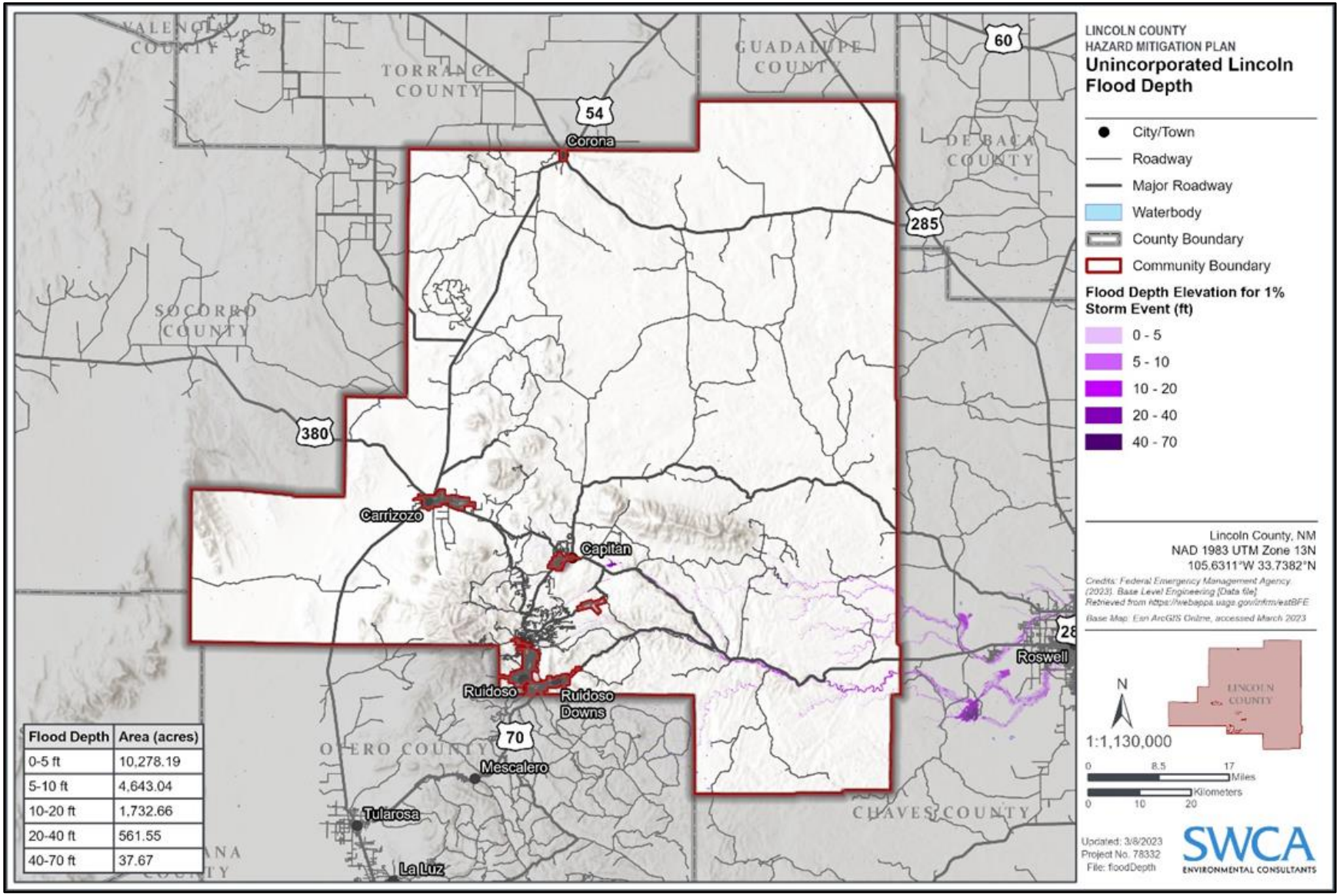


**Figure 5-42: Flood Depth for Lincoln County.**




| Flood Depth | Area (acres) |
|---|---|
| 0-5 ft | 10,278.19 |
| 5-10 ft | 4,643.04 |
| 10-20 ft | 1,732.66 |
| 20-40 ft | 561.55 |
| 40-70 ft | 37.67 |

**Village of Ruidoso**

Similar to Lincoln County, the Village of Ruidoso has the potential to be severely impacted by a flood event. For those who live or own property right on the Rio Ruidoso River or Bonito River, a large flood could have devastating consequences.

The severity of a flood impact to the Village of Ruidoso was shown by the 2008 Flood when hurricane Dolly brought tropical moisture into New Mexico, dumping up to 7 inches of rain around the village. This caused the Rio Ruidoso and Rio Bonito to rise well above flood stage and resulted in widespread and serious flooding around Ruidoso.

According to the FEMA Flood Insurance Study, the following creeks and rivers in the Village of Ruidoso could reach the magnitude shown below:

- Carrizo Creek – 12 feet above the streambed,
- Cedar Creek – 10 feet above the streambed, and
- Rio Ruidoso – 20 feet above the streambed.

With water over 12' above the streambed, Carrizo Canyon would sustain severe damage with 102 homes and businesses destroyed or have major damage; Cedar Creek would have water over 10' above the streambed, causing street flooding and affecting low water crossings. Cedar Creek canyon is narrow and steep with many homes and the USFS office in harm's way. Approximately 25 homes would be inundated with floodwaters at some level. At least 14 of those homes would be significantly damaged or destroyed. The USFS office should have enough elevation to keep from having any floodwater reach the building during a 1% chance event.

Water will be over 20' above the streambed in the Rio Ruidoso. Rio Ruidoso canyon is the most populated area of all the waterways in the Village limits. Over 120 homes and businesses including 7 public bridges would be in harm's way through the Rio Ruidoso Canyon. The Planning Team determined that 25% of those buildings would be severely damaged or destroyed.

In addition to the Flood Insurance Study for Ruidoso (2014), FIRMs, and flood hazard boundary-floodway maps, the Village of Ruidoso adopted a revision to the floodplain ordinance on May 20, 2022. Ordinance 2022-01 is amends the Village of Ruidoso Municipal Code of Ordinance, Chapter 54, Article IV, Section 54-237: Basis for Establishing Areas of Special Flood Hazard. The amendment to the ordinance includes "additional resources can be used by the Floodplain Manager for the purpose of issuing a *floodplain permit or determining floodplain BFE's or other required floodplain determination elements.*

*a) Estimated Base Flood Elevation (estBFE) Viewer*

*b) Interagency Flood Risk Management (inFRM) tools"*

The estBFE Viewer (available at https://webapps.usgs.gov/infrm/estBFE/) is an interactive web portal that includes estimate BFE and approximate flood depths determined from gridded datasets constructed from engineering flood models. The flood data may be used in conjunction with the FIRMs. Additionally, the users of the estBFE viewer web portal could view the flood risk (high, moderate, low) throughout different watersheds in a user-specified area, which have been assessed using BLE methods (explained further in Section 5.3.2.1). Users of the estBFE viewer web portal should consult the effective FIRMs and coordinate with local community officials to review flood risk information in the area of concern.

In 2014, FEMA sponsored an initiative to allow various federal agencies to integrate and engage in communication across the following states: Texas, Oklahoma, New Mexico, Louisiana, and Arkansas. This initiative incorporated efforts from FEMA, USACE, USGS, and the NWS to partner and develop the group known as the inFRM team. Each of these agencies specialize in various elements of flooding and provide a variety of tools and/or products, for example: FEMA – standards, mapping products; USACE – watershed and planning studies, watershed regulation; USGS – water quantity and water quality monitoring and analysis; NWS – precipitation estimates, real-time forecasting and precipitation products.

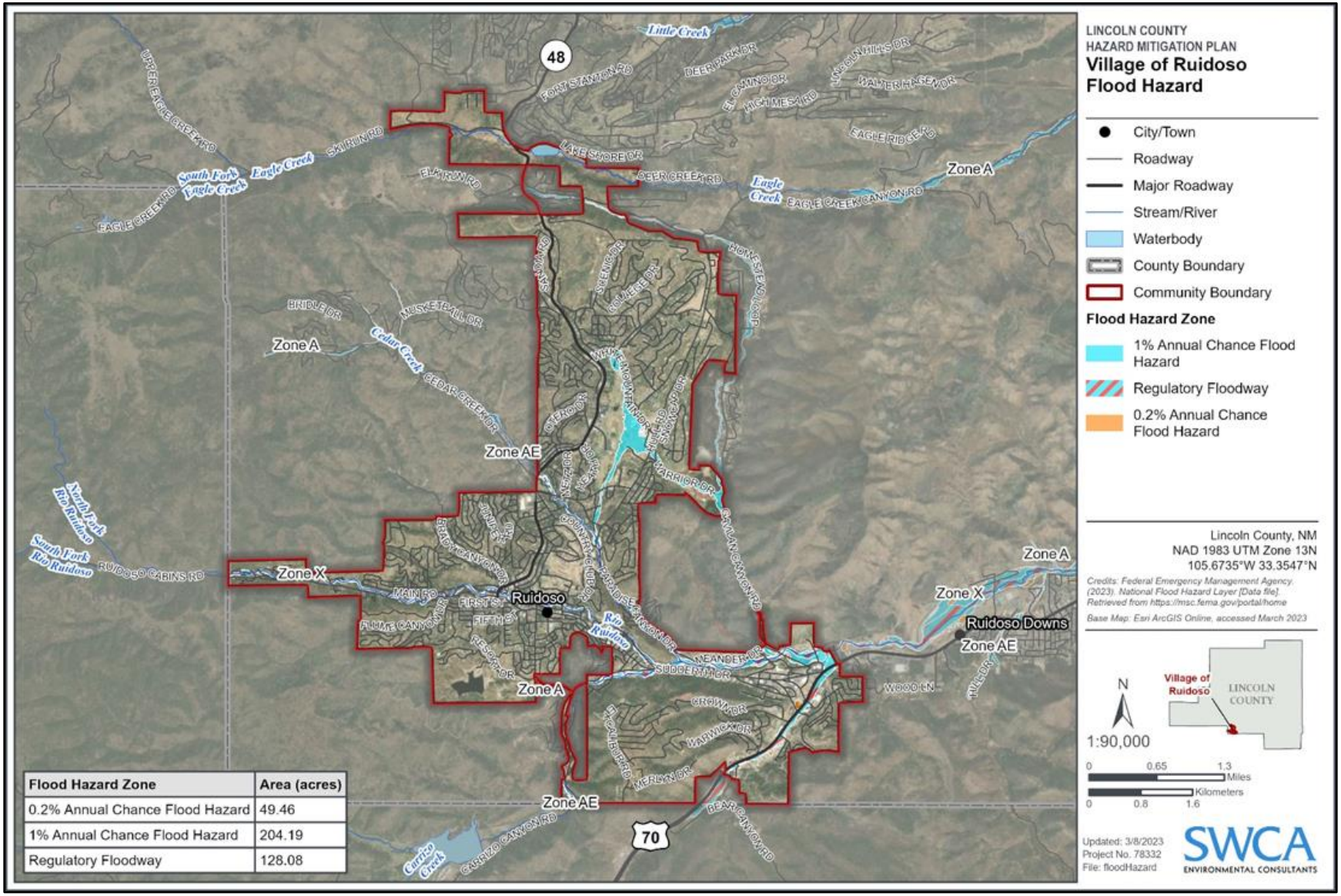
Figure 5-43 displays the flood hazard zones for the Village of Ruidoso. The Regulatory Floodways follows the Rio Ruidoso and other creeks or small channels that flow within the Ruidoso community boundary. This has an impact area of approximately 128 acres and can be shown in the turquoise color with red dashes. Anything outside the regulatory floodway is shown in a turquoise color for a 1% chance flood hazard or an orange color that has a 0.2% chance flood hazard. These flood hazard zones typically follow the same path as the regulatory floodway, they just exceed the boundaries. A 1% chance flood could impact approximately 204 acres and a 0.2% chance flood could impact approximately 49 acres.

Figure 5-44 displays the flood depth elevation for a 1% chance flood event within the Village of Ruidoso produced with Base Level Engineering as described in Section 5.3.2.1. The largest area impacted is approximately 274 acres and could have a flood depth between 0-5ft. The area impacted with a 5-10ft flood depth is approximately 26 acres. The smallest area impacted is approximately 2 acres and could have a flood depth between 10-20ft. The majority of the areas have a flood depth impact of 0-5ft and are shown in the lighter shade of purple and follow the Rio Ruidoso and smaller creeks.

The Village also owns and operates the Sierra Blanca Regional Airport. The floodplain does not interfere or cross within the boundary of the airport. Therefore, there is no immediate risk of flooding occurring. Figure 5-45 displays the flood hazard zones for the Sierra Blanca Regional Airport.

There is no mapped flood depth for the Sierra Blanca Regional Airport due to the absence of any flood hazard occurring within this jurisdiction. However, there remains a 1% chance storm event for the 100-year flood event, if the Rio Bonito or Little Creek were to overflow and cross within the boundaries of this jurisdiction.

**Figure 5-43: Flood Hazard for Village of Ruidoso.**




| Flood Hazard Zone | Area (acres) |
|---|---|
| 0.2% Annual Chance Flood Hazard | 49.46 |
| 1% Annual Chance Flood Hazard | 204.19 |
| Regulatory Floodway | 128.08 |

**Figure 5-44: Flood Depth for Village of Ruidoso.**

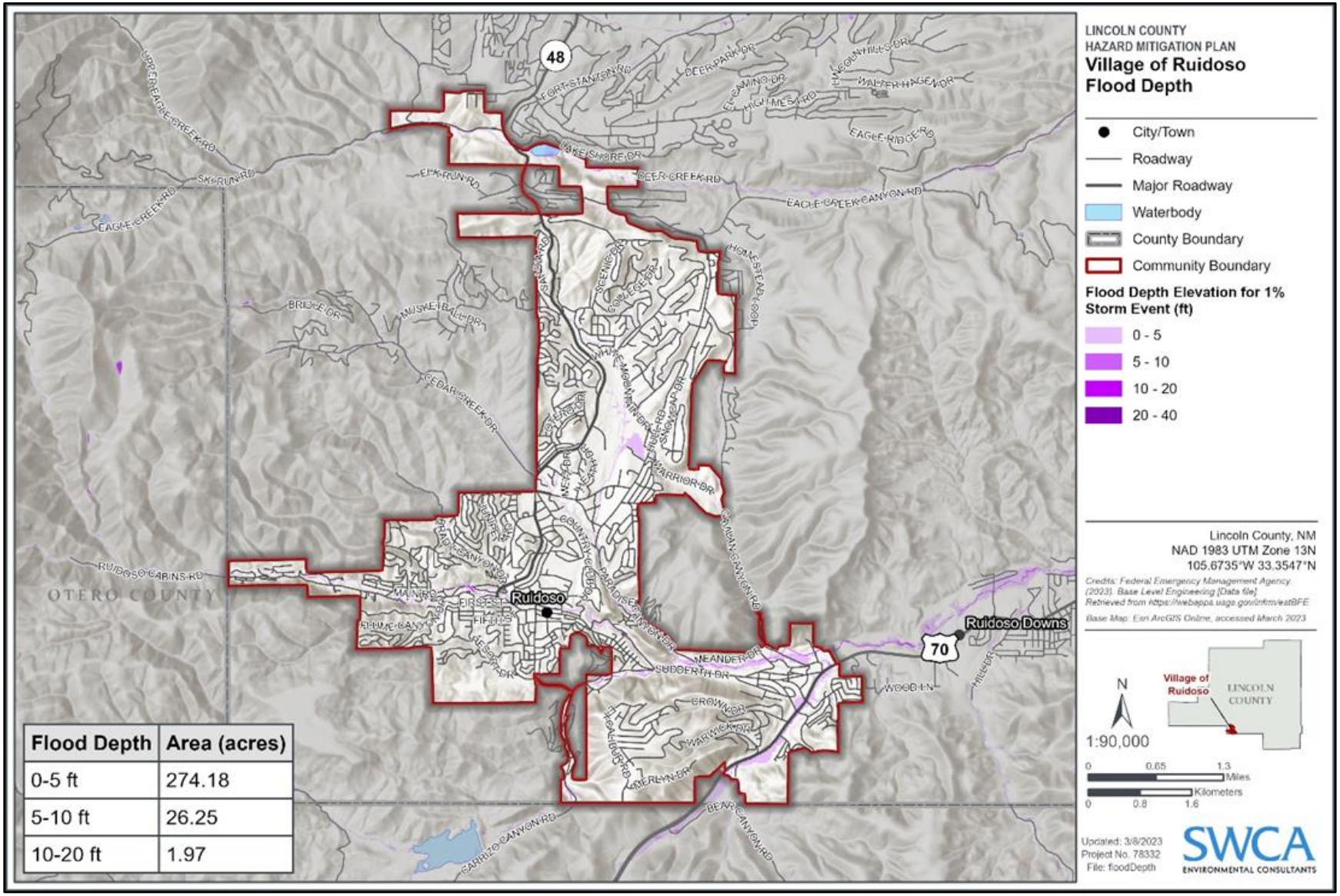
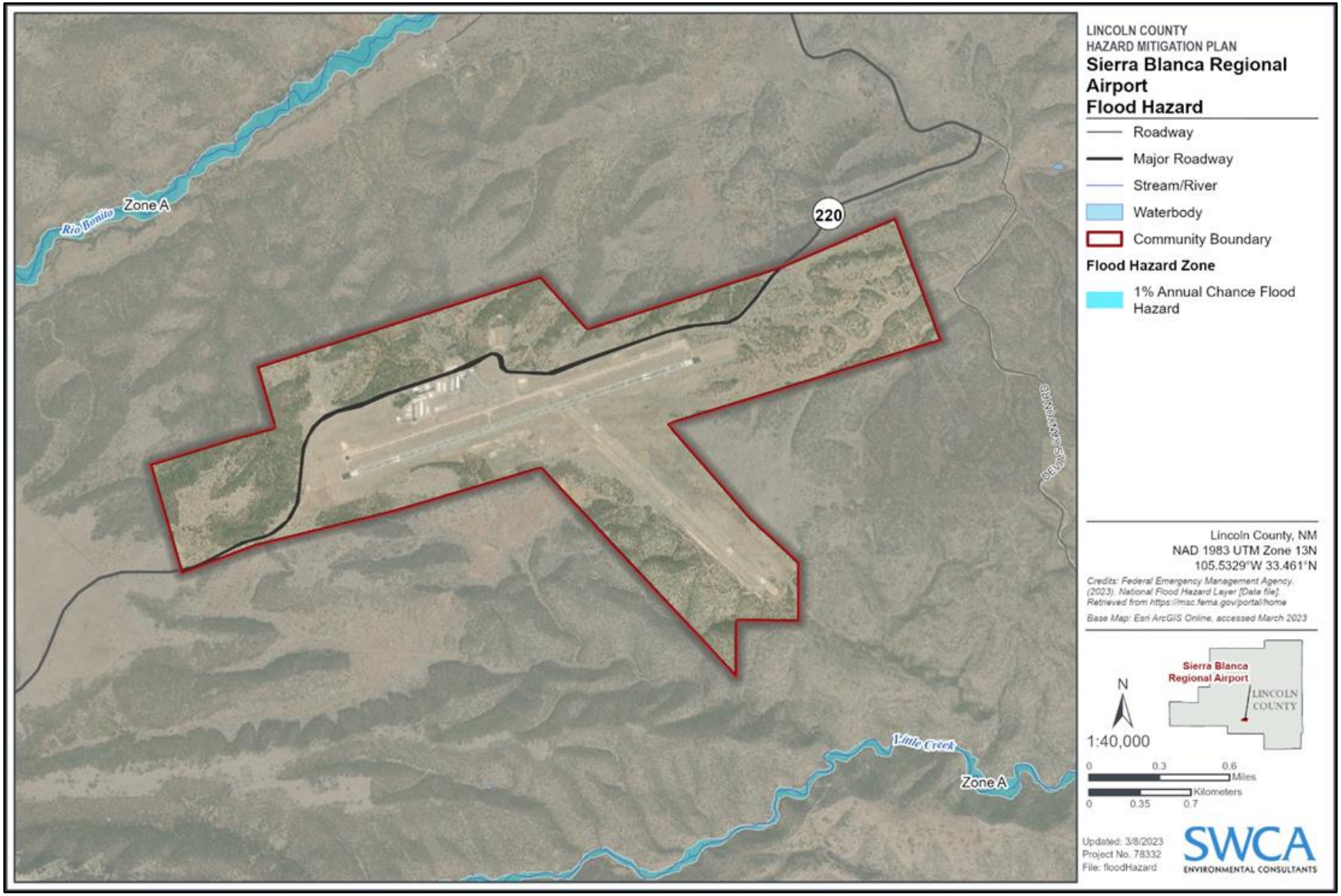


**Figure 5-45: Flood Hazard for Sierra Blanca Regional Airport.**



**City of Ruidoso Downs**

According to the FEMA Flood Insurance Study, the following river in the City of Ruidoso would potentially reach the magnitude on the following, shown below:

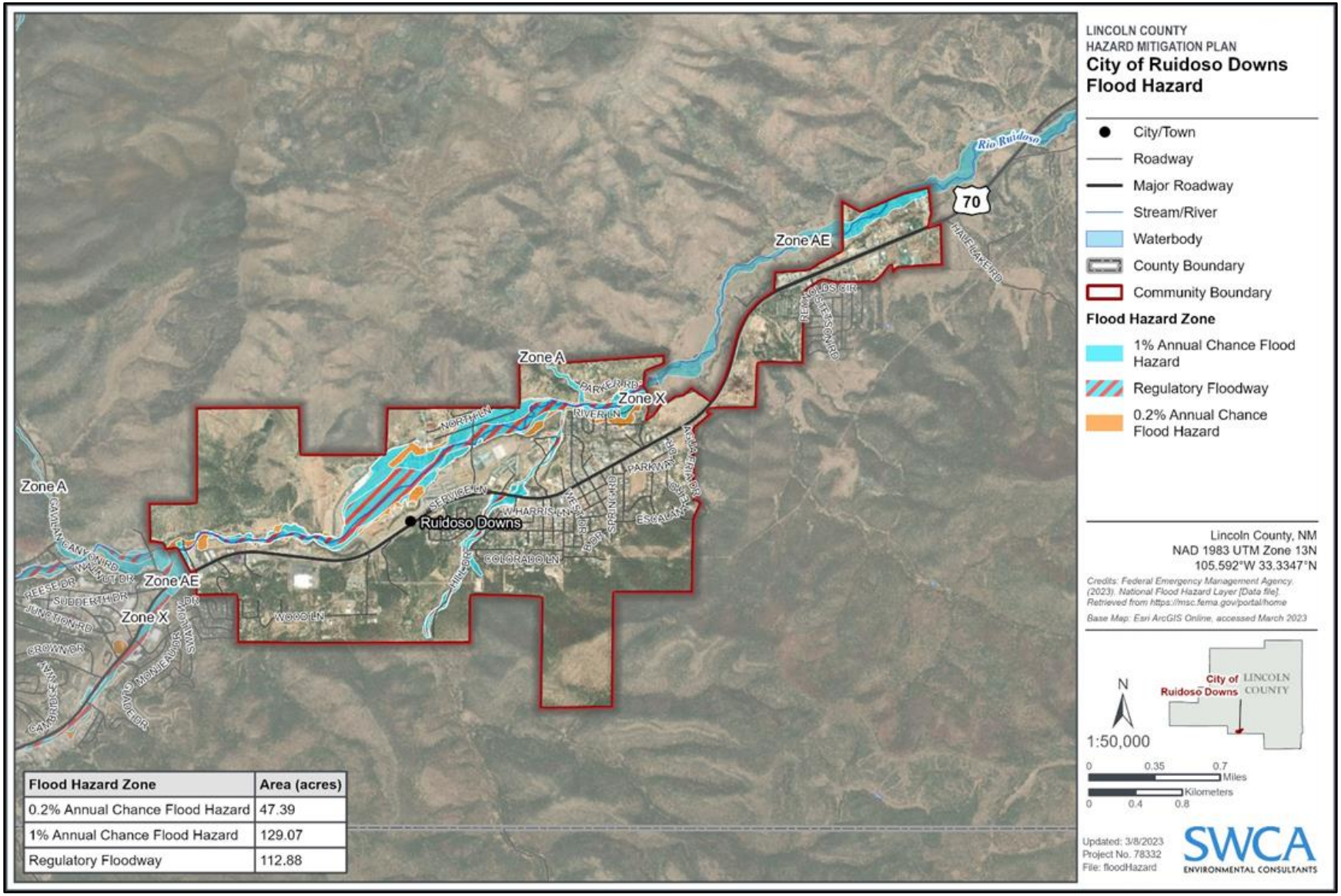
- Rio Ruidoso – 10’ -20’ above the streambed.

Approximately 89 homes were impacted by street flooding, low water crossings, and the Ruidoso Downs Racetrack would be inundated with floodwaters. According to the Planning Team, 25% of those structures would be severely damaged or destroyed.

Figure 5-46 displays the flood hazard for the City of Ruidoso Downs. The majority of the area impacted by a flood hazard zone falls just outside the regulatory floodway. This area follows along the Rio Ruidoso has approximately 129 acres and is shown in turquoise. The regulatory floodway has a turquoise color with red dashes and impacts approximately 112 acres also following the Rio Ruidoso. The 0.2% chance flood zone impacts roughly 47 acres and is shown in orange on the figure.

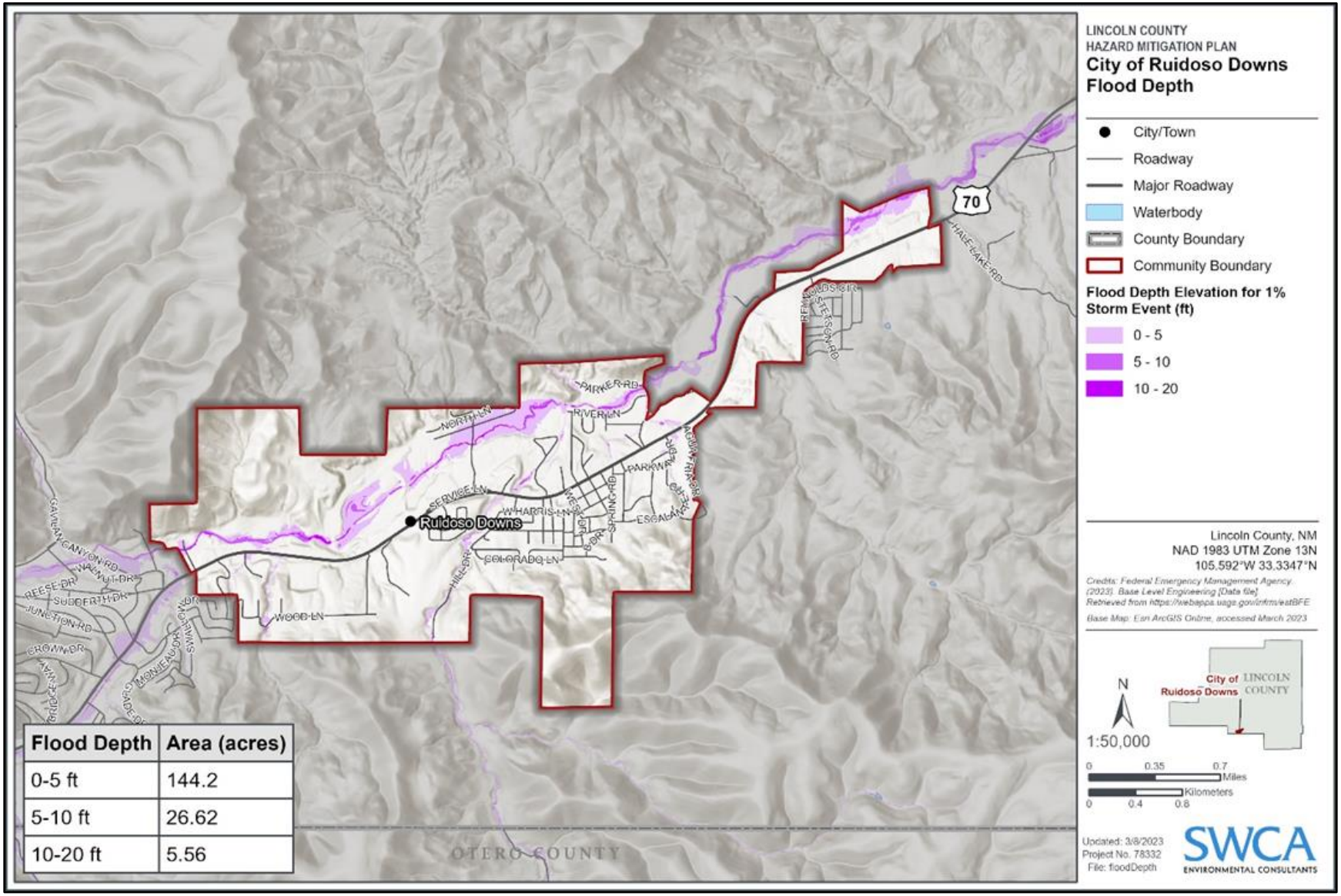
Figure 5-47 displays the flood depth elevation for a 1% chance flood event within the City of Ruidoso Downs, produced with Base Level Engineering as described in Section 5.3.2.1. The largest area impacted is approximately 144 acres and could have a flood depth between 0-5ft. The area impacted with a 5-10ft flood depth is approximately 26 acres. The smallest area impacted is approximately 5 acres and could have a flood depth between 10-20ft. Majority of the areas with a flood depth impact of 0-5ft are shown in the lighter shade of purple and follow the Rio Ruidoso.

**Figure 5-46: Flood Hazard for the City of Ruidoso Downs.**




| Flood Hazard Zone | Area (acres) |
|---|---|
| 0.2% Annual Chance Flood Hazard | 47.39 |
| 1% Annual Chance Flood Hazard | 129.07 |
| Regulatory Floodway | 112.88 |

**Figure 5-47: Flood Depth for the City of Ruidoso Downs.**



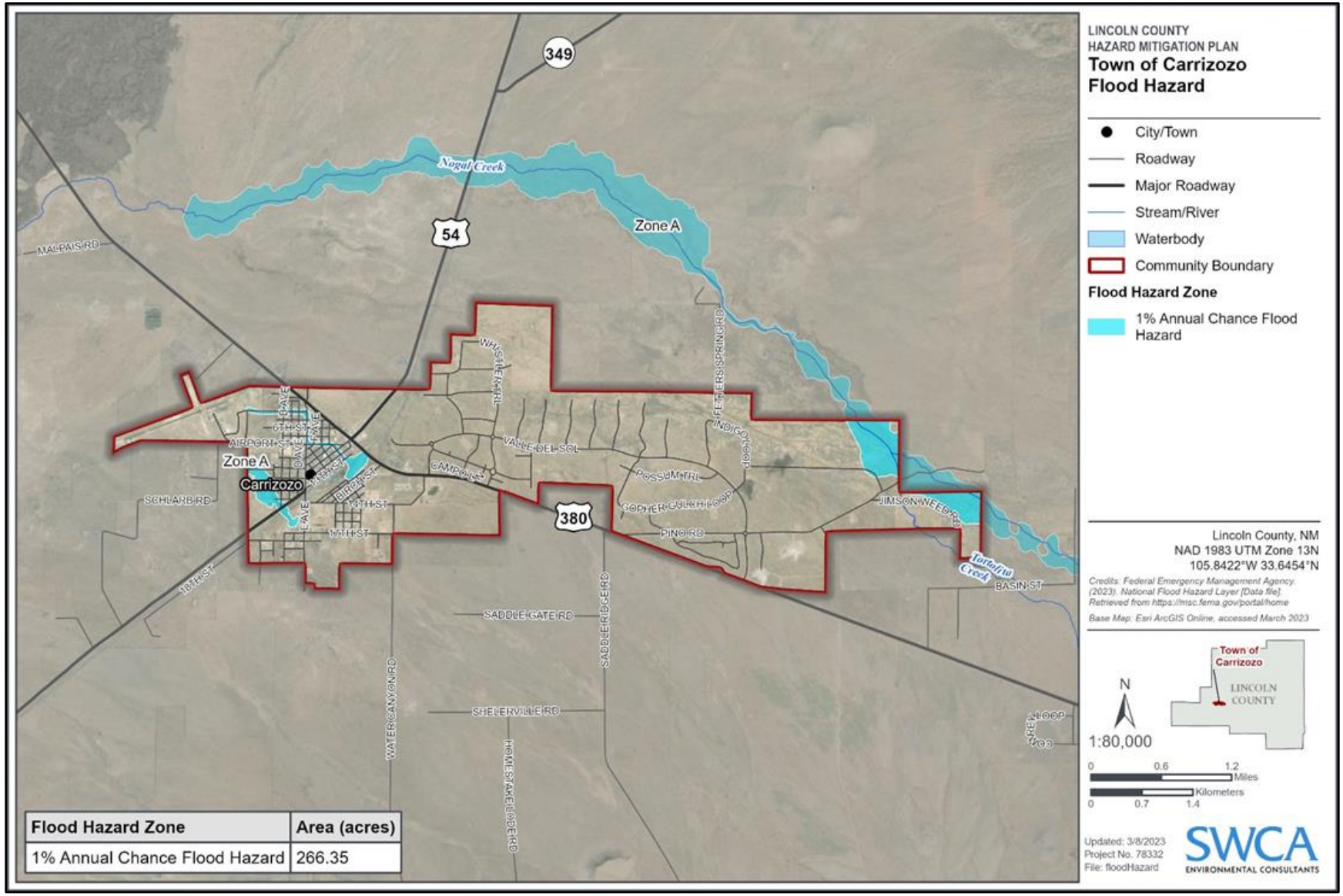
**Town of Carrizozo**

Figure 5-48 displays the flood hazard for the Town of Carrizozo. Throughout this jurisdiction there is an area (approximately 266 acres) that sees a 1% annual chance of a flood hazard occurring. There are two areas within the town that are flood hazard areas. There is also one area east of the town that is a flood hazard area due to the adjacent waters from the Nogal Creek. There are 0 acres of the regulatory floodway present in this jurisdiction.

Due to the low probability of an accumulation of flood depth occurring, there is no map displaying the flood depth for the Town of Carrizozo. Although, there is always that 1% chance storm event for the 100-year flood event.

Carrizozo Planning Team Members report that the Court House and some businesses on Central Avenue had flood damages in the past. The Town was proactive in implementing an $8.6 million highway improvement project to avoid future flooding of these structures. New Mexico Department of Transportation (NMDOT) funded the project, and it was completed in May 2023. A second street and drainage improvement project is being implemented to avoid flooding in Town Hall (intersection of 9$^{th}$ Street and Court Street). NMDOT is also funding this $293,000 project with completion in the fall 2023.

**Figure 5-48: Flood Hazard for the Town of Carrizozo.**



**Village of Capitan**

Figure 5-49 displays the flood hazard for the Village of Capitan. Throughout this jurisdiction there is an area (approximately 96 acres) that sees a 1% annual chance of a flood hazard occurring. There are no acres of the regulatory floodway present.

Figure 5-50 displays the flood depth elevation for 1% chance flood event for the Village of Capitan, produced with Base Level Engineering as described in Section 5.3.2.1. There is a presence of an area (approximately 8 acres) that displays 5 to 10 feet flood depth elevation for a 1% chance storm event east and southeast of the jurisdiction. There is also an area (approximately 26 acres) that displays 0 to 5 feet flood depth elevation for a 1% chance storm event.

According to the Capitan Fire Chief, approximately 10 years ago there was one fatality when someone drove across a flooded arroyo and their truck was swept downstream.

**Figure 5-49: Flood Hazard for the Village of Capitan.**

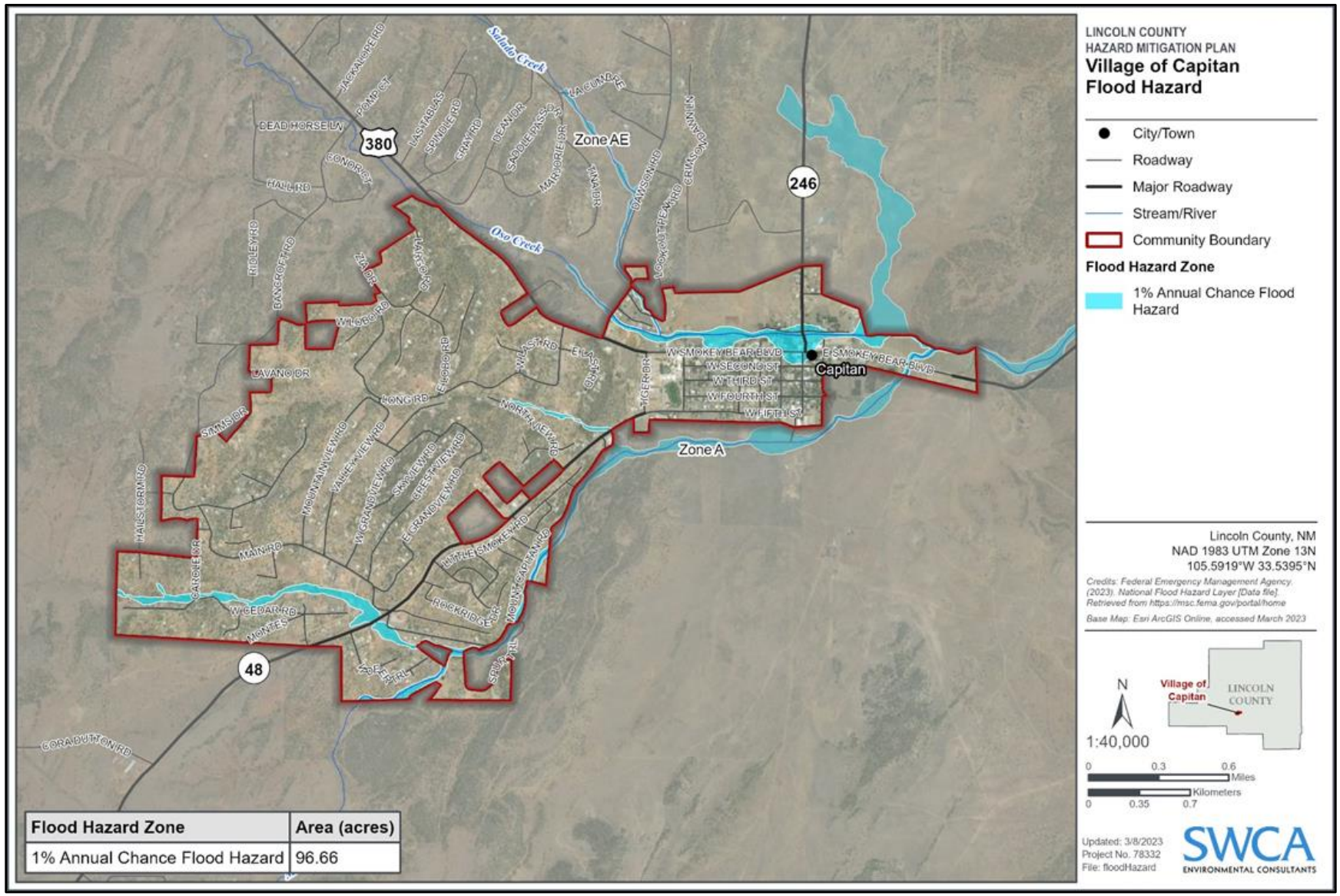
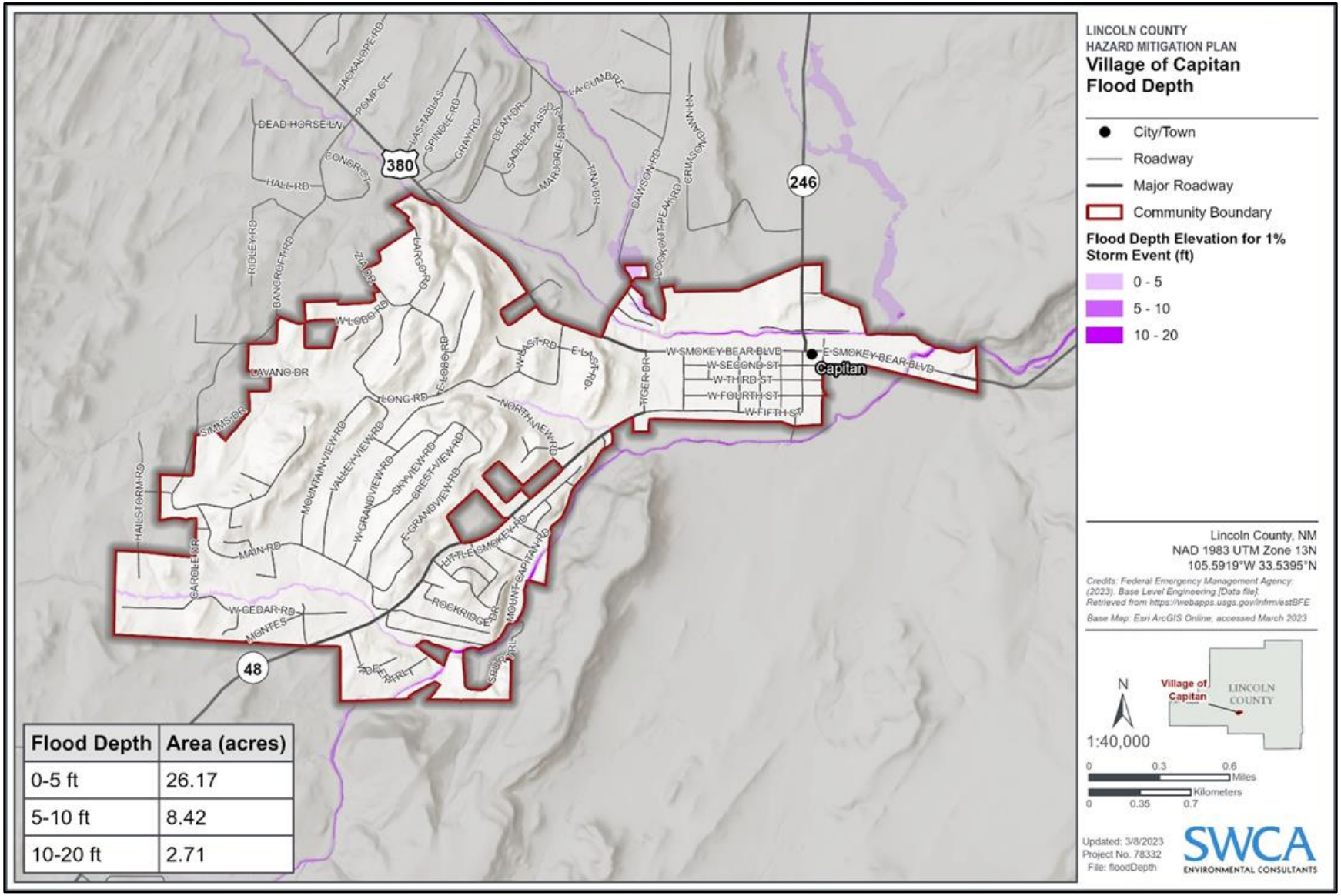


**Figure 5-50: Flood Depth for the Village of Capitan.**



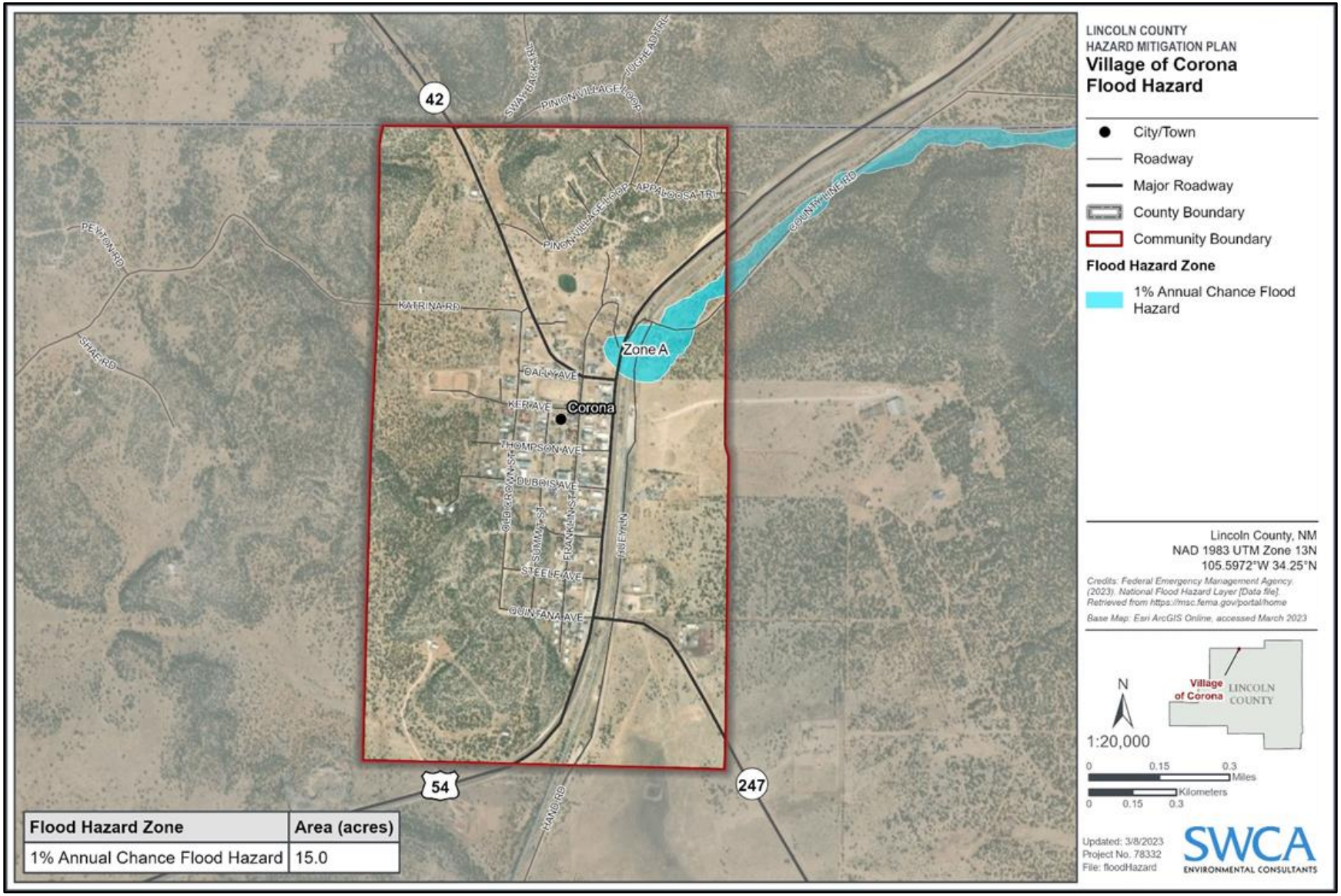

| Flood Depth | Area (acres) |
|---|---|
| 0-5 ft | 26.17 |
| 5-10 ft | 8.42 |
| 10-20 ft | 2.71 |

**Village of Corona**

Figure 5-51 displays the flood hazard for the Village of Corona. Throughout this jurisdiction there is an area (approximately 15 acres) that sees a 1% annual chance of a flood hazard occurring. There are 0 acres of the regulatory floodway present. Due to non-regulatory data not being available, there is no map displaying the flood depth for the Village of Corona. Although, there is always a 1% chance that Zone A will flood in any 365-day period.

The Planning Team representative for the Village of Corona confirmed that there is no record of flooding and no damages, even though the NCDC includes a statement about '$100,000' in damages. Due to this lack of flood occurrence and impact, the Village chose to not profile flood. The Village considers flood to be a 'nuisance' hazard.

**Figure 5-51: Flood Hazard for the Village of Corona.**



#### 5.3.2.4 Probability of Occurrence

When calculating Flood probability, the Planning Team agreed to use the PRI, explained further in Figure 5-110. Probability in Figure 5-52 below is calculated from the following criteria:

- Unlikely means no events were recorded from 2017 through 2022. This results in 0-16.65% annual probability.
- Possible means 1 to 2 events were recorded from 2017 through 2022. This results in between 16.66% and 33.33% annual probability.
- Likely means 3 to 4 events were recorded from 2017 through 2022. This results in between 33.34% and 66.67% annual probability.
- Highly Likely means 5 or more events were recorded from 2017 through 2022. This results in between 66.68% and 100% annual probability.

In addition to the general definitions used for the PRI, the Planning Team analyzed the annual probability for 2017 to 2022 and over time based on available records for each hazard. The total number of occurrences was divided by the number of years of available data; for Flood, there were 26 years of data. The annual probability for 2017 to 2022 and over time is shown below. Annual probability is calculated based on the number of occurrences divided by the number of years of data and presented as a percent anticipated to occur in 1 year. By comparing the annual probability from the past 6 years with that of all records over time, the Planning Team can consider potential changes over time, including potential impacts due to climate change. For example, the analysis revealed that there was an increase in annual probability for the County, Ruidoso, Ruidoso Downs, and Capitan when reviewing the past 6 years of data in comparison to all 26 years of data. It is understood that record keeping has improved over the years and that Annual Probability over time as presented here may not be an accurate accounting.

**Figure 5-52: Flood Hazard Probability of Occurrence**

| | Flood Hazard Probability Based on Previous Occurrence | | | | |
|---|---|---|---|---|---|
| **Jurisdiction** | **Past Occurrences 2017-2022** | **Probability 2017-2022 (Used in PRI)** | **Annual Probability 2017-2022** | **All recorded Occurrences 1996-2022** | **Annual Probability 1996-2022** |
| Lincoln County | 23 | Highly Likely | 100% (383%) | 61 | 100% (234%) |
| Village of Ruidoso | 20 | Highly Likely | 100% (333%) | 25 | 96% |
| City of Ruidoso Downs | 17 | Highly Likely | 100% (283%) | 2 | 7.7% |
| Town of Carrizozo | 0 | Unlikely | 0% | 0 | 0% |
| Village of Capitan | 3 | Likely | 50% | 5 | 19.2% |

#### 5.3.2.5 Climate Change Impacts

A major climate change concern pertaining to flooding is the cyclical nature of drought-wildfire-flood caused by disturbances to the water cycle. As discussed in the cascading events section, as the southwest generally trends toward aridification in the face of a changing climate, severe, long-lived drought will become more normal. This will cause declining forest health which will lead to more frequent, high intensity wildfires that strip the landscape of soil-supporting vegetation. Following fire and severe drought,

the soil will become hydrophobic leaving it extremely vulnerable to transport when storms move through the county. The reduction in water absorption potential creates ideal conditions for flash flooding.

Climate change is anticipated to result in more sporadic, large storm events that carry unpredictable amounts of precipitation. Storm cells are also anticipated to move slower in many cases, impacting larger areas as they move across the landscape. For Lincoln County, this will result in higher occurrences of flash flooding and sediment transport. With warming average temperatures, snowpack and winter storm occurrences are anticipated to decrease. This will result in earlier runoff and earlier occurrence of high elevation rain. These combined factors can overwhelm watersheds creating hazardous floodplain conditions. Additionally, continued flood events can result in high accumulation of sediment that can reduce the effectiveness of dams, block culverts, and create blockages for storm water infrastructure. Continued sedimentation in channels and floodplains reduces their ability to slow and hold water. This exacerbates conditions for future flooding and reduces the amount of water that is absorbed into subsurface aquifers, reducing community water supplies.

All participating jurisdictions aside from Carrizozo and Ruidoso Downs experienced increased frequency of flood events during the assessment period compared to the recorded history which began in 1996. Unincorporated Lincoln county, Ruidoso, Capitan, and Corona all experienced an increase of at least 60% in flood frequency. Many factors are at play that can contribute to this increase including impervious surface development, floodplain alterations, natural climatic fluctuations such as La Nina and El Nino, and human-caused climate change. As discussed above, climate change has resulted in changes to the weather and water cycles that can cause an increase in flood events and flash floods.

## Acequias

The Planning Team deemed acequias as an important attribute to Lincoln County and agreed that acequias need to be recognized in the HMP. Acequias are vital to the County economic viability and critical entities to the success of agriculture in Lincoln County. Agriculture is a large economic engine for Lincoln County. The Planning Team agreed to include acequias in this plan because flooding, flash flooding, and wildfires impact acequias. Many of the past flood events have washed out dams, ditches and underground pipes belonging to acequia associations. The acequia representatives did not wish to mitigate any hazards at this time but later they will participate in the update meetings and bring necessary projects to the team for consideration.

Acequias encompass more than being community ditches, they are a way of life, providing a social structure on how to live harmoniously with the land and with one another. They are recognized under New Mexico law as political subdivisions of the state. Many of the state's acequia associations have been in existence since the Spanish colonization period of the seventeenth and eighteenth centuries. Historically, they have been a principal local government unit for the distribution and use of surface water. The associations have the power of eminent domain and are authorized to borrow money and enter into contracts for maintenance and improvements. Acequia associations do not have the power to tax, so the expenses of maintenance and improvements are borne by the individuals served by the irrigation system.[1]

There are 85 acequia associations in Lincoln County (see Appendix E). For the 2023 Update, the Planning Team agreed to utilize publicly available acequia data from the New Mexico Resource Geographic Information site. The acequias are located in the drainages of Rio Bonito, Rio Hondo, and Rio Ruidoso. Each of these acequias consists of take-outs, retention ponds, dams, head gates, ditches, and similar.

[1] http://www.ose.state.nm.us/Acequias/isc_acequias.php

The Rio Bonito begins in the Sacramento Mountains with many tributaries coming together at Bonito Lake. From the lake the Rio Bonito runs east through Ft Stanton and on to a confluence with the Rio Ruidoso to form the Rio Hondo near Hondo, NM. Twenty Acequias are on the Rio Bonito from Government Spring to the confluence with the Rio Ruidoso. Numerous crops and livestock pastures are irrigated from the Rio Bonito acequias.

- The Rio Ruidoso begins in the Sacramento Mountains near Sierra Blanca and travels southeast from Sierra Blanca through the Mescalero Apache Reservation on to the Village of Ruidoso. From there the Rio Ruidoso travels east to the confluence with the Rio Bonito to form the Rio Hondo. Forty-two (42) acequias are on the Rio Ruidoso from Ruidoso to the confluence with the Bonito. Numerous crops and livestock pastures are irrigated from the Rio Ruidoso acequias.
- The Rio Hondo begins at the confluence of the Rio Bonito and the Rio Ruidoso and runs east to the county line. Eighteen (18) acequias are on the Rio Hondo from the confluence to the county line. Numerous crops and livestock pastures are irrigated from the Rio Hondo acequias.

### *5.3.3 Thunderstorms*

The Thunderstorm Profile includes a subsection on Thunderstorms, Lightning, and Hail.

#### 5.3.3.1 Description

Thunderstorms are produced when warm air near the ground rises due to surrounding cooler air or geographic force such as a mountain. As the air rises, it eventually transfers this heat into the atmosphere and the water carried with it condenses and forms clouds. The cloud continues to grow and rise as it interacts with freezing upper atmospheric air. Once the cloud has accumulated sufficient water, it will begin to fall, creating a downdraft that pushes cold air outward from the storm. Generally, upper tropospheric "air mass" thunderstorms form on warm-season afternoons and are not severe. 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. "Dry" thunderstorms are very common in the western U.S. including New Mexico. These events are characterized by rain that evaporates before reaching the ground and high lightning occurrences (NWS, 2022).

The NWS definition of a severe thunderstorm is a thunderstorm that produces hail 1 inch in diameter or more or winds gusting over 58 miles per hour (mph). Typical thunderstorms can be 3 miles wide at the base, rise to 40,000 to 60,000 feet into the troposphere, and contain 500,000 tons of condensed water. Severe thunderstorms are reported each year in all New Mexico counties.

For the purposes of storm reporting by NOAA, Lincoln County is often divided into 4 Public Forecast Zones: 1) Upper Tularosa Valley (Chihuahuan desert) which encompasses the community of Carrizozo, 2) South central mountains which contains Ruidoso, Ruidoso Downs, and Capitan, 3) South Central Highlands which includes Corona, 4) Eastern Plains and prairie. This zoning is done to account for differences in elevation and water proximity that may result in differences in observed weather. Some previous events were recorded down to zone level. In those instances, it was assumed that the weather event impacted each community falling within that forecast zone unless specified otherwise.

#### 5.3.3.2 Previous Occurrences

Thunderstorm frequency is measured in terms of incidence of thunderstorm days or days on which thunderstorms are observed. The NCDC reports 28 thunderstorm events since July 1989 causing 0 deaths, 0 injuries, and no recorded property damage. Between 2017 and 2022, the NCDC recorded eight thunderstorm events resulting in no loss of life, injury, or property damage. In some instances, the NCDC

records events in multiple hazard categories such as hail that occurred concurrently with a thunderstorm. For consistency, and to eliminate double counting, these occurrences were only counted once for each community that was impacted. It is also worth noting that some events correlated with other hazard events (a severe thunderstorm that caused flash flooding). In these instances, the event was recorded for each hazard and did not result in double counting and probability changes. Figure 5-53 includes the thunderstorm previous occurrence from January 1, 2017, through December 31, 2022. The previous occurrence listing for thunderstorms prior to January 1, 2017, is found in Appendix B-3; this is the same list that was shown in the 2018 HMP.

**Figure 5-53: Previous Occurrences of Thunderstorm per Jurisdiction, January 1, 2017, through December 31, 2022**

| Location | Date | Detailed Description |
|---|---|---|
| Southwest Lincoln County Carrizozo | 07/05/2017 | A thunderstorm that developed along the Sacramento Mountains moved west off the high terrain into the Tularosa Valley. A mesonet site on White Sand Missile Range, on the western border of the county, reported a peak wind gust up to 61 mph as the boundary crossed the area. Mesonet sites are weather stations not federally owned that report data to the NWS. |
| Southwest Lincoln County | 10/05/2017 | Heavy rainfall impacted eastern New Mexico, 4 to 6 inches of rain fell within the Pecos Valley along the eastern edge of the county. Three-day total rainfall amounts of 3 to 8 inches were reported across eastern New Mexico including high wind and hail. The storms resulted in flooding in locations including at the southwest border of the county. |
| Southwest Lincoln County Carrizozo | 07/31/2018 | Severe thunderstorms that formed over the north-central part of the state moved south throughout the day and into the county. These storms produced large hail and heavy rainfall around Carrizozo. Wind gusts of 60-70 mph were recorded at the White Sands Missile Range. |
| South Lincoln County Ruidoso | 05/14/2019 | Isolated showers and thunderstorms developed over central and eastern New Mexico. Most of this activity produced little to no rainfall with very gusty winds. A dry microburst impacted the community of Alto during the early afternoon, just north of Ruidoso, and resulted in damage to one home. One homes roof was partially removed by the gusting wind. |
| Oscura, Southwest Lincoln County<br>Sierra Blanca Regional Airport, South Lincoln County | 05/26/2019 | Dry showers and thunderstorms with strong downburst winds first developed along the Continental Divide before moving east into the Rio Grande Valley. Showers and thunderstorms quickly became severe with large hail, high winds, and several tornados. West of Oscura reported gusts up to 74 mph during the event while Sierra Blanca Airport reported 60 mph winds. |

| Location | Date | Detailed Description |
|---|---|---|
| Southcentral Lincoln County<br>Ruidoso | 08/21/2019 | Two public weather stations in Ruidoso reported rainfall rates near 10 inches per hour from a strong thunderstorm moving slowly east through the area. One station picked up 3.48 inches of rainfall in less than 1 hour, which resulted in minor flooding on the Rio Ruidoso and in Ruidoso. |
| Ruidoso | 8/28/2019 | A storm that formed over the Village of Ruidoso significantly impacted the region resulting in flooding. 2-3 inches fell in under an hour, overwhelming the soil and drain systems. Some areas near the village reported precipitation rates of about 10 inches in an hour as the storm moved east. This event is also noted in the flood section. |
| Carrizozo, West central Lincoln County | 06/23/2020 | Storms initially formed early in the afternoon over the northern high terrain of New Mexico before moving east-southeast into the Rio Grande Valley and eastern plains. The most intense thunderstorms were across the eastern plains where storms produced large hail and damaging winds. Sustained winds of up to 63 mph were recorded in Carrizozo. |

Source: Storm Events Database | National Centers for Environmental Information (noaa.gov)

#### 5.3.3.3 Thunderstorm Extent

Thunderstorms may have different characteristics in different regions of the state. Across the eastern plains, thunderstorms tend to be more organized, long-lived, and occasionally severe, producing large hail, lightning, 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. This general trend is consistent with the thunderstorm events observed in the county. The western portion, including Ruidoso, Ruidoso Downs, Capitan, and Carrizozo, is often subject to down sloping thunderstorms that move west to east and can result in large precipitation totals in short periods of time. The eastern and northern portion of the county, including Corona, experiences storms more consistent with the eastern plains. Slower moving storms often originate over the central mountain range to the northwest of county before moving southeast with high amounts of wind.

#### 5.3.3.4 Lightning

**Description**

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 the flow of electrical current from cloud to cloud or cloud to ground. Nationwide, lightning causes extensive damage to buildings and structures, kills or injures people and livestock, starts forest and wildfires, and disrupts electromagnetic transmissions. Lightning is extremely dangerous during dry lightning storms because people often remain outside rather than taking shelter. To the general public, lightning is often perceived as a minor hazard. However, lightning-caused damage, injuries, and deaths establish lightning as a significant hazard associated with any thunderstorm (Figure 5-54). Large outdoor gatherings such as sporting events, concerts, campgrounds, etc.,

are particularly vulnerable to lightning strikes. Many of the local golf courses have installed lightning awareness alarms that send out a siren when the conditions are right for lightning.

One type of lightning that is of the most concern is long continuity current lightning (LCC), often called "hot lightning". LCC channels current into the ground or other grounding object for over 40 milliseconds and carries a large electrical change. This type of lightning is associated with most wildfires that are ignited by lightning. When drought conditions exist during high lightning occurrence months, it is important to be conscious of the potential for wildfire.

Lightning can cause damage in four ways:

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

**Figure 5-54: Lightning Activity Level (LAL)**

| Lightning Activity Level | Cloud and Storm Development | Count of Cloud-to-Ground Strikes Every 5 Minutes | Average Cloud-to-Ground Strikes per Minute |
|---|---|---|---|
| 1 | No thunderstorms | - | - |
| 2 | Isolated thunderstorms. Light rain will occasionally reach the ground. Lightning is very infrequent, 1 to 5 cloud to ground strikes in a 5-minute period. | 1-5 | <1 |
| 3 | Widely scattered thunderstorms. Light to moderate rain will reach the ground. Lightning is infrequent, 6 to 10 cloud to ground strikes in a 5-minute period. | 6-10 | 1-2 |
| 4 | Scattered thunderstorms. Moderate rain is commonly produced Lightning is frequent, 11 to 15 cloud to ground strikes in a 5-minute period. | 11-15 | 2-3 |
| 5 | Numerous thunderstorms. Rainfall is moderate to heavy. Lightning is frequent and intense, greater than 15 cloud to ground strikes in a 5-minute period. | >15 | >3 |
| 6 | Dry lightning (same as LAL 3 but without rain). This type of lightning has the potential for extreme fire activity and is normally highlighted in fire weather forecasts with a Red Flag Warning. | - | - |

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

## Previous Occurrences

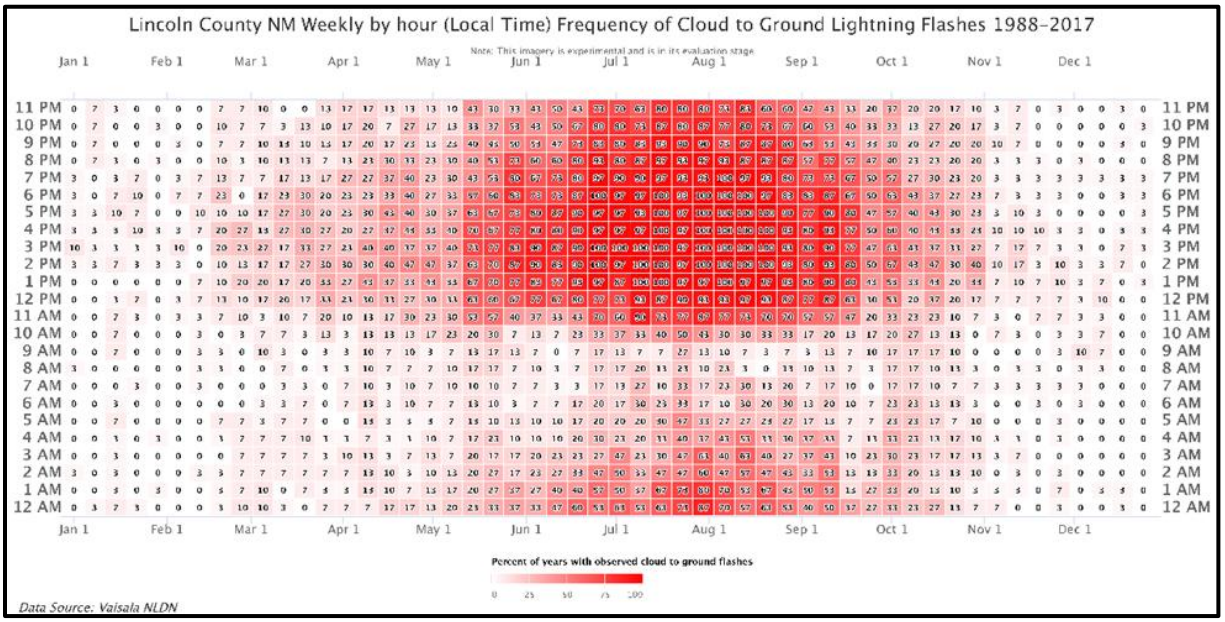
The NCDCs first record of a severe lightning storm is from July 1997 and since that date, three lightning events have been recorded resulting in one death, three injuries, and $25,000 in property damage. The single death occurred in unincorporated Lincoln County and the individual was struck while riding their motorcycle. Between 2017 and 2022, zero severe lightning events were recorded. Although no lightning events were recorded with the NCDC, it is assumed that cloud to ground lightning strikes occur at a much higher rate. The national lightning detection network, which uses remote sensing to monitor lightning activity, indicates that Lincoln County averages 18 lightning strikes per kilometer per year.

## Lightning Extent

NOAA, with data from Vaisala, a private nationwide lightning detection service, has developed a lightning frequency of occurrence calendar to highlight the most lightning prone times of year based on lightning data from 1988 to 2022. The months of June through September have the highest likelihood of lightning strikes in the county. Beginning on June 1, the county has experienced a cloud to ground lightning strike on up to 80% of days. By August 1, this percentage has reached 100 and near the end of September, the percentage dips below 50%. The highest frequency of flashes occur in the afternoon and early morning has the fewest occurrences. This information is recorded and graphed on the county scale.

Details on community specific lightning occurrence and frequency were not available from this source and it is assumed the frequency and seasonality of this hazard is consistent throughout the county. Figure 5-55 below displays the frequency of recorded lightning strikes from 1988-2017. The frequency is recorded in terms of the number of years where a cloud to ground strike was recorded at that time of day. NOAA also graphs total ground to lightning strikes on each day but a graphic for that is not included for the purposes of this HMP. Between 1988 and 2017, 1.1 million lightning strikes have been recorded in the county. July 16 through the 22$^{nd}$ has the highest total number of recorded strikes with over 75,000 strikes recorded in that week over the 29 years of recording. During the winter months, generally from November 15- March 15, the county experiences its lowest occurrence of lightning and less than 10 cloud to ground strikes are expected each month during that period. The week of December 15- 21 has one of the lowest total strikes with 56 recorded over 29 years. It should be noted that the technology and recording methods for these figures is still experimental. Assessments of lightning hazards based on these figures should be done with some reservation and understanding of the nuanced factors that create hazardous lightning conditions. Current weather and meteorological storm predictions should always be consulted when making decisions related to safe weather conditions.

**Figure 5-55: Frequency of Lighting Strikes in Lincoln County.**




### 5.3.3.5 Hail

## Description

Hail is frozen water droplets formed inside a thunderstorm cloud during the strong updrafts of warm air and downdrafts of cold air, when the water droplets are carried well above the freezing level to temperatures below 32°F; the frozen droplet begins to fall, carried by cold downdrafts, and may begin to thaw as it moves into warmer air toward the bottom of the thunderstorm. This movement up and down inside the cloud through cold then warmer temperatures causes the droplet to add layers of ice, sometimes becoming quite large, sometimes round or oval shaped and sometimes irregularly shaped, before it finally falls to the ground as hail.

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

Hail size ranges from sizes less than 0.25 inch to over 4 inches in diameter depending on storm conditions. All sizes of hail can create hazards both from falling and accumulation. The largest hail recorded in Lincoln County was measured at 2.5 inches although this is extremely rare, and storms usually record hail between the size of less than 0.25 inch up to 1.75 inches. Hail accumulation is a concern throughout the county and creates hazardous travel conditions. Accumulation over 6 inches has been recorded in every assessed community over the past 6 years. The combined NOAA/ Tornado and Storm Research Organization (TORRO) Hailstorm intensity scale is the general tool for assessing severity and impact of hail event. The scale ranges from H0 to H10 and categorized hail based on diameter in inches and provides an object approximate size comparison such as pea sized, quarter, tennis ball, etc. The full intensity scale is shown below in Figure 5-56.

**Figure 5-56: Combined NOAA/ TORRO Hailstorm Intensity Scales**

| Size Code | Intensity Category | Typical Hail Diameter (inches) | Approximate Size | Typical Damage Impacts |
|---|---|---|---|---|
| H0 | Hard Hail | Up to 0.33 | Pea | No damage |
| H1 | Potentially Damaging | 0.33 to 0.60 | Marble or Mothball | Slight damage to plants, crops |
| H2 | Potentially Damaging | 0.60 to 0.80 | Dime or grape | Significant damage to fruit, crops, vegetation |
| H3 | Severe | 0.80 to 1.20 | Nickel to Quarter | Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored |
| H4 | Severe | 1.2 to1.6 | Half Dollar to Ping Pong Ball | Widespread glass damage, vehicle bodywork damage |
| H5 | Destructive | 1.6 to 2.0 | Silver dollar to Golf Ball | Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries |
| H6 | Destructive | 2.0 to 2.4 | Lime or Egg | Aircraft bodywork dented, brick walls pitted |
| H7 | Very destructive | 2.4 to 3.0 | Tennis ball | Severe roof damage, risk of serious injuries |
| H8 | Very destructive | 3.0 to 3.5 | Baseball to Orange | Severe damage to aircraft bodywork |
| H9 | Super Hailstorms | 3.5 to 4.0 | Grapefruit | Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open |
| H10 | Super Hailstorms | 4.0+ | Softball and up | Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open |

Sources: www.torro.org.uk/research/hail/hscale

## Previous Occurrences

The NCDC reports show that 126 hail events have occurred since 1962 which resulted in $101,000 in property damage but no direct deaths or injuries. Figure 5-57 below describe the hail events, per participating jurisdiction, that occurred between January 1, 2017, and December 31, 2022, according to the NCDC. The NCDC reports multiple occurrences for events that impact multiple communities and events that include multiple hazards (i.e., hail and thunderstorms occurring simultaneously). In these instances, the event was categorized based on which hazard has a higher probability of causing damage. Thunderstorm events that included hail were counted singularly as hail events due to the higher likelihood of damage from hail.

**Figure 5- 57: Previous Occurrences of Severe Weather Hail per Jurisdiction, January 1, 2017, through December 31, 2022**

| Location | Date | Detailed Description | Magnitude |
|---|---|---|---|
| Southwest Lincoln County, Capitan | 06/06/2017 | Storms developed over the high terrain in the central part of the state producing showers and hail between pea and golf ball sized. Accumulation was several inches in places. U.S. Highway 380, east of Capitan received golf ball sized hail. | 1.75 in |
| Capitan | 06/07/2017 | A continuation of storms moving eastward from the central mountains impacted the southwest portion of the county. Several inches of quarter and golf ball sized hail accumulated near Capitan. | 1 in |
| Southeast and south-central Lincoln County | 06/25/2017 | Showers and thunderstorms moved westward across the county following a heatwave period. Hail up to nickel size impacted the south-central portion of the county. | 0.88 in |
| Southcentral Lincoln County | 06/26/2017 | Storms originated over the central mountains. The county was not heavily impacted, but penny sized hail briefly fell north of Ruidoso. | 0.75 in |
| Ruidoso, south central Lincoln County | 07/01/2017 | Storms moved westward and gained intensity over the central mountains before moving southeast. Ruidoso and east of the village received hail up to nickel size. | 0.88 in |
| Corona, Northeast Lincoln County | 08/09/2017 | Storm cells from the east and warm air moving north to form storms over the east-central plains. Marble to nickel sized hail fell with minor accumulations. | 0.88 in |
| Corona, Ruidoso, Southcentral and southeastern Lincoln County | 05/21/2018 | Storms formed near Albuquerque before shifting south and heavily impacting Lincoln County, hitting Corona, Ruidoso, and other small towns. Golf ball size hail accumulated up to 1 foot in the south-central part of the county and continued to move eastward. | 1.75 in |
| Southeast Lincoln County | 05/22/2018 | Storms formed over the southeastern portion of the county and produced quarter to egg sized hail. Some reports along Highway 380 noted tennis ball sized hail. | 2.5 in |
| Ruidoso, Southeast Lincoln County | 06/21/2018 | Slow moving storms produced hail across much of the southeastern portion of the county. Storms reached as far west as Ruidoso although the main impact was more eastern with golf ball sized hail reported. | 1.5 in |
| Carrizozo | 07/31/2018 | Thunderstorms began over the northern high terrain in the state before moving south. The storm moved off the high terrain to produce hail up to quarter sized. RVs and skylights were damaged in town from the storm. | 1 in |

| Location | Date | Detailed Description | Magnitude |
|---|---|---|---|
| Southeast Lincoln County | 06/01/2019 | Moisture than began in southern California moved east and formed larger storms over central New Mexico. The southeastern portion of the county was heavily impacted, and quarter sized hail was reported on Highway 380. | 1 in |
| Southeast Lincoln County | 06/03/2019 | Similar to storms in previous days, moisture moving east lingered over the eastern portion of the county. Half dollar sized hail fell in the southeast corner. | 1.25 in |
| Southwest Lincoln County | 06/04/2019 | Storms stemming from southern California continued to impact the county. The storms dropped moisture soon after dropping off the central mountains and impacted the southwest portion of the county. Nickle sized hail was reported near Bonito Lake and the surrounding valley region. | 0.88 in |
| Southcentral Lincoln County, Ruidoso | 07/31/2020 | Strong storms formed over the north central portion of the state before moving south. Ruidoso received quarter sized hail with heavy rain that caused flooding. | 1 in |
| Southcentral Lincoln County, Capitan | 05/22/2021 | Thunderstorms formed over the south-central highlands and mountains. These storms mostly moved north, but still impacted the county. Capitan reported penny sized hail and surrounding areas reported up to golf ball sized. | 1.5 in |
| Northeast and east-central Lincoln County, Corona | 05/28/2021 | Storms moved southeast- east across the state producing severe thunderstorms, hail, and tornadoes. Nickle sized hail was reported in Corona and accumulated to 2 inches in some areas east of town. The storm continued to move southeast, impacting the east-central portion of the county. This event is also noted in the flood section. | 0.88 in |
| Southeast and southcentral Lincoln County | 05/30/2021 | Severe thunderstorms were the main component of this storm cell that lingered over the southern portion of the state. Hail and heavy precipitation resulted in flooding in the county, damaging vehicles and homes. One individual drowned in the south of the county. Nickel to golf ball sized hail was reported in multiple areas. | 1.75 in |
| Southeast and southcentral Lincoln County | 06/01/2021 | Storms continued to form along the eastern edge of the central mountains impacting the southeast portion of the county. Nickle sized hail was reported on state Highway 368 as storms moved east. | 0.88 in |
| Southern Lincoln County, Carrizozo | 07/11/2021 | Thunderstorms formed over the norther portion of the state and moved south before dropping off the high terrain into the eastern plains. Hail up to an in in diameter fell in Carrizozo. Larger hail was reported east in the southeast corner of the county. | 2 in |

| Location | Date | Detailed Description | Magnitude |
|---|---|---|---|
| Southcentral Lincoln County | 07/25/2021 | Central and Western New Mexico were heavily impacted by scattered storms. Although severe rain was the main storm impact, hail up to nickel sized fell in communities in south central Lincoln County. | 0.88 in |
| West central Lincoln County | 06/02/2022 | High terrain thunderstorms moved south along the range producing high wind and abundant hail. Penny sized hail was reported along the western border- into central Lincoln County. | 0.75 in |

Source: Storm Events Database | National Centers for Environmental Information (noaa.gov)

**Hail Extent**

In Lincoln County, hail occurs most frequently during spring and summer. May, June, and July have the highest percentage of hail events according to the NWS. Once the summer monsoon starts, hail carrying thunderstorms often develop in the afternoons and evenings. All regions of the county are subject to hail events and have experienced hail over 1.5 inches and diameter and seen accumulation over 6 inches. 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 over 2 inches.

**Thunderstorm, Lightning, Hail Location and Extent per Participating Jurisdiction**

**Lincoln County**

The County uses a reverse 911 "Code Red" to notify the public of an approaching storm. Continuous public outreach is required to let the public know what to do to mitigate their homes against the effects of a thunderstorm. Most golf courses require golfers to seek cover during a thunderstorm.

According to the NCDC, Lincoln County had eight severe thunder and lightning storm events between January 2017 and December 2022. These events caused no recorded damage and caused no reported injuries or deaths. 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. According to the County Emergency Management Director, the May 30, 2021 thunderstorms included 3 to 4 inches of rain in a 2 to 3 hour period in the Bonito and Rio Hondo watersheds. This was very unusual, especially prior to monsoon season. At US70 mile marker 308/309 the flood water over-topped the highway which was closed for 2 hours. The Direct had never seen such high flow rates.

According to the NCDC, Lincoln County had 22 reported hail events between January 2017 and January 2023. There were no reported deaths or injuries, but $25,000 of property damage was reported. This was primarily from a storm in July 2018 quarter sized hail damaged RVs, homes, and vehicles. The expected magnitude for hail ranges in size from < 0.33 to 1.5 inches diameter. This range is consistent across the county and all assessed communities have experienced events in this range. Some events have hard larger diameter hail and those communities with higher ranges are noted below.

**Village of Ruidoso**

Thunderstorms are frequent in the VOR during the summer months of May, June, and July. Most thunderstorms in the mountains are less severe and duration than the ones in the other parts of the county. The most severe thunderstorms typically build over the mountains and travel east into the plains. In August

of 2019, a severe thunderstorm formed over the village before moving slowly east. The storm averaged 2 to 3 inches per hour but some areas reported rates up to 10 inches per hour. This flooded the Rio Ruidoso and caused minor flooding through town. Flash flooding, including as a result of deVere thunderstorms, is described in further detail in the flood profile.

Between January 2017 and December 2022, three hail events impacted the village but cause no reported property damage, injuries, or deaths. One of the most severe events occurred on May 21, 2018 when large storm cells moving south east from Albuquerque impacting most of the southcentral region of the county. Hail up to the size of golf balls fell in the Ruidoso area and accumulated up to 1 foot. Size of hail during the reporting period ranged from pea sized to golf ball and accumulated to 1 foot or more on at least two occasions. During this same period, the village experienced one severe thunderstorm event that caused no damage, injury, or death.

Many of the local golf courses have installed lightning awareness alarms that send out a siren when the conditions are right for lightning. Most of these golf courses require the golfers to seek cover during a thunderstorm. Per Figure 5-54, the magnitude of lightning for VOR is anticipated to experience storms rating 1-4, and it is unlikely that this trend will change. Per Figure 5-56, anticipated hail size for VOR ranges from a diameter of < 0.33 to 1.5 inches.

**City of Ruidoso Downs**

Wildfires have been a persistent issue for the watersheds in the region and this period was no exception. As recently as 2022 with the McBride fire which heavily impact the community, Slope instability remains a concern. This not only creates hazards in unsuspecting low-lying ground, but also impacts the water quality and flow of the Rio Ruidoso through Ruidoso Downs. Dry canyons and arroyos will rise very rapidly during thunderstorm events. Many roads, culverts, bar ditches and crossings are not adequate to deal with the high water that comes with thunderstorms. Public awareness of storm and flooding signs and notifications is critical to successfully mitigating thunderstorms. Ruidoso Downs Racetrack is in the City of Ruidoso Downs and has had high water during thunderstorms. The Racetrack has lightning sensors/sirens to notify the public of an approaching thunderstorm so they can seek shelter as storms approach.

No significant thunderstorms were recorded in the village between 2017 and 2022, however it is expected that heavy rain impacted the area due to its proximity to the central Sacramento mountains. Storms frequently move southeast across the range before moving onto the high plains which results in rain and high winds. In late August of 2019, a large storm moved through the region producing up to 3 inches per hour of rain with gusting winds. This storm impacted the village and caused minor flooding in the Rio Ruidoso.

Due to its proximity to the village of Ruidoso, Ruidoso Downs is impacted by many of the same storm systems and is often included with the village in event reporting. Ruidoso Downs was subject to two severe hail events during the 6-year planning period that resulted in no deaths, injuries, or reported property damage. On May 21, 2018, severe thunderstorms heavily impacted Ruidoso Downs and the surrounding area with golf ball sized hail accumulating up to 1 foot. On multiple occasions, hail accumulation has been reported on the highways east of and north of the village which can create a driving hazard. The magnitude of hail would range in size from < 0.33 to 1.50 inches diameter.

**Town of Carrizozo**

Carrizozo and Ruidoso are the only incorporated towns assessed in this plan that experienced a severe thunderstorm as defined and recorded by the NCDC. In late June of 2020, a large storm cell formed

over the northern mountains before moving southwest into the Rio Grande Valley. The storm impacted the town in the afternoon, bringing hail, rain, and winds consistently over 63 mph.

Dry arroyos and canyons can rise significantly and quickly during a thunderstorm event. Public awareness is critical to ensure the public is prepared for the hazards of thunderstorms. Thunderstorms cause flash/sheet flooding through town.

According to the NCDC, Carrizozo experienced two severe hailstorms during the 2017-2022 planning period. Carrizozo was the only examined community with reported property damage, totaling $25,000. No injuries or deaths related to hail were reported during this time period. The storm that resulted in this damage occurred on July 31, 2018, when severe storms formed over the northern mountain ranges before bringing moisture and wind down on the high plains. Nickle sized hail fell consistently and at a high rate, resulting in the damage mentioned above. The magnitude of hail is expected to range from < 0.33 to 2 inches diameter. In that same 6-year assessment period, the town experienced one severe thunderstorm that did not cause any damage, injuries, or deaths.

**Village of Capitan**

Due to recent year's wildfires many fire-scarred landscapes are prone to sheet flooding during thunderstorms. This not only creates hazards in unsuspecting low-lying ground, but also impacts the water quality and flow of the Magado and Salado creeks through Capitan. The 2020 Darn Canyon fire is an example of a recent event that will have lasting effects on erosion and storm water. Dry canyons and arroyos will rise very rapidly during thunderstorm events. During thunderstorms water funnels off of the highways and floods the streets in the Village. An engineering study is needed to determine the best way to mitigate storm water coming from the highway. The village of Capitan public works department has mitigated against thunderstorm runoff adequately throughout the years and has significantly reduced the threat to life and damages. Per Figure 5-54, the magnitude of lightning for the Village of Capitan is anticipated to experience storms rating 1-4, and it is unlikely that this trend will change.

Prior to the relocation of the joint high school/ middle school, the building would flood following large storm events. The school board moved the location to a more resilient location to prevent future flooding of the high school during thunderstorms. The elementary school floods during thunderstorms, the roof leaks causing black mold, and needs to be replaced or repaired.

The magnitude of hail expected for Capitan ranges in size from < 0.33 to 1.20 inches diameter, per Figure 5-56. Capitan is one of the hardest hit communities in terms of hailstorm occurrences. This is a result of the villages location; Capitan is often impacted by storms that move from the west, dropping from the central mountains on to the southcentral part of the county as well as storms moving west that often gain severity as they move across the eastern Sacramento Mountains and funnel through the valley. Four severe hailstorms were reported to have impacted the village and the surrounding area between January 2017 and December 2022. These storms did not result in any deaths, injuries, or property damage that was reported. The most severe of these storms occurred on June 7, 2017 when storms moving southeast channeled through the valley and heavily impacted Capitan, resulting in several inches of golf ball sized hail accumulation. No thunder or lightning storms were reported in the village during the assessment period.

**Village of Corona**

Thunderstorms frequently occur in June, July, and August with the wettest month being August. Thunderstorms in the Central Highlands are less severe and duration than the storms in the eastern and

southern parts of the county and often are more of a hazard due to wind. Thunderstorms can also cause flash flooding through the Village which is highlighted in the flood section.

During the period of January 2017 through December 2022, there were no recorded occurrences of severe thunderstorms in Corona. However, the village is known to be subject to storms moving south-southeast from the central mountain ranges onto the eastern plains. Caution should especially be taken during thunderstorms that occur during and following severe drought periods when soil is dry and flooding and erosion issues arise.

Although Corona is not heavily impacted by an abundance of hailstorms, the village does experience some extreme events as large storms moves south- southeast from the central mountain range. From the beginning of 2017 to the end of 2022, three severe hail events were reported by NCDC that resulted in no deaths, injuries, or property damage. On August 9, 2017 and May 28, 2021, storms moving south through the county dropped nickel sized hail on the village and the surrounding areas and accumulated up to 2 inches. A major concern for the area is hail accumulation mixed with severe wind on the highways that can make driving conditions dangerous.

#### 5.3.3.6 Probability of Occurrence

When calculating the probability of severe weather (Thunderstorm, Lightning, Hail), the Planning Team agreed to use the PRI, explained further in Figure 5-110. Probability in Figure 5-58 below is calculated based on the number of years in the last six that the hazard occurred.

- Unlikely means no events were recorded from 2017 through 2022. This results in 0 to 16.65% annual probability.
- Possible means 1 to 2 events were recorded from 2017 through 2022. This results in between 16.66% and 33.33% annual probability.
- Likely means 3 to 4 events were recorded from 2017 through 2022. This results in between 33.34% and 66.67% annual probability.
- Highly Likely means 5 or more events were recorded from 2017 through 2022. This results in between 66.68% and 100% annual probability.

In addition to the general definitions used for the PRI, the Planning Team analyzed the annual probability for 2017 to 2022 and over time based on available records for each hazard. The total number of occurrences was divided by the number of years of available data; for Thunderstorm, there was 60 years of data. The annual probability for 2017 to 2022 and over time is shown below. Annual probability is calculated based on the number of occurrences divided by the number of years of data and presented as a percent anticipated to occur in 1 year. By comparing the annual probability from the past 6 years with that of all records over time, the Planning Team can consider potential changes over time, including potential impacts due to climate change. For example, the analysis revealed that there was an increase in annual probability for all participating jurisdictions when reviewing the past 6 years of data in comparison to 60 years of data. It is understood that record keeping has improved over the years and that Annual Probability over time as presented here may not be an accurate accounting.

**Figure 5-58: Thunderstorm Probability of Occurrence**

| | Thunderstorms Probability Based on Previous Occurrence (Including Lightning and Hail) | | | | |
|---|---|---|---|---|---|
| **Jurisdiction** | **Past Occurrences 2017-2022** | **Probability 2017-2022 (Used in PRI)** | **Annual Probability 1962-2022** | **All Recorded Occurrences 1962-2022** | **Annual Probability 1962-2022** |
| Lincoln County | 28 | Highly Likely | 100% (466%) | 112 | 100% (186%) |
| Village of Ruidoso | 4 | Likely | 66.6% | 18 | 30% |
| City of Ruidoso Downs | 2 | Possible | 33.3% | 7 | 11.7% |
| Town of Carrizozo | 3 | Likely | 50% | 10 | 16.7% |
| Village of Capitan | 4 | Likely | 66.6% | 12 | 20% |
| Village of Corona | 3 | Likely | 50% | 8 | 13.3% |

#### 5.3.3.7 Climate Change Impacts

A high number of storms impacting the county result from storm cells moving eastward from the pacific. Storms generally become more intense as they move across the mountain ranges to the west of the county. As the climate warms, the evapotranspiration rates increase, bringing more water vapor into the atmosphere where it forms and grows storm cells. This leads to large, intense storm events that are less predictable in terms of their area coverage and precipitation totals. Additionally, polar regions of the globe are warming at a faster rate than lower latitudes which is altering the speed and size of global wind patterns. This creates the opportunity for far larger storm cells that move more slowly across a landscape, causing long-lived, intense storms. Variable, large storms intermixed with periods of extreme heat and drought also create flash flooding concerns as topsoil dries and becomes easily eroded by heavy precipitation. As discussed above, there is strong evidence to show that climate change creates a higher potential for wildfires, especially high intensity events. As landscapes dry under drought conditions, vegetation becomes more easily ignitable. It is important to consider this when communities are experiencing drought conditions and lightning flashes are high. Additionally, there is evidence that shows that as surface temperatures rise, it aids storm updraft. Updraft is the exchange of hot air into the atmosphere that forms storm cells. Higher rates of updraft, associated with warmer surface temperatures, allow for more LCC lightning. This increase in high ignition lightning strikes, paired with a drought-stricken landscape, can be extremely hazardous.

All assessed communities saw an increase in the frequency of thunder, lightning, and hail events over the 6-year assessment period when compared to the previous occurrence records which began in 1962. It is important to consider the potential impacts of climate change on this increase in frequency while also considering natural temporal fluctuations such as El Nino and La Nina. As discussed above, climate change may impact the severity and frequency of storms as it has disrupted global air and water cycles that play a critical role in how storms develop, move, and how long they persist.

### *5.3.4 Winter Storms and Ice Storms*

#### *5.3.4.1* Description

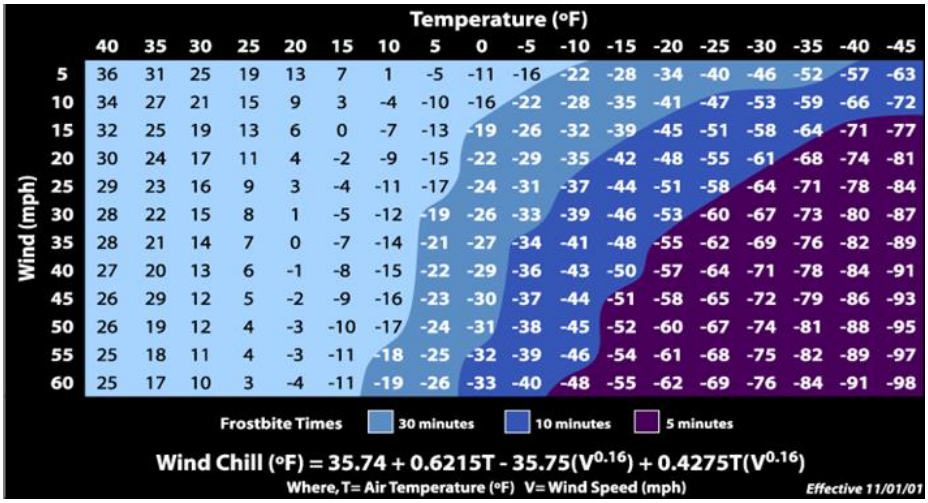
Severe winter storms can vary in size and strength and include heavy snowstorms, blizzards, ice storms, freezing drizzle or rain, sleet, and blowing and drifting snow. Extremely cold temperatures accompanied by strong winds result in potentially lethal wind chills.

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

- **Heavy snowfall** - the accumulation of 4 or more inches of snow in a 12-hour period or 6 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 for 3 hours or longer. These events generally cause visibility to drop to 0.25 mile or less.
- **Ice storm** - an occurrence where rain falls from warmer upper layers of the atmosphere to the colder ground, freezing upon contact with the ground and exposed objects near the ground.
- **Freezing drizzle/freezing rain** - the effect of drizzle or rain freezing upon impact on objects that have a temperature of 32°F or below.
- **Sleet** - solid grains or pellets of ice formed by the freezing of raindrops or the refreezing of largely melted snowflakes. This ice does not cling to surfaces.
- **Wind chill** – A measure of the effect of increased wind in freezing conditions accelerating heat loss from exposed skin. Wind chill becomes especially dangerous to human health when temperatures are at −20°F or below.

The wind chill temperature is a measure of how cold the wind makes real air temperature feel to the human body. Since wind can dramatically accelerate heat loss from the body, a blustery 30°F day would feel just as cold as a calm day with 0°F temperatures. The NWS released a scientifically accurate equation, which is used for calculating wind chill. (Figure 5-59: Please note that it is not applicable in calm winds or when the temperature is more than 50°F.)

**Figure 5-59: Wind Chill Chart.**




Source: National Weather Service and NOAA

A severe winter storm for Lincoln County as defined by the NWS is 4 or more inches of snowfall below 7,500 feet elevation or 6 or more inches of snowfall above 7,500 feet elevation in a 12- hour period, or 6 or more inches of snowfall below 7,500 feet elevation or 9 inches of snowfall above 7,500 feet elevation in a 24-hour period.

Most winter precipitation in New Mexico is associated with Pacific Ocean storms as they move across the state from west to east. As the storms move inland, moisture falls on the coastal and inland

mountain ranges of California, Nevada, Arizona, and Utah. If conditions are right, the remaining moisture falls on the slopes of New Mexico's high mountain chains.

Hazards related to winter storms and heavy snow include freezing temperatures, reduced visibility, disrupted travel from slippery and impassable roads, and damage to roofs, trees, and power and phone lines from the weight of snow accumulation.

The mountainous areas of Lincoln County are more likely to receive snow and cold than the plains and desert, but residents of high-altitude areas are more likely to be prepared for these conditions, even if they become extreme. Severe winter weather is much more likely to have a serious impact on major population centers and transportation routes, most of which are not located in the high mountains. The plains and desert areas are more susceptible to high winds that contribute to the drifting of snow, and experience more freezing events that begin with fog and drizzles. These events are especially hazardous as they cover the highways in ice making travel dangerous. During the reporting period, major highway closure in the county was reported on three occasions.

On average, the unincorporated county and the assessed communities receive at least one or two severe winter storms per year. Heavy snow and ice can paralyze a town's infrastructure and services, stranding commuters, and disrupting emergency and medical services. Accumulations of heavy snow and ice can also cause roofs to collapse and knock down trees and power lines.

The average annual snowfall ranges from about 5 inches in the southern desert and southeastern plains to more than 70 inches in the mountains west of Ruidoso. Average annual snowfall for most of the county is between 5 and 20 inches per the NWS. January is usually the coldest month, with average daytime temperatures ranging from the mid-30s °F in the central highlands and mountains to the mid 40s °F for the eastern plains. Temperatures below freezing are common in all sections of the county during the winter. Subzero temperatures are rare, except in the mountains (NWS, 2022).

#### 5.3.4.2 Previous Occurrences

The NCDC has reported 10 severe winter storm events in Lincoln County between January 2017 and December 2022. These storms did not result in any injuries or deaths. One event on January 6, 2017, resulted in $25,000 in property damage although an additional $80,000 in damages was reported in Ruidoso by the Planning Team during the 2018-2019 winter. Figure 5-60 shows the previous occurrences of severe winter storms per participating jurisdiction from January 1, 2017, through December 31, 2022. The previous occurrence listing for winter storms prior to January 1, 2017, is found in Appendix B-4; this is the same list that was shown in the 2018 HMP.

Six events are listed in the figure and many of the recorded storms impacted multiple jurisdictions. Each impacted participating jurisdiction is listed where it was impacted by a storm. The NCDC records of severe winter weather begin in 2009 and since that date, there have been 49 recorded events in the county. These events have caused a total of $1,325,000 in property damage.

NCDC records snow and winter weather events according to weather forecast zones: 1) Upper Tularosa Valley (Chihuahuan desert) which encompasses the community of Carrizozo, 2) South central mountains which contains Ruidoso, Ruidoso Downs, and Capitan, 3) South Central Highlands which includes Corona, 4) Eastern Plains and prairie. Five of the seven recorded severe events occurred fully or partially in the South-Central Mountains regions. Ruidoso Downs has chosen to exclude winter storms as a hazard due to a lack of highly impactful past events.

**Figure 5-60: Previous Occurrences of Winter Storms per Jurisdiction, January 1, 2017, through December 31, 2022**

| Location | Date | Detailed Description | Magnitude |
|---|---|---|---|
| Southcentral Mountains<br>Ruidoso<br>Ruidoso Downs<br>Capitan | 01/06/2017 | A cold airmass moved southwest impacting most of the state. Wind chill on the eastern plains reach 20-30 below zero. Freezing temperatures mixed with snow accumulation of 3-4 inches created hazardous travel conditions across the county. $25,000 in property damage was reported, mostly from car accidents. | 3-4 in. |
| South Central Mountains<br>Ruidoso<br>Ruidoso Downs<br>Capitan | 01/15/2017 | Moisture moving northeast into the state combined with a cold front over much of the high terrain in the state. The storm began as freezing rain and began freezing as the day progressed, but accumulation and road impact were low. East of the Sacramento mountains received snow between 3 and 6 inches. | 3-6 in. |
| Southcentral Mountains<br>Ruidoso<br>Ruidoso Downs<br>Capitan | 01/20/2017 | A slow-moving winter storm moved east across the county with high winds and snow. Ruidoso and communities to the northwest were most heavily impacted. Travel north of Ruidoso was heavily impaired. | 2-15 in. |
| South Central Mountains<br>Ruidoso<br>Capitan<br>South Central Highlands<br>Upper Tularosa Valley | 12/26/2018-12/27/2018 | A storm moving from the Four Corners region gained size as it moved over the central mountains. Another cold front moved west at the same time and created a larger storm that dropped 12–18 inches in the south and southwest region of the county. Ruidoso had the largest snow totals with 30 inches falling in the area. | 12-30 in |
| Eastern Lincoln County | 12/28/2018 | A storm moving southeast through the state combined with cold, west moving winds to impact the eastern portion of the county. 6-12 inches was reported in Corona and more eastern communities. | 6-12 in. |
| Eastern Lincoln County<br>Ruidoso | 03/04/2019 | A winter storm that originated over the pacific moved east into the state. Freezing fog and drizzle shifted to snow as the storm moved south. Roads into Ruidoso from the east were closed and high terrain areas of the county received between 6 and 13 inches of snow. The eastern portion of the county was most heavily impacted by road closures due to ice. | 0-13 in |

The above figure includes only severe winter weather events from the 2017-2022 planning period. The below events occurred before this time period but were included at the request of the Planning Team due to their significance.

In December 1997, a series of heavy snow events produced totals of 15 to 30 inches across eastern and central New Mexico just before Christmas. Periods of light snow actually began about the 20th and

then intensified during the 22nd through the 25th as tropical moisture began to feed a large, nearly stationary upper level low over southwest New Mexico. Lincoln County experienced road closures that lasted 2 weeks, into January. The total damages, including that of other counties, exceeded $6.5 million but indirect damages exceeded $20 million.

Two days into February 2011, an arctic cold front moved across the county and delivered sub-zero temperatures to the county. The front originated over the arctic ocean east of Canada on January 30 and slowly moved south, following the eastern edge of the Rocky Mountains. By February 1, the arctic front was centered to the northwest of the county where it interacted with other storm fronts and jet streams, spreading the storm across the southern half of the state as well as north Texas and eastern Arizona. The Southcentral Mountains and Tularosa Valley were most heavily impacted with temperatures on February 2 falling to between 20 and 30 degrees below zero. The Southcentral Highlands and Eastern County were less heavily impacted, although temperatures still reached single digits and Corona, which is in the highlands, dropped to 19 below. Freezing temperatures caused power outages and broken pipes for many residents in the county and caused infrastructure shut downs for gas and water services. Freezing temperatures lingered throughout the county for several days following the initial sub-zero temperatures.

In December 2015, heavy snow and high winds caused widespread damage and difficult travel conditions in much of eastern Lincoln County through the 30th. Snowfall amounts averaged 12 to 15 inches. The entire stretch of Interstate 40 from Albuquerque to Amarillo was shut down for nearly 36 hours. A Civil Emergency was declared for Quay, Curry, Roosevelt, De Baca, Chaves, and eastern Lincoln County as dozens of motorists were stranded in their vehicles in 6 to 10 foot snow drifts. Department of Public Safety assisted a total of 455 motorists. Emergency response personnel were even stranded trying to reach these motorists. Residents were blockaded in their homes with drifts up to the top of roofs. Xcel Energy reported power outages in at least 14,200 residences across eastern New Mexico and at least 30,000 residential disruptions during the storm. Numerous trees and power lines were downed as well as several structures due to the weight of heavy snow. Snowfall accumulations of 15 to 30 inches were common from the central mountain chain eastward across much of the plains. Ski Apache reported 41 inches. Department of Agriculture reported around 12,000 adult milking cows perished in the storm and between 30,000 and 50,000 young livestock died.

#### 5.3.4.3 Location and Extent per Participating Jurisdiction

**Lincoln County**

Lincoln County has experienced 10 heavy snow and winter storm events between January 2017 and December 2022. The most severe event occurred at the end of December 2018 when snow and extreme winter conditions were present in the county for 3 days. Some areas and communities in the mountains had snow accumulation up to 30 inches, although totals for most areas ranged from 6-12. This storm originated over the central mountain range near Albuquerque before moving southeast into the county. The storm impacted all assessed communities from Corona in the north to Ruidoso and Ruidoso Downs in the south. The magnitude for winter storms in this county is anticipated to range from moderate to heavy snow, 1 to 15 inches, with a wind chill of <10 mph to 50 mph wind, and temperatures that can fall below 0.

**Village of Ruidoso**

Winter storms are common in the village, but emergency services and residents are generally well prepared. Due to its proximity to the high mountains, snow accumulation can be large, ranging from 1-30 inches, on extreme occasions. During the assessed period, one of the heaviest daily and monthly snow totals occurred for the village. The winter of 2018-2019 saw a number of winter storm events with the three-

day storm at the end of December 2018 having the largest impact. During this event, snow totals reached 30 inches in some higher terrain areas while 8-14 was the most common accumulation total. This resulted in road closures around the city, the most impactful was the closure of Highway 48 which moves north-south through Ruidoso. During the assessed period of January 2017- December 2022, four winter storms and snow events were reported in the city. Although no deaths or injuries occurred, at least $80,000 in property damage was reported by the Planning Team for the 2018-2019 season.

**City of Ruidoso Downs**

Due to its proximity to the village of Ruidoso, Ruidoso Downs is impacted by many of the same storm systems. Ruidoso Downs was subject to three severe winter storm events during the 6-year planning period that resulted in no deaths, injuries, or reported property damage. Similar to the other communities within the southcentral mountain climatic area, the city received accumulating snow from the storms that passed through the county on December 26, 2018, through the 28th. Snow accumulation totals for the city ranged from 4-12 inches and travel in the area was hindered and completely cut off at times. U.S. 70 was intermittently closed which is the main travel route in and out of the Ruidoso Downs. Magnitude of winter storms is anticipated to range from 3-30 inches of accumulated snow although accumulation over 1 foot is rare.

**Town of Carrizozo**

The town lies at an elevation of 5,400 feet, and the transition from desert basin to high plains grassland occurs on the northern end of town. Typical snowfall lasts a day or two, but severe snowstorms periodically close Highways 54 and 38 which cross through town, stranding travelers on the road, forcing Carrizozo to provide shelter. This becomes an economic burden every year that the town must handle. During the period of 2017 to 2022, the town of Carrizozo was impacted by one severe winter storm. This event began on December 26, 2018, but did not reach the town until the following day. Snow accumulations reached 4 to 8 inches, and the storm closed U.S. 54 and Highway 380 outside of town. During the assessed period, no deaths, injuries, or property damage were reported as a result of winter storms. The magnitude for winter storms in Carrizozo is anticipated to range from moderate to heavy snow, 1 to 15 inches, with a wind chill of < 10 mph to 50 mph, and temperatures that can fall below 0.

**Village of Capitan**

Between January 2017 and December 2022, the village was impacted by four winter storm events. NCDC reports no deaths, injuries, or property damage as a result of these storms. One example of a severe event in the community was the long-lasting winter storm that that occurred at the end of December 2018. Capitan and the surrounding area saw snow accumulations between 3 and 8 inches and roads were intermittently closed during this period causing delays in travel or blocking travel in the southwest portion of the county all together. The magnitude for winter storms in Capitan is anticipated to range from moderate to heavy snow, 1 to 10 inches, with a wind chill of <10 mph to 50 mph wind, and temperatures that can fall below 0.

**Village of Corona**

One severe winter storm event was reported by the NCDC for the village of Corona during the assessment period. These storms did not cause any property damage, deaths, or injuries. The most extreme conditions experienced by the village during this period occurred on December 28, 2018, as part of a 3-day storm that impacted the county. Accumulation ranged from 6 to 12 inches in Corona and the surrounding areas with extreme winds and freezing being the main storm hazard. Low visibility, blowing snow, and icy

conditions caused the closure of U.S. 54 south of the village. The magnitude for winter storms in the Village of Corona is anticipated to range from moderate to heavy snow, 1 to 10 inches, with a wind chill of <10 mph wind to 50 mph wind and temperatures that can fall below 0.

#### 5.3.4.4 Probability of Occurrence

When calculating severe weather Winter storm probability, the Planning Team agreed to use the PRI, explained further in Figure 5-110. Probability in Figure 5-61 below is calculated based on the number of years in the last six that the hazard occurred.

- Unlikely means no events were recorded from 2017 through 2022. This results in 0-16.65% annual probability.
- Possible means 1 to 2 events were recorded from 2017 through 2022. This results in between 16.66% and 33.33% annual probability.
- Likely means 3 to 4 events were recorded from 2017 through 2022. This results in between 33.34% and 66.67% annual probability.
- Highly Likely means 5 or more events were recorded from 2017 through 2022. This results in between 66.68% and 100% annual probability.

In addition to the general definitions used for the PRI, the Planning Team analyzed the annual probability for 2017 to 2022 and over time based on available records for each hazard. The total number of occurrences was divided by the number of years of available data; for Winter Storms, there was 13 years of data. The annual probability for 2017 to 2022 and over time is shown below. Annual probability is calculated based on the number of occurrences divided by the number of years of data and presented as a percent anticipated to occur in 1 year. By comparing the annual probability from the past 6 years with that of all records over time, the Planning Team can consider potential changes over time, including potential impacts due to climate change. For example, the analysis revealed that there was an increase in annual probability for Ruidoso Downs and Village of Corona in the past 6 years. However, the annual probability over 13 years was higher for the County, Ruidoso, Carrizozo, and Corona. It is understood that record keeping has improved over the years and that Annual Probability over time as presented here may not be an accurate accounting.

**Figure 5-61: Winter Storm Probability of Occurrence**

| | Winter Storms Probability Based on Previous Occurrence | | | | |
|---|---|---|---|---|---|
| **Jurisdiction** | **Past Occurrences 2017-2022** | **Probability 2017-2022 (Used in PRI)** | **Annual Probability 2017-2022** | **All Recorded Occurrences 2009- 2022** | **Annual Probability 2009-2022** |
| Lincoln County | 10 | Highly Likely | 100% (166%) | 50 | 100% (384%) |
| Village of Ruidoso | 4 | Likely | 66.6% | 20 | 100% (153%) |
| City of Ruidoso Downs | 3 | Likely | 50% | 1 | 7.7% |
| Town of Carrizozo | 1 | Possible | 16.7% | 10 | 77% |
| Village of Capitan | 4 | Likely | 66.6% | 3 | 23% |
| Village of Corona | 1 | Possible | 16.7% | 16 | 100% (123%) |

#### 5.3.4.5 Climate Change Impact

The major impact of climate change on snow and winter storms is the elevated average temperatures associated with early season snow melt and reduced snowpack. This will reduce water availability through the year as snowpack that would generally melt slowly, feeding streams and creeks, instead runs off soon after precipitating. This is not only a problem for downstream communities that rely on runoff to fill reservoirs for a stable water supply, but also for riparian and forest vegetation communities that are dependent upon healthy watersheds with consistent base flow. The tourism industry can also be harmed by earlier runoff and decreased snowpack as the winter season is cut shorter and snow conditions diminish. Attractions such as Ski Apache could experience a shorter season and reduced visitation. Winter storms are expected to become less of a hazard as climate change continues to impact storm systems and natural system function. This is noted by the New Mexico Bureau of geology 2022 Climate Change Outlook, the 2021 New Mexico Interagency Climate Change Task Force progress report, and the 2018 NCA.

All jurisdictions of Lincoln County experienced a decrease in the frequency of observed severe winter storms between 2016 and 2023 when comparing this period to the recorded history. This change in frequency is in line with the anticipated impacts of climate change on winter storms. Higher annual average temperatures correlate with a shorter winter season when severe storms are expected. Storm events that may have historically resulted in snow could result in rain instead while elevated temperatures reduce the likelihood of snow accumulation and freezing events.

### *5.3.5 High Wind*

#### 5.3.5.1 Description

Wind is the motion of air relative to the earth's surface. In the mainland U.S. the mean annual wind speed is reported to be 8 to 12 mph, with frequent speeds of 50 mph and occasional wind speeds more than 70 mph. Large-scale extreme wind phenomena are experienced over every region of the United States and its territories. High winds can occur during a severe thunderstorm, with a strong weather system, or can flow down a mountain. When winds are sustained at 40-50 mph, isolated wind damage is possible.

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 (see Figure-65) because it is specifically adapted to wind effects on land.

Downbursts occur when storm clouds move across a land scape bring air downward with precipitation where the air spreads out across the ground. A derecho is the extreme extent of a downburst where an area of 240 miles or larger is impacted and gusts reach at least 58 mph. Frontal winds are caused by large pressure gradients moving mostly cold areas around a low-pressure system. These winds are especially hazardous in dry, fire prone conditions where winds are often sustained and reaching over 40 mph. Downslope winds are similarly hazardous and occur when warm, dry air rapidly descends down a mountain. This is common on the east slope of the Rocky Mountains. Dust storms and haboobs are another hazard of concern associated with wind events. Haboobs result from thunderstorm outflow winds that become strong enough to disturb dirt and reduce visibility while dust storm is the general term for a wind event that creates a wall of dust and debris. These storms can appear quickly, be miles long and thousands of feet high.

One type of wind event is the gap wind or canyon wind. This occurs as the wind rushes over mountain passes, "gaps," in the ridgeline of a mountain chain. Wind speeds are generally strongest at narrow canyon openings. Another type of wind event is referred to as the spillover wind, which occurs when cold air to the east of the mountains has a sufficient depth (approximately 10,000 feet above sea level) to overtop mountain ranges and spill over to the west. Windstorms are high wind events that occur in the absence of a thunderstorm and are usually driven by an approaching storms or large differences in atmospheric pressure above the windstorm location.

High wind events can create hazards in several ways and the potentially fast onset of an event necessitates quick response. Homes and infrastructure can be damaged by high winds that's pull loose materials from the structure. Mobilized materials can become projectiles and cause further property damage and harm exposed people. When driving, high winds can reduce visibility making travel unsafe. Further, high profile vehicles are at risk of overturning under high wind and gusting conditions. High wind events are also hazardous to human health as debris and sand reduce air quality creating respiratory issues.

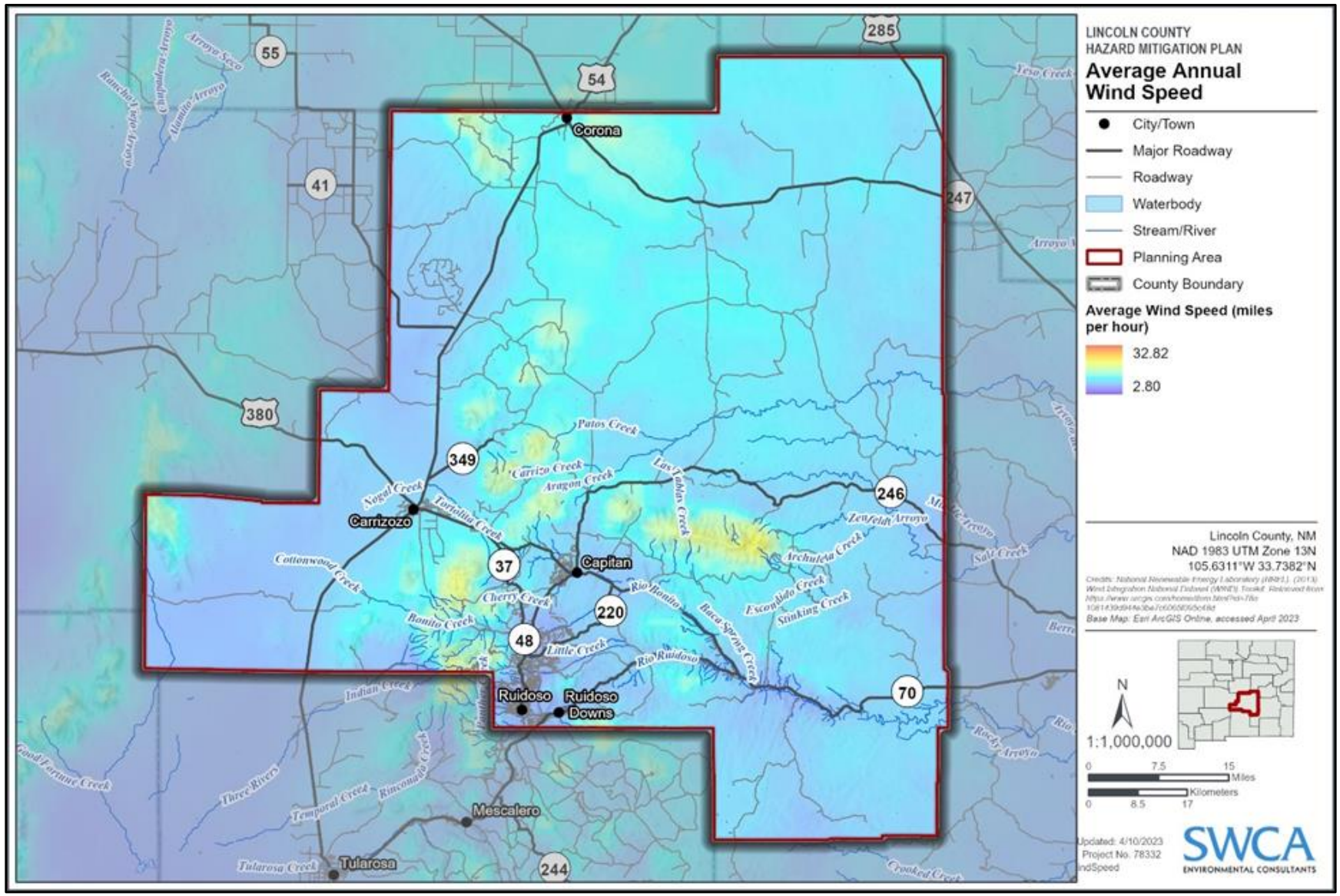
Another concern of high wind events is wildfire. High intensity winds have the potential to carry embers long distances allowing existing fires to "jump" easier and potentially igniting fire prone areas. Caution should be taken for wildfires during extreme wind events with things like machinery, fire pits, and other sparking and open flame sources. The 2018 246 fire ignited and spread as a result of extremely high winds and heat with low humidity setting the stage for a prescribed burn and abandoned campfire to spread out of control, eventually burning 4,000 acres and eight structures.

The Beaufort wind scale is one of the most widely used methods for visually assessing wind speed and its impacts when precise measurement scales are unavailable. The county has the potential to experience all levels of the Beaufort scale however a 12 rating is extremely rare and not highly likely to occur in the county. Taking note of the conditions created at each level can help mitigate wind-related risk.

All areas of the county can experience all 12 Beaufort scale categories although events in the "hurricane "category of over 73 mph are extremely rare. No events of this magnitude were observed in the county during the assessed period. Mapped data on wind intensity are limited but average annual wind speed is shown below in Figure 5-62. The data used for this map are from a pilot program created by the National Renewable Energy Lab and only used wind speed records from 2012 to show average wind speed of the course of 1 year. This map is limited by the number of years utilized but was the best available method for visualizing potential wind speed hazards in the county. Higher elevation regions of the county experience higher average wind speeds while communities in the foothills tend to be more guarded but are still subject to intense events especially as thunderstorms move east out of high terrain onto the plains. The northern portion of the county also experiences a higher average wind speed which is mostly due to larger storms that move slowly across the region after gaining intensity in the mountains at the northern portion of the state.

Consistent regional data on average wind and maximum wind are limited throughout the county. Airports provide a consistent record of day-to-day wind velocity that is useful for determining seasonal trends and times of year when high wind events are most common and reach the highest speed.

**Figure 5-62: Average Wind Speed Map of Lincoln County.**



Below are two figures developed from wind data recorded at the Ruidoso Regional Airport. Figure 5-63 graphs average monthly wind speed beginning in 2013 and ending in early 2023. The recorded speeds are monthly averages based on daily measurements of wind speed in miles per hour. Figure 5-64 graphs the monthly maximum wind speed that was recorded at the airport for each month from the beginning of 2013 through the first 2 months of 2023.

Utilized in conjunction with Figure 5-62 above, these graphics provide a continuous general record of expected average wind speed and maximum wind speed for the area near the Ruidoso Regional Airport from 2013 through 2023. January and March consistently experience the highest average wind speeds while July is typically the least windy month. 2015, on average was the least windy year graphed and experienced average July wind speeds near zero mph. The initial graphing for 2023 average wind shows a sharp rise in average speed compared to past years. Maximum monthly wind speed for the same period indicates trends similar to previous years with maximum speed at or above 35 mph. together, this indicates that the first 2 months of 2023 experienced consistently high wind speeds but did not have singular wind events that were outside of the anticipated range for the county.

It is important to note that the Smokey Bear Remote Automatic Weather Station (RAWS) provides a more accurate measurement of high winds due to its location and placement (accessing these data for analysis was attempted but not successful). The previous occurrence information in Figure 5-66 below identifies high winds between 60 and 65 mph in comparison to the same wind event measurements at the Airport being approximately 10 to 20 mph lower. According to the Lincoln County Emergency Manager, on April 12, 2022, there were wind gusts up to 71 mph at the Ruidoso Airport and weather station reporting of up to 92 mph winds. These high winds were part of why the McBride Fire spread so fast and over so many acres.

**Figure 5-63: Average Monthly Wind Speed Assessed at the Ruidoso Regional Airport.**

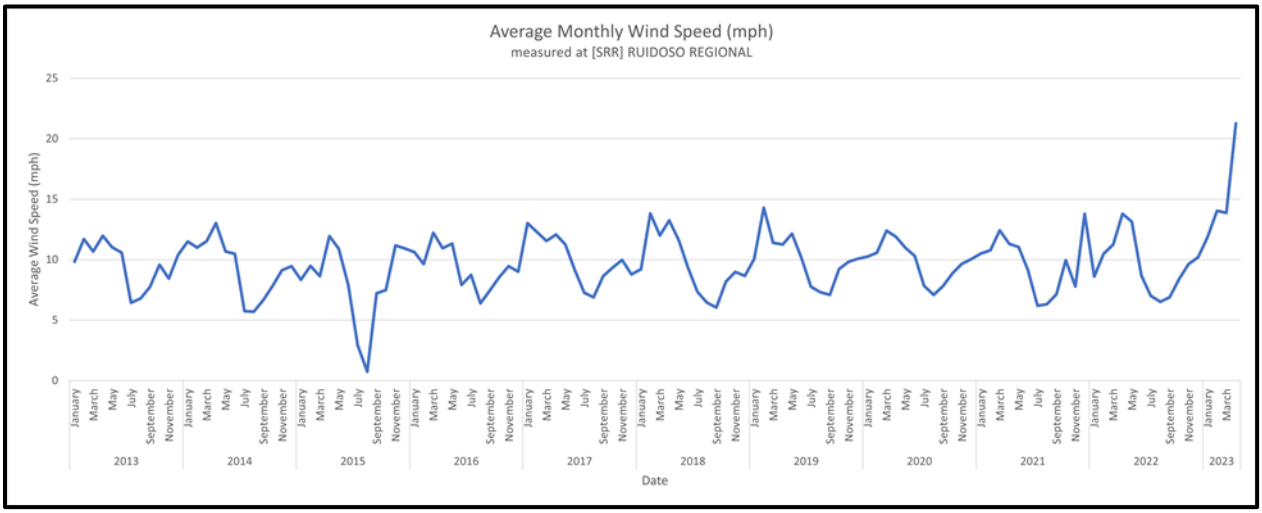
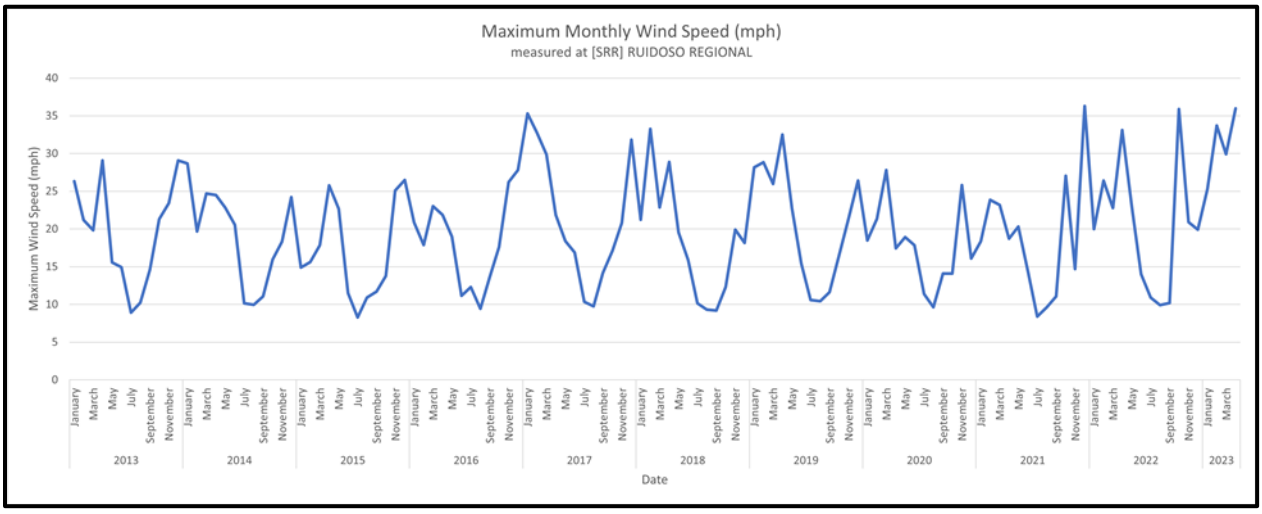


**Figure 5-64: Maximum Monthly Wind Speed Assessed at the Ruidoso Regional Airport.**




Source: [IEM: Daily Summary Data (iastate.edu)]

**Figure 5-65: Beaufort Wind Scale**

| 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 rises. Small branches begin to move. |
| 5 | 19-24 | Fresh Breeze | Smaller trees sway. |
| 6 | 25-31 | Strong Breeze | Large branches in motion. Whistling heard in overhead wires. Umbrella use becomes difficult. |
| 7 | 32-38 | Near Gale | Whole trees in motion. Effort needed to walk against the wind. |
| 8 | 39-46 | Gale | Twigs broken from trees. Cars veer on road. |
| 9 | 47-54 | Strong Gale | Light structure damage. |
| 10 | 55-63 | Storm | Trees uprooted. Considerable structural damage. |
| 11 | 64-73 | Violent Storm | Widespread structural damage. |

| Beaufort Wind Scale | | | |
|---|---|---|---|
| **Beaufort Number** | **Wind Speed (mph)** | **Description** | **Land Conditions** |
| 12 | 73-95 | Hurricane | Considerable and widespread damage to structures. |

#### 5.3.5.2 Previous Occurrences

NCDC records high wind events according to climatic zones due to the hazard's broad nature. The description of communities falling in each zone is as follows: 1) Upper Tularosa Valley (Chihuahuan desert) encompasses the community of Carrizozo, 2) South-central mountains contains Ruidoso, Ruidoso Downs, and Capitan, 3) South Central Highlands includes Corona, 4) Eastern Plains and prairie which does not contain any communities that were assessed for the purposes of this plan. Figure 5-66 shows the previous occurrences of high wind per participating jurisdiction from January 1, 2017, through December 31, 2022. The Planning Team agreed that high wind previous occurrence would focus on the past 6 years of the planning cycle.

**Figure 5-66: Previous Occurrences of High Wind per Jurisdiction, January 1, 2017, through December 31, 2022**

| Location | Date | Detailed Description | Magnitude |
|---|---|---|---|
| Eastern Lincoln County | 01/11/2017 | High winds in the area from the northern mountains across the adjacent east slopes and the high plains. Sustained winds of 40 to 50 mph with gusts between 60 and 70 mph were common. | 59 mph |
| Eastern Lincoln County | 01/19/2017 | Localized high winds over the high plains. The strongest winds occurred in rural eastern Lincoln County. Sustained winds averaged 40 to 45 mph with gusts near 60 mph. | 44 mph |
| South Central Highlands<br>Corona<br>Eastern Lincoln County<br>South Central Mountains<br>Ruidoso<br>Ruidoso Downs<br>Capitan | 01/21/2017 | A strong jet streak crossed over central and southeastern New Mexico and created an extended period of strong northwest winds. The area around Ruidoso reported peak wind gusts between 55 and 65 mph. White Sands Missile Range observations gusted as high as 61 mph. Peak wind gust to 61 mph at Sierra Blanca airport. | 70-66 mph |
| Upper Tularosa Valley<br>Carrizozo | 02/12/2017 | Peak wind gusts around 60 mph were common within the Tularosa Valley. A public weather station northwest of Carrizozo along U.S. Highway 380 reported sustained winds up to 43 mph for several hours. | 43 mph |

| Location | Date | Detailed Description | Magnitude |
|---|---|---|---|
| Eastern Lincoln County<br>South Central Mountains<br>Ruidoso<br>Ruidoso Downs<br>Capitan<br>South-Central Highlands<br>Corona | 02/23/2017 | Sustained winds in many areas of eastern New Mexico averaged 40 to 45 mph while wind gusts peaked around 60 mph. Blowing dust from White Sands National Monument was captured for the first time by the new GOES-16 satellite. Sierra Blanca Regional Airport reported a peak wind gust to 61 mph. A public weather station on the | 41-62 mph |
| South Central Mountains<br>Ruidoso<br>Ruidoso Downs<br>Capitan<br>Eastern Lincoln County<br>Upper Tularosa Valley<br>Carrizozo<br>South Central Highlands<br>Corona | 02/28/2017 | Many locations across the eastern plains reported peak winds between 65 and 75 mph. Power outages were reported around Lincoln County. The most significant blowing dust event of the season so far was reported across much of southeastern New Mexico. Sierra Blanca Regional Airport reported peak wind gusts as high as 78 mph for several hours. A public weather station along U.S. Highway 54 north of Carrizozo reported a peak wind gust up to 60 mph. | 59-78 mph |
| South Central Mountains<br>Ruidoso<br>Ruidoso Downs<br>Capitan<br>Eastern Lincoln County | 03/06/2017 | Gusts across the eastern plains averaged 60 to 65 mph with a few areas of blowing dust. The Sierra Blanca Regional Airport reported peak wind gusts between 58 and 61 mph for several hours. Sustained winds were as high as 43 mph. The Columbia Scientific Balloon Facility (CSBF) Transwestern Pump station reported peak wind gusts up to 58 mph for several hours. | 58-70 mph |
| Eastern Lincoln County | 03/23/2017 | The CSBF Transwestern Pump station reported peak wind gusts up to 62 mph with sustained winds up to 47 mph for several hours. | 62 mph |
| South Central Mountains<br>Ruidoso<br>Ruidoso Downs<br>Capitan<br>South Central Highlands<br>Corona | 03/31/2017 | Areas from the White Sands Missile Range to Ruidoso reported peak wind gusts near 60 mph. Several White Sands Missile Range sites reported high wind gusts up to 58 mph. | 58-60 mph |
| Eastern Lincoln County | 04/04/2017 | Wind gusts between 60 and 70 mph were reported. | 58 mph |
| Upper Tularosa Valley<br>Carrizozo<br>Eastern Lincoln County | 05/16/2017 | Several White Sands Missile Range sites reported peak wind gusts up to 61 mph. | 58-61 mph |

| Location | Date | Detailed Description | Magnitude |
|---|---|---|---|
| Upper Tularosa Valley<br>Carrizozo<br>South Central Highlands<br>Corona | 10/09/2017 | Carrizozo reported peak wind gusts between 40 and 50 mph. No damage was reported. | 60-64 mph |
| South Central Mountains<br>Ruidoso<br>Ruidoso Downs<br>Capitan | 12/21/2017 | The strongest winds impacted the area around Ruidoso where gusts between 55 and 65 mph were reported. Sierra Blanca Regional Airport reported peak winds between 58 mph and 66 mph periodically for several hours. | 66 mph |
| Eastern Lincoln County | 01/10/2018 | Widespread wind gusts up to 50 mph were reported over northern and central New Mexico. The strongest winds occurred over the high plains of eastern New Mexico where gusts near 60 mph were reported. Peak wind gusts topped out at 61 mph 18 miles north-northeast of Encinoso. | 61 mph |
| South Central Mountains<br>Ruidoso<br>Ruidoso Downs<br>Capitan | 01/26/2018 | The Smokey Bear RAWS station reported a brief peak wind gust to 60 mph. | 60 mph |
| South Central Mountains<br>Ruidoso<br>Ruidoso Downs<br>Capitan | 02/14/2018 | Ruidoso reported a peak wind gust to 66 mph. | 47-66 mph |
| South Central Highlands<br>Corona<br>South Central Mountains<br>Ruidoso<br>Ruidoso Downs<br>Capitan<br>Eastern Lincoln County | 02/19/2018 | The Corona Public Library weather station reported sustained winds periodically between 40 mph and 48 mph for several consecutive hours and peak wind gusts between 58 mph and 63 mph. Sierra Blanca Regional Airport reported sustained winds between 40 mph and 56 mph for several consecutive hours and peak wind gusts between 58 mph and 76 mph for several consecutive hours. | 45-76 mph |
| South Central Mountains<br>Ruidoso<br>Ruidoso Downs<br>Capitan | 02/22/2018 | Strong winds were reported around the Ruidoso area. Sierra Blanca Regional Airport reported peak wind gusts up to 58 mph. | 58 mph |
| South Central Mountains<br>Ruidoso<br>Ruidoso Downs<br>Capitan | 02/24/2018 | The weather station at the Upper Hondo Soil and Water Conservation District reported sustained winds periodically between 40 and 45 mph and a peak wind gust up to 60 mph. | 45-60 mph |
| South Central Mountains<br>Ruidoso<br>Ruidoso Downs<br>Capitan | 03/04/2018 | The Smokey Bear RAWS reported a peak wind gust up to 58 mph. Strong wind gusts around Ruidoso tossed a large trampoline into a nearby fence. | 58 mph |

| Location | Date | Detailed Description | Magnitude |
|---|---|---|---|
| South Central Mountains<br>Ruidoso<br>Ruidoso Downs<br>Capitan<br>Eastern Lincoln County | 03/15/2018 | Smokey Bear RAWS reported peak wind gusts up to 62 mph. Sierra Blanca Regional Airport reported sustained wind speeds periodically between 40 and 44 mph. | 44-62 mph |
| South Central Mountains<br>Ruidoso<br>Ruidoso Downs<br>Capitan<br>South Central Highlands<br>Corona<br>Eastern Lincoln County | 03/18/2018 | Sierra Blanca Regional Airport reported peak wind gusts between 58 mph and 62 mph for several hours. Peak sustained winds up to 47 mph were also reported for a short duration during this time. | 58-63 mph |
| Eastern Lincoln County | 04/08/2018 | The CSBF Transwestern Pump Station reported peak sustained winds between 40 mph and 51 mph for several hours and peak wind gusts between 58 mph and 65 mph. | 63-64 mph |
| Eastern Lincoln County<br>South Central Mountains<br>Ruidoso<br>Ruidoso Downs<br>Capitan<br>South Central Highlands<br>Corona<br>Upper Tularosa Valley<br>Capitan | 04/12/2018 | High temperatures in the 80s and 90s combined with very low humidity and strong winds set the stage for wildfires across the region. The 246 Fire near Capitan consumed nearly 4,000 acres as well as two homes and four outbuildings. Smokey Bear RAWS reported peak wind gusts up to 65 mph. Sierra Blanca Regional Airport reported sustained winds between 40 mph and 48 mph and peak wind gusts between 58 mph and 66 periodically for several hours. A White Sands Missile Range site reported a peak wind gust up to 58 mph. | 47-66 mph |
| South Central Highlands<br>Corona | 04/13/2018 | A weather station near Deer Canyon Preserve reported sustained winds of 40 to 41 mph periodically for a couple hours. | 41 mph |
| Eastern Lincoln County<br>South Central Mountains<br>Ruidoso<br>Ruidoso Downs<br>Capitan<br>South Central Highlands<br>Corona | 04/17/2018 | A weather station in Corona reported a peak wind gust up to 58 mph. Sierra Blanca Regional Airport reported sustained winds between 40 mph and 44 mph periodically for several hours. | 44-66 mph |
| South Central Mountains<br>Ruidoso<br>Ruidoso Downs<br>Capitan | 05/01/2018 | Most locations experienced wind gusts in the 35 to 45 mph range throughout the day. The strongest winds impacted the area around Ruidoso where a 60-mph wind gust was reported at the Smokey Bear RAWS. | 60 mph |
| Eastern Lincoln County | 05/02/2018 | The CSBF Transwestern Pump station reported peak wind gusts up to 58 mph. | 58 mph |

| Location | Date | Detailed Description | Magnitude |
|---|---|---|---|
| Upper Tularosa Valley<br>Carrizozo | 12/12/2018 | The Phillips Hill site at White Sands Missile Range reported a peak wind gust up to 60 mph. | 60 mph |
| South Central Mountains<br>Ruidoso<br>Ruidoso Downs<br>Capitan<br>South-Central Highlands<br>Corona | 12/13/2018 | The Sierra Blanca airport reported peak wind gusts up to 58 mph. The Shist site at White Sands Missile Range reported peak wind gusts between 58 mph and 62 mph. | 58-62 mph |
| South Central Mountains<br>Ruidoso<br>Ruidoso Downs<br>Capitan | 01/06/2019 | Strong westerly winds impacted areas from the east slopes of the central mountain chain across the high plains. The strongest winds occurred within Lincoln County where gusts up to 68 mph were reported. The Smokey Bear RAWS site west of Ruidoso reported a peak wind gust up to 64 mph. | 68 mph |
| South Central Highlands<br>Corona | 01/18/2019 | White Sands Missile Range mesonet sites reported peak wind gusts between 58 and 74 mph. Mesonet sites are weather stations not federally owned that report data to the NWS. | 74 mph |
| South Central Mountains<br>Ruidoso<br>Ruidoso Downs<br>Capitan | 01/21/2019 | Widespread wind gusts of 40 to 50 mph were reported over many areas with peak winds in excess of 60 mph in the higher terrain of Lincoln County. The Sierra Blanca airport reported sustained winds between 40 and 51 mph and peak wind gusts between 58 and 71 mph for several hours. | 51-71 mph |
| South Central Mountains<br>Ruidoso<br>Ruidoso Downs<br>Capitan | 02/03/2019 | Much of central and eastern New Mexico experienced wind gusts of 40 to 50 mph throughout the day. The strongest winds impacted areas around Ruidoso where gusts up to 61 mph were reported. Sierra Blanca airport reported peak wind gusts up to 61 mph. | 61 mph |
| South Central Mountains<br>Ruidoso<br>Ruidoso Downs<br>Capitan<br>South Central Highlands<br>Corona | 02/06/2019 | Several White Sands Missile Range sites reported peak wind gusts between 58 and 60 mph. Sierra Blanca airport reported a peak wind gust up to 63 mph. | 60-63 mph |

| Location | Date | Detailed Description | Magnitude |
|---|---|---|---|
| South Central Mountains<br>Ruidoso<br>Ruidoso Downs<br>Capitan<br>South-Central Highlands<br>Corona | 02/11/2019 | West to northwest winds of 25 to 35 mph with gusts near 50 mph impacted many areas of the state, but the strongest winds impacted eastern New Mexico where gusts near 60 mph were common. The Upper Hondo Soil and Water Conservation District office reported peak wind gusts up to 60 mph. A National Weather Service network site on White Sands Missile Range reported peak wind gusts up to 61 mph. | 60-61 mph |
| Upper Tularosa Valley<br>Carrizozo<br>South Central Highlands<br>Corona<br>South Central Mountains<br>Ruidoso<br>Ruidoso Downs<br>Capitan | 02/23/2019 | A National Weather Service network site on White Sands Missile Range reported a peak wind gust up to 59 mph. A weather station at the Corona public library reported a peak wind gust up to 60 mph. A weather station at the Upper Hondo Water & Conservation District office in Capitan reported sustained winds of 40 to 45 mph for several hours. | 45-60 mph |
| South Central Mountains<br>Ruidoso<br>Ruidoso Downs<br>Capitan | 03/07/2019 | A public weather station near Nogal reported sustained winds between 40 mph and 50 mph for a couple hours. | 49 mph |
| South Central Mountains<br>Ruidoso<br>Ruidoso Downs<br>Capitan<br>South-Central Highlands<br>Corona | 03/08/2019 | A National Weather Service network site on White Sands Missile Range reported peak wind gusts up to 66 mph. A weather station near Nogal reported a peak wind gust up to 60 mph. | 60-66 mph |
| Eastern Lincoln County<br>South Central Highlands<br>Corona<br>South Central Mountains<br>Ruidoso<br>Ruidoso Downs<br>Capitan<br>Upper Tularosa Valley<br>Carrizozo | 03/13/2019 | Various White Sands Missile Range sites reported sustained winds between 40 mph and 47 mph and peak wind gusts between 58 mph and 82 mph for several hours. Significant blowing dust was reported across the area. The Smokey Bear RAWS reported peak wind gusts up to 59 mph. A peak gust of 62 mph was reported 18 miles northeast of Encinoso. | 47-82 mph |

| Location | Date | Detailed Description | Magnitude |
|---|---|---|---|
| South Central Highlands<br>Corona<br>South Central Mountains<br>Ruidoso<br>Ruidoso Downs<br>Capitan<br>Upper Tularosa Valley<br>Carrizozo | 04/10/2019 | Various sources across the Ruidoso area reported sustained winds between 40 mph and 50 mph and peak wind gusts between 60 and 70 mph. A peak wind gust up to 75 mph was recorded at the Sierra Blanca airport. Significant blowing dust impacted the area from White Sands. Various sources across the Carrizozo area reported peak wind gusts between 58 mph and 62 mph for several hours. Various White Sands Missile Range sites reported peak wind gusts between 60 mph and 70 mph. Significant blowing dust impacted the area. | 49-75 mph |
| South Central Mountains<br>Ruidoso<br>Ruidoso Downs<br>Capitan | 05/17/2019 | A peak wind gust up to 58 mph was reported by the Smokey Bear RAWS southwest of Ruidoso. | 58 mph |
| South Central Mountains<br>Ruidoso<br>Ruidoso Downs<br>Capitan | 05/20/2019 | Sierra Blanca airport reported sustained winds around 41 mph for several hours and peak wind gusts up to 58 mph. | 41-58 mph |
| South Central Mountains<br>Ruidoso<br>Ruidoso Downs<br>Capitan | 05/27/2019 | Most of the experienced wind gusts in the 30 to 40 mph range, however localized high wind gusts near 60 mph impacted the Ruidoso area. The Sierra Blanca airport reported peak wind gusts up to 60 mph. | 60 mph |

#### 5.3.5.3 Location and Extent per Participating Jurisdiction

The average annual wind speed in Lincoln County is between 2 and 25 mph. The mountainous regions of the county, particularly the Capitan Mountains and the Sacramento Range in the south-central part of the county are on the upper end of this average and experience a high number of reported wind events. The majority of recorded wind events during the planning period occurred during the winter and spring seasons from November to May. March and April have the highest average wind speed as shown in Figure 5-63 above. January consistently had the maximum observed wind speed during the assessed period. These winds are generally associated with winter storm cells moving across the county.

All areas of Lincoln County experience damaging high winds, especially in the early spring, but extremely high-velocity wind over a prolonged period is rare. High wind is expected to be prominent from winter through late spring with the highest occurrence in March and April. Many events that impact the county result from cold fronts moving eastward across the county. Storm events that either form or move across the mountain ranges generally have the highest magnitude as they are aided by down sloping. Such occurrences can result in downed power lines, roof damage, trees being blown down, and difficulty in controlling high- profile vehicles on the highways. Microburst wind damage is more common since it is often associated with powerful downdrafts originating from thunderstorms. These winds are of relatively short duration. Downburst wind events occur more frequently in the warmer summer months where high winds are associated with thunderstorms common during monsoon season. Certain areas of Lincoln County are subject to hazardous dust storms when high winds blow over terrain that is relatively devoid of

vegetation. Localized dust storms can arise unexpectedly when high winds pick up dust and debris from construction sites and other denuded areas.

The village of Corona experiences the highest average annual windspeed of all assessed communities, averaging around 9 mph. The communities of Ruidoso, Ruidoso Downs, and Capitan all fall within the Southcentral Mountain weather region and experience similar average wind speeds around 6 mph. It's worth noting that Ruidoso and Ruidoso Downs generally experience more extreme events due to their higher elevation and proximity to the Sacramento mountains. During the assessed period of 2017 through 2022, five tornadoes also impacted the county and are noted further in the jurisdictions where they were reported, although none of the recorded tornadoes directly touch down in any of the communities nor did they impact the communities or infrastructure. No deaths, injuries, or damage was reported from these events, and they were mostly limited to touchdowns of less than 5 minutes. These mostly occurred in the eastern plains of the county although one tornado touched down near Carrizozo in spring of 2017.

**Lincoln County**

During the assessment period, 44 extreme wind events impacted the county. These events did not cause any reported deaths or injuries, however $500 in property damage was reported. This resulted from a high wind event on March 4, 2018, in the south and southwest portion of the county where wind speeds reached 66 mph and a trampoline was carried away, damaging fences. Severe wind is most common from late winter through early summer with February and March having the highest number of occurrences. Magnitude of severe events ranges from 35-80 mph with the highest rate occurring in the Southcentral Highlands which covers a portion of the unincorporated County. The Southcentral Mountain region experienced the highest number of events with 31. Multiple tornado events also occurred in the county during this period. One occurred near Capitan while the other was near Carrizozo. Both events were minor in extent, reaching the ground for less than 5 minutes and did not cause any damage.

According to the Lincoln County Emergency Management Director, due to high winds during the McBride Fire (2022), electricity was down for more than 4 days in some portions of the impacts area. Emergency Medical Services (EMS) across the street from the hospital was down for 4 days making communications and response more challenging.

**Village of Ruidoso**

The topography of the village makes it susceptible to down sloping as storms move from the west, over the Sacramento mountains. Tree mortality in recent years from drought and pest outbreaks has left many dead standing trees that can become windfall hazards.

Between 2017 and 2022, 27 high wind events occurred in the southcentral mountains where the village is located. Most high winds occurred during the winter and spring months from December to June. On February 28, 2017, a severe winter storm moved through the county but did not have any significant snow. Large surface-air temperature differentials created winds that swept across much of the southern portion of the county. Wind speeds reached 78 mph. And caused power outages throughout the village.

**City of Ruidoso Downs**

Recent years have seen a large number of winter storm winds, especially at higher elevations. High winds are of concern to the city for a variety of health and safety reasons. The city has multiple mobile home parks that can be damaged under severe conditions. It's noted in the city's comprehensive plan that soil health is relatively low. When high winds occur, this soil can be easily transported and pose a potential air quality threat to people in the area.

Between 2017 and 2022, 27 high wind events occurred in the village. Most high winds occurred during the winter and spring months from December to June. The highest wind speed during this time period occurred on May 20, 2019, when a spring storm that also dropped hail and heavy rain measured gusting winds at 69 mph. With sustained speeds around 57 mph.

According to the Ruidoso Downs Fire Chief/Emergency Manager, in order to determine if it is safe to land medical helicopters, the City uses handheld anemometers to measure wind speed in order to ensure staff and patient safety.

**Town of Carrizozo**

The landscape surrounding Carrizozo is generally a desert grassland with loose, rocky soil. In May of 2017, tornadoes were recorded near town. The events were short lived, touching down for only a few minutes and none reached the city limits of Carrizozo. The town is in the process of establishing a text notification system to expedite warning and evacuation notices for all hazards.

The town falls within the Upper Tularosa valley and seven severe windstorm events were reported between 2017 and 2022. The most severe event during the period of January 2017 through December 2022 occurred on April 10, 2019. Down slopping air flow from the Sacramento mountains to the east created a several hours of gusting winds between 57 and 63 mph.

**Village of Capitan**

The village is subject to similar storm-related wind events to those that impact Ruidoso and Ruidoso Downs; jet stream and storm cells moving eastward sweep over the mountains to the east and carry strong winds into the valley. Debris movement, such as sandstorms, are a wind-related concern for the village.

Capitan, along with Ruidoso and Ruidoso Downs fall within the Southcentral Mountains weather forecast zone. Between 2017 and 2022, 27 high wind events occurred in the region. Most high winds occurred during the winter and spring months from December to June. The most impactful wind event of the assessed period occurred on April 12, 2018, when a large storm cell moved east across the state from the central mountains. The storm moved out of the high terrain late in the afternoon and down sloping winds gusted from 57 to 69 mph. This fueled the spread of the 246 fire near the village which destroyed two homes and burned 40,000 acres.

**Village of Corona**

The geography of the village leaves it susceptible to high wind- and dust-related events. One tornado even touched down momentarily near the village during the assessed period.

The village is expected to experience wind event along the same seasonal frequency experienced by unincorporated Lincoln County. Fifteen total high wind events were recorded between 2017 and 2022 in the village. The most severe wind event of this period was recorded on February 19, 2018, when a large winter storm that originated in the Four Corners region slowly moved southeast across the state, distributing snow along the way and gaining size as it moved across the central mountains. Sweeping winds impacted the village throughout the afternoon and night; the public library in town reported gusts between 57 and 63 mph.

### 5.3.5.4 Probability of Occurrence

When calculating severe weather high hazard wind probability, the Planning Team agreed to use the PRI, explained further in Figure 5-110. The probability in Figure 5-67 below is calculated based on the number of years in the last six that the hazard occurred.

- Unlikely means no events were recorded from 2017 through 2022. This results in 0-16.65% annual probability.
- Possible means 1 to 2 events were recorded from 2017 through 2022. This results in between 16.66% and 33.33% annual probability.
- Likely means 3 to 4 events were recorded from 2017 through 2022. This results in between 33.34% and 66.67% annual probability.
- Highly Likely means 5 or more events were recorded from 2017 through 2022. This results in between 66.68% and 100% annual probability.

In addition to the general definitions used for the PRI, the Planning Team analyzed the annual probability for 2017 to 2022 and over time based on available records for each hazard. The total number of occurrences was divided by the number of years of available data; for High Wind, there was 13 years of data. The annual probability for 2017 to 2022 and over time is shown below. Annual probability is calculated based on the number of occurrences divided by the number of years of data and presented as a percent anticipated to occur in 1 year. By comparing the annual probability from the past 6 years with that of all records over time, the Planning Team can consider potential changes over time, including potential impacts due to climate change. For example, the analysis revealed that there was an increase in annual probability for all participating jurisdictions when comparing the past 6 years of data to the past 13 years of data. It is understood that record keeping has improved over the years and that Annual Probability over time as presented here may not be an accurate accounting.

**Figure 5-67: Probability of High Wind Hazard Occurrence per Participating Jurisdiction**

| | High Wind Probability Based on Past Occurrence | | | | |
|---|---|---|---|---|---|
| **Jurisdiction** | **Past Occurrences 2017-2022** | **Probability 2017-2022 (Used in PRI)** | **Annual Probability 2017-2022** | **All Recorded Occurrences 2009-2022** | **Annual Probability 2009-2022** |
| Lincoln County | 44 | Highly Likely | 100% (733%) | 130 | 100% (1000%) |
| Village of Ruidoso | 27 | Highly Likely | 100% (450%) | 34 | 100% (262%) |
| City of Ruidoso Downs | 27 | Highly Likely | 100% (450%) | 34 | 100% (262%) |
| Town of Carrizozo | 7 | Highly Likely | 100% (116%) | 10 | 76.9% |
| Village of Capitan | 27 | Highly Likely | 100% (450%) | 18 | 100% (138%) |
| Village of Corona | 15 | Highly Likely | 100% (250%) | 7 | 53.8% |

### 5.3.5.5 Climate Change Impacts

Climate change is expected to create more severe storm events with higher precipitation totals and stronger, longer occurring winds. As polar regions warm, mid to high latitude temperature gradients are reduced which alters the path and speed of jet streams. This alteration allows storms to grow larger, covering more area, and move slower, impacting areas for longer. Another concern is the multilevel impact of

aridification and high wind. As average temperatures increase, and warmer, spring temperatures occur earlier, soil will become dry. This could increase the occurrence of dust storms and impact agriculture by stripping away topsoil if it isn't currently planted. Additionally, much of the eastern portion of the county is covered by vegetation with relatively shallow roots or completely uncovered by vegetation. Increased wind events and speeds will result in higher rates of sandstorms and desertification which is the complete loss of biological processes and soil organic matter. This creates a highly erodible landscape where little to no vegetation can grow. Climate change–related reductions in snowpacks have also reduced the health of many forests leaving them more vulnerable to high intensity wildfires. High wind is often a catalyst or driver for destructive wildfire events and cannot be assessed in the context of climate change without consideration for the others contribution.

Over the course of the 6-year assessment period, Unincorporated Lincoln County, Ruidoso, Ruidoso Downs, and Carrizozo all saw a slight decrease in high wind event frequency while Capitan and Corona experienced slight increases. The areas that saw decreases are still categorized as likely to highly likely based on a high number of observed events. Frequency alone does not provide a full picture of how wind hazards are changing; as shown in Figure 5-64, since 2013, monthly maximum wind speeds have gradually increased with months that usually experienced limited wind now recording maximum winds similar to those recorded during peak wind season. Anecdotally, it was noted by the Planning Team that there has been in increase in destructive high wind events that is in line with the available data. This change may be correlated with climate change–related disruptions to global wind cycles.

### *5.3.6 Drought*

#### 5.3.6.1 Description

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, socio-economic, and ecological effects.

- **Meteorological** drought is defined as a period of substantially diminished precipitation duration and/or intensity. The commonly used definition of meteorological drought is an interval of time, generally on the order of months or years, during which the actual moisture supply at a given place consistently falls below the climatically appropriate moisture supply.
- **Agricultural** drought occurs when soil moisture is inadequate and does not meet the needs of a particular crop at a particular time. Agricultural drought usually occurs after or during meteorological drought but before hydrological drought and can affect livestock and other dry- land agricultural operations.
- **Hydrological** drought refers to deficiencies in surface and subsurface water supplies. It is measured as stream flow, snowpack, and as lake, reservoir, and groundwater levels. There is usually a delay between lack of rain or snow and less measurable water in streams, lakes, and reservoirs. Therefore, hydrological measurements tend to lag behind other drought indicators.
- **Socioeconomic** drought occurs when physical water shortages start to affect the health, well- being, and quality of life of the people or when the drought starts to affect the supply and demand of an economic product.

- **Ecological** drought occurs when a prolonged and widespread deficit of available water places stress on ecosystems. This causes a loss of vegetation and terrestrial and aquatic species.

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

The impacts of drought are not limited to the initial challenges that it creates for communities such as limiting water supply and reducing agricultural yields. Rather, drought can exacerbate and increase the occurrence of other natural hazards like wildfire and flash flooding. As surface and ground water supplies dry, forests, grasslands, and wetlands have limited access to water and will become dry or simply die. As dry and dead vegetation accumulates, the risk of wildfire increases. When continuous drought occurs, soil moisture is reduced, and it will become hydrophobic. This makes the soil highly erosive and can result in debris flows and flash flooding when rain occurs. Alternatively, vegetation loss leaves soil exposed which can result in dust storms that impact air quality and create hazardous travel conditions.

Much of the southwestern and southcentral portion of the county is covered in ponderosa and mixed conifer forests intermixed with communities. This creates a high occurrence of WUI communities that are affected by drought. Drought causes trees to be stressed and therefore susceptible to beetle and bug infestation, wildfire and lack of water. When the forests are dry and stressed it impacts two important parts of the County ecosystem: 1) The scenic value; and 2) fire danger.

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

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

The Palmer index (Figure 5-68) uses temperature and physical water balance models to estimate relative soil dryness. The method also captures the effects of global warming and its potential changes to evapotranspiration rates. The palmer index is most effective at determining longer term drought and is best adapted to measuring drought across time scales 12 months or longer. The standardized metrics make the index ideal for comparing relative drought conditions at varying locations that have significantly different climates and water regimes.

**Figure 5-68: Palmer Drought Severity Index**

| PDSI Classifications | |
|---|---|
| 4.00 or more | Extremely wet |
| 3.00 to 3.99 | Very wet |
| 2.00 to 2.99 | Moderately wet |

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

Source: Palmer Drought Severity Index (PDSI)

#### 5.3.6.2 Previous Occurrences

Drought events during 2016 through 2022 for Lincoln County have been recorded by the NCDC, but no deaths, injuries, or estimated monetary damages were recorded. Even though the details regarding these events were lacking in the NCDC data, according to the Planning Team, Lincoln County has experienced losses from drought events. Figure 5-69 below shows previous occurrences for drought events, per participating jurisdiction for June of each year of the 6-year planning cycle. The Planning Team chose to modify the approach to reporting previous occurrences for the 2023 HMP Update to be based on the U.S. Drought Monitor for the typical driest month of the year, June. The previous occurrence listing for drought prior to January 1, 2017, is found in Appendix B-5; this listing is based on the U.S. Department of Agriculture emergency declarations.

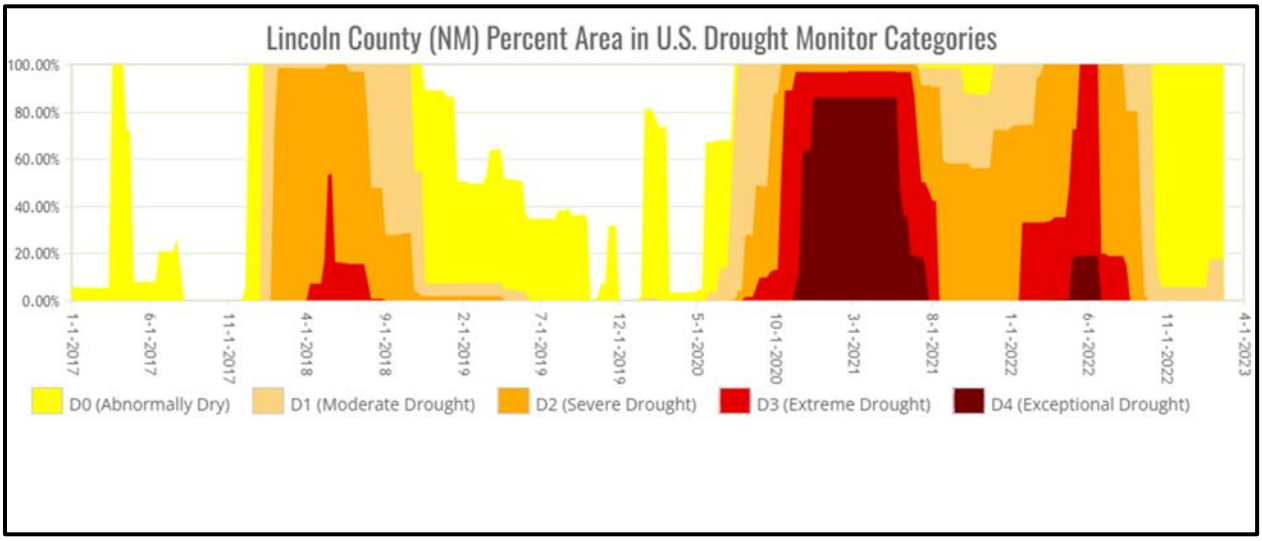
**Figure 5-69: Previous Occurrences of Drought per Jurisdiction for the month of June 2017 through 2022**

| Drought | Date 2017-2022 | Detailed Description |
|---|---|---|
| South Central Highlands – covers the region of Corona and Capitan | 3 reported events | These reported drought events ranged from moderate drought (D1, PDSI between -2.0 and -2.9), severe drought (D2, PDSI between -3.0 and -3.9), extreme drought (D3, PDSI between -4.0 and -4.9), and exceptional drought (D4, PDSI between -5.0 and -5.9). |
| Upper Tularosa Valley – covers the region of Carrizozo | 3 reported events | These reported drought events ranged from moderate drought (D1, PDSI between -2.0 and -2.9), severe drought (D2, PDSI between -3.0 and -3.9), extreme drought (D3, PDSI between -4.0 and -4.9), and exceptional drought (D4, PDSI between -5.0 and - 5.9). |
| South Central Mountains – covers the region Ruidoso and Ruidoso Downs | 3 reported events | These reported drought events ranged from moderate drought (D1, PDSI between -2.0 and -2.9), severe drought (D2, PDSI between -3.0 and -3.9), extreme drought (D3, PDSI between -4.0 and -4.9), and exceptional drought (D4, PDSI between -5.0 and - 5.9). |

| Drought | Date 2017-2022 | Detailed Description |
|---|---|---|
| Eastern Lincoln County – covers the region east of the Sacramento Mountains | 4 reported events | These reported drought events ranged from moderate drought (D1, PDSI between -2.0 and -2.9), severe drought (D2, PDSI between -3.0 and -3.9), extreme drought (D3, PDSI between -4.0 and -4.9), and exceptional drought (D4, PDSI between -5.0 and - 5.9). |

Figure 5-70 shows a timescale of the drought severity level in the county from 2017- 2022. The severity levels correspond to a color. Severity levels are shown as a percentage of area coverage through the years.

**Figure 5-70: Time Scale of Drought Conditions in the County.**




Figures 5-71 through 5-76 are snapshots of drought conditions from 2017 through 2022. To provide a consistent reference point, all maps are from June which has the highest average days under drought conditions. These maps do not necessarily correspond with the highest severity drought occurrence for each community in a given year.

In 2017, Lincoln County did not experience high rates of drought and only reached an abnormally dry rating. April and May saw the highest rates of drought during the year and the profiled communities were not heavily impacted by these events. 2017 saw consistent precipitation that helped reduce drought. Specifically, January and April saw above average precipitation as well as in July and August which are already the wettest months for the county.

2018 saw much higher rates of drought than 2017 and events during the year impacted the entire county. Extreme drought conditions were consistently present in the county between April and September with over 50% of the county experiencing extreme drought in May and June alone. All profiled communities experience severe or extreme drought. Precipitation was below average and the winter and spring months only received about 1 inch of precipitation each.

In 2019 the county saw some reprieve from the severe drought of the previous year. Severe drought was only experienced in the first three months of the year and less than 10% of the county reached that threshold. Drought still persisted in many areas though, as between 30-60% of the county experienced

abnormally dry conditions through most of the year. August through December saw high precipitation which contributed to the county heading into 2022 with less than 5% off the county experiencing abnormal dryness.

The county saw an increase in drought conditions in 2020 following some relief in 2019. In March, over 80% of the county experience abnormal dryness and about 5% reached moderate drought conditions. Precipitation was below average through the year and August, which generally sees the most precipitation, only received between 1 and 2 inches. This led to more extreme drought conditions returning to the county and by the end of the year, over 85% of the county was experiencing extreme or exceptional drought.

2021 was the most extreme drought year for the county during the planning period. Between February and August, over 80% of the county was under exceptional drought conditions. Drought persisted into the following year and only dropped to severe drought following average precipitation in July and August. Still, 100% of the county experienced at least moderate drought for the entire year.

2022 was another year of high levels of drought with severity fluctuation throughout the year and ending with over 90% of the county falling only under abnormally dry conditions by the end of the year. June saw a peak in severity as 100% of the county experienced at least extreme drought conditions. The slight decline in severity that began at the end of 2021 was short lived and by March, over 90% of the county returned to severe drought conditions. The county experiences above average precipitation through the summer months receiving 5 inches in August alone. Although severe conditions subsided near the end of the year, abnormal dryness persisted over 100% of the county leading into 2023.

**Figure 5-71: 2017 Lincoln County Drought Conditions Map and Severity Monitoring.**

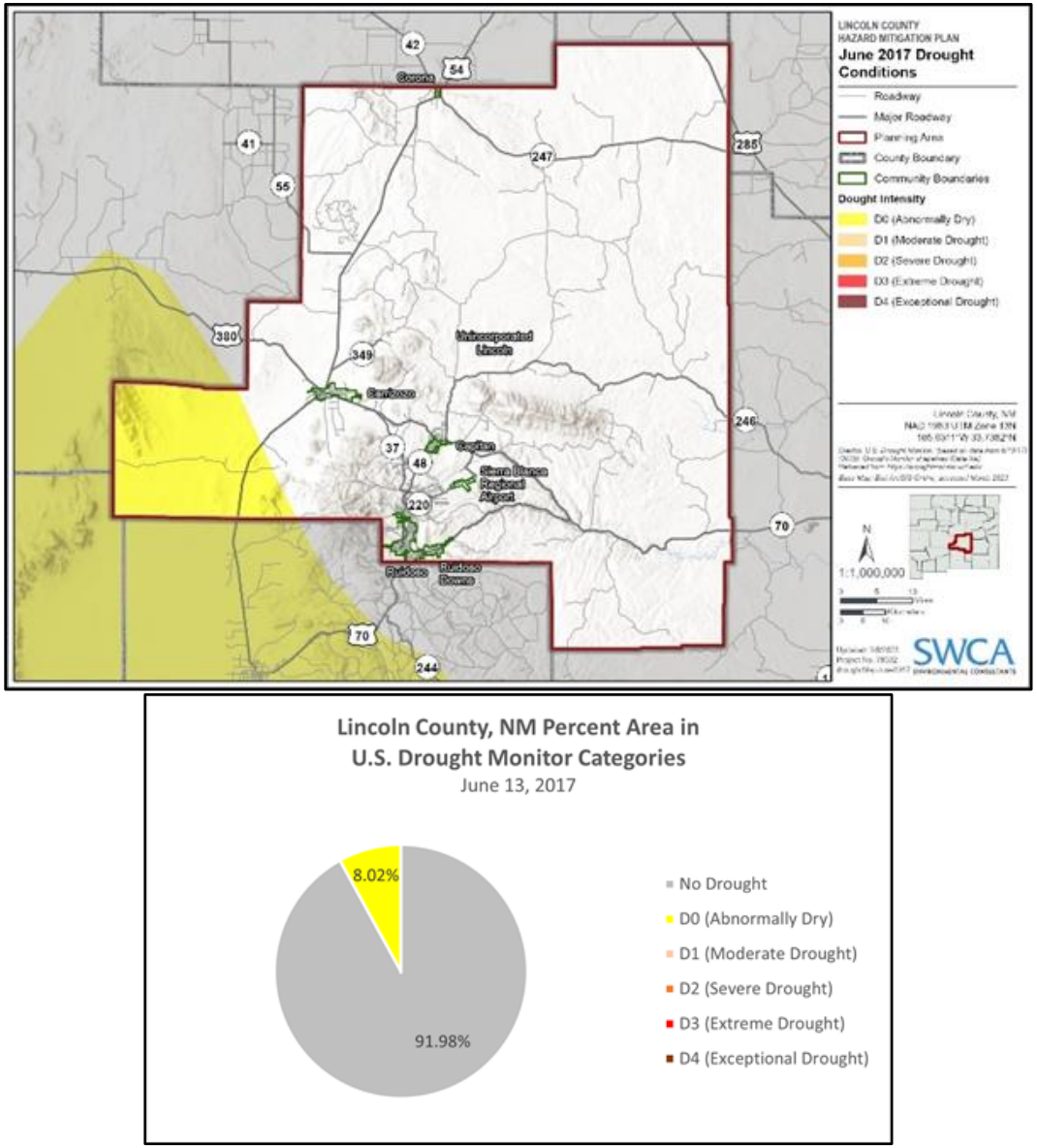
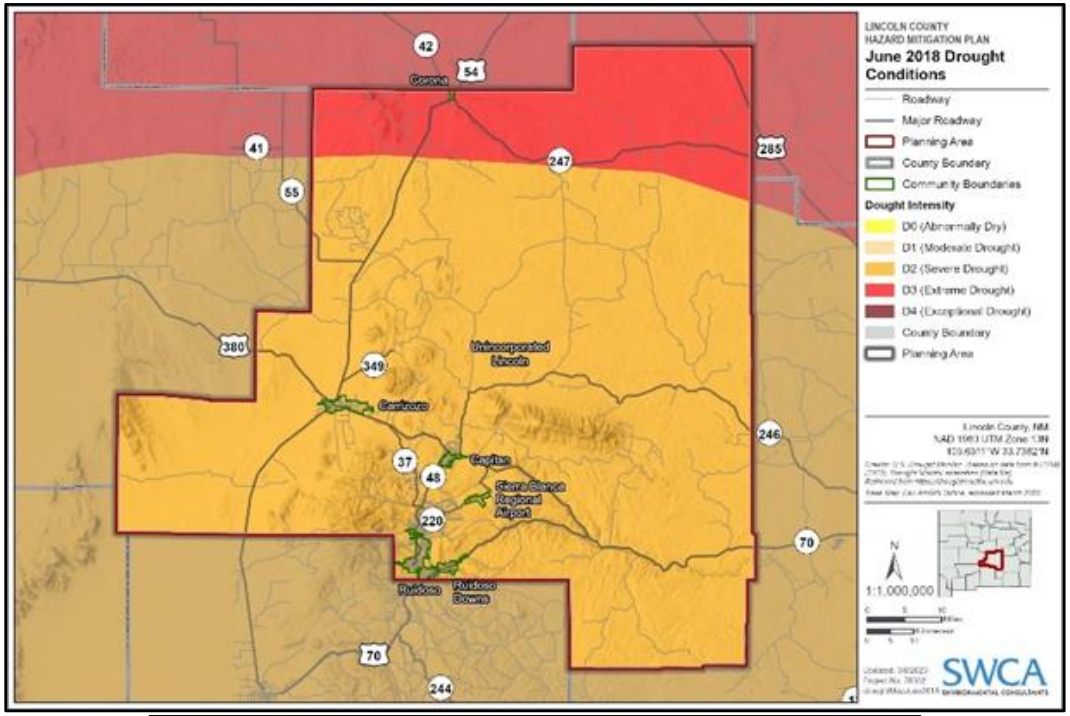


**Figure 5-72: 2018 Lincoln County Drought Conditions Map and Severity Monitoring.**



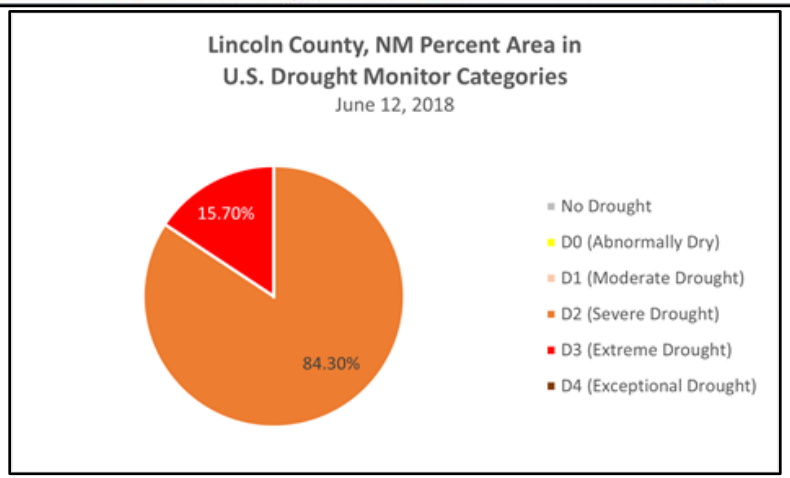
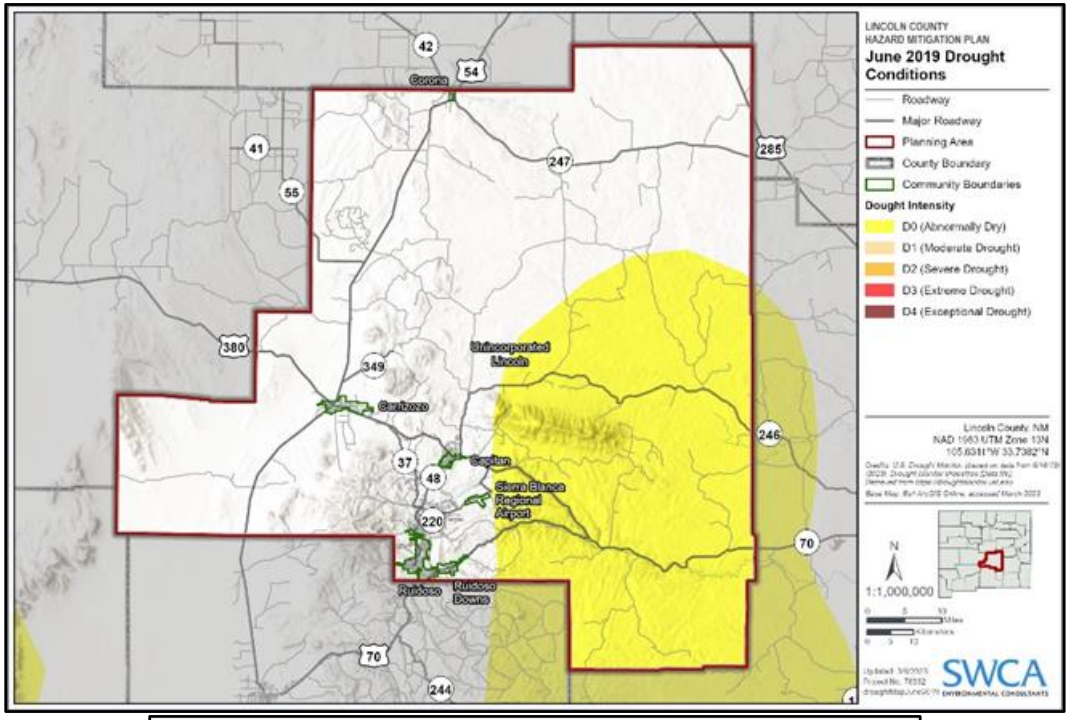



**Figure 5-73: 2019 Lincoln County Drought Conditions Map and Severity Monitoring.**



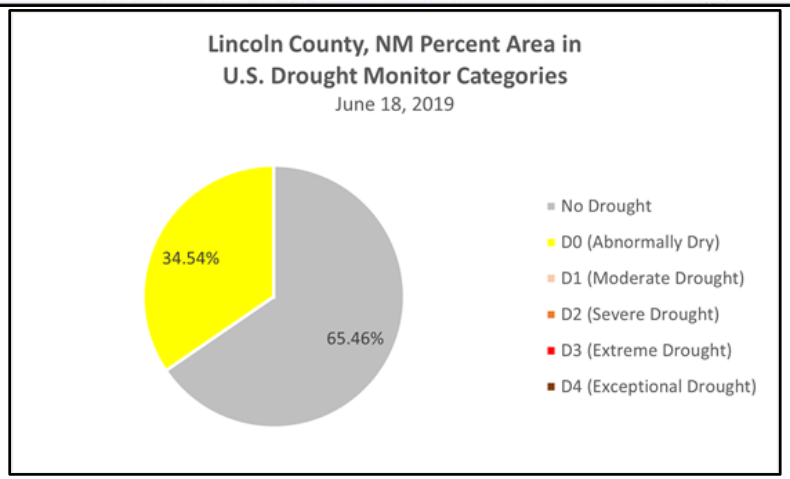
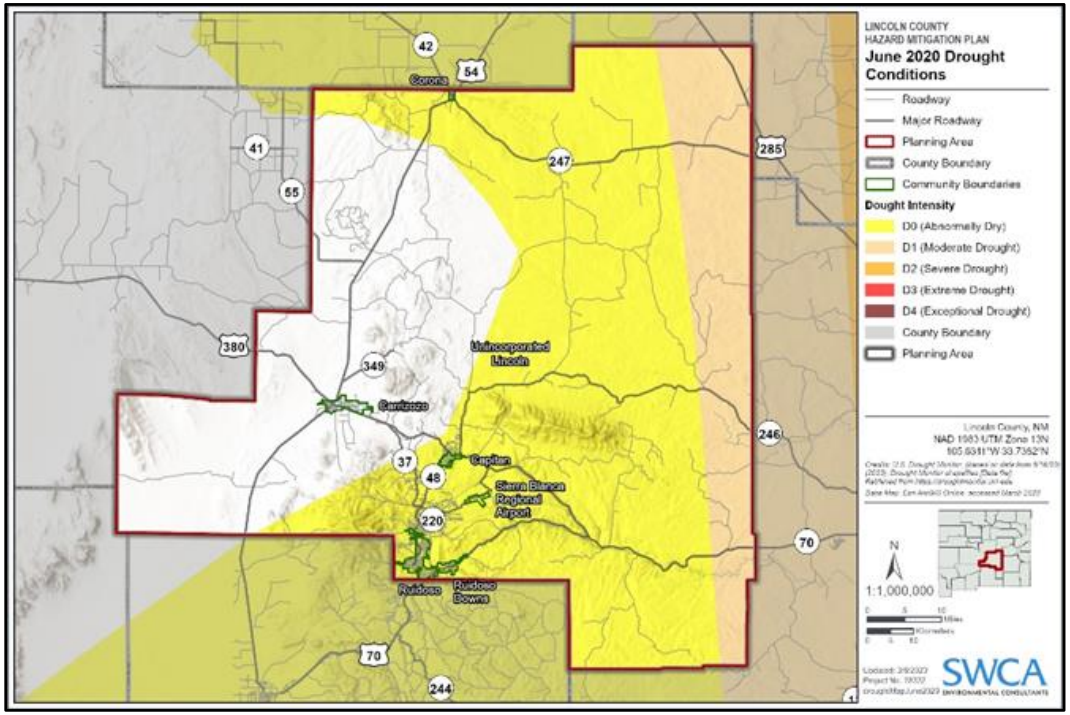



**Figure 5-74: 2020 Lincoln County Drought Conditions Map and Severity Monitoring.**



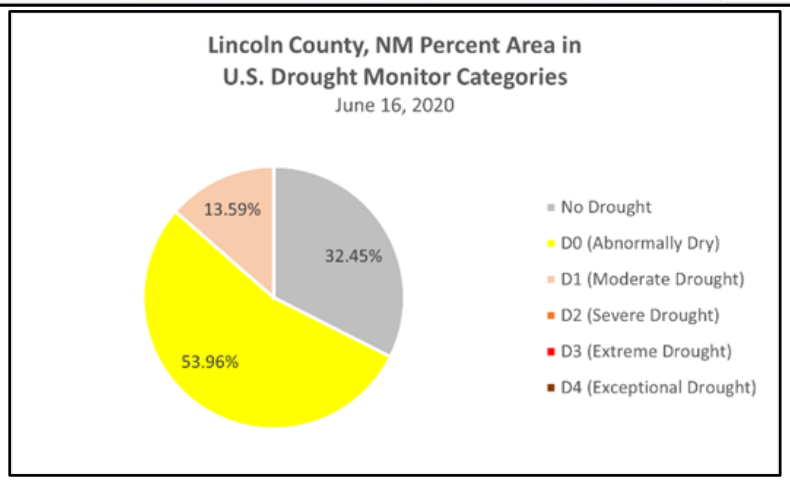
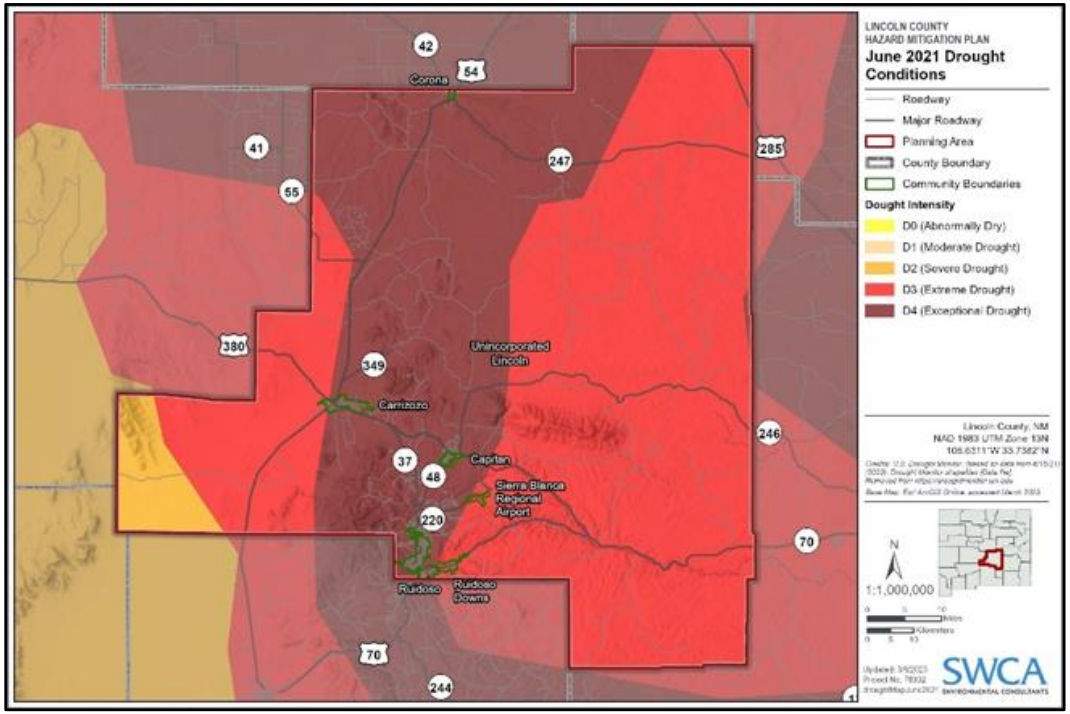



**Figure 5-75: 2021 Lincoln County Drought Conditions Map and Severity Monitoring.**



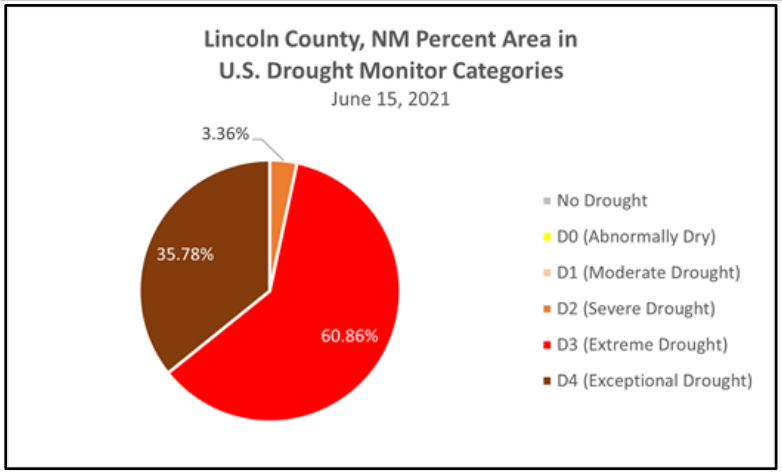
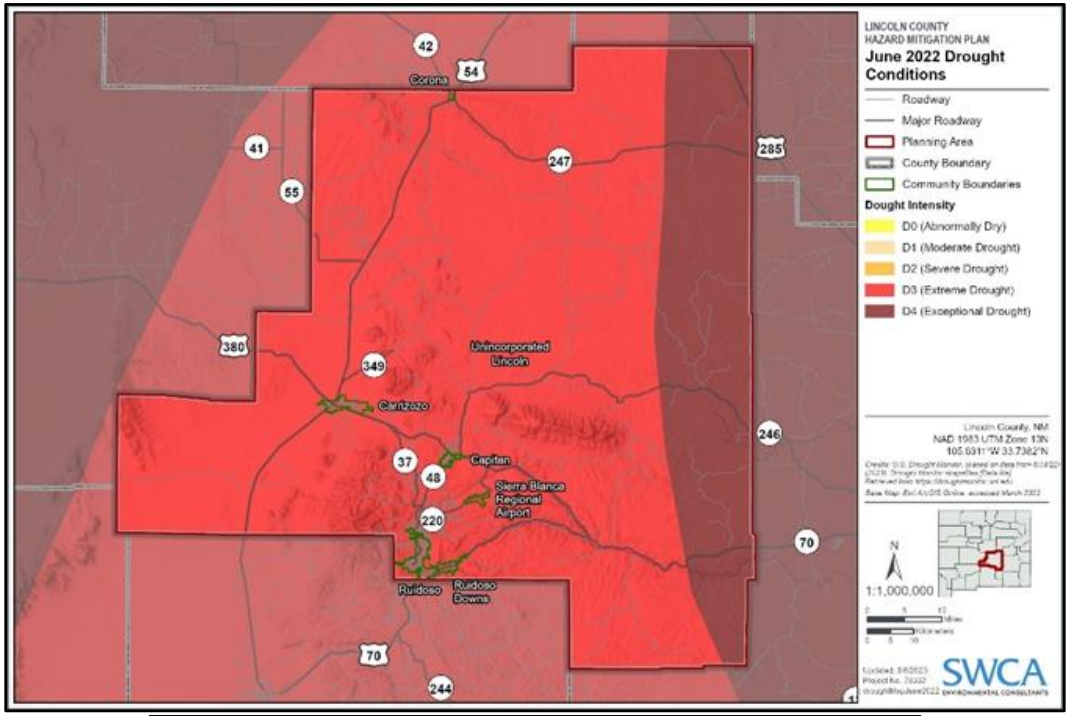
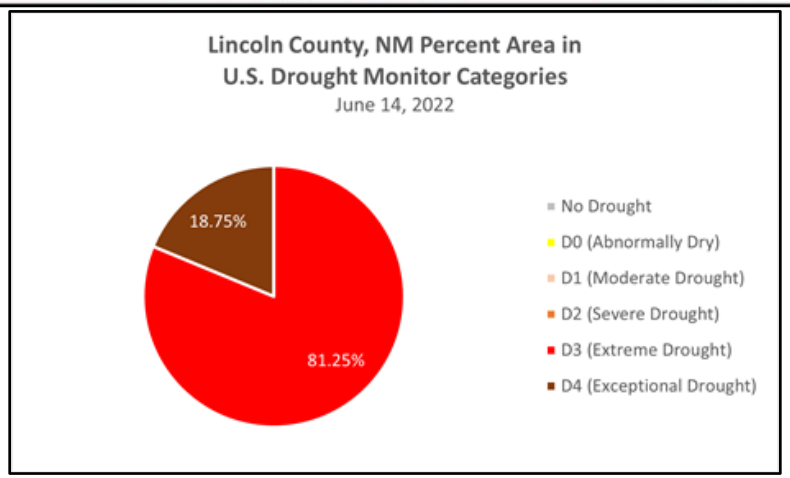



**Figure 5-76: 2022 Lincoln County Drought Conditions Map and Severity Monitoring.**



### 5.3.6.3 Location and Extent per Participating Jurisdiction

**Lincoln County**

Lincoln County has experienced some level of drought conditions consistently since November 2017. Droughts are caused by a variety of factors. Per the USGS journal article *Pacific and Atlantic Ocean influences on multidecadal drought frequency in the United States,* it is shown that conditions in the North Atlantic Ocean and the Eastern Pacific Ocean play a significant role in determining the amount of precipitation that New Mexico and the rest of the country receive. Studies show current conditions in those two oceans are similar to conditions that existed during the severe drought of the late 1940s and 1950s in New Mexico.

Drought is a regular event in all areas of Lincoln County, occurring in recurring cycles. Experts predict that drought conditions are likely to continue for the foreseeable future. The vegetation conditions across the county may range from pre-drought to severe drought conditions.

The majority of Lincoln County is dominated by a high desert, with grasslands, piñon-juniper forests, ponderosa pine forests, and dry mixed conifer forests occurring at progressively higher elevations. Stand densities in untreated forest are higher than historical norms. As of 2014, beetle and insect damage are at epidemic proportions. This combination of insects, disease, drought, and fire caused stress are responsible for significant mortality in some stands/hillsides and is expected to continue. This mortality increases fire risk while dead trees hold needles and will contribute to increased fuel loading as dead trees fall to the forest floor.

Drinking water systems throughout the county have been impacted during the drought periods. Wells should be upkept with regular maintenance and cleanliness checks, so water loss is not an issue. Due to numerous years of ongoing drought, many drinking water wells are below their normal water production. Therefore, maintaining wells and infrastructure is paramount to ensure that the public has access to drinking water.

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 and related sectors, and tourism and recreation. Drought reduces the viability and variety of crops that local produces can grow and can result in large losses if severe drought occurs during the growing season. Droughts impacts on tourism and recreation are mainly related to water resources that may dry, reducing visitation. Scenic views are impacted by declining forest health and the impacts of the drought-wildfire-flood cycle. Drought can also strain local water resources which can make water allocation difficult during peak tourism seasons.

Following extended periods of drought and severe drought, there is increased danger of forest and wildland fires. Loss of forests and trees increases erosion, causing serious damage to aquatic life, irrigation, and power development by heavy silting of streams, reservoirs, and rivers. Primary areas of concern for droughts impact on agriculture are north Highway 380 and the Hondo Valley.

The majority of Lincoln County is considered rural with many ranchers raising cattle, horses and sheep. Drought significantly impacts livestock feed by reducing the available grass and browse. In the past ranchers had to liquidate herds to save the landscape. Any drought will cause direct impact to the farmers and ranchers, which will have economic impacts. Between 2012 and 2022, the USDA issued a disaster designation in the county every year except 2016 and 2017. Source is Disaster Designation Information (usda.gov).

Per the PDSI (see Figure 5-64), the magnitude for drought in Lincoln County is anticipated to range from near normal through severe drought. Drought probability was determined based on the number of years where drought ranging from moderate to exceptional was experienced in the month of June. For the unincorporated portion of the county, these levels of drought were present in June in 4 of the 6 assessed years. In 2017 none of the unincorporated county was under drought conditions and abnormal dryness was only experienced by 8% of the county. In 2018, 83% of the county was experiencing severe drought and 15% was experiencing extreme drought. 2019 again saw low drought severity with 65% of the county experiencing no drought and 34% experiencing abnormal dryness. 2020 was slightly drier with 53% under abnormal dryness, 32% experiencing no drought, and 14% experiencing moderate drought. 2021 saw high drought occurrences with 65% of the county under extreme drought and 35% experiencing exceptional conditions. 2022 saw a similar trend with 81% under extreme drought and 18% experiencing exceptional drought in the month of June.

**Village of Ruidoso**

The Village of Ruidoso completed a water conservation plan in December of 2015 which identifies and maps water sources, distribution, and use analysis. A common trend for the resort town of Ruidoso is peaking residential and commercial use during July when tourism visitation is highest. The Village relies on a mix of surface and ground water, primarily the Rio Ruidoso and Eagle Creek watersheds. In recent years, ground water pumping has increased to compensate for more arid conditions and rises in consumption.

Drought also impacts the production of the Village drinking water wells. Wells and the water delivery system must be kept well maintained in order to get all the water available to the public. Any wasted water from leaks or faulty equipment is a waste and may impact the delivery of necessary water. Drought occurs and the production of water wells drop.

The village experienced extreme drought every year except 2017 and 2019 however, abnormal dryness persisted through all years. Drought probability was determined based on the number of years where drought ranging from moderate to exceptional was experienced in the month of June. For the unincorporated portion of the county, these levels of drought were present in June in 3 of the 6 assessed years. Per the PDSI (see Figure 5-68), the magnitude for drought in Ruidoso is anticipated to range from near normal through severe drought. In 2017 the village did not experience drought in June. In 2018, 100% of the village was under severe drought conditions. June of 2019 again saw low drought severity with no portion of the village experiencing drought. 2020 was slightly drier and Ruidoso experienced abnormal dryness in June. 2021 saw high drought occurrences and 100% of the village experience exceptional drought. 2022 was still high severity drought and in June, Ruidoso was experiencing extreme drought.

**City of Ruidoso Downs**

During the assessed period of 2017-2022, the city experienced moderate to severe drought in every year except 2017 and 2019 when the maximum drought level reached was abnormal dryness. Drought probability was determined based on the number of years where drought ranging from moderate to exceptional was experienced in the month of June. For the unincorporated portion of the county, these levels of drought were present in June in 3 of the 6 assessed years. Per the PDSI (see Figure 5-68), the magnitude for drought for the City of Ruidoso Downs is anticipated to range from near normal through severe drought. In 2017 the city did not experience drought in June. In 2018, 100% of the village was under severe drought conditions. June of 2019 again saw low drought severity with no portion of the city experiencing drought. 2020 was slightly drier and Ruidoso Downs experienced abnormal dryness in June. In June 2021, a majority of the city experienced extreme drought with the western portion being categorized as exceptional drought. In June 2022 the city was in extreme drought conditions.

**Town of Carrizozo**

Carrizozo is primarily a rural community with a strong presence of agriculture and ranching surrounding the town. During the 6-year assessment period of 2017-2022, Carrizozo experienced drought conditions similar to the unincorporated county. Drought probability was determined based on the number of years where drought ranging from moderate to exceptional was experienced in the month of June. For the unincorporated portion of the county, these levels of drought were present in June in 3 of the 6 assessed years. 2017 and 2019 saw a maximum drought severity abnormal dryness which is categorized as low risk years. In the remaining 4 years, the town experienced drought ranging from moderate to exceptional drought. In terms of the PDSI, the magnitude for drought in the Town of Carrizozo is anticipated to range from near normal through severe drought. In 2017, Carrizozo did not experience drought in June. In 2018, 100% of the town was under severe drought conditions. In both June of 2019 and 2020, Carrizozo did not experience any level of drought in June. All of the town was categorized as exceptional drought in June 2021. Again, in June of 2022, extreme drought conditions covered all of the town.

**Village of Capitan**

Similar to Carrizozo, Capitan has a high presence of ranching and agriculture that is impacted by severe drought. the magnitude for drought in the Village of Capitan is anticipated to range from near normal through severe drought according to the PDSI. Drought probability was determined based on the number of years where drought ranging from moderate to exceptional was experienced in the month of June. For the unincorporated portion of the county, these levels of drought were present in June in 3 of the 6 assessed years. The years of 2017 and 2019, just as in the rest of the county, did not reach drought conditions that would pose significant hazard to the village. In addition to concerns with agricultural viability, extended periods of drought can impact WUI communities and increase air quality and fire threat. In 2017 the village did not experience drought in June. In 2018, 100% of the village was under severe drought conditions. June of 2019 again saw low drought severity with none of Capitan experiencing drought. 2020 only saw the village only reached abnormal dryness. In June 2021, most all of Capitan experienced exceptional drought. In June 2022, the village was experiencing extreme drought.

**Village of Corona**

Drought magnitude for the Village is anticipated to match that of the unincorporated county with a PDSI range from near normal through severe drought. Drought probability was determined based on the number of years where drought ranging from moderate to exceptional was experienced in the month of June. For the unincorporated portion of the county, these levels of drought were present in June in 3 of the 6 assessed years. A particular concern for the village is compounding weather impact of drought, wind, and fire. Corona already experiences a high average wind speed; unsecured soil adds to concerns for air quality, windstorms, and wildfire. In 2017 the Village of Corona did not experience drought during June. In 2018, 100% of the village was under extreme drought conditions. June of 2019 returned to low drought severity with no portion of the city experiencing drought. 2020 also saw low severity and Corona experienced abnormal dryness in June. In June 2021, the entire village experienced exceptional drought. In June 2022, Corona was experiencing extreme drought.

### 5.3.6.4 Probability of Occurrence

When calculating severe weather Drought probability, the Planning Team agreed to use the PRI, explained further in Figure 5-110. The probability in Figure 5-77 below is calculated based on the number of years in the last six that the hazard occurred. The Planning Team decided to assess this hazard based on years with moderate to exceptional drought.

- Unlikely means no events were recorded from 2017 through 2022. This results in 0-16.65% annual probability.
- Possible means 1 to 2 events were recorded from 2017 through 2022. This results in between 16.66% and 33.33% annual probability.
- Likely means 3 to 4 events were recorded from 2017 through 2022. This results in between 33.34% and 66.67% annual probability.
- Highly Likely means 5 or more events were recorded from 2017 through 2022. This results in between 66.68% and 100% annual probability.

In addition to the general definitions used for the PRI, the Planning Team analyzed the annual probability for 2017 to 2022 and over time based on available records for each hazard. The total number of occurrences was divided by the number of years of available data; for Drought, there was 15 years of data. The annual probability for 2017 to 2022 and over time is shown below. Annual probability is calculated based on the number of occurrences divided by the number of years of data and presented as a percent anticipated to occur in 1 year. For Drought, the Planning Team determined that any Drought Monitor category moderate and above would be considered as a 'drought occurrence' for the purposes of this analysis. The June Drought Monitor Map for 2017 through 2022 was used for the analysis.

By comparing the annual probability from the past 6 years with that of all records over time, the Planning Team can consider potential changes over time, including potential impacts due to climate change.

For the annual drought probability for all recorded Occurrences, all agriculture events are included in the count. Therefore, the Planning Team recognized that for Drought, they would not compare the 2017 to 2022 annual percentage probability with annual percent probability for all recorded events. Instead, the annual percent probability for all recorded events would be considered as separate data for consideration and not in comparison to the 2017 to 2022 annual percent probability.

**Figure 5-77: Drought Probability of Occurrence**

| | Drought Probability Based on Past Occurrence | | | | |
|---|---|---|---|---|---|
| **Jurisdiction** | **Past Occurrences 2017-2022** | **Probability 2017-2022 (Used in PRI)** | **Annual Probability 2017-2022** | **All Recorded Occurrences 2007-2022** | **Annual Probability 2007-2022** |
| Lincoln County | 4 | Likely | 83.3% | 51 | 100% (340%) |
| Village of Ruidoso | 3 | Likely | 50% | 49 | 100% (327%) |
| City of Ruidoso Downs | 3 | Likely | 50% | 49 | 100% (327%) |
| Town of Carrizozo | 3 | Likely | 50% | 49 | 100% (327%) |
| Village of Capitan | 3 | Likely | 50% | 49 | 100% (327%) |
| Village of Corona | 3 | Likely | 50% | 50 | 100% (334%) |

### 5.3.6.5 Climate Change Impacts

Climate change is expected to cause more intense and lengthened periods of drought that could cause strain on water resources impacting communities and ecosystem health. Multiple sources have shown that climate change will reduce annual snowpack, increase evaporation loss, and reduce aquifer recharge

rates. These factors all contribute to water resources being below levels necessary to sustain vegetation communities. One factor that contributes toward socioeconomic drought is the climatic impact on reservoirs and water resources. A major contributing factor is an increase in evaporative water loss due to higher average temperatures and earlier warming temperatures. These reduce community water supply before it can be used, limiting a community's ability to correctly plan for water retention and leaving less water in systems for downstream communities and habitats. A more in-depth discussion about the interconnection of drought, flood, and wildfire is provided is Section 5.2.1, Cascading Events.

During the 6-year assessment period, the frequency of observed drought in the unincorporated county and the five assessed participating jurisdictions decreased when compared to the entire drought record history. Frequency alone is not satisfactory to assess the impacts of drought especially in the long term. The severity and duration of drought periods must also be considered to gain an accurate understanding of how communities, resources, and ecosystems are impacted by drought events. During the 2010-2016 assessment period, 2011 and 2013 had drought severity and duration similar to what was observed in 2020, 2021, and 2022 when exceptional drought conditions persisted for over 3 months. Without seasonal relief from drought, water resources may be depleted, and forest health will decline. As discussed above, climate change is anticipated to raise annual average temperatures and contribute to sporadic storm events that can exacerbate drought severity and reduce the soils ability to uptake precipitation.

### *5.3.7 Dam Failure*

#### 5.3.7.1 Description

As discussed shortly in the flood/ flashflood section, dam failure is another flood-related hazard that has the potential to impact communities in Lincoln County. A dam impounds water in an upstream area or reservoir. The amount of water impounded is measured in acre-feet (i.e., the volume of water that covers an acre of land to a depth of 1 foot).

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

The Office of the State Engineer, Dam Safety Bureau regulates the design, construction, reconstruction, modification, removal, abandonment, inspection, operation, and maintenance of dams more than 25 feet high with a capacity exceeding 15-acre feet or dams with a capacity of 50 acre-feet or greater that is 6 feet or more in height. Federal dam owners are required to obtain a permit for a new dam; however, the Office of the State Engineer by law does regulate the continued safety of federal dams. Dams 10 feet or less in height, or dams that store 10 acre-feet or less, generally are not regulated and are considered non-jurisdictional dams. However, if a non-jurisdictional dam threatens life and property due to an unsafe condition, the state engineer can issue a safety order to the owner requiring action to remove the threat.

The Office of the State Engineer Dam Safety Program has not yet established goals and objectives for high hazard potential dams or a listing of the high hazard dams that are a priority. The establishment these materials is a prerequisite for dam owners or managers to apply for funding under the FEMA High Hazard Potential Dam (HHPD) program. This grant supports technical assistance, planning, design, and

construction for rehabilitation activities that reduce dam risk. All participating jurisdictions expressed interest in the development and participation in HHPD once the state establishes the prerequisites.

Standard practice among federal and state dam safety offices is to classify a dam according to the potential impact a dam failure (breach) or mis-operation (unscheduled release) would have on downstream areas. The hazard potential classification system categorizes dams based on the probable loss of human life and the impacts on economic, environmental, and lifeline facilities, such as critical transportation systems and utilities. The Dam Hazard Potential Classification definitions are shown in Figure 5-78.

**Figure 5-78: Dam Failure Hazard Potential Classifications**

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

#### 5.3.7.2 Previous Occurrence

There have been no recorded Dam Failure events in Lincoln County or the assessed communities.

#### 5.3.7.3 Location and Extent per Participating Jurisdiction

**Lincoln County**

According to the National Inventory of Dams (NID) there are 4 dams located within Lincoln County. Dams in neighboring jurisdictions that may also impact Lincoln County include the Lake Mescalero Dam. Figure 5-79 provides an overview of those facilities using data from the NID and Figure 5-80 illustrates the locations. Hazard classifications were provided by the Office of the State Engineer utilizing Appendix H of the 2018 State Hazard Mitigation Plan. It is important to note that Lake Mescalero Dam is located outside the County jurisdictional boundary. However, Lincoln County, Village of Ruidoso, and City of Ruidoso Downs would be impacted at various levels depending on if there was a breech or failure.

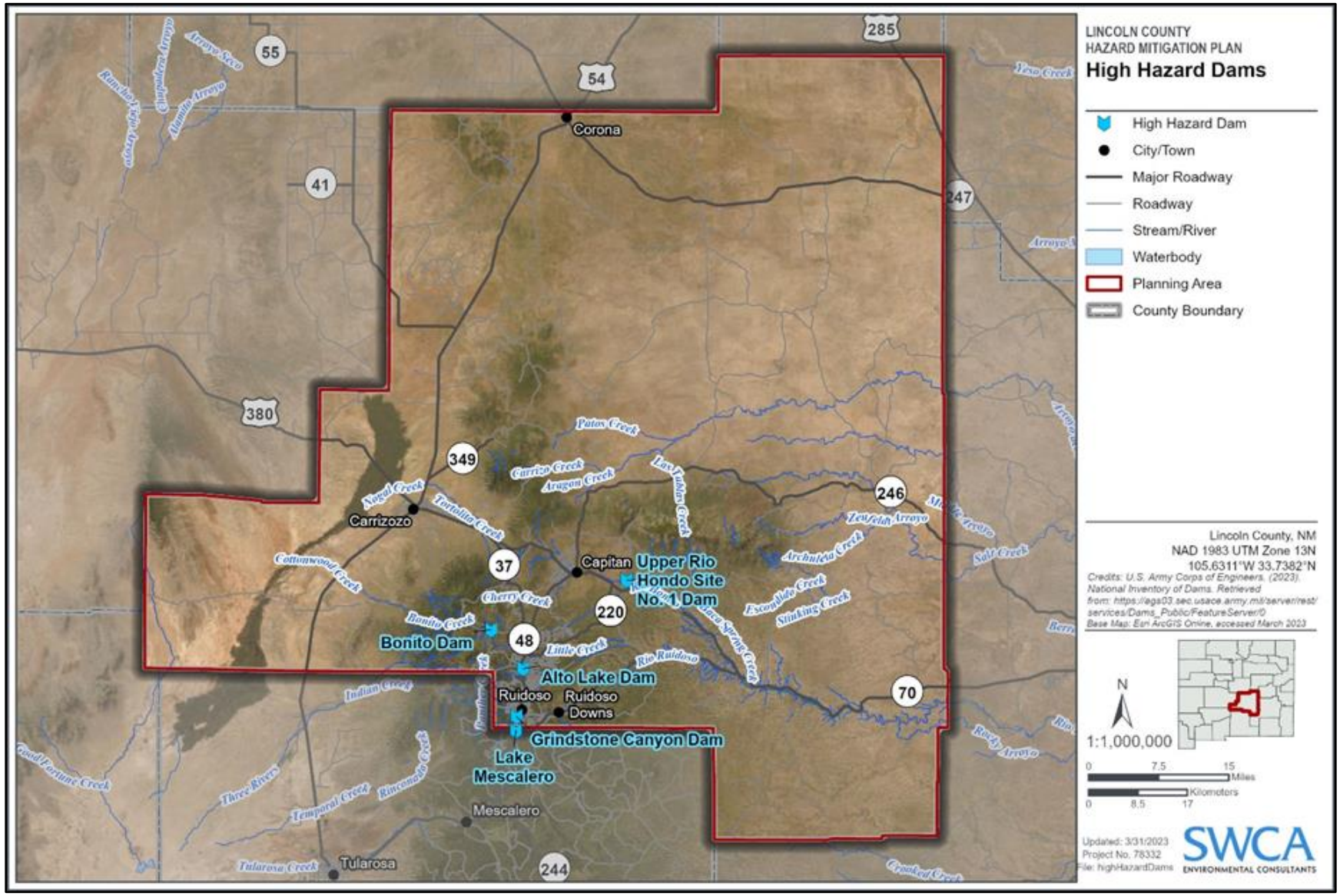
**Figure 5-79: Overview of Dams throughout Lincoln County**

| Name | River | Owner | Purpose | EAP? (Y/N) | Classification |
|---|---|---|---|---|---|
| Bonito Dam | Rio Bonito | City of Alamogordo | Water Supply | Y | High |
| Alto Lake Dam | Eagle Creek | Village of Ruidoso | Water Supply | Y | High |
| Grindstone Canyon Dam | Grindstone Canyon | Village of Ruidoso | Water Supply | Y | High |
| Upper Rio Hondo Site No. 1 Dam | Salado Creek and Gyp Spring Canyon | Upper Rio Hondo Soil & Water Conservation District | Flood Control | Y | High |

| Name | River | Owner | Purpose | EAP? (Y/N) | Classification |
|---|---|---|---|---|---|
| Lake Mescalero (located outside Lincoln County) | Carrizo Creek | BIA | Water Supply, Recreation | Y | High |

The Office of the State Engineer defines high hazard dams as any dam where failure or mis-operation will likely result in loss of life. An EAP is required for all high hazard dams. The EAP includes maps of expected inundation areas ranging from sunny day breach as well as flood condition breaching that account for dam failures under normal capacity conditions and following heavy precipitation where dam capacity is reached. The EAP also identifies preparedness and mitigation actions to reduce property damage, injury, or loss of life due to a dam breech incident. EAPs are on file with the Office of the State Engineer, the dam owner, operator, New Mexico DHSEM, and entities that have responsibilities in dam breech response.

**Figure 5-80: High Hazard Dam Locations throughout Lincoln County.**

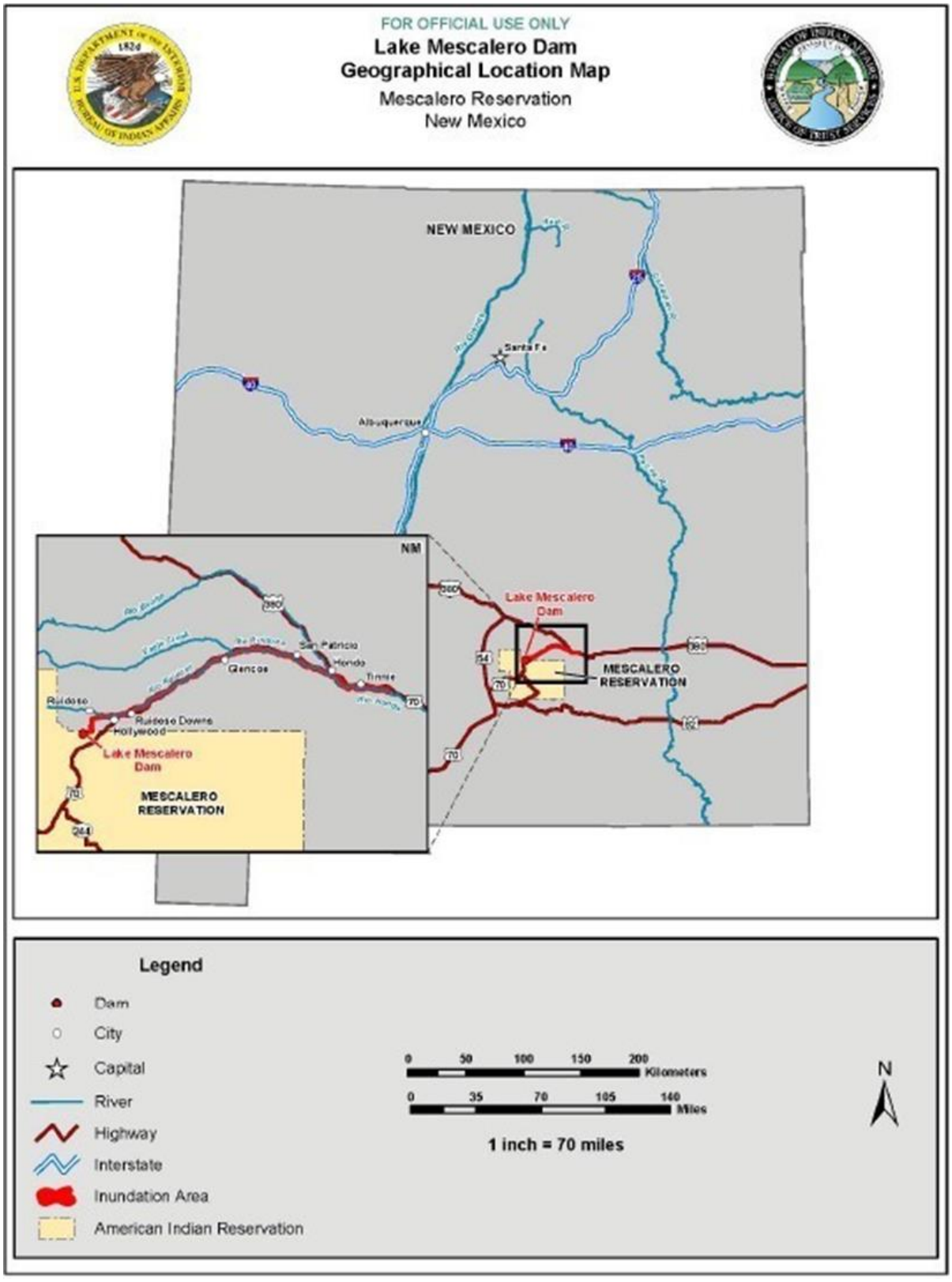


Lake Mescalero Dam, Upper Rio Hondo Dam, Bonito Dam, Grindstone Canyon Dam, , and Alto Dam have EAPs. The EAPs were reviewed for relevant information to include in the HMP Update. Each EAP has an inundation map based on modeling the dam failure under various operating conditions and an evacuation map that has been prepared from the inundation mapping. General maps showing the location of downstream inundation areas are shown in Figures 5-81 through 5-85.

Downstream impacts from a dam failure incident may be severe. As noted in the flood portion of this section, the worst-case scenario for flooding would result from failure of the Lake Mescalero and Grindstone Canyon dams which would result in the water flow in the Rio Ruidoso increasing to 40 feet above the streambed through Ruidoso and Ruidoso Downs. After Ruidoso Downs it would be 20 feet above the streambed through the Hondo Valley.

**Mescalero Lake Dam** is located outside Lincoln County, is owned by the Bureau of Indian Affairs (BIA) and managed by the Mescalero Apache Tribe. The dam is a zoned earth fill l embankment composed of a random-fill section, an upstream impervious zone, and a graded gravel filter zone. The dam has a maximum height of 85 feet, and it holds a total of 3,000 acre-feet of water. Lake Mescalero dam is classified as a high hazard facility according to the 2002 Safety Evaluation of Existing Dams (SEED) analysis report. Inundation associated with the potential failure of this dam could impact homes and commercial sites existing in the floodplain of Carrizo Valley of unincorporated Lincoln County, including two lodges within 2 miles downstream from the dam and a significant number of homes within 2 miles downstream from the dam. The floodplain downstream of the dam extends past these homes and directly into portions of the town of Ruidoso and Ruidoso Downs. The location map shown in Figure 5-81 also shows the general Inundation Area.

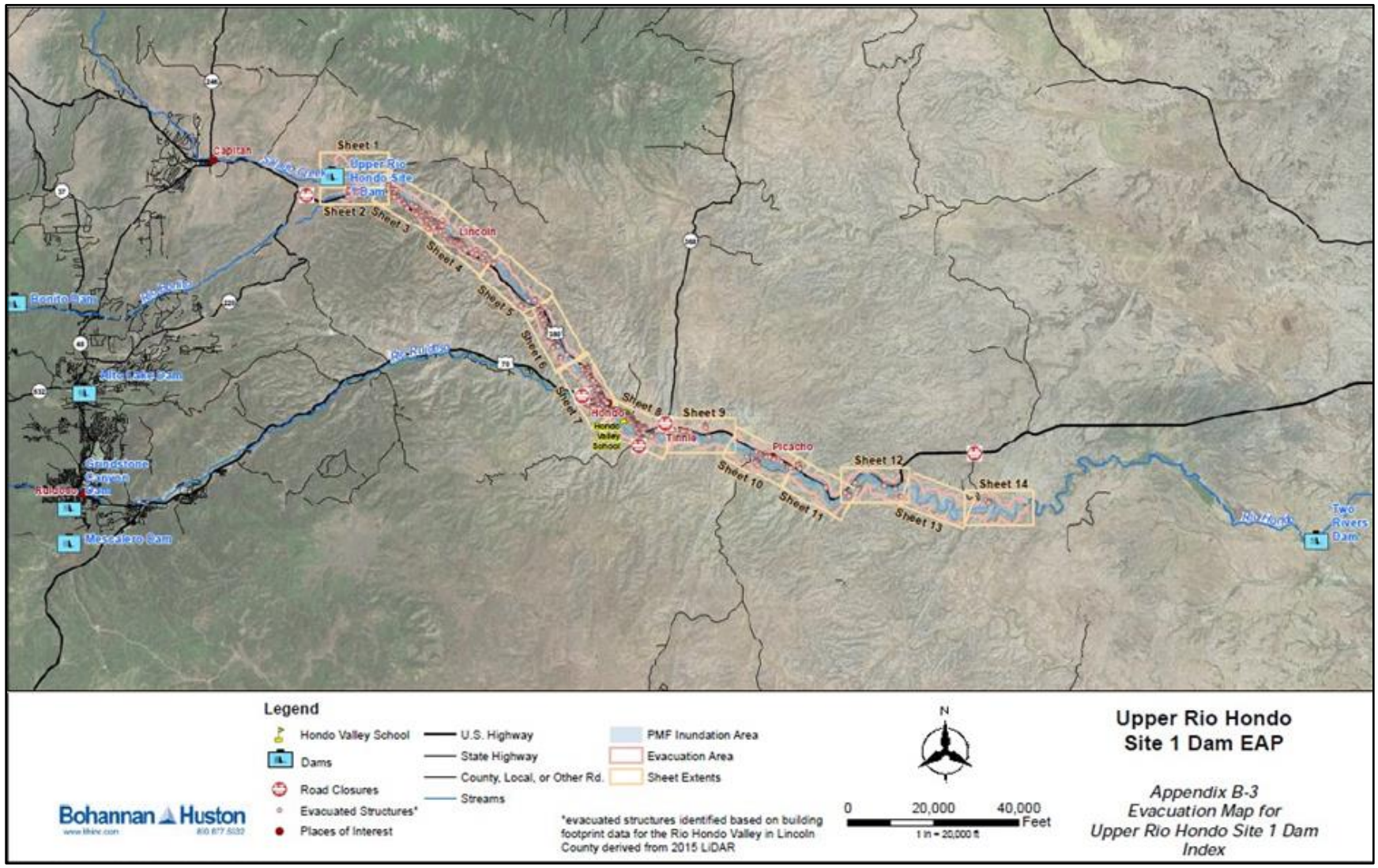
**Figure 5-81: Location Map showing General Inundation Area for Mescalero Lake Dam.**




Source: Mescalero Lake Dam EAP (2014).

**Upper Rio Hondo Dam** (**Salado**) is located in unincorporated Lincoln County, It is owned and managed by the Upper Hondo Soil and Water Conservation District. The dam is 90.5 feet high, 690 feet long, and holds a total of 7,120 acre-feet of water. It is classified as a high hazard dam. Inundation associated with the potential failure of this dam could impact any potentially occupied area along the Rio Bonito and Rio Hondo floodplains, including Lincoln, Hondo, Tinnie, and Picacho. It would also potentially impact the following major roads: U.S. Highway 380 (Billy the Kid Trail) from the State Highway 220 intersection to the juncture at County Road E-33 (approximately where the highway leaves the Rio Hondo Valley), U.S. Highway 70 prior to the U.S. Highway 380 juncture, State Highway 368 approximately 0.2 miles north of the U.S. Highway 380/70, and Alamo Canyon Road prior to the U.S. Highway 380/70 juncture. The evacuation map shown in Figure 5-82 also shows the general Inundation Area.

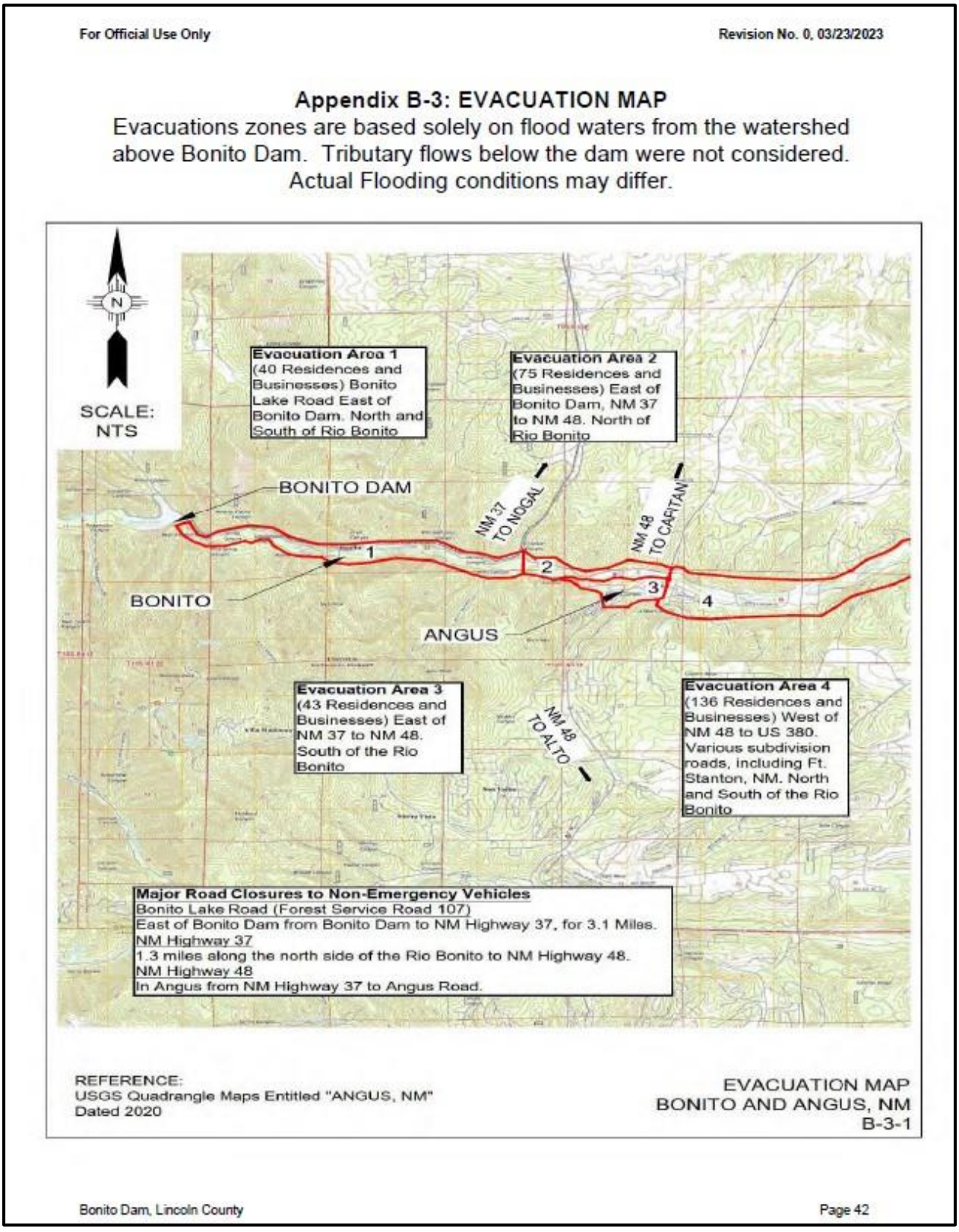
**Figure 5-82: Evacuation Map showing General Inundation Area for Upper Rio Hondo Dam.**




Source: Upper Rio Hondo Dam EAP (2017).

**Bonito**: Bonito Dam is owned and operated by the City of Alamogordo; the primary contact is the Utilities Department Director. The dam is 113 feet high and 480 feet long and holds a total of 1,273.6-acre feet of water. It is classified as a high hazard dam. The Bonito Dam is located approximately 9.5 miles northwest of the Village of Ruidoso. Inundation associated with the potential failure of this dam could impact all occupied structures along the floodplain of Rio Bonito from the Dam along State Highway 37 through the State Highway 48 bridge crossing, including the unincorporated Angus. Additional occupied structures also potentially impacted are along the Rio Bonito from the Rio Bonito State Highway 48 bridge crossing to the U.S. Highway 380 bridge crossing and through to the confluence with the Rio Ruidoso; this includes unincorporated Fort Stanton and Lincoln. In addition, occupied structures along the Rio Hondo from the intersection of U.S. Highway 380 to U.S. Highway 70 from mile post 283 to the Lincoln and Chaves County line and on to Two Rivers Dam (approximately 16 miles southwest of Roswell). It would also potentially impact the following roads: Bonito Lake Road east of the Dam to State Highway 37, State Highway 37 to State Highway 48, including the Rio Bonito crossing; State Highway 220 from mile post 13 to 15, including the crossing at Fort Stanton; U.S. Highway 380 from mile post 90 to U.S. Highway 70 at mile post 285; U.S. Highway 70 from mile post 283 to 300; and rural roads that run along the Rio Hondo from U.S. Highway 70 at mile post 300 to the Two Rivers Dam. The first page of the series of Evacuation Maps for Bonito Dam is shown in Figure 5-83.

**Figure 5-83: Page 1 of Evacuation Map for Bonito Dam.**




Source: Bonito Dam EAP (2023).

## Village of Ruidoso

The Village of Ruidoso owns and operates two dams; the Grindstone Canyon Dam is located on the southwestern outskirts of the village, and the Alto Dam is located just 4.3 miles from the center of the village. Out of the two, a dam failure from the Grindstone Canyon Dam would have the most significant impact to Ruidoso. The Bonito Dam is also located within the jurisdictional boundary of the Village of Ruidoso. However, it is owned and managed by the City of Alamogordo.

**Grindstone Canyon**: Grindstone Canyon Dam is owned by the Village of Ruidoso and managed by the Water Production Manager. The dam is 123 feet high and 1,304 feet long and holds a total of 1,793.4 acre-feet of water. It is classified as a high hazard dam. Inundation associated with the potential failure of this dam could impact the following list of communities: potentially occupied structures located along the floodplain between the dam and Carrizo Creek, the floodplain of Carrizo Creek between Bewley Lane and Rio Ruidoso, the floodplain of the Rio Ruidoso between the confluence of Carrizo Creek and Rio Hondo, and the floodplain of the Rio Hondo from the confluence with the Rio Ruidoso to Two Rivers Dam. It would also potentially impact the following major roads: State Highway 37 (north of the Rio Ruidoso to the intersection with U.S. Highway 70) and U.S. Highway 70 (from the intersection with State Highway 37 to where the highway leaves the Rio Hondo valley). The Evacuation Map shown in Figure 5-84 also shows the general Inundation Area.

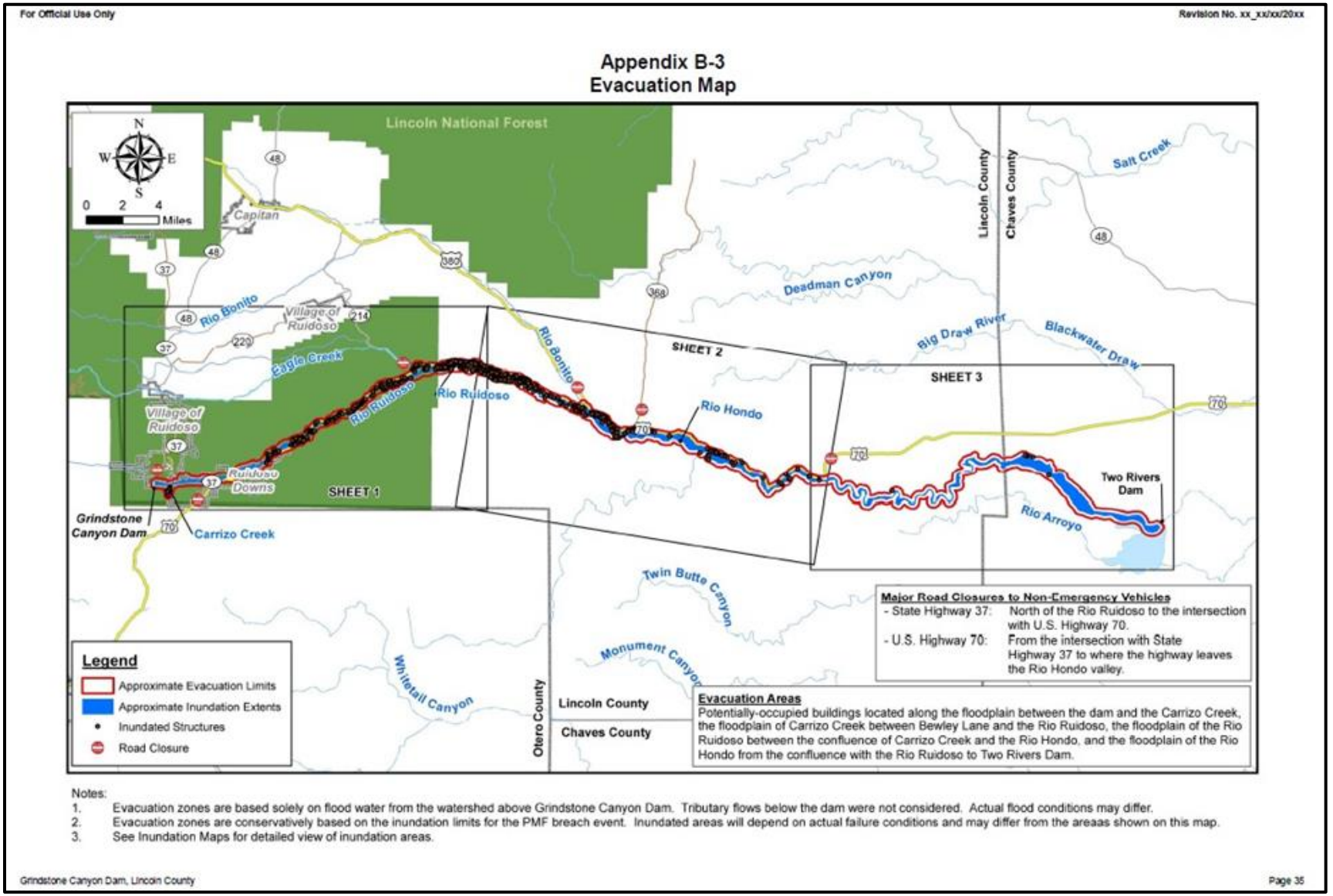
The Water Production Manager provided information on completed and ongoing maintenance-related projects.

- The Grindstone Canyon Dam Drain Cleaning Project: this project included cleaning and leveling 55 vertical floor drains, 35 vertical ceiling drains, six horizontal drains, on the north abutment gallery wall, and seven horizontal drains on the south abutment gallery wall. The project also included grading the gallery and portal entrance to improve drainage from the gallery. The grading work exposed the original concrete floor and an approximately 2-inch drainage trench. The project also included installing a removable weir at the portal entrance to measure seepage flow rates for long-term monitoring.

- Condition Assessment for Grindstone Dam Spillway and North Dam Crest Concrete Repairs: This project included reviewing the assessment findings and discussing repair options with the Village and the New Mexico Office of the State Engineer (NMOSE) Dam Safety. The contractor working on this assessment is now preparing 60-percent plans and specifications for the proposed repairs.

- The Grindstone Canyon Outlet Works Video Surveys: This survey was performed by a contractor who encountered sediment when conducting the video survey. The sediment was encountered in the Grindstone Canyon 48-inch outlet conduit, which prevented completion of the video survey. The contractor team met with the Village of Ruidoso and the NMOSE to discuss the 48-inch outlet conduit condition. NMOSE requested removal of the sediment and completion of the video survey as soon as possible. the Contractor and team are currently working with the Village of Ruidoso on the sediment removal plan and schedule. Surveys were completed of Grindstone Canyon Dam crest for long-term monitoring in June and August.

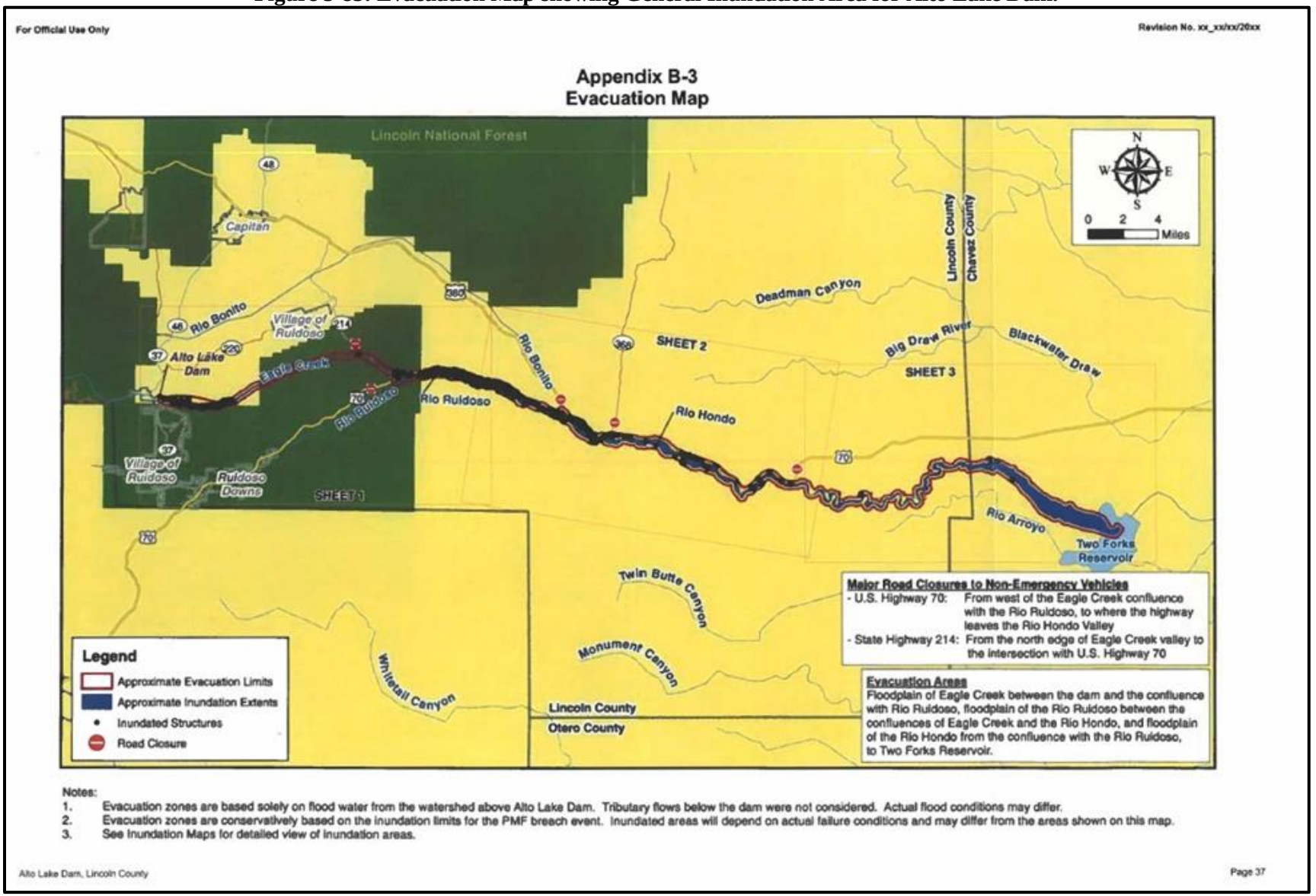
**Figure 5-84: Evacuation Map showing General Inundation Area for Grindstone Canyon Dam.**




Source: Grindstone Canyon Dam EAP (2016).

**Alto**: Alto Dam is owned by the Village of Ruidoso and managed by the Water Production Manager. The dam is 51.1 feet high and 362 feet long and holds a total of 299.7-acre feet of water. It is classified as a high hazard dam. Inundation associated with the potential failure of this dam could impact all occupied structures along the floodplain of Eagle Creek between the dam and the confluence with Rio Ruidoso, as well as the floodplain of the Rio Ruidoso between the confluences of Eagle Creek and the Rio Hondo, and the floodplain of the Rio Hondo from the confluence with the Rio Ruidoso to Two Forks Reservoir. It would also potentially impact the following major roads: U.S Highway 70 (from west of the Eagle Creek confluence with the Rio Ruidoso to where the Highway leaves the Rio Hondo valley) and State Highway 214 (from the north edge of Eagle Creek valley to the intersection with U.S. Highway 70). The Water Production Manager has recently begun preliminary planning for an EAP update. The evacuation map shown in Figure 5-85 also shows the general Inundation Area.

**Figure 5-85: Evacuation Map showing General Inundation Area for Alto Lake Dam.**




Source: Alto Lake Dam EAP (2015).

**City of Ruidoso Downs**

The City of Ruidoso Downs does not own or operate any dams however, the community will be impacted by a dam failure of the Grindstone Canyon Dam and Mescalero Lake Dam.

Grindstone Dam: Inundation associated with the potential failure of this dam would potentially impact the following list of communities: potentially occupied structures located along the floodplain between the dam and Carrizo Creek, the floodplain of Carrizo Creek between Bewley Lane and Rio Ruidoso, the floodplain of the Rio Ruidoso between the confluence of Carrizo Creek and Rio Hondo, and the floodplain of the Rio Hondo from the confluence with the Rio Ruidoso to Two Rivers Dam. It would also potentially impact the following major roads: State Highway 37 (north of the Rio Ruidoso to the intersection with U.S. Highway 70) and U.S. Highway 70 (from the intersection with State Highway 37 to where the highway leaves the Rio Hondo valley).

Lake Mescalero Dam: Inundation associated with the potential failure of this dam would potentially impact the following list of communities: homes and commercial sites existing in the floodplain of Carrizo Valley, including two lodges within 2 miles downstream from the dam and a significant number of homes within 2 miles downstream from the dam. The floodplain downstream of the dam extends past these homes and directly into portions of the town of Ruidoso, New Mexico.

### 5.3.7.4 Probability of Occurrence

When calculating the probability for Dam Failure, the Planning Team agreed to use the PRI, explained further in Figure 5-110. Probability in Figure 5-86 below is calculated from the following criteria:

- Unlikely means no events were recorded from 2017 through 2022. This results in 0-16.65% annual probability.

In addition to the general definitions used for the PRI, the Planning Team analyzed the annual probability for 2017 to 2022 and over time based on available records for the other hazards. Since there have been no recorded occurrences of dam failure, there is 0% annual probability for the 2017 to 2022 time period.

**Figure 5-86: Dam Failure Probability of Occurrence**

| Dam Failure Probability of Occurrence per Participating Jurisdiction | | |
|---|---|---|
| **Jurisdiction** | **Past Occurrences** | **Probability** |
| Lincoln County | 0 | Unlikely |
| Village of Ruidoso | 0 | Unlikely |
| City of Ruidoso Downs | 0 | Unlikely |
| Town of Carrizozo | Not a Selected Hazard for Carrizozo | |
| Village of Capitan | Not a Selected Hazard for Capitan | |
| Village of Corona | Not a Selected Hazard for Corona | |

### 5.3.7.5 Climate Change

Climate change is expected to disrupt water and storm cycles, increase wildfire intensity, and dry soil; all factors that combine to impact the effectiveness and safety of dams. As discussed in the severe storms section, severity and extent of storms is expected to increase as atmospheric wind cycles are

disrupted by warming, specifically in polar regions. Simultaneously, temperatures are expected to increase with earlier spring warming and more intense summer heat. This temperature increase, along with a reduction in soil water retention creates conditions for catastrophic wildfire events. As soil dries from rising temperatures, and following wildfire events, the soil becomes hydrophobic, meaning it doesn't absorb water near its normal rate or will not bond with water at all. This results in storm water that carries large amounts of soil and sediment with it as it moves across the landscape in the watersheds. This transported sediment becomes trapped behind the dam and accumulates over time. This is a natural occurrence of dams that must be addressed occasionally; however, hydrophobic soil from climate change induced drought and wildfires speeds up this process, reducing the time before sedimentation must be addressed. Excess sediment behind a dam reduces the overall capacity of the dam which is of particular concern for flood attenuation dams such as the Upper Rio Honda dam. For the other dams in and around the county, reduced capacity correlates with a reduction in water supply that is a major concern for a region already experiencing drought and water supply challenges. The buildup of transported sediment also places a larger load on the dam; this could become an issue with older dams and create breach concerns during severe storm events with high precipitation totals.

## 5.4 Vulnerability Analysis Methodology

### *5.4.1 Overview*

The following sections summarize the methodologies used to perform the vulnerability analysis portion of the risk assessment. For this update, the entire vulnerability analysis was either revised or updated to reflect the availability of new hazard data, 2020 census data, and changes to the process as identified by the Planning Team. Analysis of impacts to critical infrastructure, structures, and socially vulnerable populations comprise the Vulnerability Analysis for the HMP Update. The description of how the analysis differed from the HMP Update is included in Sections 5.3.2 through 5.3.4.

### *5.4.2 Critical Infrastructure*

The 2018 HMP listed an 'asset inventory' in table format, identifying both critical and non-critical categories. The figures did not include addresses or geospatial identifiers. The asset inventory included critical facilities, non-critical facilities, and infrastructure. The definition of 'critical facility' that was used in the 2018 HMP was taken from the 2013 State Hazard Mitigation Plan.

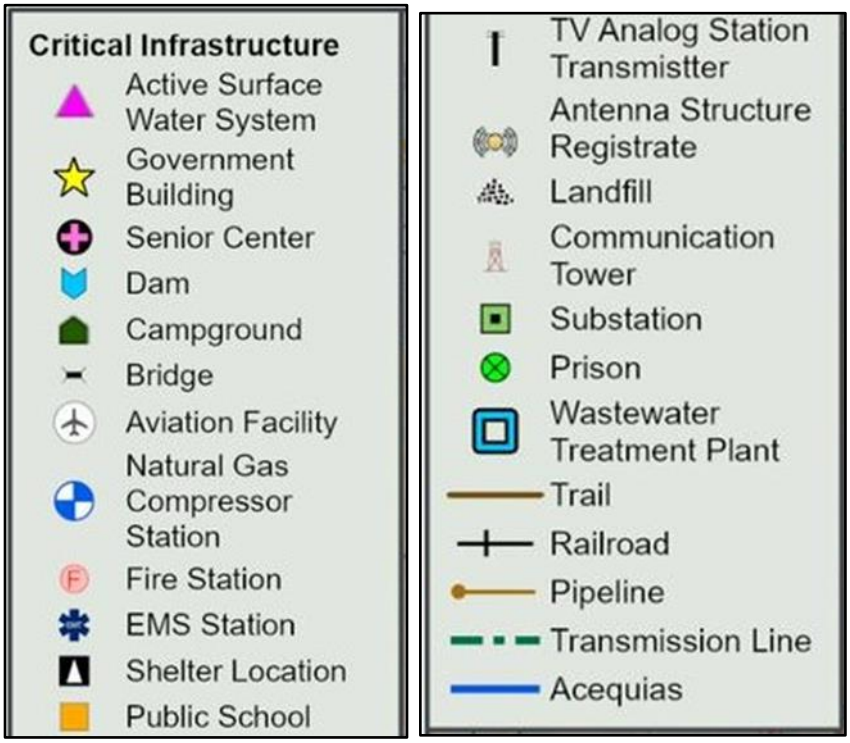
For the 2023 Update, the Planning Team decided to use the term 'critical infrastructure' to represent all facilities and infrastructure that meet the definition described below which is based on the 2018 State Hazard Mitigation Plan definition of "critical facility". Critical Infrastructure for the purposes of this HMP Update means:

- Assets, facilities, or infrastructure that are vital to the health, safety, and well-being of community members during and after a natural disaster; or
- Assets, facilities, or infrastructure that if impacted during a natural disaster may affect response and recovery.
- Examples include locations
    - that are vital to the response or recovery effort, including utilities, transportation networks, and communication networks
    - where public health and safety functions are performed or coordinated that house socially vulnerable populations requiring special consideration
    - that can create secondary hazards, such as nuclear power plants and hazardous materials production or storage facilities

- that house socially vulnerable populations requiring special consideration

For the 2023 Update, the Planning Team also agreed to utilize publicly available mapped layers from the Homeland Infrastructure Foundation Level Data (HIFLD) plus a publicly available government buildings layer from the New Mexico Resource Geographic Information site to identify the critical facilities to be included in the Vulnerability Analysis. The 24-data layers included in the Vulnerability Analysis are shown below in Figure 5-87.

**Figure 5-87: 24 Data Layers in Vulnerability Analysis.**




The vulnerability of each participating jurisdiction was analyzed with respect to the impact on critical infrastructure for each hazard. The analysis below is by jurisdiction and then by hazard. The Critical Infrastructure map for each participating jurisdiction includes icons representing each layer of data that is publicly available. A web-based mapping tool was utilized to conduct the analysis. However, the scale for mapping in this Plan is not conducive to showing the level of detail. Therefore, identification of critical infrastructure and the vulnerability to each hazard is shown in the chart below. Note that the Federal Identification Number (FID) is included for some of the locations below.

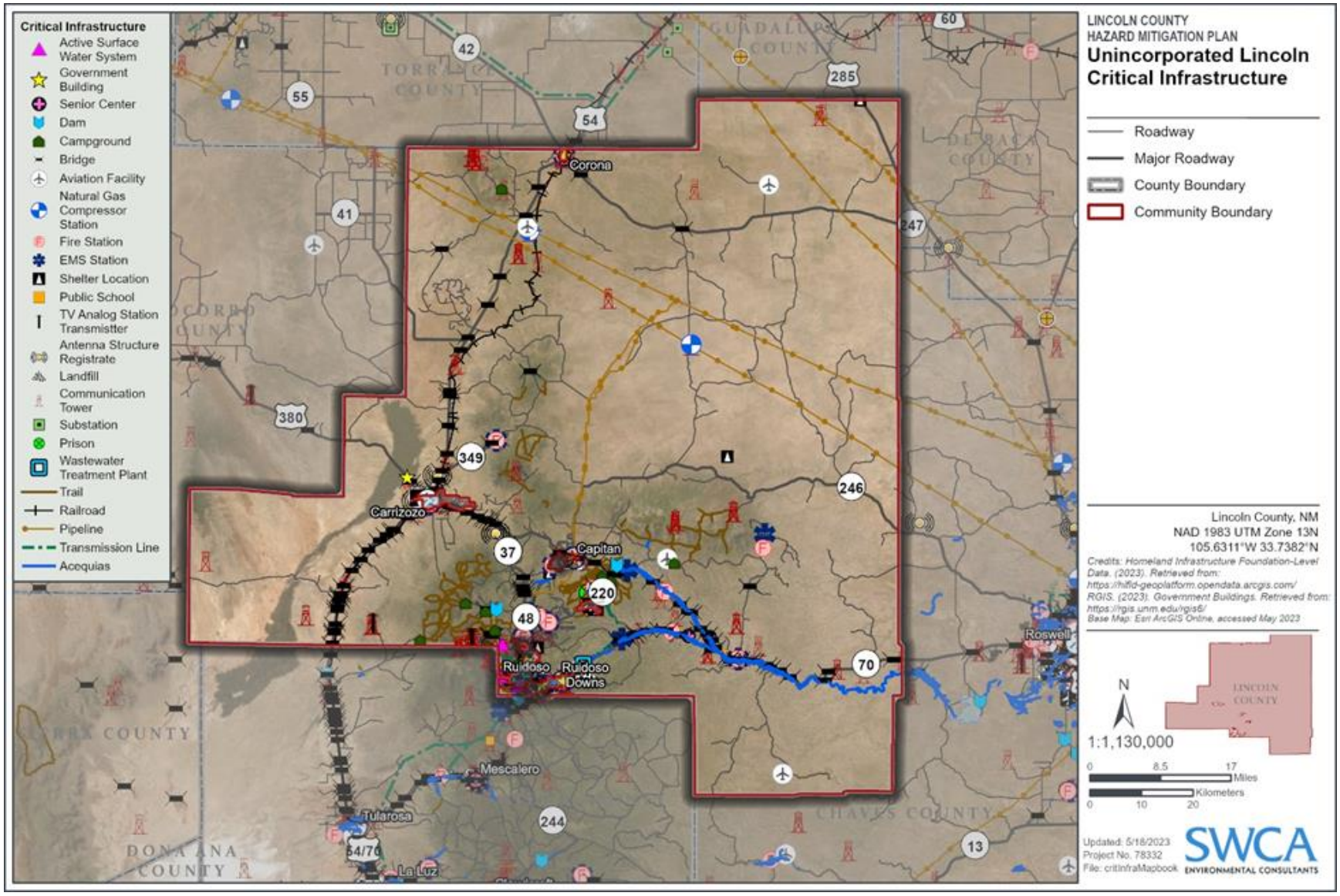
### 5.4.2.1 Lincoln County

**Changes in Development**

Regarding changes in development within the last 5 years, unincorporated Lincoln County has shown minimal commercial and residential development with a decrease in population. This trend is anticipated to continue over the next 5 years. Because the decrease has been distributed throughout the county, there has been no change to the vulnerability of natural hazards.

Wind turbine projects are being planned and implementation is expected within the next 5-year period. The locations are in the unincorporated portion of the county in the area of Corona and Capitan. As these projects are planned and implemented, vulnerability to natural hazards will be analyzed more fully.

**Figure 5-88: Map of Critical Infrastructure for Unincorporated Lincoln County.**



## Wildfire

Lincoln County contains a total of 215 critical infrastructure facilities (Figure 5-88). Of that total, 136 fall within the high-risk wildfire areas and 31 fall within the moderate wildfire areas. Figure 5-89 lists the names of infrastructure with high wildfire risk. Infrastructure that falls within the high wildfire hazard zone should be considered a priority for mitigation actions. Infrastructure in this category falls in a geography that is considered at high risk of wildfire events due to a combination of vegetation, topography, community proximity, and other fire ignition and spread modeling criteria. Prioritizing actions on or around these infrastructures will greatly improve a community's likelihood of minimizing wildfire hazard and ensuring continued functionality in the event of a fire and during the recovery process. Infrastructure that falls in the moderate wildfire risk category should be prioritized but is not as crucial as those deemed high risk. Infrastructure in this category is at risk of wildfire but may be more resilient or in less of a threat zone due to the surrounding landscape, past fuels management, infrastructure materials, and other contributing risk factors.

Wildfire and smoke from spring through fall can have a negative impact on tourists coming to the area for recreation opportunities. This can result in reduced revenue, taxes, and similar economic losses.

**Figure 5-89: Critical Infrastructure within Moderate/High Wildfire Zone (Lincoln County)**

| Critical Infrastructure within the Moderate and High Wildfire Risk Zone | |
|---|---|
| **Campground** | |
| Bonito Creek (FID – 2) - Moderate | |
| **Bridges** | |
| 27-B009 (FID 265) – 0.3 miles West (W) of US70 @ Mile Post (MP) 274 - High | US54 (FID 122) – 9.4 miles South (S) of NM42/Corona - High |
| NM-37 (FID 264): 12.3 miles North (N) of NM48/Angus - Moderate | NM-247 (FID 245) – 17.8 miles East (E) of US54 - High |
| **Aviation Facilities** | |
| Skeen Ranch (FID – 5) - Moderate | |
| **Fire Stations** | |
| Arabela Fire Department (1652 County Road (Rd) 368) - Moderate | |
| **Communication Towers** | |
| 549751 (E of Tecolote Peak and Elda Rd; S of Gallinas and N of Tecolote) - Moderate | 134299 (S of Highway 70 along Country Road E033) - Moderate |
| 936014 (NE of Jicarilla Mountains) - High | 593387 (NE of Tinnie, NM) - Moderate |
| 489275 (E of Jicarilla Mountains) - High | 602620 (SE of Bonito on Buck Mountain) - High |
| 1174193 (SE of intersection of Pine Lodge Rd and Seven Rivers Rd) - Moderate | 886497 (E of Alto and Kokopelli Golf Club) - Moderate |
| 870334 (SE of intersection of Pine Lodge Rd and Seven Rivers Rd) - Moderate | 384378 (NE of Lookout Mountain) - High |

| **Critical Infrastructure within the Moderate and High Wildfire Risk Zone** | |
|---|---|
| 148942 (S of Capitan Mountains along Capitan Gap) - Moderate | 1161716 (N of Buck Mountain) - High |
| 450543 (S of Capitan Mountains along Capitan Gap) - Moderate | 777351(Approx. 2 miles W of Alto) - High |
| 1161672 (Approx. 0.5 miles E of Capitan limits) - High | 777364 (N of Moon Mountain and E of Ruidoso) - Moderate |
| 146259 (Approx. 0.5 miles E of Capitan limits) - High | |
| **Trails** | |
| Sand Wash - High | Pierce Canyon - High |
| Warner Gulch - High | Pine Ridge Trail - High |
| Patos Mountain Trail - High | Doherty Ridge - High |
| Trail Canyon - High | Petroglyph Trail - High |
| Barber Springs Trail - High | North Base - Moderate |
| Carrizo Peak -- High | Barber Ridge - High |
| Capitan Peak - High | Big Bonito - High |
| Johnnie Canyon Trail - High | Sander's Ridge - High |
| Seven Cabins - High | Little Bonito - Moderate |
| Summit - High | Unimproved Road* [Look into line 43 and 65] - High |
| South Base - High | Pancho Canyon - Moderate |
| Zamora Trail - High | North Cedar Creek - High |
| Cedar Creek Village Access - High | Lower Cedar Creek - Moderate |
| East Well Trail - High | Elk Valley Trail - High |
| East Mesa Trail - High | Elk Meadow Trail - High |
| Tortolita Canyon - High | Capitan Overlook Trail - High |
| Gaylord Canyon - High | Ft. Stanton South Trail –High |
| Nogal Peak - High | Ft. Stanton North Trail –High |
| Water Canyon - High | Oak Ridge - High |
| Goat Canyon - High | Upper Raven - High |
| Goat Spring Trail - High | Lower Raven - Moderate |
| Pennsylvania Canyon - High | Perk Ridge Trail - High |
| Three Rivers - High | Norman Canyon - High |
| Grindstone Mesa Loop - High | Lower Apache Trail - High |
| Grindstone Spur - High | Outlaw Trail - High |

| Critical Infrastructure within the Moderate and High Wildfire Risk Zone | |
|---|---|
| Grindstone Trail (Mine Canyon) - High | Salado Trail - High |
| Grindstone Canyon Loop - High | Crest - High |
| Grindstone Connector - High | Perk Canyon Trail - High |
| Grindstone Ridge - High | Deer Valley Trail - High |
| Peacock Trail - High | Pierce Canyon - High |
| Skyline Trail – High | Phantom - High |
| South Fork - High | Copeland Canyon - Moderate |
| Homestead Loop - Moderate | Mitt and Bar - High |
| Clear Water - High | Padilla Trail - Moderate |
| Cave Canyon Trail - High | Thorium Canyon – High |
| Alfred Hale Connector - High | Trail Access Loop - High |
| Tucson Mountain - High | Rodamaker Canyon - High |
| Dry Mills - High | Buffalo Soldier Trail - High |
| Kit Carson Loop Trail - High | Aspen - High |
| Spring Canyon - High | Zamora Trail - High |
| Bluefront - Moderate | Argentina Canyon - High |
| Cedar Creek - High | Miner's Road - High |
| Mills Canyon - High | North Eagle Creek - High |
| Telephone Canyon - High | Church Mountain - High |
| Dry Canyon - High | Maverick - High |
| Skull Springs - High | Pershing Trail - High |
| Petroglyph Trail Access - High | Downhill - Moderate |
| Turkey Canyon - High | Rio Bonito Trail - High |
| Cut Across - High | Cedar Ridge Trail - High |
| Capitan Overlook Trail - High | Rio Bonito Trail - High |
| **Railroad** | |
| NM Railroad (FID 11) - High | NM Railroad (FID 21) - High |
| Heartland Division (FID 84) - High | Heartland Division (FID 91) - High |
| Heartland Division (FID 92) - High | NM Railroad (FID 93) - High |
| Heartland Division (FID 157) - High | Heartland Division (FID 158) - High |
| Heartland Division (FID 159) - High | NM Railroad (FID 194) - Moderate |
| NM Railroad (FID 195) - High | |

| Critical Infrastructure within the Moderate and High Wildfire Risk Zone | |
|---|---|
| **Pipelines** | |
| Enterprise Products Operating, Limited Liability Corporation (LLC) – Highly Volatile Liquid (FID 1) - High | Enterprise Products Operating, LLC – EPL (FID 2) - High |
| Enterprise Products Operating, LLC – Highly Volatile Liquid (FID 3) - High | Giant Pipeline Company (Co.) – Crude Oil (FID 5) - High |
| Kinder Morgan CO2 Company, LP – Carbon Dioxide (FID 6) - High | El Paso Natural Gas Co. – Natural Gas (FID 11) - High |
| El Paso Natural Gas Co. – Natural Gas (FID 12) - High | El Paso Natural Gas Co. – Natural Gas (FID 15) - High |
| Transwestern Pipeline Co. – Natural Gas (FID 32) - High | Transwestern Pipeline Co. – Natural Gas (FID 33) - High |
| Transwestern Pipeline Co. – Natural Gas (FID 34) - High | Transwestern Pipeline Co. – Natural Gas (FID 35) - High |
| Transwestern Pipeline Co. – Natural Gas (FID 36) - High | Zia Natural Gas Co. – Natural Gas (FID40) - High |
| Zia Natural Gas Co. – Natural Gas (FID 41) - High | El Paso Natural Gas Co. – Natural Gas (FID 44) - Moderate |
| El Paso Natural Gas Co. – Natural Gas (FID 16) - High | El Paso Natural Gas Co. – Natural Gas (FID 17) - High |
| **Transmission Lines** | |
| In Service AC Transmission Line – Glencoe (FID 6) - High | In Service AC Transmission Line – Hollywood (FID 7) - High |
| In Service AC Transmission Line – Hollywood (FID 25) - High | In Service AC Transmission Line – Ski Run (FID 26) - High |

**Flood**

Lincoln County contains a total of 215 critical infrastructure facilities. Of that total, 48 are within the 1% annual flood risk area. Infrastructure within these areas has a 1% probability of flooding on an annual basis and a 26% of flooding over the course of a 30-year mortgage, as defined by FEMA. The areas with 1% annual flood risk are also often referred to as the 100-year floodplain. Infrastructure in these areas could be impacted by flood events in several ways; flood water could fully inundate things like buildings and energy and transportation-related facilities and can damage or reduce the effectiveness of things like trails and bridges. Figure 5-90 lists infrastructure within the 1% annual flood risk zone.

The Regional Wastewater Plant for the Village of Ruidoso and Ruidoso Downs is not within the flood zone. The Planning Team requested to include the wastewater treatment plant (WWTP) to the list of critical infrastructure. The WWTP is located along U.S. Highway 70, northeast of Ruidoso Downs; the plant is approximately 150 feet from the outer boundary of the plant to the outmost boundary of the flood zone and approximately 240 feet from the outer boundary of the plant to the Rio Ruidoso.

**Figure 5-90: Critical Infrastructure within Flood Risk Zone (Lincoln County)**

| **Critical Infrastructure within 1% Annual Flood Risk Zone** | |
|---|---|
| **Dams** | |
| Bonito Dam | Upper Rio Hondo Site Number (No.) 1 Dam |
| **Trails** | |
| Access Trail | Lower Cedar Creek |
| Trail Access Loop | Upper Cedar Creek |
| Tortolita Canyon | Salado Trail |
| Homestead Cutoff | Rio Bonito Trail |
| Homestead Loop | East Well Trail |
| Zamora Trail | Elk Meadow Trail |
| Mills Canyon | Tract 4 Trail |
| Ft. Stanton North Trail | Tract 3 South Trail |
| Ft. Stanton South Trail | Nogal Canyon |
| Petroglyph Trail Access | Petroglyph Trail |
| **Railroad** | |
| Heartland Division (Object ID 15) | |
| **Pipelines** | |
| Giant Pipeline Co. – Crude Oil (Object ID 4) | El Paso Natural Gas Co. – Natural Gas (Object ID 6) |
| Transwestern Pipeline Co. – Natural Gas (Object ID 14) | Transwestern Pipeline Co. – Natural Gas (Object ID 15) |
| Transwestern Pipeline Co. – Natural Gas (Object ID 16) | Zia Natural Gas Co. – Natural Gas (Object ID19) |
| Zia Natural Gas Co. – Natural Gas (Object ID 21) | El Paso Natural Gas Co. – Natural Gas (Object ID 24) |
| El Paso Natural Gas Co. – Natural Gas (Object ID 25) | |
| **Transmission Lines** | |
| In Service AC Transmission Line – Glencoe (FID 6) | In Service AC Transmission Line – Hollywood (FID 7) |
| In Service AC Transmission Line – Hollywood (FID25) | In Service AC Transmission Line – Ski Run (FID26) |
| **Substation** | |
| In Service Substation – Glencoe (FID 10) | |

| Critical Infrastructure within 1% Annual Flood Risk Zone | |
|---|---|
| **Bridges** | |
| FID – 164: 9.7 miles N of NM48 @ Angus | FID – 189: 2.2 miles S of US380 |
| FID – 342: T10S, R12, SEC12 | FID – 247: 9.0 miles N Junction (Jct.) US70/NM368 |
| FID – 207: 400 S Jct. NM48 | FID – 187: 250 W US380 @ MP 150.1 |

**Thunderstorms**

Severe thunderstorms, which includes lightning and hail, are a broad hazard that impacts the entire county. Of the 215 pieces of critical infrastructure present in unincorporated Lincoln County, all have the potential to be damaged or have their functionality impaired or stopped due to severe weather. Due to the widespread nature of this hazard, and the lack of mapped data on high frequency occurrence areas, individual infrastructure was not assessed in terms of their vulnerability. Rather, this section identifies the potential impacts to the critical infrastructure that is present within the county.

A major infrastructure risk related to severe thunderstorms is loss of power. This can be caused by lightning strikes, extreme precipitation, and severe hailstorms with high accumulation and/or large hail that causes physical damage. Power outages are most likely to impact homes, public buildings, airports, public health facilities, and communication towers and facilities. Many facilities, such as hospitals, are equipped with backup power generators, however widespread power outages can cause facilities to become overwhelmed.

For airports, severe storms often cause grounding of flights, especially during severe lightning and hail events. This reduces or eliminates this form of travel in and out of the county. Campgrounds and trails are most heavily impacted by storms with high precipitation that may cause high levels of erosion and flooding in some cases. Campers and hikers are vulnerable to lightning strikes, hail strikes, and erosion-related hazards when using these facilities if a severe storm arises. Primitive facilities such as bathrooms that are common at trails and campgrounds may also be destroyed by severe storms. Railroads can be damaged by heavy precipitation that can erode the ground under tracks as well as by delays caused from high intensity storms. Similarly, Pipelines can become unsafe or damaged through erosion causing storm events that destabilize the ground around and under pipes. This is also true for transmission lines where footers and support may lose stability or be tipped over. Transmission lines may also be impact by lightning that knocks down poles or disconnects lines which can also create fire hazards.

**Winter Storms/ Ice Storms**

Winter storms and Ice storms also impact the entire county although higher elevation communities are more vulnerable and experience higher severity and frequency of these events relative to the plains regions. Due to the generally low accumulation of snow throughout the county, freezing is anticipated to have the largest impact on critical infrastructure throughout the county. Critical infrastructure that is most vulnerable to winter and ice storms include: airports, communication towers, substations, transmission lines, and pipelines.

Heavy snow and freezing rain impact airports by delaying or shutting down travel as flights become hazardous and require more time for de-icing and runway clearing. Similar to thunderstorms, winter storms can cause power outages that impact homes, established shelters, and emergency facilities. Accumulating ice and snow can down communication towers, transmission lines, and utility poles in extreme conditions. These issues may take days to rectify depending on the severity of the storm and infrastructure damage.

Natural gas pipelines may be damaged by extreme cold that causes water in and around the pipes to freeze, potentially causing cracking. Pipelines in the county include natural gas, carbon dioxide, crude oil, and highly volatile liquids; all of which create unique hazards for communities and environmental health in the event of their failure. Major roads may be closed or have hazardous travel conditions under severe winter weather. This can cause delays or stoppage of emergency services as well as leave travelers vulnerable to crashes and stranding in freezing temperatures.

**High Wind**

High wind is a hazard that may exist on its own or accompany thunderstorms or winter storms. High wind is a widespread hazard that impacts the entire county and is often hard to define the extent of. The south-central portion of the county and high elevation regions experience the most severe wind events and infrastructure in these areas should be prepared accordingly. All buildings and homes in the county can be damaged by high wind events when they pick up objects and carry sand and debris that can cause property damage. Traveling along major roads in the county may become hazardous, especially for high profile vehicles. Power outages may occur as a result of transmission line poles being knocked over by high wind. Similarly, Lines on substations may be damaged or broken from wind events.

**Drought**

Drought can have broad impacts on infrastructure but is most impactful to water resources while also raising risks of wildfire and flooding. As drought severity increases, watersheds dry and community reliance on groundwater increases. Overextraction can cause land subsidence where the ground slowly or dramatically sinks in the absence of ground water support. In 2017, the New Mexico Bureau of Geology released a study ranking the susceptibility of soil collapse throughout the state. A large portion of the unincorporated county was ranked as highly susceptible to soil collapse (rating based on a 1-4 scale with 4 being highly susceptible). Areas rated at a four include the valley between the Sacramento mountains and Capitan Mountain, the southwest portion of the county northwest from Ruidoso, and the northcentral portion of the county northeast of the Jicarilla mountains. This drought induced hazard can cause damage to buildings as soil compacts, and potentially destabilize transmission line poles and communication towers under extreme conditions. Drought also creates danger for pipelines that can be cracked or broken as the soil around them dries and shifts. Rail roads, bridges, airports, and roads can all be damaged by severe drought and high temperatures associated with extended events. Soil under these infrastructures can dry and compress, destabilizing concrete, and tracks. As forest health decreases under drought conditions, the risk of catastrophic wildfire increases placing trails and campgrounds at risk as well as infrastructure falling within the WUI. Drought creates similar concerns for increased flash flood risk as drought impacted soil cannot properly absorb precipitation and attenuate flooding.

**Dam Failure**

A Failure of the Alto Lake dam would have minimal impact on critical infrastructure but is expected to impact homes along the inundation path. One shelter location (J bar country church) is located in the flood path. However, based on reservoir capacity and floodplain location, impacted critical facilities can be estimated. The copper canyon and Angus canyon fire stations both fall within the expected inundation zone. One bridge, one communication towner, and one shelter also fall within the anticipated impact zone- located at the intersection of state Highways 48 and 37. A portion of mills canyon trail would also be inundated in the event of a dam failure.

#### 5.4.2.2 Village of Ruidoso

Critical Infrastructure Mapping for the Village of Ruidoso does not include wells. The Village requested that these features not be included on the map for public safety reasons.

**Changes in Development**

Regarding changes in development within the last 5 years, the Village of Ruidoso has shown minimal commercial and residential development with a decrease in population. This trend is anticipated to continue over the next 5 years. Because the decrease has been distributed throughout the Village, there has been no change to the vulnerability of natural hazards.

**Figure 5-91: Map of Critical Infrastructure for the Village of Ruidoso.**

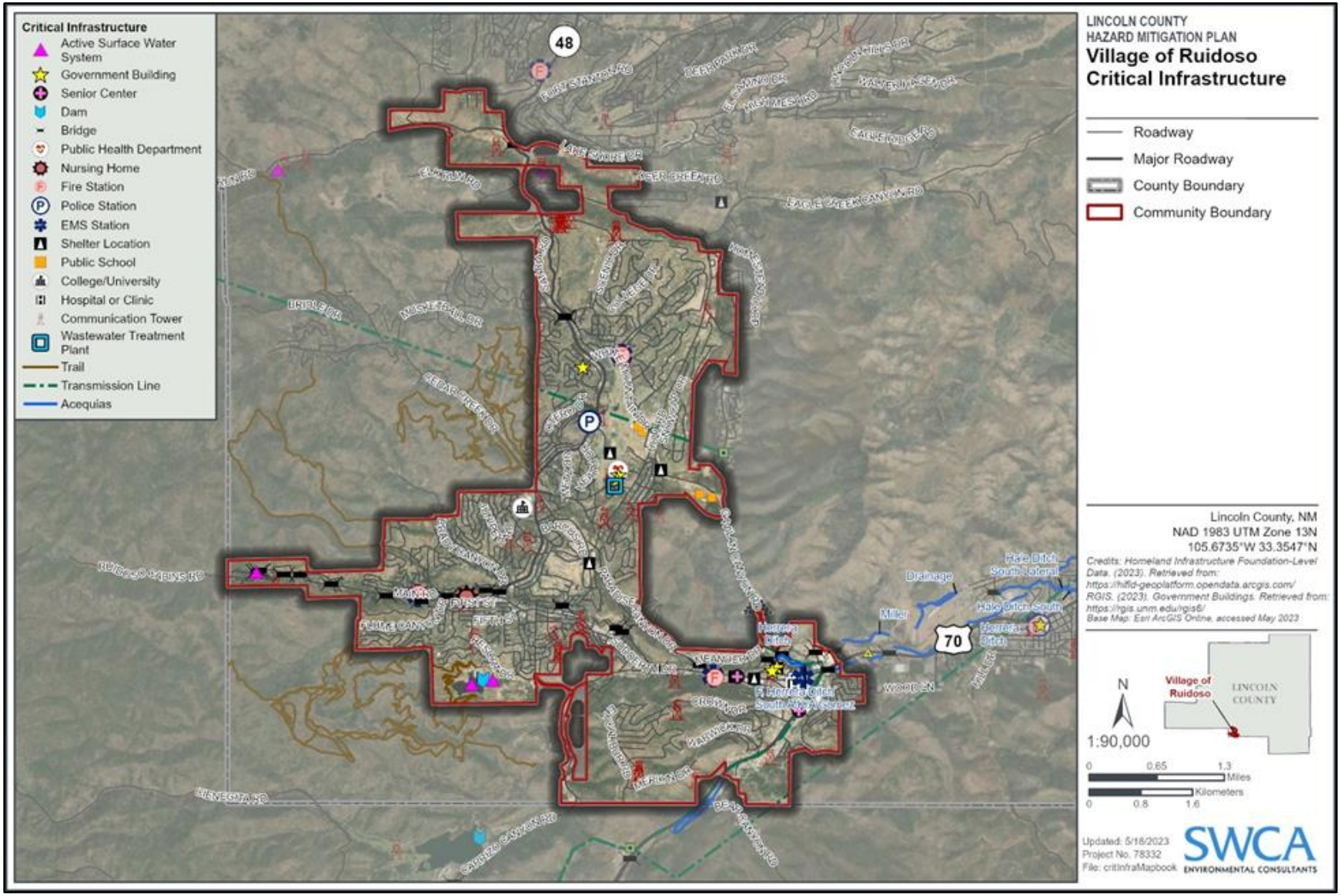
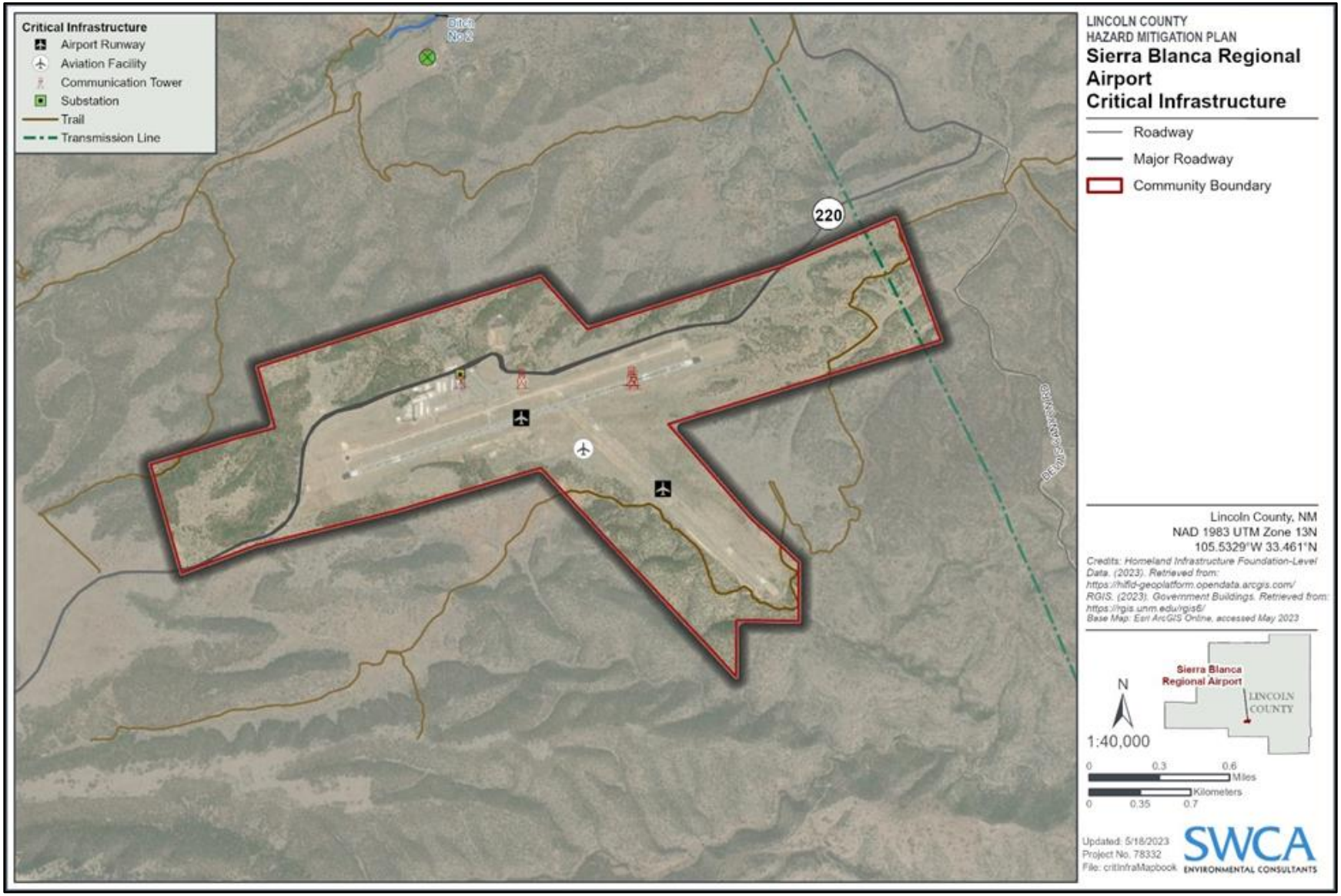


**Figure 5-92: Map of Critical Infrastructure at Sierra Blanca Regional Airport.**



## Wildfire

The village of Ruidoso contains a total of 60 critical infrastructure facilities (Figure 5-91). Of that total, six fall within the high-risk wildfire areas, nine fall within moderate risk wildfire areas. Figure 5-93 lists the names of infrastructure with moderate to high wildfire risk. Infrastructure that falls within the high wildfire hazard zone should be considered a priority for mitigation actions. Infrastructure in this category falls in a geography that is considered at high risk of wildfire events due to a combination of vegetation, topography, community proximity, and other fire ignition and spread modeling criteria. Prioritizing actions on or around these infrastructures will greatly improve a community's likelihood of minimizing wildfire hazard and ensuring continued functionality in the event of a fire and during the recovery process. Infrastructure that falls in the moderate wildfire risk category should be prioritized but is not as crucial as those deemed high risk. Infrastructure in this category is at risk of wildfire but may be more resilient or in less of a threat zone due to the surrounding landscape, past fuels management, Infrastructure materials, and other contributing risk factors.

Wildfires can cause significant long-lasting damage to water resources. The village has a large number of wells that can become contaminated by wildfire. Wells can be infiltrated by chemicals and microorganisms following fire impacts. This can be directly related to chemicals from the fire as well as fire suppressants used by fire fighters. Wells should always be tested following a fire and owners should check or replace well heads and components that support the function of the well.

The Sierra Blanca Regional Airport and the critical infrastructure contained within it also fall under the jurisdiction of the Village of Ruidoso and are assessed with the same criteria (Figure 5-92). The airport is situated about 15 miles northwest of the village along state highway 220. No critical infrastructure facilities fall within the moderate or high-risk zones; however, portions of the airport property fall within high wildfire risk zones, primarily the western end of the property. Additionally, the landscape surrounding the airport has a high occurrence of moderate and high wildfire risk zones. It is anticipated that fire intensity in this area is relatively low due to the vegetation composition. None the less, wildfires pose a threat to functionality of the airport as low intensity fires may cause delays and closures.

Wildfire and smoke from spring through fall can have a negative impact on tourists coming to the area for recreation opportunities. This can result in reduced revenue, taxes, and similar economic losses.

**Figure 5-93: Critical Infrastructure within Moderate/High Wildfire Zone (Village of Ruidoso)**

| **Critical Infrastructure within the Moderate and High Wildfire Risk Zone** | |
|---|---|
| **Bridges** | |
| 27-Z003 (FID 230) – 0.1 miles S of Main Rd - Moderate | NM48 (FID 210) – 6.5 miles N Jct) NM48 & US70 - Moderate |
| NM48 (FID 6) – 4.7 miles N Jct. US70/Ruidoso - Moderate | |
| **Landfills** | |
| Gavilan Canyon Solid Waste Transfer Station (430 Gavilan Canyon Rd) - Moderate | |
| **Communication Towers** | |
| FID – 42: ASR - High | FID – 376: Land Mobile (LM) -Private - Moderate |

| **Critical Infrastructure within the Moderate and High Wildfire Risk Zone** | |
|---|---|
| FID – 938: Microwave - High | FID – 425: LM-Private - Moderate |
| FID – 1142: Microwave - High | FID – 725: LM-Private - Moderate |
| **Trails** | |
| Grindstone Trail (Mine Canyon) - High | Grindstone Canyon Loop - Moderate |
| **Transmission Lines** | |
| Sierra Blanca Regional Airport (Glencoe FID – 6) - High | Village of Ruidoso (Hollywood FID – 25) - High |
| Village of Ruidoso (Ski Run FID – 26) - Moderate | |

At 211 Service Road, the new Court House has been built and the planned Horton Complex (Regional Dispatch Center) will be constructed in the next year. These buildings fall within a low wildfire risk area but are still within the WUI. The complex is located less than a block from the 1% annual flood risk area.

**Flood**

The village of Ruidoso contains a total of 60 critical infrastructure facilities. Of that total, 41 are within the 1% annual flood risk area. Figure 5-94 lists infrastructure within the 1% annual flood risk zone. Infrastructure within these areas have a 1% probability of flooding on an annual basis and a 26% probability of flooding over the course of a 30-year mortgage, as defined by FEMA. The areas with 1% annual flood risk are also often referred to as the 100-year floodplain. Infrastructure in these areas could be impacted by flood events in several ways; flood water could fully inundate things like buildings and energy and transportation-related facilities and can damage or reduce the effectiveness of things like trails and bridges.

The Regional Wastewater Plant for the Village of Ruidoso and Ruidoso Downs is not within the flood zone. The Planning Team requested to include the WWTP to the list of critical infrastructure. The WWTP is located along U.S. Highway 70, northeast of Ruidoso Downs; the plant is approximately 150 feet from the outer boundary of the plant to the outmost boundary of the flood zone and approximately 240 feet from the outer boundary of the plant to the Rio Ruidoso.

The new Court House and the planned Horton Complex (Regional Dispatch Center) are located less than a block from the 1% annual flood risk area. Flooding impacts are not anticipated for these government buildings. See the Dam Failure vulnerability discussion for potential impacts.

According to the Ruidoso Fire Chief, flooding impacts will be minimal to the following government buildings if there is a total breech of both the Grindstone Dam and Mescalero Lake Dams: Fire Station 1, new Court House, and Horton Complex.

Although not listed, the village contains many water wells that are critical to the community's water supply. Flood waters can carry contaminants such as waste, oil, bacteria, and excessive debris. In the event of a flood, excess water may seep into the well, containing any contaminants carried by it. Water wells should be tested following flood inundation to ensure the water system has not been compromised.

**Figure 5-94: Critical Infrastructure within Flood Risk Zone (Village of Ruidoso)**

| Critical Infrastructure within 1% Annual Flood Risk Zone | |
|---|---|
| **Public Schools** | |
| White Mountain Elementary (203 White Mountain Drive (Dr)) | |
| **Communication Towers** | |
| FID – 721: LM-Private | FID – 323: LM-Private |
| FID – 307: LM-Private | |
| **Transmission Lines** | |
| Village of Ruidoso (Hollywood FID – 7) | Village of Ruidoso (Ski Run FID – 26) |
| **Bridges** | |
| FID – 230: 0.1 miles S of Main Rd | FID – 133: Jct. US70/NM48 |
| FID – 178: 0.1 miles N of NM48 | FID – 255: Main Rd & Fox Drive |
| FID – 177: 0.4 miles NW Jct. NM48 | FID – 336: Jct. Main Rd/Flume Can. Rd |
| FID – 307: 0.5 miles NW US70/NM48 | FID – 250: 535 N of US70 |
| FID – 251: 540 N of Gavilan Canyon | FID – 5: 3.5 miles N of US70/Ruidoso |
| FID – 308: 446 N of US70 | FID – 252: 628 ft. W of NM48 |
| FID – 232: Near River Trail | FID – 228: E end of N Loop Dr |
| FID – 231: River Trail/Rio Ruidoso | FID – 229: W end of N Loop Dr |
| FID – 30: 14.4 miles E Jct. US380/Hondo | FID – 253: 84 ft. N of Maine Rd |
| FID – 312: 457 fr of US70 | FID – 226: 200 N of Jct. Main Rd |
| FID – 227: 0.1 miles NW of Main Rd | FID – 249: 0.3 miles N of US70 |
| FID 174: 0.1 miles S US70 @ MP 293.4 | FID – 135: 5.3 miles NE of Jct. NM48 |
| FID – 188: 7.4 miles E Otero/Lincoln Cl | FID – 81: 0.2 miles S Jct. US70/380 |
| FID – 240: 2.0 miles E Jct. US380/Hondo | FID – 23: 0.8 miles E Jct. US380/Hondo |
| FID – 186: 0.25 miles S US70 @ MP 284.3 | FID – 244: 0.1 miles W of US70/380 Hondo |
| FID – 185: 0.2 miles E of US70 @ MP 273 | FID – 265: 0.3 miles W of US70 @ MP 274 |
| FID – 286: 4.51 miles W US70/380 | FID – 241: 10.1 miles W Jct. US380/Hondo |
| FID – 285: 3.82 miles E of US70 @ MP 278 | |

## Thunderstorms

The infrastructure expected to be most impacted by Thunderstorms, including lightning and hail, is airports, emergency response and health facilities, communication towers, transmission lines, and substations. These infrastructure are distributed through the village and the transmission line runs east-west just north of the police station. All these facilities have the potential to lose power during severe thunderstorm conditions. Due to Ruidoso's proximity to the Sacramento Mountains, storms may move across the village quickly and carry large amounts of precipitation. This can overwhelm storm water

systems and create flooding hazards, particularly concerning infrastructure on the east edge of the town such as the multiple EMS stations, shelters, and fire stations. Large hail can cause structural damage to buildings and facilities such as the airport, government buildings, schools, and hospitals. Communication towers and transmission lines may also be damaged or impeded by large and accumulating hail.

**Winter Storms**

Heavy snow accumulation, freezing rain, and extreme winter temperatures pose a threat to the functionality of most critical infrastructure facilities in Ruidoso. Power outages related to downed transmission lines and impaired substations can impact power village wide. Road travel can become hazardous or be completely shut off with high snow accumulation and icy roads from freezing.

**High wind**

High wind is a hazard that may exist on its own or accompany thunderstorms or winter storms. The village is located in a high average wind region of the county and high elevation portions are expected to experience the most severe wind events. Large, gusting wind events are common and infrastructure in these areas should be prepared accordingly. All buildings and homes in Ruidoso can be damaged by high wind events when they pick up objects and carry sand and debris that can cause property damage. Traveling along major roads in and out of the village may become hazardous, especially for high profile vehicles. Power outages may occur because of transmission line poles being knocked over by high wind. Similarly, Lines on substations may be damaged or broken from wind events.

**Drought**

The village has on average 6-20 water wells per square kilometer, most of which are at depths of greater than 40 feet, according to the New Mexico Bureau of Geology. This 2017 study of collapsible soil susceptibility ranks most of the village and the surrounding landscape as highly susceptible to soil collapse (rating based on a 1-4 scale with 4 being highly susceptible). This drought induced hazard can cause damage to buildings as soil compacts, and potentially destabilize transmission line poles and roads. Drying soil is less absorptive of rain and runoff and can exacerbate flooding risk. This also creates potential water resource impacts from sedimentation which is of particular concern for acequias which may require additional maintenance.

Communities may see a reduction in the output and effectiveness of water wells during extended drought period. Subsurface aquifers can dry below the level of the well pump resulting in loss of water.

**Dam Failure**

A failure of Grindstone dam is anticipated to be the most impactful to the village as the path of water movement following a rupture would inundate many homes and critical facilities along its path. Five bridges are located directly downstream of the failure path as well as the Ruidoso Fire Station 1, and three shelter locations.

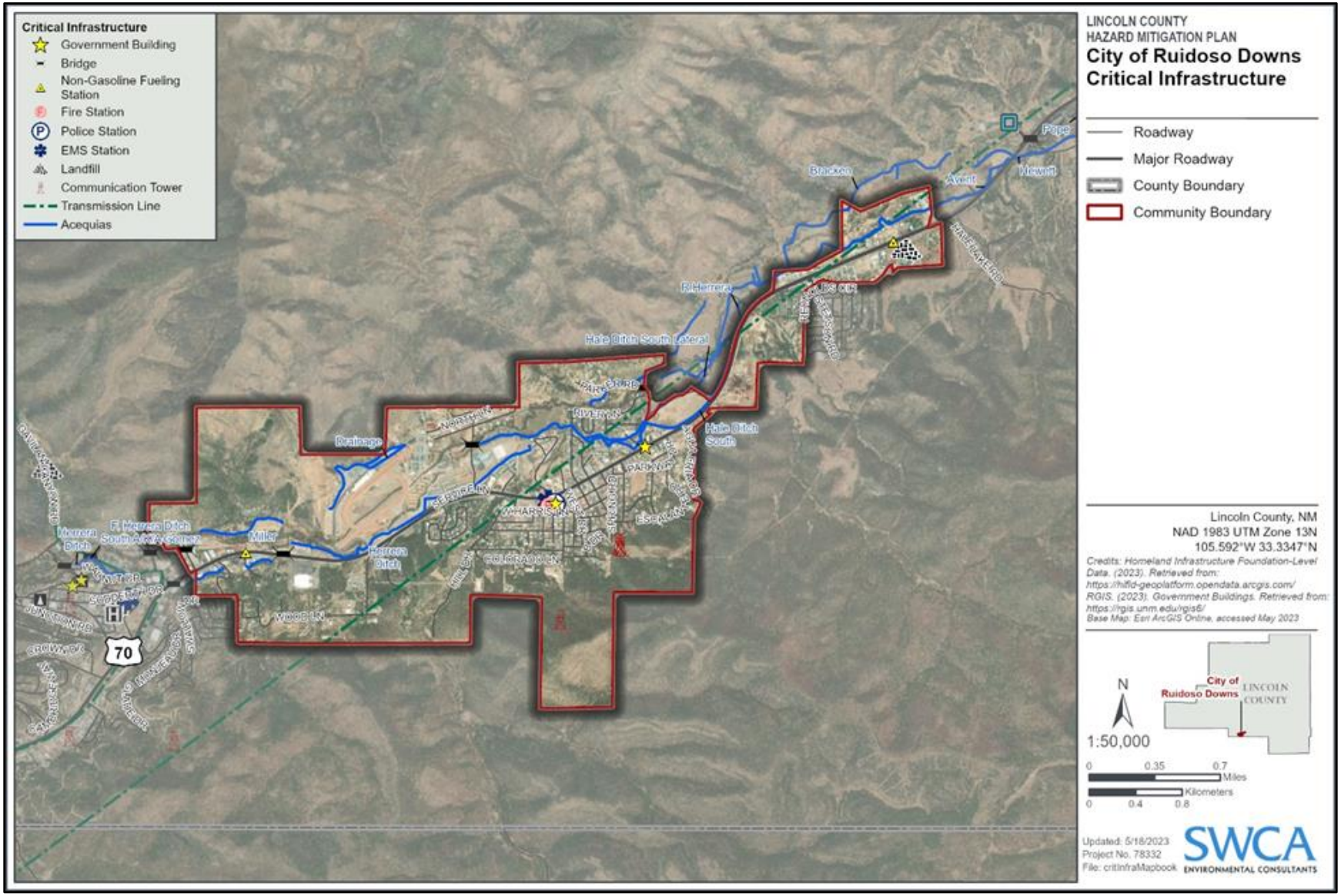
Based on the assessment conducted during planning for Fire Station 1, the new Court House, and Horton Complex, it was noted that in the very rare case that both Grindstone Dam and Mescalero Lake Dam had total failure, these three government buildings may have be impacted.

#### 5.4.2.3 City of Ruidoso Downs

**Changes in Development**

Regarding changes in development within the last 5 years, the City of Ruidoso Downs has shown minimal commercial and residential development, which is anticipated to continue within the next 5 years. Portions of the new Aqua Fria development (central-west boundary of the city bounded by Aqua Fria Drive, Escalante Road and Spring Road) is in the moderate wildfire risk area. As part of the building permit, the property owner is required to thin the lot in the areas near the structures. Additional homes are expected to be built in this area over the next 5 years. A Super Allsup's was built in the Avalon neighborhood (north of US70 toward the eastern side of the city). Additional commercial development is anticipated over the next 5 years, but specific locations have not been identified. Other than the new Aqua Fria development, there are no additional changes to the vulnerability of the severe weather hazards.

**Figure 5-95: Map of Critical Infrastructure for the City of Ruidoso Downs.**



## Wildfire

Ruidoso Downs contains a total of 8 critical infrastructure facilities (Figure 5-95). Of that total, 7 fall within the high-risk wildfire. Figure 5-96 lists the names of infrastructure with high wildfire risk. Infrastructure that falls within the high wildfire hazard zone should be considered a priority for mitigation actions. Infrastructure in this category falls in a geography that is considered at high risk of wildfire events due to a combination of vegetation, topography, community proximity, and other fire ignition and spread modeling criteria. Prioritizing actions on or around these infrastructures will greatly improve a community's likelihood of minimizing wildfire hazard and ensuring continued functionality in the event of a fire and during the recovery process. Infrastructure that falls in the moderate wildfire risk category should be prioritized but is not as crucial as those deemed high risk. Infrastructure in this category is at risk of wildfire but may be more resilient or in less of a threat zone due to the surrounding landscape, past fuels management, infrastructure material, and other contributing risk factors.

The Sierra Contracting Dump site is located between US70 and the eastern City line, to the northeast of the Aqua Fria Development. A portion of the site is in the moderate to high fire risk area.

Wildfire and smoke from spring through fall can have a negative impact on tourists coming to the area for recreation opportunities. This can result in reduced revenue, taxes, and similar economic losses.

**Figure 5-96: Critical Infrastructure within Moderate/High Wildfire Zone (Ruidoso Downs)**

| **Critical Infrastructure within the Moderate and High Wildfire Risk Zone** | |
|---|---|
| **Communication Towers** | |
| FID – 618: LM-Private - High | FID – 668: LM-Private - High |
| FID – 631: LM-Private - High | FID – 1108: Microwave - High |
| FID – 632: LM-Private - High | FID – 1109: Microwave - High |
| **Transmission Line** | |
| In Service AC Transmission Line (0.5 mile of transmission line from Wood Ln heading NE) - High | |

## Flood

Ruidoso Downs contains a total of eight critical infrastructure facilities. Of that total, one is within the 1% annual flood risk area. Figure 5-97 lists infrastructure within the 1% annual flood risk zone. Infrastructure within these areas has a 1% probability of flooding on an annual basis and a 26% of flooding over the course of a 30-year mortgage, as defined by FEMA. The areas with 1% annual flood risk are also often referred to as the 100-year floodplain. Infrastructure in these areas could be impacted by flood events in several ways; flood water could fully inundate things like buildings and energy and transportation-related facilities and can damage or reduce the effectiveness of things like trails and bridges.

According to the Planning Team, the Village of Ruidoso WWTP could be impacted by flooding in the City of Ruidoso Downs. The Treatment Plant is located at the east end of Ruidoso Downs next to U.S. Route 70 in the Rio Ruidoso floodplain.

**Figure 5-97: Critical Infrastructure within Flood Risk Zone (Ruidoso Downs)**

| Critical Infrastructure within 1% Annual Flood Risk Zone |
|---|
| Transmission Lines |
| City of Ruidoso Downs (Hollywood) – FID 25 |
| Treatment Plant |
| Ruidoso Downs Wastewater Treatment Plant* |

*At the request of the Planning Team, this infrastructure was added. It is located approximately 0.35 miles northeast of the most northeastern part of the Ruidoso Downs boundary line. The property line for the WWTP is approximately 160 feet north from the area considered a 1% annual flood risk zone.

**Thunderstorms**

Infrastructure hazard concerns for thunderstorms in the City of Ruidoso Downs include transmission lines, which run south west to north east, communication towers, Government buildings, and emergency response facilities. Severe thunderstorms, including lightning and hail, can cause outages and physical damage to transmission lines and communications towers via electrocution, large and or accumulating hail, and thunderstorms with high precipitation totals and high wind. Government buildings and emergency response facilities can also experience reduced or halted service due to loss of power. Acequias may be damaged or overwhelmed by high precipitation and hail accumulation; this is especially a concern during monsoon season and for systems that are fed by watersheds with burn scars.

**High Wind**

The main critical infrastructure vulnerable to high wind are transmission lines and communication towers which are mostly located on the south edge of town and near the police station. These facilities can be destabilized by high wind events if a secure foundation is not present. For facilities falling within the floodplain that may experience some level of flooding, the base may be compromised by the dual impacts of water and wind.

**Drought**

Severe drought conditions dry soil and reduce available water in watersheds and subsurface sources. This can create instability for structures requiring solid foundations such as transmission lines, communication towers, and bridges. Acequias may become dry and subject to flash flooding even under normal precipitation conditions. This can also create large sediment movements that can congest and reduce the effectiveness of acequias.

**Dam Failure**

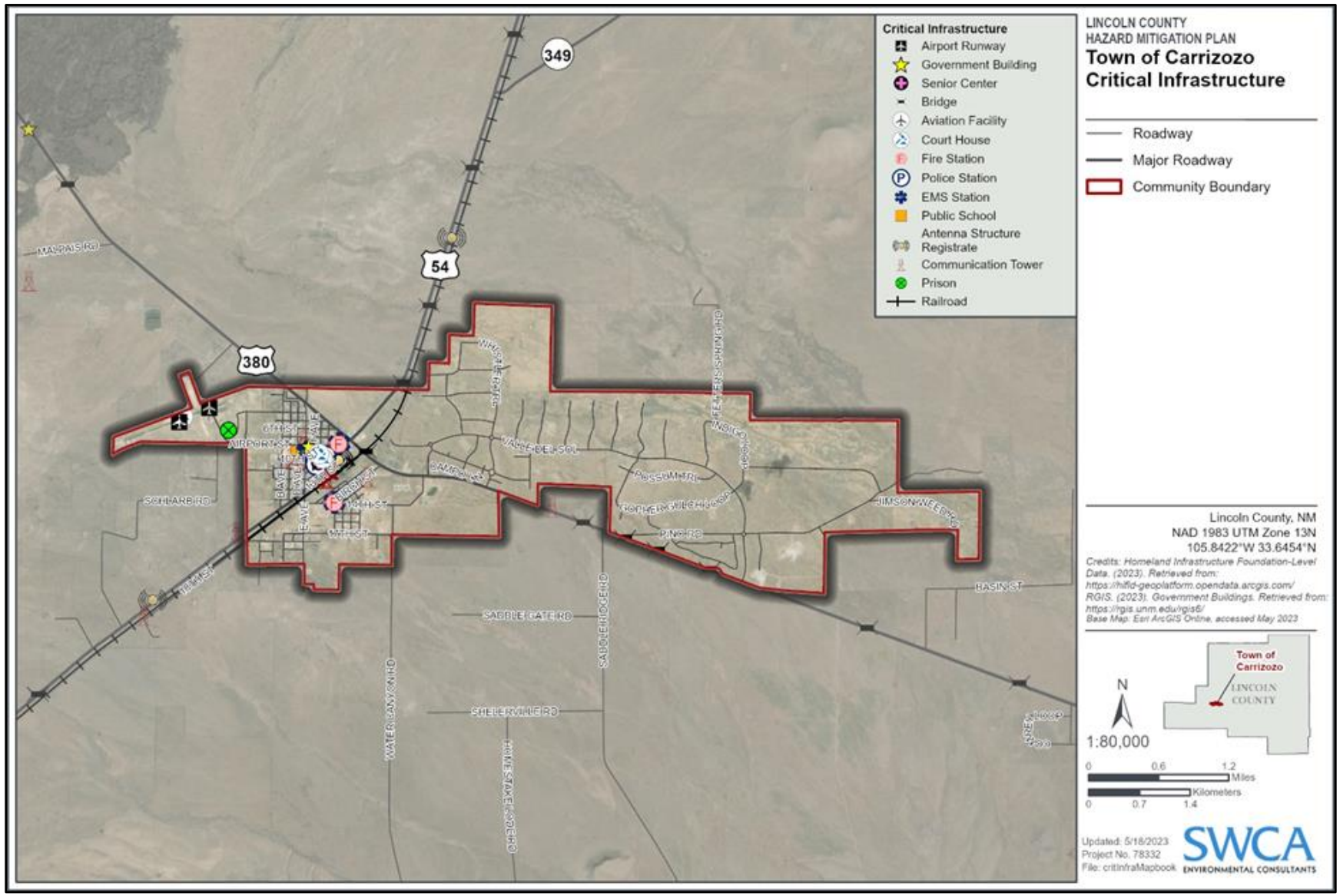
A dam failure at Grindstone dam is anticipated to cause property damage to homes and inundate critical infrastructure in the city. The city racetrack, located centrally in the city along U.S. 70, would be fully inundated in the event of a failure. U.S. Highway 70 may experience some inundation or destabilization along its edges where it runs close to Rio Ruidoso. One transmission line that runs through the city could be damaged by flood waters washing away guide poles.

#### 5.4.2.4 Town of Carrizozo

**Changes in Development**

Regarding changes in development within the last 5 years, Carrizozo has shown minimal commercial and residential development with a slight increase in population, which is anticipated to continue within the next 5 years. Most of the anticipated development is infilled so there if no anticipated increase in natural hazard vulnerability. However, 215 acres is being developed for a mix of residential and commercial uses (north/northwest jurisdictional boundary with U.S. 54 and U.S. 380 as the other two boundaries). None of these 215 acres is shown as being in the wildfire risk area or the floodplain. However, highway closures due to natural hazards would likely impact travel to and from this newly developed area.

**Figure 5-98: Map of Critical Infrastructure for the Town of Carrizozo.**



**Wildfire**

The Town of Carrizozo contains a total of 6 critical infrastructure facilities (Figure 5-98). No critical infrastructure facilities are located in an area designated as either moderate or high wildfire risk.

**Flood**

Of the six identified critical infrastructure facilities in Carrizozo, four are within the 1% annual flood risk area. Figure 5-99 lists infrastructure within the 1% annual flood risk zone. Infrastructure within these areas has a 1% probability of flooding on an annual basis and a 26% of flooding over the course of a 30-year mortgage, as defined by FEMA. The areas with 1% annual flood risk are also often referred to as the 100-year floodplain. Infrastructure in these areas could be impacted by flood events in a number of ways; flood water could fully inundate things like buildings and energy and transportation-related facilities and can damage or reduce the effectiveness of things like trails and bridges.

**Figure 5-99: Critical Infrastructure within Flood Risk Zone (Town of Carrizozo)**

| Critical Infrastructure within 1% Annual Flood Risk Zone | |
|---|---|
| **Railroads** | |
| NM Railroad (FID – 86) | NM Railroad (FID – 192) |
| Heartland Division (FID – 99) | Heartland Division (FID – 211) |

**Thunderstorms**

The infrastructure expected to be most impacted by Thunderstorms, including lightning and hail, is airports, emergency response and health facilities, communication towers, TV transmitters, shelter locations, and public schools. All facilities have the potential to lose power during severe thunderstorm conditions. Large hail can cause structural damage to buildings and facilities such as the airport, government buildings, schools, and hospitals. Communication towers and TV transmitters may also be damaged or have communication interference due to large and accumulating hail and heavy precipitation. This could hinder the ability to notify people of hazard danger.

**Winter Storms**

Heavy snow accumulation, freezing rain, and extreme winter temperatures pose a threat to the functionality of most critical infrastructure facilities in Carrizozo. Power outages related to downed communication towers and TV transmitters can impact communication throughout the town. Road travel can become hazardous or be completely shut off when snow accumulation is high and roads ice over from freezing and rain. Travel in and out of the airport may also be restricted due to winter weather. Shelters may become overwhelmed depending on the severity of winter weather.

**High wind**

High wind poses a threat to multiple communication facilities in Carrizozo including antenna structures, communication towers and TV transmitters. The town has a high number of communication towers centrally located along 13th street. If the base support of these structures is not properly secured, they may tip or become unstable. Under high wind, the airport may be forced to ground flights. Multiple tornadoes were reported near the town during the assessment period which raises the threat of wind-related damage from flying debris.

**Drought**

The main impact of drought on critical infrastructure in Carrizozo is on water resources and secondary impacts of drying and water-resistant soils. Structures such as bridges, communication towers, rail tracks and runways. These facilities may lose stability or alignment as the soil beneath them contracts. Similarly, in the event of heavy precipitation following extended drought periods, soil may be quickly washed away, reducing ground support for these facilities.

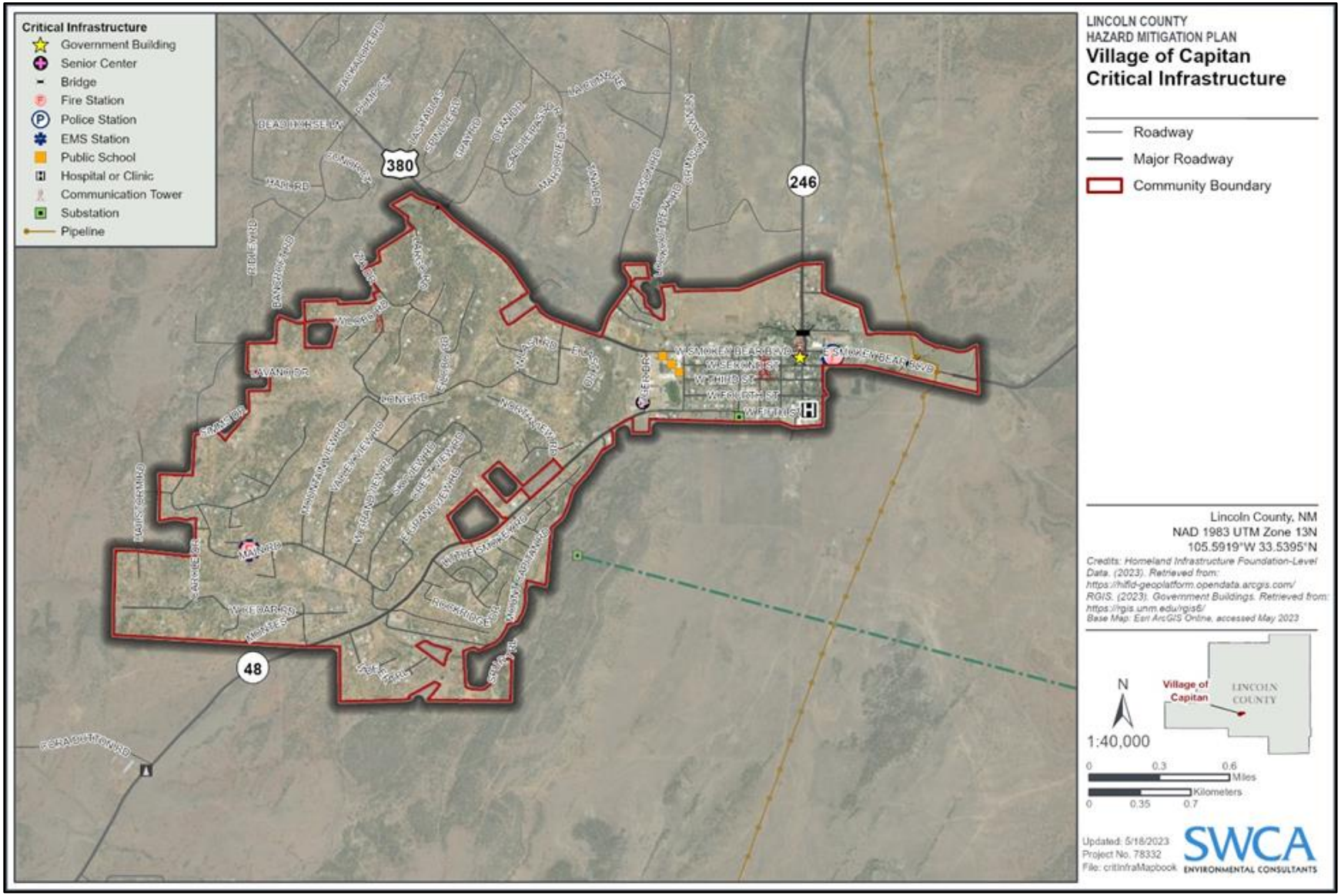
#### 5.4.2.5 Village of Capitan

**Changes in Development**

Regarding changes in development within the last 5 years, Capitan has shown minimal commercial development with the addition of Family Dollar and Dollar General stores. There has been minimal residential development with an overall decrease in population. This trend is anticipated to continue over the next 5 years. Therefore, there has been no change to the vulnerability of the natural hazards.

Wind turbine projects are being planned and implementation is expected within the next 5-year period. The location may be in the unincorporated portion of the county in the area of Capitan. As these projects are planned and implemented, vulnerability to natural hazards will be analyzed more fully.

**Figure 5-100: Map of Critical Infrastructure for the Village of Capitan.**



## Wildfire

Village of Capitan contains a total of 14 critical infrastructure facilities (Figure 5-100). Of that total, 2 fall within the high-risk wildfire areas. Figure 5-101 lists the names of infrastructure with high wildfire risk. Infrastructure that falls within the high wildfire hazard zone should be considered a priority for mitigation actions. Infrastructure in this category falls in a geography that is considered at high risk of wildfire events due to a combination of vegetation, topography, community proximity, and other fire ignition and spread modeling criteria. Prioritizing actions on or around these infrastructures will greatly improve a community's likelihood of minimizing wildfire hazard and ensuring continued functionality in the event of a fire and during the recovery process. Infrastructure that falls in the moderate wildfire risk category should be prioritized but is not as crucial as those deemed high risk. Infrastructure in this category is at risk of wildfire but may be more resilient or in less of a threat zone due to the surrounding landscape, past fuels management, infrastructure material, and other contributing risk factors.

**Figure 5-101: Critical Infrastructure within Moderate/High Wildfire Zone (Village of Capitan)**

| Critical Infrastructure within the Moderate and High Wildfire Risk Zone |
|---|
| **Natural Gas Compressor Station** |
| Station 8 (Booster Pumping Station) – Transwestern Rd, 27.6 miles SW of Corona) - High |
| **Shelter Locations** |
| Trinity Baptist Church – High |

## Flood

Fourteen critical infrastructure facilities were identified in the Village of Capitan, with 11 located within the 1% annual flood risk area. Figure 5-102 lists infrastructure within the 1% annual flood risk zone. Infrastructure within these areas has a 1% probability of flooding on an annual basis and a 26% of flooding over the course of a 30-year mortgage, as defined by FEMA. The areas with 1% annual flood risk are also often referred to as the 100-year floodplain. Infrastructure in these areas could be impacted by flood events in a number of ways; flood water could fully inundate things like buildings and energy and transportation-related facilities and can damage or reduce the effectiveness of things like trails and bridges.

**Figure 5-102: Critical Infrastructure within Flood Risk Zone (Village of Capitan)**

| Critical Infrastructure within 1% Annual Flood Risk Zone |
|---|
| **Government Buildings** |
| Capitan Village Hall-114 Lincoln Avenue |
| **EMS Stations** |
| State Highway 37 (FID – 43) |
| **Communication Towers** |
| FID – 761: LM-Private |
| **Pipelines** |
| Zia Natural Gas Co. – Natural Gas (Object ID20) |

| Critical Infrastructure within 1% Annual Flood Risk Zone | |
|---|---|
| **Bridges** | |
| FID – 28: 2.6 miles N of US380/Carrizozo | FID – 67: 0.4 miles E of NM37/US380 |
| FID – 289: 0.47 miles E of NM48/Capitan | FID – 179: 400 N of US380/Capitan |
| FID – 290: 5.6 miles E of NM48/Capitan | FID – 69: 5.1 Miles E of NM48/Capitan |
| FID – 166: 17.0 miles E Jct. NM48/Capitan | |

**Thunderstorms**

Infrastructure hazard concerns for thunderstorms in the Village of Capitan include transmission lines, communication towers, Government buildings, and emergency response facilities. Severe thunderstorms, including lightning and hail, can cause outages and physical damage to transmission lines and communications towers via electrocution, large and or accumulating hail, and thunderstorms with high precipitation totals and high wind. Government buildings and emergency response facilities can also experience reduced or halted service due to loss of power. Acequias may be damaged or overwhelmed by high precipitation and hail accumulation; this is especially a concern during monsoon season and for systems that are fed by watersheds with burn scars.

**Winter Storms**

The main expected impacts on critical infrastructure from winter storms including freezing rain and ice storms are loss of power and hazardous travel. Loss of power can impact the airport, emergency response facilities, schools, and shelters. High accumulation of snow and ice storms can cause disruption to communication towners, antennas, and TV transmitters. The village also has one natural gas pipeline on the eastern edge of the village that could be damaged by freezing.

**High wind**

High wind poses a threat to multiple communication facilities in Capitan including communication towers and TV transmitters. If the base support of these structures is not properly secured, they may tip or become unstable. Under high wind, the airport may be forced to ground flights.

**Drought**

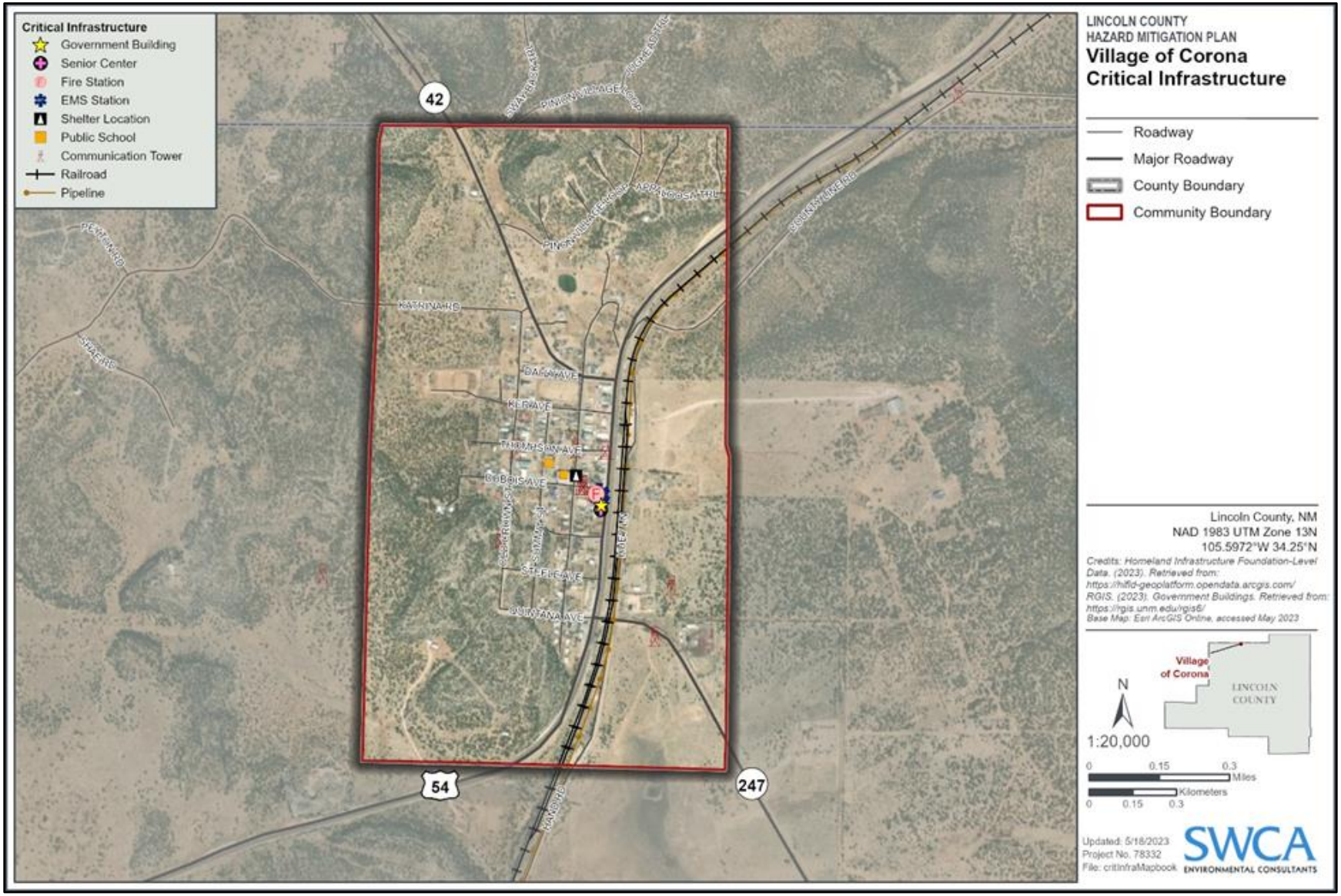
Severe drought conditions dry soil and reduce available water in watersheds and subsurface sources. This can create instability for structures requiring solid foundations such as TV transmitters, communication towers, and natural gas compressor stations. Pipelines may be damaged by contracting soil that could cause cracks.

#### 5.4.2.6 Village of Corona

**Changes in Development**

Regarding changes in development within the last 5 years, the Village of Corona has shown some commercial and residential development due to the construction of wind turbines in the surrounding area. There has been a slight increase in population, which is anticipated to continue within the next 5 years. Due to the nature of the construction and increased activity, there has been an increase in vulnerability in wildfire and high wind prone areas.

**Figure 5-103: Map of Critical Infrastructure for the Village of Corona.**



## Wildfire

Village of Corona contains a total of nine critical infrastructure facilities (Figure 5-103). Of that total, five fall within the moderate risk wildfire areas. Figure 5-104 lists the names of infrastructure with high wildfire risk. Infrastructure that falls within the high wildfire hazard zone should be considered a priority for mitigation actions. Infrastructure in this category falls in a geography that is considered at high risk of wildfire events due to a combination of vegetation, topography, community proximity, and other fire ignition and spread modeling criteria. Prioritizing actions on or around these infrastructures will greatly improve a community's likelihood of minimizing wildfire hazard and ensuring continued functionality in the event of a fire and during the recovery process. Infrastructure that falls in the moderate wildfire risk category should be prioritized but is not as crucial as those deemed high risk. Infrastructure in this category is at risk of wildfire but may be more resilient or in less of a threat zone due to the surrounding landscape, past fuels management, infrastructure material, and other contributing risk factors.

**Figure 5-104: Critical Infrastructure within Moderate/High Wildfire Zone (Village of Corona)**

| **Critical Infrastructure within the Moderate and High Wildfire Risk Zone** | |
|---|---|
| **Railroads** | |
| Railroad Owner: UP (FID – 61) - Moderate | Heartland Division – Railroad Owner: UP (FID – 63) - Moderate |
| Heartland Division – Railroad Owner: UP (FID – 64) - Moderate | |
| **Pipelines** | |
| El Paso Natural Gas Co. (FID pipelines – 15) - Moderate | |
| **Aviation Facilities** | |
| High Desert Ranch - Moderate | |

## Flood

The Village of Corona contains a total of nine critical infrastructure facilities. Of that total, two are within the 1% annual flood risk area. Figure 5-105 lists infrastructure within the 1% annual flood risk zone. Infrastructure within these areas has a 1% probability of flooding on an annual basis and a 26% of flooding over the course of a 30-year mortgage, as defined by FEMA. The areas with 1% annual flood risk are also often referred to as the 100-year floodplain. Infrastructure in these areas could be impacted by flood events in a number of ways; flood water could fully inundate things like buildings and energy and transportation-related facilities and can damage or reduce the effectiveness of things like trails and bridges.

**Figure 5-105: Critical Infrastructure within Flood Risk Zone (Village of Corona)**

| **Critical Infrastructure within 1% Annual Flood Risk Zone** |
|---|
| **Railroads** |
| Heartland Division – Railroad Owner: UP (FID – 63) |
| **Pipelines** |
| El Paso Natural Gas Co. (FID pipelines – 15) |

**Winter Storms**

Heavy snow accumulation, freezing rain, and extreme winter temperatures pose a threat to the functionality of most critical infrastructure facilities in Corona. Power outages related to downed communication towers can impact communication throughout the village. Road travel can become hazardous or be completely shut off when snow accumulation is high and roads ice over from freezing and rain. Travel in and out of the airport may also be restricted due to winter weather. Shelters may become overwhelmed depending on the severity of winter weather. Pipelines may become a hazard as freezing temperatures can cause cracks.

**High wind**

High wind poses a threat to multiple facilities in Corona including communication towers and aviation facilities. If the base support of these structures is not properly secured, they may tip or become unstable. These facilities are centrally located in town along Thompson Avenue and Franklin Street. Flights may be grounded with persistent high wind. Under high wind, the airport may be forced to ground flights. Road travel in and out of the village may become hazardous, especially for high profile vehicles. Multiple tornadoes were reported near Corona during the assessment period which raises the threat of wind-related damage from flying debris.

***Drought***

The main impact of drought on critical infrastructure in Corona is on water resources and secondary impacts of drying and water-resistant soils. Structures such as bridges, communication towers, rail tracks and runways may lose stability or alignment as the soil beneath them contracts. Similarly, in the event of heavy precipitation following extended drought periods, soil may be quickly washed away, reducing ground support for these facilities. Pipelines and natural gas compressor stations may also be in danger as soil subsides, causing shifts around these facilities that can cause cracking.

### *5.4.3 Loss/Damage Estimates*

Loss estimates for the 2018 HMP, included a residential asset inventory and 2010 U.S. Census block data. Economic loss and human exposure estimates for each hazard for each participating jurisdiction were accomplished by intersecting the asset inventory with the hazard profiles and compiling both exposed residential count and replacement value. For the 2018 HMP, the Planning Team identified the percent of estimated damage for each hazard based on previous occurrence, personal experience, and knowledge of the community.

For the 2023 Update, the Planning Team used Lincoln County Assessor's data to identify the combined value of property and structures for residential uses, combined value of property and structures for commercial uses, and utility values. These three values were calculated for each of the participating jurisdictions. The Planning Team reviewed 2018 HMP percent of estimated damage for each hazard, confirmed the percentages, made modifications, and identified the percentage for new hazards identified in the screening process.

Combining the estimated loss of residential, commercial, and utility damages for each hazard for each participating jurisdiction provides a more comprehensive depiction of what may be experienced when impacted by a natural disaster.

Economic losses to residential parcels/structures, commercial parcels/structures, and utilities were estimated by multiplying the total valuation for each category by the percent of damage estimated for each hazard for each community. The estimated damages for each community are summarized in Figures 5-106-1 through 5-106-6 below. Total values for residential, commercial, and utilities are shown at the bottom of each community Estimated Damage chart below. It is important to note the following when reviewing the estimated damages:

- The Assessor's data is formatted by school district and not by incorporated jurisdiction. Integrating the appropriate figures for each incorporated jurisdiction was completed based on an understanding of the current Assessor's data limitations. It was advised that the Planning Team not rely on the Assessor's number of structures under the residential or commercial categories as out-buildings, accessory structures, and similar are not exclusively counted under one category.
- Figures shown as commercial include some housing that is rented. These figures are identified in the Assessor's data as 'non-residential'.
- The percentage of damage per hazard per participating jurisdiction is subjective and was determined by the Planning Team Members from each jurisdiction.
- The damage estimates are solely intended to provide a general understanding of the relative risk of each hazard and potential magnitude of loss.

**Figure 5-106-1: Estimated Damages – Lincoln County**

| Estimated Damages - Lincoln County | | | | | |
|---|---|---|---|---|---|
| **Hazard** | **% damaged** | **Residential** | **Commercial** | **Utility Value** | **Total Damages** |
| Wildfire | 75% | $ 1,323,724,665.75 | $ 180,831,534.75 | $ 198,601,454.25 | **$ 1,703,157,654.75** |
| Flood | 75% | $ 1,323,724,665.75 | $ 180,831,534.75 | $ 198,601,454.25 | **$ 1,703,157,654.75** |
| Thunderstorms | 75% | $ 1,323,724,665.75 | $ 180,831,534.75 | $ 198,601,454.25 | **$ 1,703,157,654.75** |
| Winter Storms | 75% | $ 1,323,724,665.75 | $ 180,831,534.75 | $ 198,601,454.25 | **$ 1,703,157,654.75** |
| Drought | 75% | $ 1,323,724,665.75 | $ 180,831,534.75 | $ 198,601,454.25 | **$ 1,703,157,654.75** |
| Dam Failure | 25% | $ 441,241,555.25 | $ 60,277,178.25 | $ 66,200,484.75 | **$ 567,719,218.25** |
| High Wind | 35% | $ 617,738,177.35 | $ 84,388,049.55 | $ 92,680,678.65 | **$ 794,806,905.55** |
| | | | | | ***$ 9,878,314,397.55*** |
| | | | | *Residential Parcels and Structure Value* | *$ 241,108,713.00* |
| | | | | *Commercial Parcels and Structure Value* | *$ 532,882,086.00* |
| | | | | *Utility Value* | *$ 264,801,939.00* |

**Figure 5-106-2: Estimated Damages – Village of Ruidoso**

| Estimated Damages - Village of Ruidoso | | | | | |
|---|---|---|---|---|---|
| **Hazard** | **% damaged** | **Residential** | **Commercial** | **Utility Value** | **Total Damages** |
| Wildfire | 75% | $ 1,065,445,575.75 | $ 468,282,042.00 | $ 27,614,232.00 | **$ 1,561,341,849.75** |
| Flood | 25% | $ 355,148,525.25 | $ 156,094,014.00 | $ 9,204,744.00 | **$ 520,447,283.25** |
| Thunderstorms | 25% | $ 355,148,525.25 | $ 156,094,014.00 | $ 9,204,744.00 | **$ 520,447,283.25** |
| Winter Storms | 50% | $ 710,297,050.50 | $ 312,188,028.00 | $ 18,409,488.00 | **$ 1,040,894,566.50** |
| Drought | 10% | $ 142,059,410.10 | $ 62,437,605.60 | $ 3,681,897.60 | **$ 208,178,913.30** |
| Dam Failure | 75% | $ 1,065,445,575.75 | $ 468,282,042.00 | $ 27,614,232.00 | **$ 1,561,341,849.75** |
| High Wind | 25% | $ 355,148,525.25 | $ 156,094,014.00 | $ 9,204,744.00 | **$ 520,447,283.25** |
| | | | | | ***$ 5,933,099,029.05*** |

| Estimated Damages - Village of Ruidoso | | | | | |
|---|---|---|---|---|---|
| **Hazard** | **% damaged** | **Residential** | **Commercial** | **Utility Value** | **Total Damages** |
| | | | | *Residential Parcels and Structure Value* | *$ 1,420,594,101.00* |
| | | | | *Commercial Parcels and Structure Value* | *$ 624,376,056.00* |
| | | | | *Utility Value* | *$ 36,818,976.00* |

**Figure 5-106-3: Estimated Damages – City of Ruidoso Downs**

| Estimated Damages - City of Ruidoso Downs | | | | | |
|---|---|---|---|---|---|
| **Hazard** | **% Damages** | **Residential** | **Commercial** | **Utility Value** | **Total Damages** |
| Wildfire | 30% | $ 34,101,927.90 | $ 23,456,690.10 | $ 1,617,372.00 | **$ 59,175,990.00** |
| Flood | 20% | $ 22,734,618.60 | $ 15,637,793.40 | $ 1,078,248.00 | **$ 39,450,660.00** |
| Thunderstorms | 30% | $ 34,101,927.90 | $ 23,456,690.10 | $ 1,617,372.00 | **$ 59,175,990.00** |
| Winter Storms | 40% | $45,469,237.20 | $31,275,586.80 | $ 2,156,496.00 | **$ 78,901,320.00** |
| Drought | 20% | $ 22,734,618.60 | $ 15,637,793.40 | $ 1,078,248.00 | **$ 39,450,660.00** |
| Dam Failure | 20% | $ 22,734,618.60 | $ 15,637,793.40 | $ 1,078,248.00 | **$ 39,450,660.00** |
| High Wind | 35% | $39,785,582.55 | $27,366,138.45 | $ 1,886,934.00 | **$ 69,038,655.00** |
| | | | | | ***$ $384,643,935.00*** |
| | | | | *Residential Parcels and Structure Value* | *$ 113,673,093.00* |
| | | | | *Commercial Parcels and Structure Value* | *$ 78,188,967.00* |
| | | | | *Utility Value* | *$ 5,391,240.00* |

**Figure 5-106-4: Estimated Damages – Town of Carrizozo**

| Estimated Damages - Town of Carrizozo | | | | | |
|---|---|---|---|---|---|
| **Hazard** | **% Damages** | **Residential** | **Commercial** | **Utility Value** | **Total Damages** |
| Wildfire | 30% | $ 10,610,915.40 | $ 11,493,198.90 | $ 1,473,137.10 | **$ 23,577,251.40** |
| Flood | 25% | $ 8,842,429.50 | $ 9,577,665.75 | $ 1,227,614.25 | **$ 19,647,709.50** |

| Estimated Damages - Town of Carrizozo | | | | | |
|---|---|---|---|---|---|
| **Hazard** | **% Damages** | **Residential** | **Commercial** | **Utility Value** | **Total Damages** |
| Thunderstorms | 10% | $ 3,536,971.80 | $ 3,831,066.30 | $ 491,045.70 | **$ 7,859,083.80** |
| Winter Storms | 10% | $ 3,536,971.80 | $ 3,831,066.30 | $ 491,045.70 | **$ 7,859,083.80** |
| Drought | 10% | $ 3,536,971.80 | $ 3,831,066.30 | $ 491,045.70 | **$ 7,859,083.80** |
| High Wind | 30% | $ 10,610,915.40 | $ 11,493,198.90 | $ 1,473,137.10 | **$ 23,577,251.40** |
| | | | | | ***$ 90,379,463.70*** |
| | | | | *Residential Parcels and Structure Value* | *$ 35,369,718.00* |
| | | | | *Commercial Parcels and Structure Value* | *$ 38,310,663.00* |
| | | | | *Utility Value* | *$ 4,910,457.00* |

**Figure 5-106-5: Estimated Damages – Village of Capitan**

| Estimated Damages - Village of Capitan | | | | | |
|---|---|---|---|---|---|
| **Hazard** | **% Damages** | **Residential** | **Commercial** | **Utility Value** | **Total Damages** |
| Wildfire | 50% | $ 38,288,125.50 | $ 10,295,800.50 | $ 1,727,028.00 | **$ 50,310,954.00** |
| Flood | 10% | $ 7,657,625.10 | $ 2,059,160.10 | $ 345,405.60 | **$ 10,062,190.80** |
| Thunderstorms | 50% | $ 38,288,125.50 | $ 10,295,800.50 | $ 1,727,028.00 | **$ 50,310,954.00** |
| Winter Storms | 30% | $ 22,972,875.30 | $ 6,177,480.30 | $ 1,036,216.80 | **$ 30,186,572.40** |
| Drought | 20% | $ 15,315,250.20 | $ 4,118,320.20 | $ 690,811.20 | **$ 20,124,381.60** |
| High Wind | 10% | $ 7,657,625.10 | $ 2,059,160.10 | $ 345,405.60 | **$ 10,062,190.80** |
| | | | | | ***$ 171,057,243.60*** |
| | | | | *Residential Parcels and Structure Value* | *$ 76,576,251.00* |
| | | | | *Commercial Parcels and Structure Value* | *$ 20,591,601.00* |
| | | | | *Utility Value* | *$ 3,454,056.00* |

**Figure 5-106-6: Estimated Damages – Village of Corona**

| Estimated Damages - Village of Corona | | | | | |
|---|---|---|---|---|---|
| **Hazard** | **% Damages** | **Residential** | **Commercial** | **Utility Value** | **Total Damages** |
| Wildfire | 40% | $ 2,867,054.80 | $ 6,664,982.40 | $ 1,880,600.40 | **$ 11,412,637.60** |
| Thunderstorms | 30% | $ 2,150,291.10 | $ 4,998,736.80 | $ 1,410,450.30 | **$ 8,559,478.20** |
| Winter Storms | 30% | $ 2,150,291.10 | $ 4,998,736.80 | $ 1,410,450.30 | **$ 8,559,478.20** |
| Drought | 30% | $ 2,150,291.10 | $ 4,998,736.80 | $ 1,410,450.30 | **$ 8,559,478.20** |
| High Wind | 30% | $ 2,150,291.10 | $ 4,998,736.80 | $ 1,410,450.30 | **$ 8,559,478.20** |
| | | | | | ***$ 45,650,550.40*** |
| | | | | *Residential Parcels and Structure Value* | *$ 7,167,637.00* |
| | | | | *Commercial Parcels and Structure Value* | *$ 16,662,456.00* |
| | | | | *Utility Value* | *$ 4,701,501.00* |

### *5.4.4 Social Vulnerability*

For the 2018 HMP, impacts to the population were estimated by intersecting the hazards with the 2010 Census block population for each participating jurisdiction. The four population categories identified in the 2018 HMP were second home, disabled, elderly, and poverty.

As the terminology has changed in past several years, we now refer to social vulnerability as "the potential for loss within an individual or social group, recognizing that some characteristics influence an individual's or group's ability to prepare, respond, cope, or recover from an event. These characteristics can overlap within populations to create heightened vulnerability, which may be compounded by infrastructure deficiencies within communities and historic or existing discriminatory government policies" (FEMA 2023). Understanding the location and number of vulnerable populations is necessary for emergency managers, first responders, community planners, and decision makers to build capacity to mitigate and recover from hazard events. By better understanding vulnerable populations and the challenges they face, communities can identify proactive mitigation actions to lessen the impacts of natural disasters for these community members in particular.

For this HMP Update, the Center for Disease Control and Prevention's (CDC) Social Vulnerability Index Rating (SVI Rating) was identified for each community (ATSDR 2022). The overall SVI rating identifies the relative vulnerability for each census tract in the country. It takes into account 15 different social vulnerability indicators that are grouped into four different categories.

1. Socioeconomic: Below 150% Poverty; Unemployed; Housing Cost Burden; No High School Diploma; No Health Insurance
2. Household Characteristics: Aged 65 and Older; Aged 17 and Younger; Civilian with a Disability; Single-Parent Households; English Language Proficiency
3. Racial & Ethnic Minority Status
4. Housing Type and Transportation; Multi-Unit Structures; Mobile Homes; Crowding; No Vehicle; Group Quarters

Figure 5-107 shows the SVI rating for each tract and Figure 5-108 shows the SVI Rating for each participating jurisdiction. As an example, Lincoln County's SVI ranking signifies that 71.07% of tracts in the nation are less vulnerable than the Lincoln County tracts and that 28.93% tracts in the nation are more vulnerable.

**Figure 5-107: SVI Rating by Tract.**

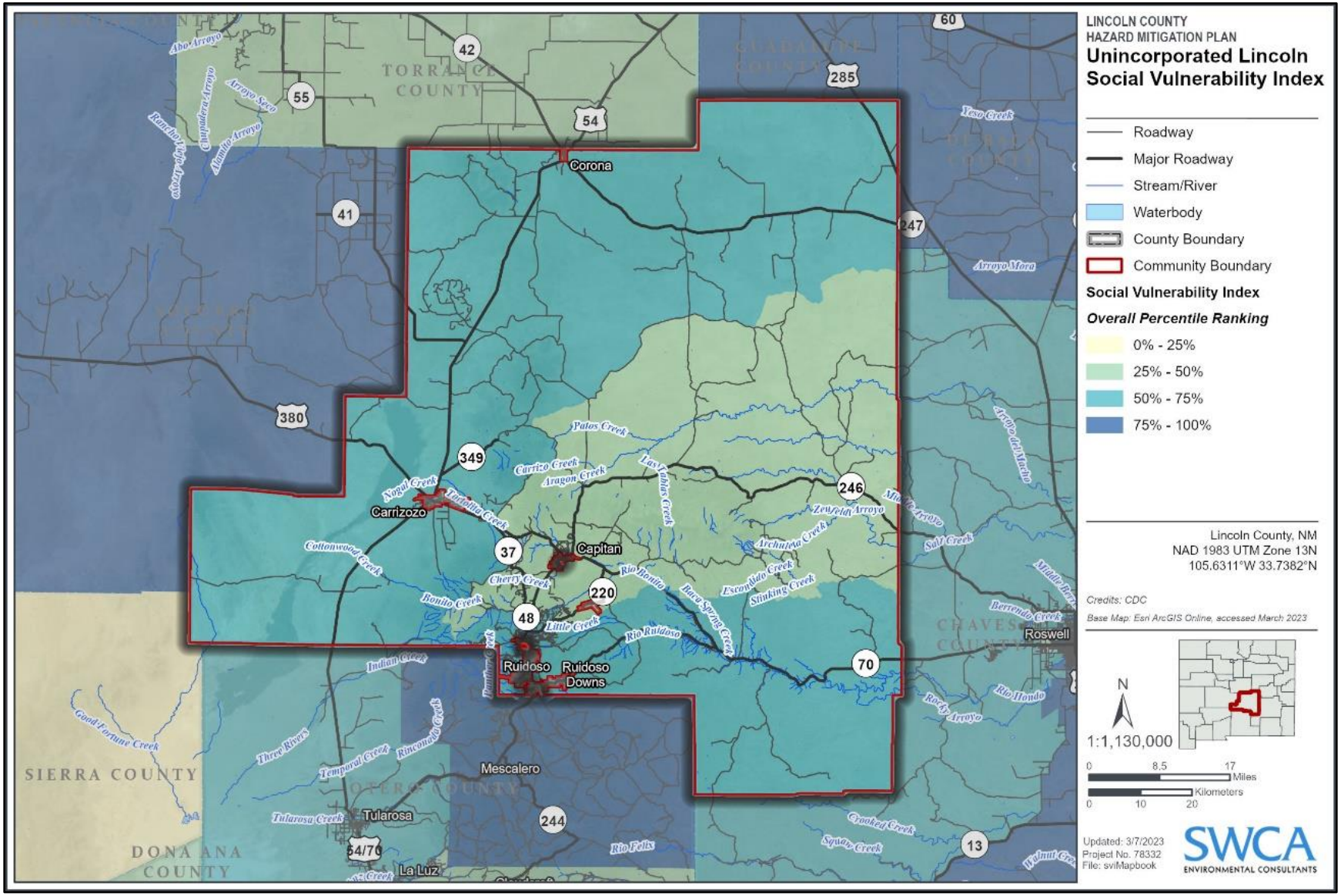


**Figure 5-108: Overall SVI Rating per Participating Jurisdiction**

| **Overall SVI Rating per** Participating **Jurisdiction** | |
|---|---|
| **Jurisdiction** | **SVI Rating** |
| Lincoln County | 71.07% |
| Village of Ruidoso | 62.40%* |
| City of Ruidoso Downs | 60.51% |
| Town of Carrizozo | 77.47%* |
| Village of Capitan | 47.16% |
| Village of Corona | 77.47% |

*Average of two Census Tracts

In addition to identifying the overall SVI Rating for each community, the Planning Team identified six social vulnerability indicators to analyze in more detail. Figure 5-109 shows the total population for each participating jurisdiction plus the percent of the population below poverty, without health insurance, 65 and older, with a disability, households without a smartphone, and households without a broadband subscription. This data is sourced from the U.S. Census Bureau's American Community Survey (2020). Based on the information shown below emergency managers, first responders, community planners, and decision makers may choose to:

- Provide strategic outreach that does not rely on internet in communities with a higher percentage of households without a broadband subscription
- Provide strategic outreach that does not rely on a smartphone for accessing information in communities with a higher percentage of households without smartphones
- Plan for and accommodate older and disabled community members when responding to, recovering from, and mitigating natural disasters. An example would be to include accessible shelters for jurisdictions with a higher percentage of older or disabled community members.
- Plan for and accommodate community members that are below poverty or do not have health insurance when responding to, recovering from, and mitigating natural disasters. An example would be to provide meals and medical services for jurisdictions with a higher percentage of community members that are below poverty or do not have health insurance.

**Figure 5-109: Social Vulnerability Indicators per Participating Jurisdiction**

| **Social Vulnerability Indicators per** Participating **Jurisdiction** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Jurisdiction** | **Total Population** | **% Below Poverty** | **% w/o Health Insurance** | **% 65 and Older** | **% with Disability** | **% Households w/o Smartphones** | **% Households w/o Broadband** |
| Lincoln County | 7,283 | 6.44% | 13.83% | 34.63% | 23.09% | 8.99% | 9.47% |
| Village of Ruidoso | 7,629 | 9.40% | 10.50% | 27.90% | 20.50% | 10.40% | 17.30% |
| Capitan | 1,354 | 9.40% | 3.60% | 25.50% | 26.80% | 27.50% | 18.70% |

| **Social Vulnerability Indicators per** Participating **Jurisdiction** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Jurisdiction** | **Total Population** | **% Below Poverty** | **% w/o Health Insurance** | **% 65 and Older** | **% with Disability** | **% Households w/o Smartphones** | **% Households w/o Broadband** |
| Ruidoso Downs | 2,618 | 32.50% | 15.30% | 22.10% | 17.30% | 16.20% | 33.90% |
| Carrizozo | 904 | 37.90% | 18.40% | 21.50% | 29.20% | 27.70% | 46.80% |
| Corona | 104 | 4.80% | 1.00% | 34.60% | 38.50% | 21.00% | 12.90% |

## 5.5 Priority Risk Index Evaluation

The PRI is used to assess the perceived overall risk for each of the hazards for each participating jurisdiction. The PRI value is obtained by assigning varying degrees of risk to five categories for each hazard, and then calculating an index value based on a weighting approach. The PRI value can be used to compare relative importance of each hazard within one community and across all communities. The 2018 HMP included a PRI Index ranking at the beginning of the Vulnerability Section.

For the HMP Update, the Planning Team made several changes to the approach for the PRI. The definitions for each category were reviewed and several were updated to clarify the intent. The weighting approach for each category was maintained as identified in the 2018 HMP. As changed by the Planning Team, a description of each category is below.

**Probability:** The likelihood of the hazard occurring or reoccurring. It may be defined in historical frequencies, statistical probabilities, hazard probability maps and/or general descriptors (e.g., unlikely, likely, highly likely).

The probability of future occurrences was assessed based on the frequency of past occurrences over the planning period of 6 years, from January 2017 through December 2022 (the collection ended in December 2016 for the 2018 HMP). Below are the definitions for each of four categories (Unlikely, Possible, Likely, and Highly Likely). For example, a hazard that occurred 3 out of the last 6 years would be categorized as “Likely”. This probability analysis was conducted for each hazard for each community.

In addition to the general definitions described, the Planning Team analyzed the annual probability for 2017 to 2022 and over time based on available records for each hazard. The total number of occurrences was divided by the number of years of available data. Annual probability is calculated based on the number of occurrences divided by the number of years of data and presented as a percent anticipated to occur in 1 year. The annual probability percentage for 2017 through 2022 was determined based on how many times the event occurred in the 6 year period.

- By comparing the annual probability from the past 6 years with that of all records over time, the Planning Team can consider potential changes over time, including potential impacts due to climate change. Annual probability for 2017 to 2022 and annual probability over time is shown in the hazard profiles.
- Unlikely means no events were recorded from 2017 through 2022. This results in 0-16.65% annual probability.

- Possible means 1 to 2 events were recorded from 2017 through 2022. This results in between 16.66% and 33.33% annual probability.
- Likely means 3 to 4 events were recorded from 2017 through 2022. This results in between 33.34% and 66.67% annual probability.
- Highly Likely means 5 or more events were recorded from 2017 through 2022. This results in between 66.68% and 100% annual probability.

**Impact:** The consequences or effects of each hazard on the participant's assets identified in the vulnerability assessment.

Future Impact was assessed based on the number of deaths, injuries, property damage, and critical facility impact. For a hazard to be categorized, only one of the criteria at each level must be reached. For example, if a community had one hazard event that causes a shutdown of critical facilities for 1 day or longer, it would be categorized as a "Limited" impact.

**Spatial Extent:** The geographic area of each participating jurisdiction that may be impacted by the hazard. Note this is a different concept than 'extent' as discussed in the hazard profiles with the meaning of magnitude or severity.

**Warning Time:** Amount of time before hazard occurrence that community knows the event is anticipated.

**Duration:** Amount of time the hazard occurs in a specific community.

Application of the PRI is illustrated by the following example below. Community #1 is assessing the hazard of flooding, and has decided that the following assignments best describe the flooding hazard for their community:

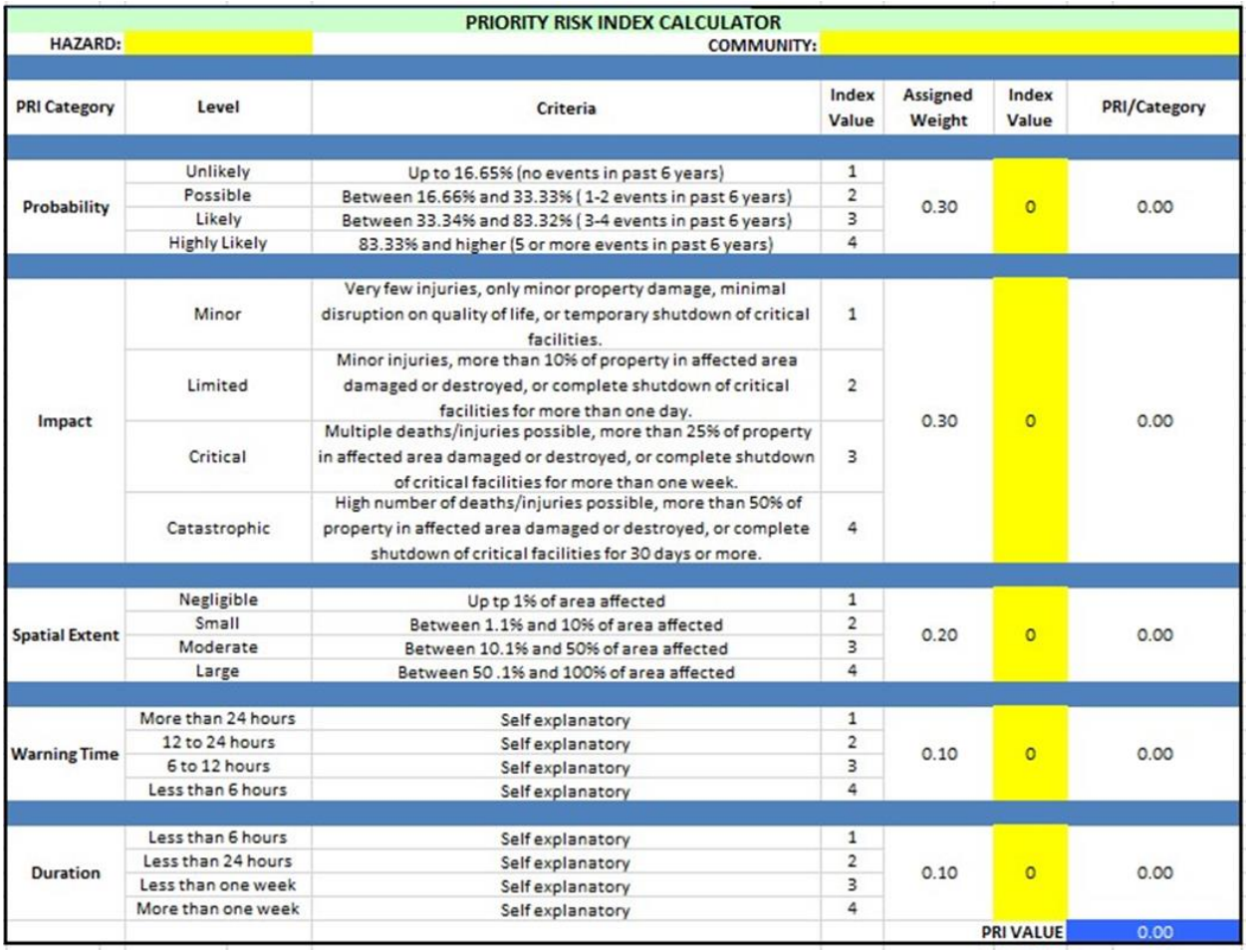
- Probability = Likely (3), Impact = Critical (3), Spatial Extent = small (2), Warning Time = 12-24 hours (2), Duration = Less than 6 hours (1)

  The PRI for the flooding hazard would then be:

  PRI = [(3*0.30) +(3*0.30)+(2*0.20)+ (2*0.10)+(1*0.10)] PRI = 2.5

Figure 5-110 shows the blank PRI Calculator Template. Figures 5-111-1 through 5-111-6 show the category ranking and PRI for each hazard in a table summary for each participating jurisdiction. Figure 5-112 shows the PRI values for all participating jurisdictions and all hazards for ease of comparison.

**Figure 5-110: PRI Calculator Template.**



PRIORITY RISK INDEX CALCULATOR

HAZARD: COMMUNITY:

| PRI Category | Level | Criteria | Index Value | Assigned Weight | Index Value | PRI/Category |
|---|---|---|---|---|---|---|
| Probability | Unlikely | Up to 16.65% (no events in past 6 years) | 1 | 0.30 | 0 | 0.00 |
| | Possible | Between 16.66% and 33.33% ( 1-2 events in past 6 years) | 2 | | | |
| | Likely | Between 33.34% and 83.32% ( 3-4 events in past 6 years) | 3 | | | |
| | Highly Likely | 83.33% and higher (5 or more events in past 6 years) | 4 | | | |
| Impact | Minor | Very few injuries, only minor property damage, minimal disruption on quality of life, or temporary shutdown of critical facilities. | 1 | 0.30 | 0 | 0.00 |
| | Limited | Minor injuries, more than 10% of property in affected area damaged or destroyed, or complete shutdown of critical facilities for more than one day. | 2 | | | |
| | Critical | Multiple deaths/injuries possible, more than 25% of property in affected area damaged or destroyed, or complete shutdown of critical facilities for more than one week. | 3 | | | |
| | Catastrophic | High number of deaths/injuries possible, more than 50% of property in affected area damaged or destroyed, or complete shutdown of critical facilities for 30 days or more. | 4 | | | |
| Spatial Extent | Negligible | Up tp 1% of area affected | 1 | 0.20 | 0 | 0.00 |
| | Small | Between 1.1% and 10% of area affected | 2 | | | |
| | Moderate | Between 10.1% and 50% of area affected | 3 | | | |
| | Large | Between 50 .1% and 100% of area affected | 4 | | | |
| Warning Time | More than 24 hours | Self explanatory | 1 | 0.10 | 0 | 0.00 |
| | 12 to 24 hours | Self explanatory | 2 | | | |
| | 6 to 12 hours | Self explanatory | 3 | | | |
| | Less than 6 hours | Self explanatory | 4 | | | |
| Duration | Less than 6 hours | Self explanatory | 1 | 0.10 | 0 | 0.00 |
| | Less than 24 hours | Self explanatory | 2 | | | |
| | Less than one week | Self explanatory | 3 | | | |
| | More than one week | Self explanatory | 4 | | | |
| | | | | | PRI VALUE | 0.00 |

**Figure 5-111-1: PRI Summary for Lincoln County**

| PRI Summary – Lincoln County | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Priority** | **Hazard** | **Probability** | **Impact** | **Spatial Extent** | **Warning Time** | **Duration** | **PRI** |
| 1 | Wildfire | Highly Likely | Catastrophic | Moderate | < 6 hrs | > Week | 3.8 |
| 2 | Flood | Highly Likely | Critical | Moderate | < 6 hrs | < Week | 3.7 |
| 3 | Thunderstorms | Highly Likely | Catastrophic | Moderate | 6 - 12 hrs | < 24 hrs | 3.3 |
| 4 | Winter Storms | Highly Likely | Critical | Moderate | 6 – 12 hrs | < Week | 3.0 |
| 5 | High Wind | Highly Likely | Limited | Moderate | < 24 hrs | < Week | 2.8 |
| 6 | Drought | Likely | Limited | Large | > 24 hrs | > Week | 2.7 |
| 7 | Dam Failure | Unlikely | Critical | Moderate | 6 – 12 hrs | < Week | 2.5 |

**Figure 5-111-2: PRI Summary for Village of Ruidoso**

| PRI Summary – Village of Ruidoso | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Priority** | **Hazard** | **Probability** | **Impact** | **Spatial Extent** | **Warning Time** | **Duration** | **PRI** |
| 1 | Wildfire | Possible | Catastrophic | Moderate | < 6 hrs | < Week | 3.1 |
| 2 | Flood | Highly Likely | Critical | Small | 6 - 12 hrs | < Week | 3.1 |
| 3 | High Wind | Highly Likely | Critical | Moderate | > 24 hrs | < Week | 3.1 |
| 4 | Dam Failure | Unlikely | Catastrophic | Moderate | < 6 hrs | > Week | 2.9 |
| 5 | Thunderstorms | Likely | Limited | Moderate | > 24 hrs | < Week | 2.5 |
| 6 | Winter Storm | Likely | Limited | Moderate | > 24 hrs | < Week | 2.5 |
| 7 | Drought | Likely | Limited | Small | > 24 hrs | > Week | 2.4 |

**Figure 5-111-3: PRI Summary for City of Ruidoso Downs**

| PRI Summary – City of Ruidoso Downs | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Priority** | **Hazard** | **Probability** | **Impact** | **Spatial Extent** | **Warning Time** | **Duration** | **PRI** |
| 1 | High Wind | Highly Likely | Limited | Moderate | 12 -24 hrs | < Week | 2.9 |
| 2 | Winter Storm | Highly Likely | Limited | Moderate | 12 -24 hrs | < Week | 2.6 |
| 3 | Wildfire | Possible | Limited | Moderate | < 6 hrs | < Week | 2.5 |
| 4 | Drought | Likely | Minor | Large | > 24 hrs | > Week | 2.5 |
| 5 | Dam Failure | Unlikely | Limited | Large | < 6 hrs | > Week | 2.5 |
| 6 | Thunderstorms | Possible | Limited | Moderate | 12 -24 hrs | < Week | 2.3 |
| 7 | Flood | Possible | Limited | Small | 6 - 12 hrs | < Week | 2.2 |

**Figure 5-111-4: PRI Summary for Town of Carrizozo**

| PRI Summary – Town of Carrizozo | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Priority** | **Hazard** | **Probability** | **Impact** | **Spatial Extent** | **Warning Time** | **Duration** | **PRI** |
| 1 | High Wind | Highly Likely | Limited | Moderate | 6 - 12 hrs | < 24 hrs | 2.9 |
| 2 | Thunderstorms | Likely | Limited | Moderate | 12 - 24 hrs | < Week | 2.6 |
| 3 | Winter Storms | Possible | Limited | Moderate | 12 - 24 hrs | < Week | 2.3 |
| 4 | Drought | Likely | Minor | Moderate | > 24 hrs | > Week | 2.3 |
| 5 | Wildfire | Unlikely | Limited | Small | < 6 hrs | < 6 hrs | 1.8 |
| 6 | Flood | Unlikely | Minor | Small | < 6 hrs | < 24 hrs | 1.6 |

**Figure 5-111-5: PRI Summary for Village of Capitan**

| PRI Summary – Village of Capitan | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Priority** | **Hazard** | **Probability** | **Impact** | **Spatial Extent** | **Warning Time** | **Duration** | **PRI** |
| 1 | Wildfire | Highly Likely | Limited | Moderate | < 6 hrs | < 24 hrs | 3.0 |
| 2 | High Wind | Highly Likely | Limited | Large | > 24 hrs | < 24 hrs | 2.9 |
| 3 | Winter Storms | Likely | Limited | Large | > 24 hrs | < Week | 2.7 |
| 4 | Flood | Likely | Limited | Small | < 6 hrs | < 24 hrs | 2.5 |
| 5 | Drought | Likely | Minor | Large | > 24 hrs | > week | 2.5 |
| 6 | Thunderstorms | Likely | Limited | Moderate | > 24 hrs | < 24 hrs | 2.4 |

**Figure 5-111-6: PRI Summary for Village of Corona**

| PRI Summary – Village of Corona | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Priority** | **Hazard** | **Probability** | **Impact** | **Spatial Extent** | **Warning Time** | **Duration** | **PRI** |
| 1 | High Wind | Highly Likely | Limited | Large | 12 - 24 hrs | < 24 hrs | 3.0 |
| 2 | Thunderstorm | Likely | Limited | Moderate | 6 – 12 hrs | < 6 hrs | 2.5 |
| 3 | Wildfire | Unlikely | Limited | Moderate | < 6 hrs | > Week | 2.3 |
| 4 | Winter Storms | Possible | Limited | Moderate | 12 - 24 hrs | < Week | 2.3 |
| 5 | Drought | Likely | Minor | Moderate | > 24 hrs | > Week | 2.3 |

**Figure 5-112: PRI Values for All Participating Jurisdictions and All Hazards**

| Priority Risk Index for All Participating Jurisdictions and All Hazards | | | | | | |
|---|---|---|---|---|---|---|
| **Hazard** | **Lincoln County** | **Village of Ruidoso** | **City of Ruidoso Downs** | **Town of Carrizozo** | **Village of Capitan** | **Village of Corona** |
| Wildfire | 3.8 | 3.7 | 3.1 | 1.8 | 3.0 | 2.3 |
| Flood | 3.7 | 3.1 | 2.7 | 1.6 | 2.5 | not profiled |
| Thunderstorm | 3.5 | 2.5 | 2.3 | 2.6 | 2.4 | 2.5 |
| Winter Storm | 3.3 | 2.5 | 2.6 | 2.3 | 2.7 | 2.3 |
| High Wind | 2.8 | 3.1 | 2.5 | 2.9 | 2.9 | 3.0 |
| Drought | 2.7 | 2.4 | 2.5 | 2.3 | 2.5 | 2.3 |
| Dam Failure | 2.5 | 2.9 | 2.9 | not profiled | not profiled | not profiled |

# SECTION 6: MITIGATION STRATEGY

**§201.6(c)(3):** [The plan must include the following: a] *mitigation strategy* that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools. This section must include:

i. A description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.
ii. A section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure. All plans approved by FEMA after October 1, 2008, must also address the jurisdiction's participation in the NFIP, and continued compliance with NFIP requirements, as appropriate.
iii. An action plan describing how the actions identified in paragraph (c)(3)(ii) of this section will be prioritized, implemented, and administered by the local jurisdiction. Prioritization will include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.
iv. For multi-jurisdictional plans, there must be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.

The mitigation strategy provides the "what, when, and how" of actions that will reduce or eliminate natural hazard impacts. The primary components of the mitigation strategy are generally categorized into the Goals and Objectives, Capability Assessment, Mitigation Actions and Implementation Strategy. The full 2018 HMP strategy was reviewed and updated by the Planning Team. For each section below, the Planning Team evaluated the 2018 approach and made changes for the 2023 HMP. Specifics of the changes and updates are discussed in the subsections below.

## 6.1 Hazard Mitigation Goals and Objectives

The ultimate mission of all hazard mitigation is the protection and preservation of life and property from the effects of the occurrence of natural hazards. Local governments can make progress toward this goal through coordinated planning and financing to achieve the specific objectives set forth in their hazard mitigation plans. The 2018 HMP goals and objectives were reviewed by the Planning Team and were determined to still be appropriate for all the participating jurisdictions. The only change made was to add one missing word from the first 2018 HMP goal (underlined below). The 2023 HMP goals are as follows:

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

Mitigation strategies in this HMP address critical infrastructure, public assets, private property, and impacts to the communities' quality of life. The following mitigation objectives are the general steps the communities will take to accomplish the goals:

- Increasing awareness of hazards and their effects;
- Decreasing the possibility of impact from the most significant threats;
- Decreasing the vulnerability of critical and non-critical facilities;
- Increasing established response mechanisms by enhancing partnerships; and

- Increasing coordination and communication between levels of government regarding incidents and response mechanisms.

## 6.2 Capability Assessment

An important component of the Mitigation Strategy is a review of each participating jurisdiction's resources in order to identify, evaluate, and enhance the capacity of local resources to mitigate the effects of hazards. The capability assessment is comprised of several components:

- ✓ Legal and Regulatory Review – This summarizes the legal and regulatory capabilities, including ordinances, codes, plans, manuals, guidelines, and technical reports that address hazard mitigation activities.
- ✓ Technical Staff and Personnel – This summarizes the administrative and technical capacity of the participating jurisdiction's staff, personnel resources, and in some cases contract services.
- ✓ Fiscal Capability – This summarizes each participating jurisdiction's fiscal capability to provide the financial resources to implement the mitigation strategy.
- ✓ NFIP Program Participation – Although a portion of the NFIP description was included in the flood profile (Section 5), an assessment of each community's participation in the NFIP is included here as a way to measure local capability.

### *6.2.1 Jurisdictional Capabilities*

Figures 6-1-1 through 6-1-6 provide an overview of the legal and regulatory capabilities, the staff and personnel capabilities, and the fiscal capabilities of each participating jurisdiction. The information provided includes a brief listing of current codes, mitigation relevant ordinances, plans, and studies/reports. However, prior to the capability figures for each participating jurisdiction, the Planning Team has included a summary description of key plans, ordinances, and programs relevant to the HMP.

The Lincoln County CWPP (2019) provides a framework to address wildfire risk throughout Lincoln County and specifically identified at risk communities within or near the WUI. The CWPP allows both at-risk communities and the County as a whole to evaluate current conditions and identify opportunities, strategies, and resources for wildfire mitigation. Additionally, the plan proposes important actions and recommendations to prevent wildfire risk including developing defensible space around structures and valuable infrastructure, fuels management efforts, increasing public engagement and outreach efforts, adopting additional rules and regulations in the WUI, prioritizing training for county and municipal fire districts, and collaborating with fire protection authorities throughout the region.

The Village of Ruidoso is a proud Firewise community and is committed to preparing for and preventing wildfires within the community. In 2003, the Village established its own Forestry Department, which has led to the creation and revision of fire safety ordinances and standards including the Village of Ruidoso Fire Ordinance (2021), the Village of Ruidoso Fuels Management Standards (2016), and the Village of Ruidoso Urban-Wildland Interface Code (2007). The Fire Ordinance is part of the Village's municipal code and addresses requirements for fire safety inspections and penalties associated with violations. The Fuels Management Standards specify requirements for minimizing fire risk to properties in the Village. The standards are categorized into zones according to their proximity to structures. Lastly, the Urban-Wildland Interface Code addresses regulations to mitigate fire risks, including the use of 1-hour fire-resistive building materials; enclosing eaves, fascias, and soffits; and performing forest debris removal. Each of these documents work together to increase the Village of Ruidoso's capacity to meet its hazard mitigation goals and objectives.

The Village of Ruidoso Comprehensive Plan (2019) includes a dedicated section on hazard mitigation, highlighting the Village's current conditions, capacity to address hazards, existing plans, policies, and programs, accomplishments, planned improvements, and future goals and objectives. One of the Village's primary goals is to maintain a well-educated community around hazard mitigation. The Village has created numerous community groups, educational programs, and publicly available resources to educate and inform community members on hazard mitigation and response strategies. Additionally, the Village is committed to adopting additional hazard mitigation rules and regulations, enforcing fuels management standards on private property, and collaborating with surrounding jurisdictions on hazard mitigation and response efforts.

The City of Ruidoso Downs Comprehensive Plan (2021) includes a hazard mitigation element that describes the approaches and strategies adopted by the City to reduce both short-term and long-term risk from various hazards. The plan addresses coordination with the Lincoln County Office of Emergency Management, existing hazard mitigation plans, descriptions of specific hazards with the potential to impact Ruidoso Downs, and outlines hazard mitigation best practices recommended by FEMA and the American Planning Association. Of the numerous goals, objectives, and strategies outlined in the plan, Ruidoso Downs has prioritized improving the community's ability to prepare for, respond to, and recover from hazards, reducing the risk of wildfire, and minimizing the City's vulnerability to flooding and dam failure.

The Town of Carrizozo Comprehensive Plan (2021) includes a dedicated section on hazard mitigation, summarizing the Town's existing fire protection, emergency services, and mitigation efforts. This section also integrates existing plans and policies, recommendations to improve mitigation strategies and emergency response, and the Town's planned goals, policies, and actions for the coming years. Specifically, the Town of Carrizozo included a specific goal to ensure residents are well-educated in hazard mitigation measures. The Town identified the benefits of building a stronger working relationship with Lincoln County related to hazard mitigation planning and implementation efforts. The Town of Carrizozo also hopes to enhance partnerships with federal and state entities in order to support the Town's goals to improve fire and law enforcement services, emphasize education to inform residents of potential hazards and best practices for mitigation, and increase overall fire safety in the community.

Figures 6-1-1-1 through 6-1-6-3 summarize 1) the legal and regulatory capabilities, 2) the staff and personnel employed by each participating jurisdiction that serve as a resource for hazard mitigation, plus 3) the fiscal capability and budgetary tools available to each participating jurisdiction. Each of these three figures are listed below by jurisdiction. The asterisk* highlights the jurisdiction's explanation on how these capabilities can be expanded.

**Figure 6-1-1-1: Legal and Regulatory Capabilities for Lincoln County**

| Regulatory Tools for Hazard Mitigation | Description | Responsible Department/Agency |
|---|---|---|
| CODES | • International Building Code | • NM State Construction Industries Division |
| ORDINANCES | • Subdivision/Zoning Ordinance<br>• Open Burning Ordinance 2011<br>• Flood Damage Prevention Ordinance 2014 | • Planning Department<br>• Office of Emergency Services (OES)<br>• County Floodplain Manager |

| Regulatory Tools for Hazard Mitigation | Description | Responsible Department/Agency |
|---|---|---|
| PLANS, MANUALS, and/or GUIDELINES | • Comprehensive Plan 2007<br>• ICIP 2024-2028<br>• Local Emergency Operations Plan 2014<br>• County CWPP 2019 | • Planning Department<br>• Lincoln County Manager<br>• Lincoln County Emergency Services Director<br>• Lincoln County Emergency Services Director |

*Legal and regulatory capabilities for Lincoln County can be expanded by adding a code enforcement officer, and development of a Communication Plan.

**Figure 6-1-1-2: Staff and Personnel Capabilities for Lincoln County**

| Staff/Personnel Resources | ☑ | Department/Agency - Position |
|---|---|---|
| Planner(s) or engineer(s) with knowledge of land development and land management practices | | Contract personnel |
| Engineer(s) or professional(s) trained in construction practices related to buildings and/or infrastructure | | Contract personnel |
| Planner(s) or engineer(s) with an understanding of natural and/or human- caused hazards | | Contract personnel |
| Floodplain Manager | ☑ | Lincoln County Planning Department |
| Surveyors | | Contract personnel |
| Staff with education or expertise to assess the community's vulnerability to hazards | ☑ | Lincoln County Emergency Services Director<br>Fire Chief<br>EMS |
| Personnel skilled in GIS and/or HAZUS | | Contract personnel |
| Scientists familiar with the hazards of the community | | Contract personnel |
| Emergency Manager | ☑ | Lincoln County Emergency Services Director |
| Grant writer(s) | | Contract personnel |
| Others | | |

*Technical staff and personnel capabilities can be expanded by hiring a county engineer.

**Figure 6-1-1-3: Fiscal Capabilities for Lincoln County**

| Financial Resources | Accessible or Eligible to Use (Yes, No, Don't Know) | Comments |
|---|---|---|
| Community Development Block Grants | Yes | Every few years, the County receives CDBG funds. To date no mitigation projects have been implemented. |
| CIP funding | Yes | Fire Department station improvements and apparatus. To date no mitigation projects have been implemented. |
| Authority to levy taxes for specific purposes | Yes | Used to build the new hospital. To date no mitigation projects have been implemented. |
| Fees for water, sewer, gas, or electric service | No | |
| Impact fees for homebuyers or new developments/homes | No | |
| Incur debt through general obligation bonds | Yes | |
| Incur debt through special tax bonds | Yes | |
| Other<br>USDA/NRCS Rural Development | Yes | Funds were used in 2021 to modify drainage after a flood in the Hondo Valley.<br>NRCS directly funded acequias in 2021 to rebuild a low-water crossing and improve drainage. |

*Fiscal capabilities can be expanded by bond issues and State and Federal grants.

**Figure 6-1-2-1: Legal and Regulatory Capabilities for Village of Ruidoso**

| Regulatory Tools for Hazard Mitigation | Description | Responsible Department/Agency |
|---|---|---|
| CODES | • International Building Code | • Planning Department |
| ORDINANCES | • Floodplain Management Ordinance<br>• Subdivision/Zoning Ordinance<br>• Village Fire Ordinance<br>• Village Fuels Management Standards<br>• Village Urban Wildland Interface Code | • Village Floodplain Manager<br>• Planning Department<br>• Forestry Director<br>• Forestry Director<br>• Forestry Director |

| Regulatory Tools for Hazard Mitigation | Description | Responsible Department/Agency |
|---|---|---|
| PLANS, MANUALS, and/or GUIDELINES | • Comprehensive Plan 2019<br>• ICIP 2024-2028<br>• Village Emergency Operations Plan 2018<br>• County CWPP 2019<br>• Grindstone Canyon Dam Emergency Action Plan 2016<br>• Alto Lake Dam Emergency Action Plan 2017 | • Planning Department<br>• City Manager<br>• Emergency Manager<br>• Forestry Director<br>• Water and Sewer Department<br>• Water and Sewer Department |

* Legal and regulatory capabilities for the Village of Ruidoso can be expanded by developing a Communication Plan.

**Figure 6-1-2-2: Staff and Personnel Capabilities for Village of Ruidoso**

| Staff/Personnel Resources | ☑ | Department/Agency - Position |
|---|---|---|
| Planner(s) or engineer(s) with knowledge of land development and land management practices | ☑ | Planning Department |
| Engineer(s) or professional(s) trained in construction practices related to buildings and/or infrastructure | | Contract personnel |
| Planner(s) or engineer(s) with an understanding of natural and/or human- caused hazards | | Contract personnel |
| Floodplain Manager | ☑ | Village Floodplain Manager |
| Surveyors | | Contract personnel |
| Staff with education or expertise to assess the community's vulnerability to hazards | ☑ | EMS<br>Fire Chief<br>Police Chief<br>Forestry Director |
| Personnel skilled in GIS and/or HAZUS | | Forestry Director and Forestry Staff<br>Water Resources Manager<br>Planning Department GIS Coordinator<br>Contract personnel |
| Scientists familiar with the hazards of the community | | Forestry Director<br>Fire Chief<br>Police Chief<br>Utilities Director<br>Contract personnel |
| Emergency Manager | ☑ | Fire Chief |
| Grant writer(s) | ☑ | Forestry Director<br>Contract personnel |
| Others | | |

* Technical staff and personnel capabilities for the Village of Ruidoso can be expanded by hiring a village engineer.

**Figure 6-1-2-3: Fiscal Capabilities for Village of Ruidoso**

| Financial Resources | Accessible or Eligible to Use (Yes, No, Don't Know) | Comments |
|---|---|---|
| Community Development Block Grants | Yes | |
| CIP funding | Yes | |
| Authority to levy taxes for specific purposes | Yes | |
| Fees for water, sewer, gas, or electric service | Yes | |
| Impact fees for homebuyers or new developments/homes | Yes | |
| Incur debt through general obligation bonds | Yes | |
| Incur debt through special tax bonds | Yes | |
| Other | Yes | |

* Fiscal capabilities for the Village of Ruidoso can be expanded by obtaining State and Federal grants, and low interest loans.

**Figure 6-1-3-1: Legal and Regulatory Capabilities for City of Ruidoso Downs**

| Regulatory Tools for Hazard Mitigation | Description | Responsible Department/Agency |
|---|---|---|
| CODES | • International Building Code | • NM State Construction Industries Division |
| ORDINANCES | • Floodplain Management Ordinance<br>• Forest Management Ordinance (tree removal and thinning requirements)<br>• Subdivision/Zoning Ordinance | • City Floodplain Manager<br>• Fire Chief, Planning and Zoning Department<br>• Planning and Zoning Department |
| PLANS, MANUALS, and/or GUIDELINES | • Comprehensive Plan 2021<br>• ICIP 2024-2028<br>• County CWPP 2019<br>• County Emergency Operations Plan | • Mayor<br>• Mayor<br>• Fire Chief<br>• City Emergency Manager (currently Fire Chief) |

* Legal and regulatory capabilities for the City of Ruidoso Downs can be expanded by developing a Communication Plan.

**Figure 6-1-3-2: Staff and Personnel Capabilities for City of Ruidoso Downs**

| Staff/Personnel Resources | ☑ | Department/Agency - Position |
|---|---|---|
| Planner(s) or engineer(s) with knowledge of land development and land management practices | ☑ | Planning Services Director |

| Staff/Personnel Resources | ☑ | Department/Agency - Position |
|---|---|---|
| Engineer(s) or professional(s) trained in construction practices related to buildings and/or infrastructure | | Contract personnel |
| Planner(s) or engineer(s) with an understanding of natural and/or human- caused hazards | | Contract personnel |
| Floodplain Manager | ☑ | City Floodplain Manager |
| Surveyors | | Contract personnel |
| Staff with education or expertise to assess the community's vulnerability to hazards | ☑ | Fire Chief EMS |
| Personnel skilled in GIS and/or HAZUS | | Contract personnel |
| Scientists familiar with the hazards of the community | | Contract personnel |
| Emergency Manager | ☑ | Fire Chief |
| Grant writer(s) | | Contract personnel |
| Others | | |

* Technical staff and personnel capabilities for the City of Ruidoso Downs can be expanded by hiring a Building Code Enforcement Officer and city engineer.

**Figure 6-1-3-3: Fiscal Capabilities for City of Ruidoso Downs**

| Financial Resources | Accessible or Eligible to Use (Yes, No, Don't Know) | Comments |
|---|---|---|
| Community Development Block Grants | Yes | 2018 grant used for roads and drainage improvements. |
| CIP funding | Yes | |
| Authority to levy taxes for specific purposes | Yes | |
| Fees for water, sewer, gas, or electric service | Yes | |
| Impact fees for homebuyers or new developments/homes | No | |
| Incur debt through general obligation bonds | Yes | |
| Incur debt through special tax bonds | Yes | |
| Other | Yes | |

* Fiscal capabilities for the City of Ruidoso Downs can be expanded by State and Federal Grants, and low interest loans.

**Figure 6-1-4-1: Legal and Regulatory Capabilities for Town of Carrizozo**

| Regulatory Tools for Hazard Mitigation | Description | Responsible Department/Agency |
|---|---|---|
| CODES | • International Building Code<br>• Fire Prevention Code | • NM State Construction Industries Division<br>• Mayor sends notification letter and Police Department follow-up with citation if necessary |
| ORDINANCES | • Floodplain Management Ordinance | • Lincoln County Floodplain Manager |
| PLANS, MANUALS, and/or GUIDELINES | • Comprehensive Plan 2021<br>• ICIP<br>• Water Contingency Plan<br>• County CWPP 2019 | • Mayor<br>• Mayor<br>• Public Works Superintendent<br>• County Emergency Manager |

* Legal and regulatory capabilities for the Town of Carrizozo can be expanded by developing a Communication Plan.

**Figure 6-1-4-2: Staff and Personnel Capabilities for Town of Carrizozo**

| Staff/Personnel Resources | ☑ | Department/Agency - Position |
|---|---|---|
| Planner(s) or engineer(s) with knowledge of land development and land management practices | | Contract personnel |
| Engineer(s) or professional(s) trained in construction practices related to buildings and/or infrastructure | | Contract personnel |
| Planner(s) or engineer(s) with an understanding of natural and/or human- caused hazards | | Contract personnel |
| Floodplain Manager | ☑ | Managed by Lincoln County Floodplain Manager |
| Surveyors | | Contract personnel |
| Staff with education or expertise to assess the community's vulnerability to hazards | ☑ | Town Hall Department (Mayor, Clerk, support staff) |
| Personnel skilled in GIS and/or HAZUS | | Contract personnel |
| Scientists familiar with the hazards of the community | | Contract personnel |
| Emergency Manager | ☑ | Lincoln County Emergency Manager |
| Grant writer(s) | | Contract personnel |
| Others | | |

* Technical staff and personnel capabilities for the Town of Carrizozo can be expanded by hiring a Town engineer and Building Code Enforcement Officer.

**Figure 6-1-4-3: Fiscal Capabilities for Town of Carrizozo**

| Financial Resources | Accessible or Eligible to Use (Yes, No, Don't Know) | Comments |
|---|---|---|
| Community Development Block Grants | Yes | |
| CIP funding | Yes | |
| Authority to levy taxes for specific purposes | No | |
| Fees for water, sewer, gas, or electric service | No | |
| Impact fees for homebuyers or new developments/homes | No | |
| Incur debt through general obligation bonds | No | |
| Incur debt through special tax bonds | Yes | |
| Other | | |
| NMDOT funded road improvements with flood mitigation component | | 9th Street Project and Central Avenue Project (US54) |

* Fiscal capabilities for the Town of Carrizozo can be expanded by State and Federal grants, and low interest loans.

**Figure 6-1-5-1: Legal and Regulatory Capabilities for Village of Capitan**

| Regulatory Tools for Hazard Mitigation | Description | Responsible Department/Agency |
|---|---|---|
| CODES | • International Building Code | • NM State Construction Industries Division |
| ORDINANCES | • Floodplain Management Ordinance | • Lincoln County Floodplain Manager |
| PLANS, MANUALS, and/or GUIDELINES | • Village Comprehensive Plan 2013<br>• County CWPP 2019<br>• Drinking Water Bureau Emergency Response Plan 2015 | • Mayor<br>• Fire Chief<br>• Water System Manager |

* Legal and regulatory capabilities for the Village of Capitan can be expanded by developing a Communication Plan.

**Figure 6-1-5-2: Staff and Personnel Capabilities for Village of Capitan**

| Staff/Personnel Resources | ☑ | Department/Agency - Position |
|---|---|---|
| Planner(s) or engineer(s) with knowledge of land development and land management practices | | Contract personnel |
| Engineer(s) or professional(s) trained in construction practices related to buildings and/or infrastructure | | Contract personnel |

| Staff/Personnel Resources | ☑ | Department/Agency - Position |
|---|---|---|
| Planner(s) or engineer(s) with an understanding of natural and/or human- caused hazards | | Contract personnel |
| Floodplain Manager | ☑ | Managed by Lincoln County Floodplain Manager |
| Surveyors | | Contract personnel |
| Staff with education or expertise to assess the community's vulnerability to hazards | ☑ | Fire Chief |
| Personnel skilled in GIS and/or HAZUS | | Contract personnel |
| Scientists familiar with the hazards of the community | | Contract personnel |
| Emergency manager | ☑ | Fire Chief |
| Grant writer(s) | | Contract personnel |
| Others | | |

* Technical staff and personnel capabilities for the Village of Capitan can be expanded by hiring a Building Code Enforcement Officer and a village engineer.

**Figure 6-1-5-3: Fiscal Capabilities for Village of Capitan**

| Financial Resources | Accessible or Eligible to Use (Yes, No, Don't Know) | Comments |
|---|---|---|
| Community Development Block Grants | Yes | |
| CIP funding | Yes | |
| Authority to levy taxes for specific purposes | Yes | |
| Fees for water, sewer, gas, or electric service | Yes | |
| Impact fees for homebuyers or new developments/homes | Don't know | |
| Incur debt through general obligation bonds | Yes | |
| Incur debt through special tax bonds | Yes | |
| Other | Yes | |

* Fiscal capabilities for the Village of Capitan can be expanded by State and Federal grants, and low interest loans.

**Figure 6-1-6-1: Legal and Regulatory Capabilities for Village of Corona**

| Regulatory Tools for Hazard Mitigation | Description | Responsible Department/Agency |
|---|---|---|
| CODES | • International Building Code | • NM State Construction Industries Division |

| Regulatory Tools for Hazard Mitigation | Description | Responsible Department/Agency |
|---|---|---|
| ORDINANCES | | |
| PLANS, MANUALS, and/or GUIDELINES | • Village Comprehensive Plan 2013<br>• County CWPP 2019<br>• Village Fire Plan 2004 | • Mayor<br>• Fire Chief<br>• Fire Chief |

* Legal and regulatory capabilities for the Village of Corona can be expanded by developing a Communication Plan and updating the Comprehensive Plan.

**Figure 6-1-6-2: Staff and Personnel Capabilities for Village of Corona**

| Staff/Personnel Resources | ☑ | Department/Agency - Position |
|---|---|---|
| Planner(s) or engineer(s) with knowledge of land development and land management practices | | Contract personnel |
| Engineer(s) or professional(s) trained in construction practices related to buildings and/or infrastructure | | Contract personnel |
| Planner(s) or engineer(s) with an understanding of natural and/or human- caused hazards | | Contract personnel |
| Floodplain Manager | | |
| Surveyors | | Contract personnel |
| Staff with education or expertise to assess the community's vulnerability to hazards | ☑ | Fire Chief |
| Personnel skilled in GIS and/or HAZUS | | Contract personnel |
| Scientists familiar with the hazards of the community | | Contract personnel |
| Emergency Manager | ☑ | Fire Chief |
| Grant writer(s) | | Contract personnel |
| Others | | |

* Technical staff and personnel capabilities for the Village of Corona can be expanded by hiring a Building Code Enforcement Officer, and village engineer.

**Figure 6-1-6-3: Fiscal Capabilities for Village of Corona**

| Financial Resources | Accessible or Eligible to Use (Yes, No, Don't Know) | Comments |
|---|---|---|
| Community Development Block Grants | Yes | |
| CIP funding | Yes | |

| Financial Resources | Accessible or Eligible to Use (Yes, No, Don't Know) | Comments |
|---|---|---|
| Authority to levy taxes for specific purposes | Yes | |
| Fees for water, sewer, gas, or electric service | No | |
| Impact fees for homebuyers or new developments/homes | No | |
| Incur debt through general obligation bonds | Yes | |
| Incur debt through special tax bonds | Yes | |
| Other | Yes | |

* Fiscal capabilities for the Village of Corona can be expanded by State and Federal grants, and low interest loans.

### *6.2.2 National Flood Insurance Program Participation*

More detailed information about the NFIP and each community's participation is found in the flood hazard profile at the end of Section 5.3.2.6. The narrative below includes a general summary and responses to the 2023 NFIP assessment.

Participation in the NFIP is a key element of any community's local floodplain management and flood mitigation strategy. Lincoln County and all incorporated jurisdictions participate in the NFIP at varying levels, except for the Village of Corona. Joining the NFIP requires the adoption of a floodplain management ordinance that requires jurisdictions to follow established minimum standards set forth by FEMA and the State of New Mexico when developing in the floodplain. These standards require that all new buildings and substantial improvements to existing buildings will be protected from damage by the 1% chance flood event ("100-year flood), and that new floodplain development will not aggravate existing flood problems or increase damage to other properties.

All five NFIP participating communities have adopted standards that are more stringent than the federal minimum to do more to protect life and property. For the County, Carrizozo, and Capitan, site plans are required to be certified and footing plans are required to be prepared by a Professional Engineer. For the Village of Ruidoso, an Elevation Certificate is required by ordinance for construction of additions, new development, or substantial improvements. In addition, any construction below the BFE requires engineering. Survey and site plans are to be stamped by a design professional. For any development in the floodplain in Ruidoso Downs, site plans are required to be certified and footing plans are required to be prepared by a Professional Engineer. In addition, an Elevation Certificate from a surveyor must be obtained prior to submitting the plans for the design of a new residence in the Special Flood Hazard Area.

Each of the participating jurisdictions performed an overall assessment of their participation in the NFIP program by responding to the following questions:

**Question 1:** Describe your jurisdiction's current floodplain management / regulation process for construction of new or substantially improved development within your jurisdiction.

**Question 2:** Describe the status and/or validity of the current floodplain hazard mapping for your jurisdiction.

**Question 3:** Describe any community assistance activities (e.g., help with obtaining Elevation Certificates, flood hazard identification assistance, flood insurance acquisition guidance, public involvement activities, etc.).

**Question 4:** Describe identified needs in your floodplain management program. This could include things like updating the floodplain management code/regulation, establishing written review procedures, modifying or adding flood hazard area mapping, etc.

Responses were provided by all jurisdictions regardless of their participation status in the NFIP program. Figure 6-2 below summarizes the responses provided by each of the currently participating jurisdictions.

**Figure 6-2: NFIP Program Assessment for Lincoln County and Participating Jurisdictions**

| Jurisdiction | | Responses to Questions 1-4 |
|---|---|---|
| Lincoln County, Town of Carrizozo, Village of Capitan | Q1 | Any development is regulated by an ordinance approved by the elected officials. Permit forms, certified site plans and engineered footing plans are required to be approved for any development in the floodplain. The floodplain is administered to by a CFM. |
| | Q2 | FIRM's for floodplain do not have enough detailed information, and require the property owner to hire a Surveyor/Engineer to give the correct BFE and delineate the floodplain in all zones. |
| | Q3 | Community assistance includes issuance of flood information letters, information on flood insurance along with hazard identification services. |
| | Q4 | Needs are to include complete FIRMs for all locations |
| Village of Ruidoso | Q1 | All permits are checked for flood zone. All properties in an AE or A (Village's only flood hazard zones), are then required to fill out a Floodplain Application to determine the extent of construction. An Elevation Certificate is required for construction of additions, new development, or substantial improvement. In addition, the project must meet FEMA requirements for compliance for new work and the existing development, as may be required. In 2022, the Village passed a revision to the floodplain ordinance allowing for the Floodplain Administrator to use additional resources for determining the Base Flood Elevation or for other required floodplain determination elements (Estimated BFE Viewer and inFRM tools). |
| | Q2 | FEMA floodplain maps last updated November 5, 2014. See Ruidoso Municipal code. |
| | Q3 | The Village provides a FIRMette upon request for properties to show property is in or out of a flood hazard zones |
| | Q4 | Clear and accurate flood map for flood zones. FEMA maps are not accurate for most projects. Several locations have been noted where the BFE is off by several feet. In some areas the stream bed has changed in height from severe rainstorms and other factors. |

| Jurisdiction | | Responses to Questions 1-4 |
|---|---|---|
| City of Ruidoso Downs | Q1 | The City of Ruidoso Downs follows a pre-development review process that determines if a proposed development will be impacted by the FEMA mapped floodplain. The City follows chapter 154 (Flood Hazard Regulations) of the land use ordinance to mitigate potential flood hazards in all areas of development. All building and manufactured home placements are regulated and signed off by the Floodplain Administrator prior to the work being started. An Elevation Certificate from a surveyor must be obtained prior to submitting the plans for the design of a new residence in the Special Flood Hazard Area. In addition, site plans are required to be certified and footing plans are required to be prepared by a Professional Engineer. |
| | Q2 | The City of Ruidoso Downs adopted the recently revised and approved FEMA flood maps that were effective on November 5, 2014. |
| | Q3 | The City of Ruidoso Downs through the Planning Department provides assistance and information to property owners on permit requirements and general insurance information. Handouts, pamphlets, an informational bulletin board, and City web site with flood zones are all options for citizens to access floodplain information. A FIRMette is provided upon request. |
| | Q4 | The City of Ruidoso Downs will probably look at increasing our freeboard requirement to 1 foot above base flood elevation as an added safety measure in our development requirements. |

## 6.3 Mitigation Actions and Implementation Strategy

Mitigation actions are identified by each participating jurisdiction for each hazard type. The process used to identify the 2023 actions was accomplished in three steps. First, an assessment of the 2018 HMP projects was performed. Second, a new list of actions for the 2023 HMP Plan was developed by combining the carry forward results from the 2018 action assessment and adding new actions. Third, an implementation strategy for each action was included in the chart descriptors. Details of each step and the results of the process are summarized in the following subsections.

### *6.3.1 2018 Mitigation Actions Assessment*

The Planning Team reviewed and assessed the actions listed in the 2018 HMP. The assessment included evaluating and classifying each of the previously identified actions regarding status and disposition. Status was identified as either no action, in progress, or complete. If an action was identified as in-progress, accomplishments and new steps were included in the action description. Disposition was identified as keep, revise, or delete. This approach and the definitions are consistent with the 2018 HMP approach used for the 2012 HMP planning cycle action assessment. A listing of deleted actions is shown in Figure 6-3. The status and disposition for all actions that were kept or revised for the 2023 HMP are shown in the far right column of Figures 6-5-1 through 6-5-6.

**Figure 6-3: Deleted 2018 Actions for All Participating Jurisdictions**

| Community | Action Description | Hazard Mitigated | Reason for deletion |
|---|---|---|---|
| Lincoln County | Conduct public outreach to raise awareness of threats and how to mitigate from thunderstorms including how citizens can prepare for the impact of these events. | Thunderstorms | Combined with multi-hazard action in 2023 HMP |
| Lincoln County | Conduct public outreach awareness on the impacts of Dam Failure and how to mitigate private property and move personal property out of the way of the oncoming flood waters due to dam failure. | Dam Failure | Combined with multi-hazard action in 2023 HMP |
| Village of Ruidoso | Increase city's water storage capacity by adding a new water storage tank. | Drought | New water storage tank added in 2022. Action completed. |
| Village of Ruidoso | Conduct public outreach to raise awareness of threats from drought and how citizens can mitigate the impact of drought. This action can include a series of public meetings with local and visiting subject matter experts to educate the public on drought and its impacts on water availability, fire danger, flora and fauna impacts, wildlife impacts and how citizens can cope with these impacts. | Drought | Combined with multi-hazard action in 2023 HMP |

| Community | Action Description | Hazard Mitigated | Reason for deletion |
|---|---|---|---|
| Village of Ruidoso | Conduct public outreach awareness on the impacts of Dam Failure and how to mitigate private property against dam failure and move personal property out of the way of the oncoming floodwaters due to dam failure. | Dam Failure | Combined with multi-hazard action in 2023 HMP |
| Town of Carrizozo | Repair and/or replace existing defective hydrants and install new hydrants within town limits. Mark hydrants and erect bollards around hydrants located in high-traffic areas. Add hydrant icons on town maps and website so residents know locations and contact information for reporting leaks. | Wildfire | Considered a 'response' action and therefore not included |

### *6.3.2 2023 Mitigation Actions and Implementation Strategy*

After reviewing the 2018 actions and determining disposition, the Planning Team also included new actions. Each community developed new actions using the goals, objectives, updated hazard profiles, results of the vulnerability analysis, and updated capability assessment. In some cases new actions were included for hazards that were not profiled in the 2018 HMP. In other cases, a community identified new actions based on the updated risk assessment, updated capability assessment, or increased knowledge about available resources to support mitigation. The Planning Team agreed to modify the column headers for the action charts to include the following topics,

- **Action Identifier**: This numbering system will allow for quick reference to the specific action. As agreed by the Planning Team, actions are listed in order of the County's PRI score. If two actions are to be mitigated, the action is listed in order of the first PRI named. If more than two actions are to be mitigated, the actions are listed after Dam Failure (the seventh ranked hazard for the County according to the PRI scores). After the order of the hazards, the actions are listed based on the highest priority.
- **Priority Ranking**: This high-medium-low approach to prioritization is described in Section 6.3.3.
- **Action Description**: This provides a short overview of the action intent and includes example locations in some instances.
- **Hazards Mitigated**: This lists the hazards to be mitigated by the specific action.
- **Cost Effectiveness**: This describes a favorable benefit versus cost evaluation, including monetary and non-monetary benefits. Examples of non-monetary benefits are improvement of quality of life or the natural ecosystem.
    - Low Cost Effectiveness means that the benefits may not equal costs or that more research is needed.
    - Medium Cost Effectiveness means that the benefits are estimated to equal the costs.
    - High Cost Effectiveness means that the benefits are estimated to exceed the costs.
- **Duration:** This refers to the anticipated timeline for implementation. Short duration means that the project will be implemented in years 1 or 2 of the plan approval cycle. Medium duration means that

the project will be implemented in years 3 or 4 of the plan approval cycle. Long duration means that the project will be implemented in year 5 of the plan approval cycle. If a project will be implemented in several different years, duration is identified as in-progress. For in-progress duration actions a description of what steps are anticipated throughout the 5-year plan approval cycle is included in the project description.

- **Likely Responsible Entities or Parties:** This includes the organization, agency, or entity that is anticipated to serve in a leadership role to get the project planned, funded, and implemented.
- **Potential Funding Sources:** This lists the potential funding sources to implement the project. Acronyms used in the chart are defined below.
  - CWDG is the U.S. Forest Service Community Wildfire Defense Grant
  - BRIC is FEMA's Building Resilient Infrastructure and Communities grant
  - EWP is the Natural Resource Conservation Service (NRCS) Emergency Watershed Protection grant. NRCS is within the USDA
  - HMPG is FEMA's Hazards Mitigation Grant Program
  - HMGP-PF is FEMA's Hazards Mitigation Grant Program -Post Fire
  - PNM is Power New Mexico
  - PER is Preliminary Engineering Report
- **2018 Status:** As described in the 2018 Mitigation Actions Assessment (Section 6.3.1), status and disposition are used to describe each action included in the 2018 HMP. Status was identified as either no action, in progress, or complete. Disposition was identified as keep, revise, or delete.

The implementation strategy is shown in the following columns of the action chart: priority ranking, cost effectiveness, duration, likely responsible entity or party, and potential funding sources.

### *6.3.3 Prioritization Process*

For the 2018 HMP, each action was assigned a priority ranking of high, medium, or low based on the following considerations:

- A favorable benefit versus cost evaluation, wherein the perceived direct and indirect benefits outweighed the project cost.
- A direct beneficial impact on the ability to protect life and/or property from natural hazards.
- A mitigation solution with a long-term effectiveness.

For the 2023 HMP, the Planning Team agreed to use a modified version of the Social, Technical, Administrative, Political, Legal, Economic, and Environmental approach (STAPLE+E). For the 2012 HMP, this approach was utilized with detailed scoring for each STAPLE+E category. For the 2023 HMP, the Planning Team started with the 2012 descriptions used for each STAPLE+E category and modified the narrative to meet their current intention. Figure 6-4 summarizes the STAPLE+E categories as defined on the instruction sheet provided to the Planning Team. Each action was assigned a priority ranking of high, medium, or low based on the following definitions. Each community determined the appropriate ranking for their actions based on consideration of all STAPLE+E categories.

- A low priority action is one that meets a few of the STAPLE+E Characteristics (1 to 2).
- A medium priority action is one that meets some of the STAPLE+E Characteristics (3 to 4)
- A high priority action is one that meets most of the STAPLE+E Characteristics (5 or more)

**Figure 6-4: STAPLE+E Category Definitions**

| Category | Description | Evaluation Criteria |
|---|---|---|
| Social | Public support of the overall implementation strategy and specific mitigation action, including addressing vulnerable populations. | • Action is compatible with present and future community values<br>• Positive impact* on cultural values or resources<br>• Positive impact* on a specific segment of the population, including vulnerable populations<br>• Positive impact* on established neighborhoods, voting districts, or relocation impact |
| Technical | Action presents a reasonable solution, given the technological requirements of the proposed project. | • Action is technically feasibility<br>• The solution is long-term<br>• Action results in a reduction of natural hazard impacts (either primary or secondary impacts) |
| Administrative | Availability of anticipated administrative capabilities including staffing, funding, and maintenance requirements of the action. | • Current staffing and/or technical experts are available (or can be readily obtained) to plan for and implement the action<br>• Oversight staffing is available for meeting the requirements of funding mechanisms such as grants, loans, and similar |
| Political | Current community and state political support related to the environment, economic development, safety, emergency management, and similar. | • Political support for implementation and monitoring.<br>• Local champion or proponent of the action to ensure the action is successful.<br>• Support by decision makers to provide a lead department, agency or representative to oversee the action to completion. |
| Legal | Legal authority at the local, state, and/or federal level to implement the action. | • Primary assigned entity has the legal authority to implement or partner to accomplish the action.<br>• The action meets (or can readily meet) all local, state, and federal requirements.<br>• Anticipated legal challenges or liability should be taken into account when considering if the action has ‘legal’ support. |

| Category | Description | Evaluation Criteria |
|---|---|---|
| Economic | Cost effectiveness of the action and availability of funding for the action. | • Costs seem reasonable considering likely benefits (consider monetary and non-monetary benefits)<br>• The financial burden placed on the tax base or local economy to implement this action is reasonable.<br>• Positive contribution* to other community economic goals, such as capital improvements or economic development.<br>• Funding can be readily obtained or is possible through competitive opportunities from outside sources of funding.<br>• It is anticipated that the community has the ability to meet the match requirements for outside funding sources. |
| Environment | Impact to the natural environment and cultural resources plus consistent with concepts of resiliency. | • Maintains or has a positive impact* on natural and cultural resources<br>• Maintains or has a positive contribution* the community's ability to return to normal function after a hazard event<br>• Consistent with community's environmental goals<br>• Consistent with applicable environmental laws |

*Positive impact or contribution means a reduction in risk from natural hazards and/or improvement to quality of life.

### *6.3.4 2023 Mitigation Action Charts*

Figures 6-5-1 through 6-5-6 summarize the updated mitigation actions and implementation strategy for each participating jurisdiction. Actions that are considered related to emergency response are shown in italic. Lincoln County and the Village of Corona each have one response action included below. The Town of Carrizozo includes wildfire response in two multi-hazard actions.

Actions listed below will be implemented based on available staffing, funding, and leadership support. The Commissions, Councils, and Boards of Trustees need to support and approve implementation of actions. It is possible that low cost actions that may be included in a community's budget may be able to be implemented without specific action taken by the governing body. However, Planning Team points of contact would inform and discuss the actions with the appropriate governing body so that situational awareness is maintained. Based on current capabilities (as described in Figures 6-1-1-1 through 6-1-6-3), it is anticipated that only a limited number of actions can be accomplished in the coming 5-year planning cycle.

**Figure 6-5-1: Mitigation Actions for Unincorporated Lincoln County**

| Action Identifier | Priority Ranking | Action Description | Hazard(s) Mitigated | Cost Effectiveness | Duration | Responsible Entity(ies) | Funding Sources | 2018 Status |
|---|---|---|---|---|---|---|---|---|
| LCO1 | Low | Implement hazardous fuels reduction around critical facilities. Examples include Nogal Fire Station, Lincoln Fire Station, Capitan Communication Tower. | Wildfire | Medium | Long-term | Lincoln County Road Department Manager | County Budget, State Forestry grants, BRIC, HMGP, CWDG | No action, Revise |
| LCO2 | Low | Reduce hazardous fuel loads in WUI to reduce impacts to residential structures. The highest priority location is in the West Gavilan are (Alto community) | Wildfire | Medium | Long-term | Lincoln County OES Manager | County Budget, State Forestry, BRIC, HMGP, CWDG | No action, Revise |
| LCO3 | High | Modify low water crossing designs to enhance capacity to pass peak discharge and reduce lateral erosion. A PER would be prepared to identify the design components that would be installed at each existing low water crossing. This may include concrete erosion control along the channel bottom, stabilization on the slopes, and possibly above grade crossings. Example locations are Skeen Road, Salazar Road, Snell Road Bancroft Road, Fair Grounds Crossing, State Highway 368. Year 1 and 2 would be PER, year 3 would be securing funding for highest priority locations, years 4 and 5 would be construction. | Flood | High | Ongoing | Lincoln County OES Manager, NMDOT Capitan District | County Budget, NMDOT, BRIC, HMGP | No action, Revise |

| Action Identifier | Priority Ranking | Action Description | Hazard(s) Mitigated | Cost Effectiveness | Duration | Responsible Entity(ies) | Funding Sources | 2018 Status |
|---|---|---|---|---|---|---|---|---|
| LCO4 | High | Improve drainage on roads that are impassible or difficult to access during flood events so that stormwater is conveyed from the road surface and stored in ponds or ditches. Example locations are Bogle Road, Patos Road, Jicarilla Road, Bonito Lake Road, Nogal Road, Blackwater Draw Road and Devils Canyon. Years 1 and 2 would be PER, year 3 would be securing funding for highest priority locations, years 4 and 5 would be construction. | Flood | High | Ongoing | Lincoln County Road Department, manager | County Budget, NMDOT, BRIC, HMGP | No action, Revise |
| LCO5 | Low | Clear the debris out of the Rio Bonito channel between the Bonito Lake Dam east to Highway 48 in order to allow water to flow downstream without obstruction during flood and thunderstorms. To make sure that the debris does not stack up at the Highway 48 bridge and wash it out. This is a required ongoing maintenance activity. | Flood, Thunderstorms | Medium | Long-term | Lincoln County OES Manager, City of Alamogordo | County budget, NMDOT, NRCS EWP, City of Alamogordo | No action, Keep |
| LCO6 | Medium | Install improved grounding systems for communication antennas against lightning. The improvements would ensure there would be no damage to the antenna, radio, and repeaters. An example of the highest priority location is the Emergency Communications Antennae at the County Emergency Operations Center. | Thunderstorms | Medium | Long-term | Lincoln County OES, Manager, County Commission | County Budget, BRIC, HMGP | No action, Keep |

| Action Identifier | Priority Ranking | Action Description | Hazard(s) Mitigated | Cost Effectiveness | Duration | Responsible Entity(ies) | Funding Sources | 2018 Status |
|---|---|---|---|---|---|---|---|---|
| LCO7 | Low | Install permanent snow fence along Highway 246 to mitigate snowdrifts on the road during severe winter storms. The fences will keep snow drifts from accumulating and allow for vehicles to access the roadway. | Winter Storms | Low | Medium-term | Lincoln County Road Department, Manager and NMDOT Capitan District | County Budget, NM DOT, BRIC, HMGP | No action, Revise |
| LCO8 | Low | Add additional insulation to critical facilities that can function as warming shelters during winter storms. Examples include the Bonita Fire Department and Sunterra Station. | Winter Storms | Low | Long-term | Lincoln County OES Manager | County and State Fire Marshall's Office grants, BRIC, HMGP | No action, Revise |
| LCO9 | Medium | Drill wells deeper to create greater water capacity and enlarge storage system. Year 1 determine priority locations. Year 2 obtain funding. Year 3 and 4 design and construct upgrades. | Drought | Medium | Ongoing | Domestic Water Supply Systems in coordination with County Planning Department | State Budget, Water Trust Board, BRIC, HMGP | New |
| LCO10 | Low | Adopt a water conservation plan for the water systems within the county and for citizens with private wells. Consumers and citizens can mitigate the effects of drought by conserving water. Although the County doesn't own the water systems, the County assists with repairs and maintenance to domestic water supply systems. | Drought | Low | Long-term | Lincoln County OES Manager, Planning Director, County Commission | County Budget, Water Trust Board, BRIC, HMGP | No action, Revise |
| LCO11 | Medium | Create and implement a county ordinance that requires people within the dam inundation area below the Bonita dam to tie down materials and equipment that are not permanently affixed to the ground and remove debris within the inundation area. | Dam Failure | Low | Long-term | County Floodplain Administrator | County Budget, BRIC, FMA | No action, Revise |

| Action Identifier | Priority Ranking | Action Description | Hazard(s) Mitigated | Cost Effectiveness | Duration | Responsible Entity(ies) | Funding Sources | 2018 Status |
|---|---|---|---|---|---|---|---|---|
| LCO12 | High | Conduct public outreach to raise awareness of threats from natural hazards. This action may include a series of public meetings with local and visiting subject matter experts. To date outreach has included staff interaction with the public at community events. The enhanced public outreach activities would include Public Service Announcements and flyers. Messaging would include hazard-specific information and reference material. Specific topics identified include creating programs for reducing burnable debris on private properties; flood safety and mitigation measures for private property owners; lightning and hail mitigation measures; drought impacts on water availability, fire danger, vegetation, and wildlife; moving non-affixed materials out of dam inundation zone. | Wildfire, Flood, Thunderstorms, Winter Storms, High Wind, Drought, Dam Failure | Medium | Ongoing | Lincoln County OES Manager | County Budget, State Forestry, NMDOT, BRIC, HMGP | In progress, Revise |
| LCO13 | Low | Stabilize communication towers with guy wires to protect from natural hazard impacts. Ensure compliance with the Communication Plan. | Wildfire, Flood, Thunderstorms, Winter Storms, High Wind, Dam Failure | Medium | Medium-term | Lincoln County OES, Manager, County Commission | County Budget, BRIC, HMGP | New |
| *LCO14* | *Low* | *Response Action: Develop an all Lincoln County multi-jurisdictional communications plan. This plan will be led by Lincoln County OES Manager.* | *Wildfire, Flood, Thunderstorms, Winter Storms, High Wind, Dam Failure* | *Medium* | *Long-term* | *Lincoln County OES Manager* | *County and State Budgets, grants, and FEMA* | *No action, Keep* |

**Figure 6-5-2: Mitigation Actions for Village of Ruidoso**

| Action Identifier | Priority Ranking | Action Description | Hazard(s) Mitigated | Cost Effectiveness | Duration | Responsible Entity(ies) | Funding Sources | 2018 Status |
|---|---|---|---|---|---|---|---|---|
| RUV1 | High | Implement hazardous fuels reduction for areas bordering the jurisdictional boundary. A high priority example is the Wood Lane area. The Village will coordinate with USFS as some acreage is in their ownership. In years 1 and 2 secure funding. In years 3 through 5 implement treatments. | Wildfire | Medium | Ongoing | Village of Ruidoso Fire Chief | Village Budget, State Forestry, USFS, CWDG, BRIC. HMGP, HMGP-PF | No Action, Revise |
| RUV2 | High | Move powerlines below ground to reduce wildfire ignitions and mitigate against power outages in Flood, Thunderstorm, Winter Storms, and High Wind. The highest priority location is along Main Rd. in the Upper Canyon area. In years 3 and 4 secure funding, prepare design, and begin permitting. With environmental clearance likely taking 1 year or more, implementation is anticipated at the beginning of the next planning cycle. | Wildfire, Flood, Thunderstorm, Winter Storms, and High Wind | High | Medium-term | Village of Ruidoso Public Works Department Director | Village Budget, BRIC, HMGP, HMGP-PF, PNM | No Action, Revise |
| RUV3 | High | Implement defensible space and hazardous fuels reduction to create a buffer zone around the Grindstone Lake area bordering Mescalero Reservation. USFS has treated some acreage and the remainder is anticipated to be completed during the planning cycle. | Wildfire | Medium | Ongoing | USFA with partner support from Village of Ruidoso Fire Chief | Village Budget, State Forestry, BRIC, HMGP, HMGP-PF, , CWDG | In progress, Revise |

| Action Identifier | Priority Ranking | Action Description | Hazard(s) Mitigated | Cost Effectiveness | Duration | Responsible Entity(ies) | Funding Sources | 2018 Status |
|---|---|---|---|---|---|---|---|---|
| RUV4 | Medium | Implement defensible space and hazardous fuels reduction around critical facilities. Example priority locations are the PNM power substation in Gavilan Canyon; water tanks; sewer treatment plants; Fire Stations 1, 2, & 3; Ruidoso Fire Sub Stations at Close Rd and Cree Meadows Dr.; Police Station; and Village Hall. Progress to date includes completed thinning behind Fire Stations 1 and 2. The McBride Fire burned the area near the PNM substation so no additional thinning is required in that location during the planning cycle. | Wildfire | Medium | Ongoing | Village of Ruidoso Forestry Director | Village Budget, State Forestry, BRIC, HMGP, HMGP-PF, CWDG | In progress, Revise |
| RUV5 | High | Increase the capacity and design of culverts and drainage to reduce flood impacts and post-fire burn scar debris flow impacts. The highest priority locations are near the Rio Ruidoso in Mid-town, the eastern half of Sudderth Dr. (continuing to Highway 70), and Village owned property within the McBride Fire burn scar. In years 1 and 2 secure funding. In years 3 through 5 design, permit, and implement. | Flood | High | Ongoing | Village of Ruidoso Public Works Department Director | Village Budget, BRIC, HMGP, HMGP-PF | No Action, Revise |

| Action Identifier | Priority Ranking | Action Description | Hazard(s) Mitigated | Cost Effectiveness | Duration | Responsible Entity(ies) | Funding Sources | 2018 Status |
|---|---|---|---|---|---|---|---|---|
| RUV6 | Medium | Create and Implement a Village ordinance that requires people within dam inundation areas and the flood prone areas to tie down materials and equipment that are not permanently affixed to the ground and remove debris within the inundation area. Removing debris and personal property will reduce the amount of material that will plug bridges and culverts or could cause damage to downstream property. In years 3 and 4 it is anticipated that the ordinance will be drafted, the public will comment, and Council will adopt. | Flood, Dam Failure | Medium | Medium-term | Village Floodplain Manager | Village Budget for staff time, BRIC, HMGP | No action, Revise |
| RUV7 | High | Install improved grounding systems for communication antennas against lightning. The improvements would ensure there would be no damage to the antenna, radio, and repeaters. | Thunderstorms | Medium | Short-term | Village of Ruidoso Emergency Services | Village Budget, BRIC, HMGP | New |
| RUV8 | Medium | Drill wells deeper to create greater water capacity and enlarge storage system. In year 1 determine priority locations. In year 2 obtain funding. In years 3 and 4 design and construct upgrades. | Drought | High | Ongoing | Village of Ruidoso Public Works Department Director | Village Budgets, Water Trust Board | New |

| Action Identifier | Priority Ranking | Action Description | Hazard(s) Mitigated | Cost Effectiveness | Duration | Responsible Entity(ies) | Funding Sources | 2018 Status |
|---|---|---|---|---|---|---|---|---|
| RUV9 | High | Conduct public outreach to raise awareness of threats from natural hazards. To date, outreach has included staff interaction with the public at community events regarding defensible space, flood and high wind. Wildfire and flood brochures and flyers are also handed out. In addition, wildfire and flood mitigation and preparedness has been included in social media postings and in the Village monthly newsletter that gets mailed to all utility subscribers. The enhanced public outreach activities would include additional hazards like Thunderstorm, Winter Storms, Drought, and Dam Failure. Additional brochures, flyers, Public Service Announcements, and public meetings with local or visiting SMEs are activities being considered. Specific topics identified include: how to mitigate property and structures from the impacts of Thunderstorms, Winter Storms, High Wind; drought impacts on water availability, fire danger, vegetation, and wildlife; moving non-affixed materials out of flood and dam inundation zones; the Village's early warning system and messaging during severe weather events. | Wildfire, Flood, Thunderstorms, Winter Storms, High Wind, Drought, Dam Failure | High | On-going | Village of Ruidoso emergency services, manager | Village Budgets, State Fire Marshall, BRIC, HMGP, HMGP-PF | In progress, Revise |

| Action Identifier | Priority Ranking | Action Description | Hazard(s) Mitigated | Cost Effectiveness | Duration | Responsible Entity(ies) | Funding Sources | 2018 Status |
|---|---|---|---|---|---|---|---|---|
| RUV10 | High | Upgrade existing generators in government buildings to assure essential functions can continue during power outages. Upgrades must be made to the capacity and connections of existing generators. This will reduce the community's impacts from flood, thunderstorms, high winds, and winter storms. Examples of high priority locations are Village Hall, Convention Center, and Community Center. In years 1 and 2 the Preliminary Engineers Report will be prepared and funding will be secured for the high priority locations. Implementation is anticipated for years 3 and 4. | Wildfire, Flood, Thunderstorms, High Wind, Winter Storms, Dam Failure | High | On-going | Village Community Development Director | City Budget, BRIC, HMGP | New |
| RUV11 | Medium | Install a system of data recording multi-hazard weather stations with automatic notification capacity. The weather stations would monitor precipitation, lightning, and high wind. In years 1 and 2 secure the funding and create the specifications. Installation is anticipated in year 3. | Wildfire, Flood, Thunderstorms, High Wind, Winter Storms | Medium | On-going | Village Emergency Manager | City Budget, BRIC, HMGP | New |

**Figure 6-5-3: Mitigation Actions for City of Ruidoso Downs**

| Action Identifier | Priority Ranking | Action Description | Hazard(s) Mitigated | Cost Effectiveness | Duration | Responsible Entity(ies) | Funding Source(s) | 2018 Status |
|---|---|---|---|---|---|---|---|---|
| RDC1 | High | Create a thinned buffer zone with hazardous fuels reduction bordering the City limits. Examples include the Turkey Canyon area and the Wood Lane area. | Wildfire | Medium | Short-term | City of Ruidoso Downs Fire Chief | City and State Budgets, BRIC, HMGP, HMGP-PF, CWDG | No action, Keep |
| RDC2 | High | Increase the capacity of culverts and drainage ditches in the Ruidoso Gardens subdivision to pass high flows of the Rio Ruidoso. Phase One is to conduct a PER to determine project design criteria. Phase Two would be preparation of construction drawings, permitting, and implementation. | Flood | Medium | Long-term | City of Ruidoso Downs Public Works Director | City and State Budgets, grants USFS, BRIC, HMGP | No action, Keep |
| RDC3 | Low | Improve drainage on roads and highways in flood prone areas to reduce impacts. Phase One is to conduct a PER to determine priority project locations and design criteria. Phase Two would be preparation of construction drawings, permitting, and implementation for the highest priority locations. | Flood | Medium | Long-term | City of Ruidoso Downs Public Works Director | City and State Budgets, grants USFS, BRIC, HMGP | No action, Keep |
| RDC4 | Medium | Harden the Emergency Services Communication antenna against lightning. | Thunderstorms | High | Short-term | City of Ruidoso Downs Fire Chief | City and State Budgets, grants USFS, BRIC, HMGP | No action, Keep |
| RDC5 | High | Harden the Emergency Services Communication antenna against severe winds. | High Wind | High | Medium-term | City of Ruidoso Downs Fire Chief | City and State Budgets, grants USFS, BRIC, HMGP | No action, Keep |

| Action Identifier | Priority Ranking | Action Description | Hazard(s) Mitigated | Cost Effectiveness | Duration | Responsible Entity(ies) | Funding Source(s) | 2018 Status |
|---|---|---|---|---|---|---|---|---|
| RDC6 | Medium | Conduct public outreach to raise awareness of threats from drought and how citizens can mitigate the impact of drought. This action can include a series of public meetings with local and visiting subject matter experts to educate the public on drought and its impacts on water availability, fire danger, flora and fauna impacts, wildlife impacts and how citizens can cope with these impacts. | Drought | Low | Ongoing | City of Ruidoso Downs Fire Chief | City and State Budgets, grants USFS, BRIC, HMGP | No action, Keep |
| RDC7 | High | Improve early warning capability by installing two new hazard sirens. This will give the community and its residents the opportunity to take protective measures to move personal property, vehicles and people out of harm's way. | Flood, Thunderstorms, Dam Failure | Low | Short-term | City of Ruidoso Downs Fire Chief | City and State Budgets, grants USFS, BRIC, HMGP | No action, Keep |
| RDC8 | High | Upgrade existing generators in government buildings to ensure essential functions can continue during power outages. Upgrades must be made to the capacity and connections of existing generators. This will reduce the community's impacts from flood, thunderstorms, high winds, and winter storms. | Flood, Thunderstorms, High Wind, Winter Storms | Medium | Medium-term | City of Ruidoso Downs Fire Chief | City and State Budgets, grants USFS, BRIC, HMGP | No action, Keep |

| Action Identifier | Priority Ranking | Action Description | Hazard(s) Mitigated | Cost Effectiveness | Duration | Responsible Entity(ies) | Funding Source(s) | 2018 Status |
|---|---|---|---|---|---|---|---|---|
| RDC9 | Medium | Conduct public outreach and awareness on the early warning system and the effects of wildfire, flood, thunderstorms, winter storms, high wind, and dam failures. Inform citizens on how to mitigate their homes and property against thunderstorms and dam failures. | Wildfire, Flood, Thunderstorms, Winter Storms, High Wind, Dam Failure | Low | Ongoing | City of Ruidoso Downs Fire Chief | City and State Budgets, grants USFS, BRIC, HMGP | No action, Keep |

**Figure 6-5-4: Mitigation Actions for Town of Carrizozo**

| Action Identifier | Priority Ranking | Action Description | Hazard(s) Mitigated | Cost Effectiveness | Duration | Responsible Entity(ies) | Funding Sources | 2018 Status |
|---|---|---|---|---|---|---|---|---|
| CRZ1 | Medium | Drill additional water wells to improve auxiliary water supplies during drought periods. Increase in water supply will help to reduce impacts of wildfire and drought. | *Wildfire*, Drought | Medium | Long-term | Town of Carrizozo Public Works Department | Town budget, State grants and loans, USDA, BRIC, HMGP | Keep, Revised |
| CRZ2 | Medium | Upgrade current water delivery system pipe material and diameter size to increase efficiency of water delivery. Increase in water supply will help to reduce impacts of wildfire and drought | *Wildfire*, Drought | Medium | Long-term | Town of Carrizozo Public Works Department | Town budget, State grants and loans, USDA, BRIC, HMGP | Keep, Revised |
| CRZ3 | High | Implement street and drainage projects to mitigate flooding on local roads and state highways including those listed in 2022-2026 ICIP Plan. Implement projects to reduce standing water on roadways. Purchase new road improvement equipment using eligible funding to support this action. | Flood | Medium | Long-term | Town of Carrizozo Public Works Department | Town budget, State grants and loans, USDA, BRIC, HMGP | New |

| Action Identifier | Priority Ranking | Action Description | Hazard(s) Mitigated | Cost Effectiveness | Duration | Responsible Entity(ies) | Funding Sources | 2018 Status |
|---|---|---|---|---|---|---|---|---|
| CRZ4 | Medium | Re-channel ditches to reduce flood impacts to private and town-owned property. This will include obtaining easements with property owners, preparing construction drawings, implementing the drainage modifications, and coordinating with the assessor's office. | Flood | High | Long-term | Lincoln County Assessor's Office, Town of Carrizozo Town Hall, Public Works Department | Town budget, Lincoln County, State grants and loans, USDA, BRIC, FEMA | New |
| CRZ5 | High | Adopt an ordinance that requires securing straps and specific placement requirements for antennas, flag poles, and lights. Enforcement of the ordinance will reduce impacts from natural hazards. | High wind, Winter Storm, Thunderstorms, Flood | High | Short-term | Town of Carrizozo Board of Trustees | Town budget, BRIC, HMGP | No action, Keep |
| CRZ6 | High | Install sirens on critical infrastructure buildings/structures. Examples include enhancing the siren at the library/police station. Test on a set schedule. Improved early warning will give the community and its residents the opportunity to take protective measures to move personal property, vehicles and people out of harm's way. | Wildfire, Flood, Winter Storm, High Wind, Thunderstorms | Medium | Long-term | Town of Carrizozo Police Department, Public Works Department, Carrizozo Volunteer Fire Department | Town budget, Lincoln County, State grants and loans, USDA, BRIC, HMGP | No action, Revised |
| CRZ7 | Medium | Conduct public outreach on benefits of retrofitting buildings and property to withstand natural hazards. Educate citizens on best practices for reducing injury and damage to property during natural disasters. Conduct town meetings on siren warning systems meaning and use. Place signs on shelter buildings. | Wildfire, Winter Storm, Thunderstorms, High Wind, Flood | High | Short-term | Town of Carrizozo Town Hall, local not-for-profit organizations | Town budget, State grants, USDA, BRIC, HMGP | New |

| Action Identifier | Priority Ranking | Action Description | Hazard(s) Mitigated | Cost Effectiveness | Duration | Responsible Entity(ies) | Funding Sources | 2018 Status |
|---|---|---|---|---|---|---|---|---|
| CRZ8 | Low | Retro-fit existing government buildings to serve as a shelter for residents and visitors to reduce injury and damage during natural disasters. | Wildfire, Flood, Winter Storm, High Wind, Thunderstorms | High | Long-term | Town of Carrizozo Public Works Department, local not-for-profits | Town budget, Lincoln County, State grants and loans, USDA, BRIC, HMGP | No action, Keep |
| CRZ9 | Low | Install backup permanently installed generators to power water/wastewater/solid waste/ evacuation shelters/ government services infrastructure to be used during outages due to natural disasters for the purpose of reducing injury and damages to infrastructure. Re-wire buildings for generator use. | Drought, Wildfire, Flooding, High Wind, Winter Storms | Medium | Short-term | Town of Carrizozo Public Works Department | Town budget, State grants and loans, USDA, BRIC, HMGP | No Action, Keep |

**Figure 6-5-5: Mitigation Actions for Village of Capitan**

| Action Identifier | Priority Ranking | Action Description | Hazard(s) Mitigated | Cost Effectiveness | Duration | Responsible Entity(ies) | Funding Sources | 2018 Status |
|---|---|---|---|---|---|---|---|---|
| CAP1 | High | Implement hazardous fuel reduction on National Forest on the West side of town (approximately 1,000 acres of Piñon/Juniper landscape on rolling hills and some steep canyons). The USFS District Ranger and the Village of Capitan have agreed to coordinate on this activity. | Wildfire | Medium | Long-term | Smokey Bear Ranger District/District Ranger/ in cooperation with the Village of Capitan Public | Village Budget, State Forestry, BRIC, HMGP, HMGP-PF, CWDG | No action, Keep |

| Action Identifier | Priority Ranking | Action Description | Hazard(s) Mitigated | Cost Effectiveness | Duration | Responsible Entity(ies) | Funding Sources | 2018 Status |
|---|---|---|---|---|---|---|---|---|
| CAP2 | Medium | Adopt and implement an ordinance for property owners to clear debris and maintain a defensible space around their residences.<br>The ordinance will be part of a defensible space plan that will be developed for the community. Implementation of this plan will reduce the injury and impacts of wildfire. | Wildfire | Low | Short-term | Village of Capitan Council, Mayor Dennis Haskel | Village Budget, BRIC, HMGP, HMGP-PF | No action, Keep |
| CAP3 | High | Install signage at flood-prone streets to reduce ingress/egress to government buildings during storm events. | Flood, Thunderstorms | High | Short-term | Village of Capitan, Mayor | Village Budget, State grants and loans, BRIC, HMGP | New |
| CAP4 | High | Install signage at all low water crossings on both sides of drainage to discourage crossing during storm events and therefore reduce injury/death. | Flood, Thunderstorms | High | Short-term | Village of Capitan, Mayor | Village Budget, State grants and loans, BRIC, HMGP | New |
| CAP5 | High | Install depth gauges in arroyos at low-water crossings to make drivers aware of the risk. This will reduce injury and damage to property due to flooding. | Flood, Thunderstorms | High | Short-term | Village of Capitan, Mayor | Village Budget, State grants and loans, BRIC, HMGP | New |
| CAP6 | Low | Retrofit the roof/windows or rebuild the Capitan Elementary Schools with more resilient materials to meet building code standards. The current elementary schools flood and leak during thunderstorms. | Thunderstorms | High | Long-term | Capitan Schools, Superintendent | Village Budget, State grants and loans, BRIC, HMGP | No action, Keep |

| Action Identifier | Priority Ranking | Action Description | Hazard(s) Mitigated | Cost Effectiveness | Duration | Responsible Entity(ies) | Funding Sources | 2018 Status |
|---|---|---|---|---|---|---|---|---|
| CAP7 | Low | Conduct a PER for flash flooding for the village including the subdivision. The Village needs engineering study to help develop a plan to mitigate flash flooding. Flash flooding occurs during thunderstorm rain events. This report will alleviate data deficiencies for missing information. Once PER is complete a mitigation strategy will be added to this plan. | Thunderstorms | Low | Long-term | Village of Capitan Public Works, Public works director | NM Finance Authority Planning Grant, State, BRIC, HMGP | No action, Keep |
| CAP8 | Medium | Conduct Public outreach & awareness to the public regarding severe winter storms. Create brochures to include information on how to mitigate against a severe winter storm, what to expect and how to be prepared with enough water, food, batteries, flashlights and a possible backup generator. | Winter Storms | Low | Medium-term | Village of Capitan Public Works, Director | Village Budget, State grants and loans, BRIC, HMGP | No action, Keep |
| CAP9 | Medium | Stabilize communication towers with guy lines to protect from natural hazard impacts. Coordinate with County Emergency. | Winter Storms, High Wind | High | Long-term | Village of Capitan, Mayor | Village Budget, State grants and loans, BRIC, HMGP | New |
| CAP10 | Low | Install additional insulation in the ceiling of the Village Hall to mitigate a Severe Winter Storm and ensure that government services continue. | Winter Storms | Low | Long-term | Village of Capitan, Mayor | Village Budget, State grants and loans, BRIC, HMGP | No action, Keep |
| CAP11 | Medium | Conduct Public outreach & awareness regarding drought. Create brochures to include information on water saving techniques and devices. This action will help residents mitigate drought and conserve water. | Drought | Low | Medium-term | Village of Capitan Public Works, Director | Village Budget, State grants and loans, BRIC, HMGP | No action, Keep |

| Action Identifier | Priority Ranking | Action Description | Hazard(s) Mitigated | Cost Effectiveness | Duration | Responsible Entity(ies) | Funding Sources | 2018 Status |
|---|---|---|---|---|---|---|---|---|
| CAP12 | Low | Add or replace Landscaping in all public areas with xeriscape for the purpose of conserving water supplies during drought. | Drought | Low | Long-term | Village of Capitan Public Works, Director | Village Budget, State grants and loans, BRIC, HMGP | No action, Keep |
| CAP13 | High | Conduct public outreach and awareness on all hazards. Create hard copy brochures to be placed at government buildings. Post this same information on the Village website. | High Wind, Winter Storms, Flood, Drought, Thunderstorms, Wildfire | High | Medium-term | Village of Capitan, Mayor | Village Budget, State grants and loans, BRIC, HMGP | New |

**Figure 6-5-6: Mitigation Actions for Village of Corona**

| Action Identifier | Priority Ranking | Action Description | Hazard(s) Mitigated | Cost Effectiveness | Duration | Responsible Entity(ies) | Funding Sources | 2018 Status |
|---|---|---|---|---|---|---|---|---|
| COR1 | High | Implement hazard fuels reduction on the south and west corridors (approximately 80 acres). Defensible space prescription as per NM State Forestry prescription. | Wildfire | Medium | Long-term | Mayor of the Village of Corona | Village budget, State grants, Soil and Water Conservation District grants, (USDA), BRIC, HMGP, CWDG | No action, Revise |
| *COR2* | *Medium* | *Response Action: Install fire hydrants to extend fire coverage capabilities and maintain all fire hydrants in the system to ensure good fire protection* | *Wildfire* | *High* | *Long-term* | *Village of Corona, Mayor and Fire Chief* | *Village Budget* | *New* |
| COR3 | Low | Conduct a public awareness program to assist residents in protecting electronics from lightning strikes. Post warning signage at the park and pond. | Thunderstorms | Medium | Short-term | Village of Corona, Mayor | Village Budget, BRIC, HMGP | New |

| Action Identifier | Priority Ranking | Action Description | Hazard(s) Mitigated | Cost Effectiveness | Duration | Responsible Entity(ies) | Funding Sources | 2018 Status |
|---|---|---|---|---|---|---|---|---|
| COR4 | Medium | Conduct a public awareness outreach program by creating brochures on how to be prepared for a winter storm and how to mitigate their home and household against severe winter storms. | Winter Storms | Medium | Short-term | Village of Corona Mayor | Village budget, State grants, BRIC, HMGP | No action, Revise |
| COR5 | Medium | Install snow fence around the perimeter of Red Cloud water wells #7 & #8 to keep access open, during a severe winter storm in order to allow crews to access the wells for maintenance, repairs and temporary backup power to reduce potential damage to critical infrastructure. | Winter Storms | High | Long-term | Village of Corona Mayor | Village budget, State grants, BRIC, HMGP | No action, Revise |
| COR6 | High | Upgrade government garage/shop doors to meet high wind rating requirements. | High Wind | High | Long-term | Village of Corona Mayor and Fire Chief | Village budget, State grants, BRIC, HMGP | New |
| COR7 | High | Improve roof coverings, anchor roof-mounted heating, ventilation, and air conditioning units on public buildings and critical facilities to reduce the impact of high winds. | High Wind | High | Long-term | Village of Corona, Mayor | Village Budget, BRIC, HMGP | New |
| COR8 | Low | Conduct a public outreach program to educate residents on improving roof coverings and anchoring roof-mounted infrastructure. | High Wind | Medium | Short-term | Village of Corona, Mayor | Village Budget, BRIC, HMGP | New |
| COR9 | High | Add xeriscape landscaping for reducing water use on landscaping on land owned by the Village. Although some installation has been implemented, additional locations are needed. | Drought | High | Long-term | Village of Corona Mayor | Village Budget, BRIC, HMGP | In progress, Revise |

| Action Identifier | Priority Ranking | Action Description | Hazard(s) Mitigated | Cost Effectiveness | Duration | Responsible Entity(ies) | Funding Sources | 2018 Status |
|---|---|---|---|---|---|---|---|---|
| COR10 | Medium | Conduct a public outreach program by up-dating and distributing brochures informing residents how they can save water and mitigate drought. The brochures will include water saving techniques and devices. To date, outreach has consisted of presentations at community events. | Drought | Medium | Long-term | Village of Corona Mayor | Village budget, State grants, BRIC, HMGP | In progress, Revise |
| COR11 | High | Install and maintain surge protection and power backups on critical electronic equipment to avoid electric outages due to natural hazards. This will reduce potential property damage and mitigate injury. | Wildfire, Thunderstorms, Winter Storms, High Wind | High | Long-term | Village of Corona, Mayor | Village Budget, BRIC, HMGP | New |

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# SECTION 7: PLAN MAINTENANCE PROCEDURES

**§201.6(c)(4):** [The plan must include the following: a] *plan maintenance process* that includes:

i. A section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.

ii. A process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.

iii. Discussion on how the community will continue public participation in the plan maintenance process.

The HMP must describe the processes or mechanisms for maintaining and updating the hazard mitigation plan within the 5-year planning cycle. Elements of this plan maintenance section include:

- Monitoring and Evaluating the Plan
- Updating the Plan
- Continued Public Participation
- 2023 HMP integration into other planning mechanisms

The following subsections provide a description of the past plan maintenance procedures and activities and documents the proposed procedures and schedule for the next planning cycle.

## 7.1 Monitoring and Evaluation

### *7.1.1 2018 to 2023 Plan Cycle*

In regard to HMP maintenance and evaluation over the 5-year approval cycle, the 2018 HMP Planning Team committed to meet annually and to conduct an annual evaluation using two different forms. One form was focused on over-all evaluation of effectiveness and one form was focused on action progress. The 2023 Planning Team confirmed that these steps did not happen due to many large fires, focus on response and public safety, staff turnover, plus personnel changes.

### *7.1.2 Monitoring and Evaluation for 5-year approval cycle*

The 2023 Planning Team agreed to the following changes for the up-coming 5-year approval cycle. These changes were made based on more realistic expectations for implementation. The monitoring and evaluation will occur in year two of the plan approval cycle and will be directed by the Lincoln County and Village of Ruidoso Emergency Managers as described in the Plan Update subsection (Section 7.2).

- A revised evaluation form will be created by the 2023 HMP planning consultant for the Planning Team to use. The 2023 Evaluation and Action Status Form will combine the most pertinent information from the two forms referenced in the 2018 HMP (Plan Update Evaluation Worksheet and Mitigation Access Progress Report Worksheet). The Evaluation and Action Status Form is found in Appendix H. Topics included are the review of each Section of the HMP, with emphasis on the Mitigation Strategy components.
- In year two, the Planning Team contact from each community will facilitate and document an evaluation of the plan effectiveness, including progress on mitigation actions, using the Evaluation and Action Status Form. The Form will be emailed to all participants prior to a Year-2 Planning Team Meeting. The expectation is that the Form will be completed and brought to the Planning Team meeting for group discussion.

- A summary memo will be prepared by the Lincoln County and Village of Ruidoso Emergency Managers, to include a description of feedback, updates, or changes from each community. Any Planning Team agreed-upon changes to the HMP monitoring and evaluation approach will also be included in the summary memo.
- A formal presentation of the relevant material will be presented to each participating jurisdiction's Commission, Council, or Board of Trustees only if a major update to the HMP is proposed prior to the next 5-year update.

## 7.2 Plan Update

### *7.2.1 2018 to 2022 Plan Cycle*

The 2018 HMP was to adhere to the following update schedule.

One year prior to the plan expiration date, the Planning Team was to re-convene to review and assess the Plan Update Evaluation Worksheets and Mitigation Access Progress Report Worksheets that were to have been prepared annually. The Planning Team would then update the appropriate portions of the HMP and produce the HMP Update document. The HMP Update would then be submitted to New Mexico DHSEM and FEMA for review, comment, and approval. After FEMA would issue the Approval Pending Adoption letter, all participating jurisdictions would adopt the HMP Update.

In regard to funding the 2023 HMP Update, the Village of Ruidoso submitted a sub-grant application to New Mexico DHSEM in the fall of 2020, assuming there was sufficient time to secure a contractor, update the plan, and get FEMA approval before the July 24, 2023 expiration of the 2018 HMP. The application was under review throughout 2021 and into 2022. It was approved for funding under the Building Resilient Infrastructure and Communities grant and the sub-grant was awarded in June 2022. The Village of Ruidoso released the Request for Proposals in November 2022 and the resulting contract with SWCA Environmental Consultants was executed in January 2023. The Planning Process (Section 3) describes the steps completed to update the 2018 HMP.

### *7.2.2 Update for Five-year Approval Cycle*

In year two of the approval cycle, the Planning Team will reconvene for evaluation, maintenance, and up-date coordination. Ruidoso and Lincoln County Emergency Managers will take the lead in organizing the meeting. The Evaluation and Action Status Form will be utilized as described above in the Monitoring and Evaluation subsection (Section 7.1.2).

In year three of the approval cycle, the Ruidoso and Lincoln County Emergency Managers will coordinate on submittal of the application for funding the next HMP update. All participating jurisdictions will be requested to provide a participation and matching funds commitment letter to be included in the funding application.

At the beginning of year 4 of the approval cycle, Ruidoso and Lincoln County Emergency Managers will coordinate on starting the competitive procurement process.

During year 4 of the approval cycle, 18 months (or more) prior to the expiration of the 2023 HMP, the 12-month update planning process will begin.

During year 5 of the approval cycle, no less than 6-months prior to the expiration of the 2023 HMP, the 6-month State and FEMA review and approval steps will begin. All participating jurisdictions will adopt the updated HMP and FEMA will provide the Approval Letter prior to the expiration of the 2023 HMP.

## 7.3 Continued Public Involvement

### *7.3.1 2018 to 2022 Plan Cycle*

In regard to public engagement over the 5-year approval cycle, the 2018 HMP Planning Team committed that each community was to post the completed HMP on their website with a link to the Ruidoso HMP update webpage. In addition, hard copies of the HMP were to be made available at "all jurisdictional public libraries, jurisdictional city halls, and County courthouse". Also, the public was invited to give feedback at monthly council or board meetings. The 2023 Planning Team confirmed that Ruidoso hosted an HMP-specific section of their website which provided the HMP, related information, and contacts. Corona provided hard copy of the 2018 HMP at the library and Village Hall.

### *7.3.2 Public Involvement for 5-year Approval Cycle*

In regard to ongoing public engagement over the coming 5-year approval cycle, the 2023 HMP Planning Team committed to the following.

- The 2023 HMP will be posted to the Ruidoso website on a dedicated HMP section. The HMP section will be maintained by the Village of Ruidoso Emergency Manager and Public Information Officer. Updates will include the results of the contact information for comments or questions, accomplishments of milestones, and similar. Examples of milestones include
  - FEMA HMP approval
  - availability of approved HMP on community websites and hard copy at administrative buildings
  - results of the year two evaluation
  - receipt of funding for the 2028 HMP up-date
  - kick-off for the 2028 up-date
- Each participating jurisdiction will provide a link to the Ruidoso HMP webpage section.
- Hard copies of the HMP will be available at every participating jurisdiction's administrative office.
- HMP feedback at any of the monthly commission, council, or board meetings will be reported to the Planning Team primary point of contact for response and inclusion in the monitoring and evaluation process.
- Participating jurisdictions that have social media accounts will post when HMP milestones are accomplished.
- If a major HMP update is proposed based on evaluation feedback and prior to the start of the 2028 HMP planning cycle, a formal presentation of the relevant material will be presented to each participating jurisdiction's Commission, Council, or Board of Trustees only if a major update to the HMP is proposed prior to the next 5-year update.

## 7.4 Integration into Other Planning Mechanisms for the Next 5-Year Cycle

Integration and/or incorporation of the HMP into other planning mechanisms, either by content or reference, enhances a community's ability to perform hazard mitigation by expanding the scope of the HMP's influence. It also helps communities to capitalize on all available mechanisms at their disposal to reduce the impact of natural hazards.

Based on lessons learned from integrating the 2018 HMP during the last cycle, the Planning Team agreed to incorporate the 2023 HMP Update over the next 5-year planning cycle in several ways. Description of integration opportunities are listed below.

- Use or refer to HMP hazard profiles, vulnerability assessment, capabilities, goals, objectives, actions, local adoption, and/or FEMA approval when:
  - Revisions to emergency management, wildfire protection, land use, comprehensive, strategic, and other planning documents.
  - Revising codes and ordinances, planning documents, and other long-term strategic plans; and
  - Making funding requests for implementation.
- Include specific actions in capital improvement plans and programming.
- Use the HMP as a resource during governing body meetings, LEPC meetings, and similar.
- Refer to the HMP as a multi-jurisdictional cooperative effort with implementation benefits that will contribute to the region becoming more resilient to natural hazards.

Specific opportunities for integrating and/or referencing the HMP into other planning mechanisms over the next 5 years are summarized by participating jurisdiction in Figures 7-1-1 through 7-1-6. The participating jurisdiction's Planning Team primary point of contact will work with the administration and governing body to ensure that the appropriate SME is informed of the relevant sections of the HMP that could be integrated into each plan revision. Based on the past planning cycles, the Planning Team anticipates integration of the risk assessments, capabilities, and actions will be the most prevalent use of the 2023 HMP Update.

Although each jurisdiction has particular processes for incorporating and adopting planning documents, most of the procedures are similar for the six participating jurisdictions. New or updated plans are usually developed in draft format and presented to the respective governing body in a public forum for initial review and comment. Upon resolution of all comments the plan is presented again to the governing body for final approval and adoption.

**Figure 7-1-1: Lincoln County 2023 HMP Integration Strategy**

| Planning Mechanism | Description of Planning Mechanism Opportunity |
|---|---|
| County Community Wildfire Protection Plan (CWPP) | The 2023 Hazard Mitigation Plan (HMP) will be utilized to inform the 5-year update of the 2019 County CWPP (anticipated for update in 2024). In particular, the risk assessment used in the 2023 HMP is a more recent wildfire risk assessment (State's 2020 Forest Action Plan). HMP wildfire actions will also be reviewed for incorporation in the CWPP. The South Central Mountain Resource Conservation and Development Council is taking the lead on securing funding and overseeing the CWPP Update. The County Emergency Management Director will serve as the Planning Team liaison from the County. |
| Lincoln County Emergency Operations Plan (EOP) | The 2014 EOP is reviewed and updated on an as-needed basis, although the last full update was in 2014. The next EOP update will include integration of relevant concepts from the HMP such as social vulnerability, risk assessment, and goals from the HMP. The County Emergency Management Director will serve as the Planning Team liaison from the County. |

| Planning Mechanism | Description of Planning Mechanism Opportunity |
|---|---|
| Infrastructure Capital Improvement Plan (ICIP) | The 2023 HMP will be utilized to inform and guide the submittal and funding of capital improvement projects on an annual basis. The Community Development and Water Resources Departments serve as the leads. Directors from these two Departments will serve as the primary subject matter experts (SME) for integrating the HMP. |
| County Comprehensive Plan | The 2007 Comprehensive Plan will have the next update in 2027. Therefore, the 2023 HMP will be integrated into the appropriate sections. Likely the risk assessment, capabilities, and mitigation strategy concepts will be incorporated. The County Emergency Management Director will serve as the Planning Team liaison from the County. However, each Department Director will serve as SME for the relevant topics. |

**Figure 7-1-2: Village of Ruidoso 2023 HMP Integration Strategy**

| Planning Mechanism | Description of Planning Mechanism Opportunity |
|---|---|
| Village of Ruidoso Emergency Operations Plan (EOP) | The 2018 EOP is reviewed and updated on an as-needed basis. The next EOP update will include integration of relevant concepts from the Hazard Mitigation Plan (HMP) such as social vulnerability, risk assessment, and goals from the HMP. The Village Emergency Manager will serve as the Planning Team Liaison from the Village of Ruidoso. |
| Infrastructure Capital Improvement Plan (ICIP) | The 2023 HMP will be utilized to inform and guide the submittal and funding of capital improvement projects on an annual basis. The Community Development and Water Resources Departments serve as the leads. |
| County Community Wildfire Protection Plan (CCWP) | The 2023 HMP will be utilized to inform the 5-year update of the 2019 County CWPP. In particular, the risk assessment used in the 2023 HMP is a more recent wildfire risk assessment (State's 2020 Forest Action Plan). HMP wildfire actions will also be reviewed for incorporation in the CWPP. The South Central Mountain Resource Conservation and Development Council is taking the lead on securing funding and overseeing the CWPP Update. The Fire Chief will serve as the Planning Team liaison from the Village. |
| Village of Ruidoso Comprehensive Plan | The 2019 Comprehensive Plan will have the next update in 2027. The most current HMP information on risk assessments, capabilities, and mitigation strategy concepts will be integrated into the Comprehensive Plan update. The Emergency Manager will serve as the Planning Team liaison. However, each Department Director will serve as subject matter expert for the relevant topics. |

| Planning Mechanism | Description of Planning Mechanism Opportunity |
|---|---|
| Grindstone Canyon Dam Emergency Action Plan (EAP) | The Grindstone Canyon Dam EAP is reviewed and updated as needed on an annual basis. During the next update, relevant information from the 2023 HMP will be incorporated, such as hazard profiles and mitigation recommendations as deemed appropriate. The Dam Failure actions will be considered and incorporated as deemed appropriate. The Water Production Manager will serve as the lead for integrating the HMP into future updates. |
| Alto Lake Dam EAP | The Alto Lake Dam EAP is reviewed and updated as needed on an annual basis. During the next update, relevant information from the 2023 HMP will be incorporated. The Water Production Manager will serve as the lead for integrating the HMP into future updates. |

**Figure 7-1-3: Future Plan Integration Strategy for City of Ruidoso Downs**

| Plan Integration Strategy for Next 5 Years: | |
|---|---|
| **Planning Mechanism** | **Description of Planning Mechanism Opportunity** |
| Infrastructure Capital Improvement Plan (ICIP) | The 2023 Hazard Mitigation Plan (HMP) will be utilized to inform and guide the submittal and funding of capital improvement projects on an annual basis. The Public Works Departments serves as the lead. |
| City of Ruidoso Downs Comprehensive Plan | The next update of the 2021 Comprehensive Plan will not occur until 2041 and there will be four HMP updates prepared prior to that time. The most current HMP information on risk assessments, capabilities, and mitigation strategy concepts will be integrated into the Comprehensive Plan update. The Fire Chief/Emergency Manager will serve as the Planning Team liaison. However, each Department Director will serve as subject matter expert for the relevant topics. |
| County Community Wildfire Protection Plan (CWPP) | The 2023 HMP will be utilized to inform the 5-year update of the 2019 County CWPP. In particular, the risk assessment used in the 2023 HMP is a more recent wildfire risk assessment (State's 2020 Forest Action Plan). HMP wildfire actions will also be reviewed for incorporation in the CWPP. The South Central Mountain Resource Conservation and Development Council is taking the lead on securing funding and overseeing the CWPP Update. The City participates through the Greater Ruidoso WUI Working Group. |

**Figure 7-1-4: Future Plan Integration Strategy for Town of Carrizozo**

| **Plan Integration Strategy for Next 5 Years:** | |
|---|---|
| **Planning Mechanism** | **Description of Planning Mechanism Opportunity** |
| Town of Carrizozo Comprehensive Plan | The next update of the 2021 Comprehensive Plan will not occur until 2041 and there will be four Hazard Mitigation Plan (HMP) updates prepared prior to that time. The most current HMP information on risk assessments, capabilities, and mitigation strategy concepts will be integrated into the Comprehensive Plan update. The mayor will serve as the Planning Team liaison. However, each Department Director will serve as subject matter expert for the relevant topics. |
| Infrastructure Capital Improvement Plan (ICIP) | The 2023 HMP will be utilized to inform and guide the submittal and funding of capital improvement projects on an annual basis. The Public Works Departments serves as the lead. |
| Water Contingency Plan | The Water Contingency Plan is updated on an as-needed basis. During the next update, relevant information from the 2023 HMP will be incorporated, such as profiles and mitigation actions as deemed appropriate. The Town Clerk will serve as the lead for integrating the HMP into future updates. |
| County Community Wildfire Protection Plan (CWPP) | The 2023 HMP will be utilized to inform the 5-year update of the County 2019 CWPP. In particular, the risk assessment used in the 2023 HMP is a more recent wildfire risk assessment (State's 2020 Forest Action Plan). HMP wildfire actions will also be reviewed for incorporation in the CWPP. The South Central Mountain Resource Conservation and Development Council is taking the lead on securing funding and overseeing the CWPP Update. The Town participates through the Greater Ruidoso WUI Working Group. |

**Figure 7-1-5: Future Plan Integration Strategy for Village of Capitan**

| **Plan Integration Strategy for Next 5 Years:** | |
|---|---|
| **Planning Mechanism** | **Description of Planning Mechanism Opportunity** |
| Village Comprehensive Plan | The next update of the 2013 Comprehensive Plan will not occur until 2033 and there will be two Hazard Mitigation Plan (HMP) updates prepared prior to that time. The most current HMP information on risk assessments, capabilities, and mitigation strategy concepts will be integrated into the Comprehensive Plan update. The Fire Chief will serve as the Planning Team liaison. However, each Department Director will serve as subject matter expert for the relevant topics. |
| Drinking Water Bureau Emergency Response Plan | The 2015 Drinking Water Emergency Response Plan is updated on an as-needed basis. During the next update, relevant information from the 2023 HMP will be incorporated, including hazard profile information and mitigation actions. The Water Systems Manager will serve as the lead for integrating the HMP into future updates. |

| Plan Integration Strategy for Next 5 Years: | |
|---|---|
| **Planning Mechanism** | **Description of Planning Mechanism Opportunity** |
| County Community Wildfire Protection Plan (CWPP) | The 2023 HMP will be utilized to inform the 5-year update of the County 2019 CWPP. In particular, the risk assessment used in the 2023 HMP is a more recent wildfire risk assessment (State's 2020 Forest Action Plan). HMP wildfire actions will also be reviewed for incorporation in the CWPP. The South Central Mountain Resource Conservation and Development Council is taking the lead on securing funding and overseeing the CWPP Update. The Fire Chief will serve as the Planning Team liaison from the Village. |

**Figure 7-1-6: Future Plan Integration Strategy for Village of Corona**

| Plan Integration Strategy for Next 5 Years: | |
|---|---|
| **Planning Mechanism** | **Description of Planning Mechanism Opportunity** |
| Village Comprehensive Plan | The next update of the 2013 Comprehensive Plan will not occur until 2033 and there will be two Hazard Mitigation Plan (HMP) updates prepared prior to that time. The most current HMP information on risk assessments, capabilities, and mitigation strategy concepts will be integrated into the Comprehensive Plan update. The Village Clerk will serve as the Planning Team liaison. However, each Department Director will serve as subject matter expert for the relevant topics. |
| County Community Wildfire Protection Plan (CWPP) | The 2023 HMP will be utilized to inform the 5-year update of the 2019 County CWPP. In particular, the risk assessment used in the 2023 HMP is a more recent wildfire risk assessment (State's 2020 Forest Action Plan). HMP wildfire actions will also be reviewed for incorporation in the CWPP. The South Central Mountain Resource Conservation and Development Council is taking the lead on securing funding and overseeing the CWPP Update. The Village participates through the Greater Ruidoso WUI Working Group. |