Chapter 2: Hazard Identification and Risk Assessment

An existing HMP could not be located by the Chairman of the HMPT, the State of New Mexico Mitigation Officer or the consultant. Therefore, the HMPT was tasked with identifying and prioritizing hazards and mitigation projects for the first time. Through a series of meetings documented in Appendix A, the HMPT was provided information on the mitigation process, how to identify hazards, and potential mitigation projects appropriate for Catron County and the Village of Reserve.

Tables 3 and 4 outline how and what hazards were identified by the HMPT for Catron County and the Village of Reserve. These hazards are listed in order of priority as determined by the majority of the HMPT. A brief summary of the relevant issues is provided for these hazards with more detail regarding each hazard provided later within this Plan.

Table 3: Catron County Hazards

Hazard	Why identified
Wildfire/Wildland Urban Interface	Hundreds of acres in Catron County are forested and as such are susceptible to wildfires. Recent historical management of forest has contributed to higher than healthy tree densities and accumulation of fuels present a significant, continued threat of wildfire to structures located in the wildland-urban interface area. Additionally, the County's water comes from the watersheds located within the forest and is threatened by wildfires.
Floods/Flash Floods	Flash floods are aptly named: inundation can occur suddenly with high velocity stormwater flows. Although the duration of these events is usually brief, the damages can be quite severe. In the past, flash floods have affected many low-lying areas throughout Catron County and this is expected to continue. However, specific impacts depend on the location, duration, and quantity of rainfall and are therefore difficult to predict. Flash floods are more likely to occur in drainage ways that receive runoff from watersheds with steep slopes and narrow stream valleys.
Severe Weather (winter storms, extreme cold)	Catron County is susceptible to a full range of weather conditions, including winter storms/extreme cold. Due to the elevation and topography, winter weather is most likely to threaten the population in Catron County.
Drought	A drought is a period of prolonged dryness that depletes both ground and surface water. Droughts are common in New Mexico. The southwestern climate is arid with average annual precipitation ranges from less than 12 inches. This normally meager annual precipitation causes extended periods of scant flow in rivers, and any measurable decrease in precipitation rates can create drought conditions in a relatively short period of time. Additionally, recovery from drought conditions may take years of above average precipitation to replenish rivers, reservoirs and groundwater.

Table 4: Village of Reserve Hazards

Hazard	Why identified
Wildfire/Wildland Urban Interface	The Village of Reserve is surrounded by hundreds of forested acres that are susceptible to wildfires. Recent historical management of forest has contributed to higher than healthy tree densities and accumulation of fuels present a significant, continued threat of wildfire to structures in the Village of Reserve.
Floods/Flash Floods	Flash floods are aptly named: inundation can occur suddenly with high velocity storm water flows. Although the duration of these events is usually brief, the damages can be quite severe. In the past, flash floods have affected the Village of Reserve and this is expected to continue. Additionally, the uncontrolled San Francisco River runs through the Village of Reserve.
Severe Weather (winter storms, extreme cold)	The residents of the Village of Reserve are especially vulnerable to winter weather, due to their lack of local infrastructure and a high poverty rate.
Drought	A drought is a period of prolonged dryness that depletes both ground and surface water. The Village of Reserve operates a water system for local residents.

The Hazard Identification and Risk Assessment portrays the threats of natural hazards, the vulnerabilities of Catron County and the Village of Reserve to those hazards identified, and the consequences of hazards impacting the community. Each natural hazard identified is addressed as a threat and is identified and further evaluated in the in the Hazard Profile. The vulnerabilities to and consequences of a given hazard are addressed in the Vulnerability Analysis. Vulnerability is analyzed in terms of exposure of both population and infrastructure to each hazard. Consequences are identified as anticipated, predicted, or documented. Impacts caused by a given hazard when considering the vulnerability analysis and the characteristics of the hazard are outlined in the following hazard profiles.

Wildfires

Location

Catron County includes the Gila National Forest, the Apache National Forest and the Cibola National Forest and nearly every structure in the County may be threatened by wildfire. Catron County and the Village of Reserve have been proactive in identifying areas of risk and have a series of CWPP to address both risk and mitigations. These CWPPs are regularly updated and provide a comprehensive list of areas of concern. The Catron County/Village of Reserve HMP will use the information to provide an overview of Wildfire threat to the County and the Village of Reserve. The history and extent of vulnerability in Catron County are identified in the twelve Catron County CWPPs copies of these documents are available at http://www.emnrd.state.nm.us/SFD/FireMgt/cwpps.html.

Catron County

Numerous subdivisions in the Wildland Urban Interface (WUI) along State Highway 60 from Quemado, Pie Town and Datil will present risk to new homes in those areas that are located in or near the WUI. The maps shown in Appendix B, as provided by the Catron County CWPP, illustrates these areas. The HMPT has identified two areas of risk located along State Road 12 from mile marker 32 to marker 36 and the intersection of U.S. 180 & S.R. 12 which threaten both the utility easement and local traffic due to the presence of heavy ladder fuels.

Village of Reserve

Due to its location within a WUI, all structures within in the Village of Reserve are threatened by wildfire (Map 3 Appendix B). The HMPT also identified two areas of concern within the Village of Reserve; Main St. from intersection of State Road 12 to intersection of the one way access road and Esther Street to San Francisco Avenue on the mesa.

Extent

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

Catron County has completed a Community Wildfire Protection Plan (CWPP) for the entire county and also has 11 supplemental CWPPs that provide more in-depth information on Catron County wildfire hazards. Catron County's CWPP was developed to be a landscape scale overview which provides direction and guidelines for short- and long-term planning in Catron County. This HMP will use the CWPPs for examination of wildfire in Catron County. Copies of the CWPPs can be found in on the New

Mexico State Department of Energy, Minerals, and Natural Resources website (http://www.emnrd.state.nm.us/SFD/FireMgt/cwpps.html).

Wildland Urban Interface (WUI) is defined in the Catron County CWPP (2006) as “an area in or adjacent to a) a community, including isolated parcels of private property containing structures, b) infrastructure, or c) watershed. The defined WUI in Catron County is used to identify the location of areas at risk and vulnerable to wildfire. Each of these areas has topographic features and fuel conditions (fuel type, fuel loading and arrangement) that have the potential to endanger that WUI.” The definitions in the Healthy Forests Restoration Act (HFRA) for "at risk community" and "WUI" were used as guidelines for development of collaborative identification of WUIs. WUI fires are a particular concern because they pose risks to human lives, property, structures, and critical infrastructure more directly than the other types of wildland fires.

Every fire season, catastrophic losses occur as a result of wildfire in WUI areas in the western United States. Homes are lost, businesses are destroyed, community infrastructure is damaged, and most tragically, lives are lost. Precautionary action taken before a wildfire strikes often makes the difference between saving and losing a structure. Creating defensible space and reducing the ignitability of homes, businesses, and other structures are important components in wildfire hazard reduction. WUI studies suggest that the intense radiant heat of a wildfire is unlikely to ignite a structure that is more than 30 feet away as long as there is no direct flame impingement. Studies of home survivability indicate that homes with noncombustible roofs and a minimum of 30 feet of defensible space have an 85-percent survival rate (Cohen and Saveland 1997). Conversely, homes with wood shake roofs and less than 30 feet of defensible space have a 15 percent survival rate. The National Fire Protection Associations Standard NFPA 1144 provides a methodology for assessing wildland fire ignition hazards around existing structures, residential developments, and subdivisions and improved property or planned property improvement that will be located in a wildland/urban interface area, and provides minimum requirements for new construction to reduce the potential of structure ignition from wildland fires. Wildfires may also lead to mudslides, floods, and debris flows in areas where the fire removes the vegetative covering along slopes or burns hot enough to create hydrophobic soils (heat damaged soils that resist water penetration).

Wildfires can occur at any time of day and during any month of the year, but the peak fire season in New Mexico (Catron County and the Village of Reserve) is normally from March through July. The length of the fire season and the peak months vary appreciably from year to year. Land use, vegetation, amount of combustible materials present, and weather conditions such as wind, low humidity, and lack of precipitation are the chief factors in determining the number of fires and acreage burned. Generally, fires are more likely when vegetation is dry from a winter with little snow and/or a spring and summer with sparse rainfall, especially if wet antecedent conditions produced an abundance of fine fuels. Wildfires have potential to cause significant injury, death, and damage to property. The potential for property damage from fire increases each year as more properties are developed on forested land and increased numbers of people use these areas and adjacent wildland. Fires can have a serious negative impact on the economy of an affected area, especially the logging, recreation, and tourism industries, upon which many counties depend. Major costs associated with wildfires may include the salvage and removal of downed timber and debris, the restoration of the burned area, replacement of lost infrastructure like fencing, transmission lines and communication towers, and preparation for or

recovery from post-fire flooding. Additionally, agricultural production and food processing systems are highly vulnerable to the effects of wildfire.

The indirect effects of wildfires can also be catastrophic. Large, intense fires can harm the soil, waterways and the land itself. Soil exposed to intense heat may become hydrophobic (lose its capability to absorb moisture and support life). Post-fire impacts may include widespread soil erosion and sedimentation leading to physical degradation of waterways, harm to aquatic life, degraded water quality, and increased risk of flooding and debris flows. Lands stripped of vegetation by wildfires are also subject to increased landslide hazards. Smoke from wildfire threatens air quality and can affect both human and livestock production and health.

Wildfire has greater consequences in some ecosystems than in others. In New Mexico, the interactions between forests, water, and fire are complex and sensitive to disturbance. High elevation forested watersheds produce most of the perennial flow in New Mexico's rivers and recharge underground aquifers. High severity fires in these watersheds can have negative impacts on downstream water supplies. (State of New Mexico Hazard Mitigation Plan 2018)

The criteria to be used when establishing WUI boundaries in the Catron County Community Wildfire Protection Plan (CWPP) were:

1. Fuel Hazard Threat Level
2. Risk of Occurrence
3. Values at Risk

The Catron County CWPP identifies 196 WUIs with a total 2,863 structures in the WUIs countywide. Each WUI is addressed within the 11 supplemental CWPPs. Table 5 captures the total number of homes and an approximate value at risk within the County and the Village.

Table 5: Housing Units at Risk

Affected Region	Housing Units	Median Value	Value of Housing Units at Risk 2018
Catron County	2585	$166,000	$429,110,000
Village of Reserve	278	$89,200	$24,797,600

Map 1 in Appendix B identifies the overall Wildfire Risk within Catron County CWPP. Risk is defined by:

A low rating is considered to be within the natural (historical) range of variability or characteristic vegetation and fuels conditions.

Moderate and high indicate uncharacteristic conditions and may indicate an over- abundance of very dense timber that is a high threat.

The Fire Danger Rating System included in Table 6 below was created as a method of conveying in a simple way the relative danger level to the public. Note that the National Wildfire Coordinating Group announced that the National Fire Danger Rating System 2016 (NFDRS2016) will replace the existing 1978 and 1988 NFDRS models by May 2020. Additional information can be found at https://www.nwcg.gov/sites/default/files/memos/eb-m-18-001.pdf

Table 6: Fire Danger Rating System

Fire Danger Rating System		
Rating	**basic description**	**detailed description**
CLASS 1: Low Danger (L) COLOR CODE: **Green**	Fires not easily started	Fuels do not ignite readily from small firebrands. Fires in open or cured grassland may burn freely a few hours after rain, but wood fires spread slowly by creeping or smoldering and burn in irregular fingers. There is little danger of spotting.
CLASS 2: Moderate Danger (M) COLOR CODE: **Blue**	Fires start easily and spread at a moderate rate	Fires can start from most accidental causes. Fires in open cured grassland will burn briskly and spread rapidly on windy days. Woods fires spread slowly to moderately fast. The average fire is of moderate intensity, although heavy concentrations of fuel – especially draped fuel -- may burn hot. Short-distance spotting may occur, but is not persistent. Fires are not likely to become serious and control is relatively easy.
CLASS 3: High Danger (H) COLOR CODE: **Yellow**	Fires start easily and spread at a rapid rate	All fine dead fuels ignite readily and fires start easily from most causes. Unattended brush and campfires are likely to escape. Fires spread rapidly and short-distance spotting is common. High intensity burning may develop on slopes or in concentrations of fine fuel. Fires may become serious and their control difficult, unless they are hit hard and fast while small.
CLASS 4: Very High Danger (VH) COLOR CODE: **Orange**	Fires start very easily and spread at a very fast rate	Fires start easily from all causes and immediately after ignition, spread rapidly and increase quickly in intensity. Spot fires are a constant danger. Fires burning in light fuels may quickly develop high-intensity characteristics - such as long-distance spotting - and fire whirlwinds, when they burn into heavier fuels. Direct attack at the head of such fires is rarely possible after they have been burning more than a few minutes.
CLASS 5: Extreme (E) COLOR CODE: **Red**	Fire situation is explosive and can result in extensive property damage	Fires under extreme conditions start quickly, spread furiously and burn intensely. All fires are potentially serious. Development into high-intensity burning will usually be faster and occur from smaller fires than in the Very High Danger class (4). Direct attack is rarely possible and may be dangerous, except immediately after ignition. Fires that develop headway in heavy slash or in conifer stands may be unmanageable while the extreme burning condition lasts. Under these conditions, the only effective and safe control action is on the flanks, until the weather changes or the fuel supply lessens.

Hundreds of acres in Catron County including the Village of Reserve are forested and as such are susceptible to wildfires. Recent historical management of forest has contributed to higher than healthy tree densities and accumulation of fuels present a significant, continued threat of wildfire to structures located in the wildland-urban interface area. Additionally, the County's water comes from the watersheds located within the forest and is threatened by wildfires. Catron County and the Village of Reserve may experience the full range of severity as described in the Fire Danger Rating system above. Fire danger has and will likely continue to extend from Low Danger - Code Green to the highest danger rating of Extreme – Code Red.

All communities in Catron County have been identified by the New Mexico Forestry Division as either medium or high risk for wildfire. Catron County is located in State Preparedness Area 6. Map 4 in Appendix B shows the extent of wildfire hazard potential throughout State Preparedness Area 6 and Catron County. This area has experienced more acreage burned than any other preparedness area in the State. This is primarily due to the Whitewater-Baldy Fire Complex wildfire that was the largest wildfire in State history. The severity of a wildfire is largely determined by the number of acres that it consumed, and the magnitude of the Whitewater-Baldy Fire Complex fire is evidence that the combination of fuel conditions and difficult terrain within Catron County have a high likelihood of sustaining a large wildfire again.

Previous Occurrences

In June 2012 the Cable News Network (CNN) reported the Whitewater-Baldy Fire Complex to be the largest wildfire in New Mexico's history. The fire started in May of 2012 in the Gila Wilderness located within Catron County. The fire produced enough smoke to prompt officials to caution that children, adults with heart disease and other sensitive groups should not go outdoors.

Lightning ignited the Whitewater-Baldy Fire Complex wildfire on May 9, 2012 flames devoured 227,000 acres (more than 354 square miles) by early June. Over 1,200 personnel were involved in fighting the fire but it was less than 15% contained nearly a month later.

Two separate strikes of lightning caused the mountainous fire: the Baldy Fire started May 9, 2012 in an inaccessible area of the rugged wilderness, and the Whitewater Fire was reported on May 16 several miles west of the Baldy Fire, Forest Service officials said. The two fires in the Gila National Forest combined May 23, enhanced by drought and sustained winds of 40 mph to 50 mph, authorities said.

It was the May 16 event that led crews to try to suppress the entirety of the fire but "the extreme fire activity, coupled with incredibly rugged terrain and large boulders falling down the steep canyons forced fire crews out of the area. The fire began 15 miles east of Glenwood, New Mexico, and was fueled by conifers, ponderosa pines, pinons, junipers and grass. Residents were evacuated in the unincorporated communities of Mogollon and Willow Creek. Although the residents of the Village of Reserve were not evacuated and the Village was not impacted directly by the fire, its residents, businesses, and community were impacted by the large emergency response to the fire and the impacts from smoke in the nearby area.

Although wildfires are known to occur in Catron County and the Village of Reserve, no other wildfires were reported in the National Centers for Environmental Information (NCEI).

Vulnerability

The potential for property damage from fire increases each year as more recreational properties are developed on forested land and increased numbers of people use these areas. Fires can extensively affect the economy of an affected area, especially the logging, recreation, and tourism industries, upon which many counties depend. Major direct costs associated with wildfires are the salvage and removal of downed timber and debris and the restoration of the burned area. Additionally, agricultural production and food processing systems are highly vulnerable to the effects of wildfire. The indirect effects of wildfires can also be catastrophic. In addition to stripping the land of vegetation and destroying forest resources, large, intense fires can harm the soil, waterways and the land itself. Soil exposed to intense heat may lose its capability to absorb moisture and support life. If burned-out woodlands and grasslands are not replanted quickly, widespread soil erosion, mudflows and siltation of rivers could result, thereby enhancing flood potential, harming aquatic life and degrading water quality. Lands stripped of vegetation by wildfires are also subject to increased landslide hazards. Smoke from fires threatens air quality and can affect both human and livestock production and health.

Future Probability

All communities in Catron County have been identified by the New Mexico Forestry Division as having either medium or high risk of wildfire including the Village of Reserve. Catron County is located in State Preparedness Area 6. This area has experienced the most acres burned than any other Preparedness Area in the State of New Mexico. Map 4 in Appendix B shows the wildfire hazard potential model results for Preparedness Area 6. This map shows the extent and potential for wildfire within Catron County.

The risk of wildfire presented in Map 4 was based on various criteria including:

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

Development of the current and future subdivisions continue to increase the complexity of the wildland/urban interface in Catron County and the Village of Reserve as the communities grow in close proximity of the Gila National Forest, Cibola National Forest, Bureau of Land Management administered lands and New Mexico State Trust lands. As the number of subdivisions and concurrent population rises, the potential for catastrophic wildland/urban interface fires will only worsen if the unhealthy state of forest on both public and private lands is left unmanaged (Catron County CWPP, 2015).

The Catron County CWPP identifies 196 WUIs with a total 2,863 structures currently in the WUIs countywide. Due to the location within heavily forested areas, vegetation and ladder fuel overgrowth, the probability of drought and the medium to high risk of wildfire already identified, there is a 100% probability that a devastating wildfire will again threaten Catron County within the next 5 years. Although the Village of Reserve is relatively small in terms of total land and the amount of forest contained within the

Village boundaries, it is also 100 percent probable that a devastating wildfire in the surrounding forest will impact the Village of Reserve due to its proximity to wildland, the effects of smoke from wildland fires in the area and the potential evacuation of the Village and surrounding areas.

Flooding

Location

Catron County

No Special Flood Hazard Areas (SFHA) are mapped in the unincorporated portions of Catron County, however, flash flooding can and does occur throughout Catron County (Appendix B Map #5). Since the unincorporated areas in Catron County are sparely populated flooding events can and do occur without creating any reportable damage. However, areas along the banks of rivers and creeks are vulnerable to flood damages. The HMPT identified several locations within the County that have been historically known to flood and have sustained repeated damages to the road and to the bridges. Whitewater Creek and Mineral Creek bridge crossing have repeated issues with debris accumulation that causes road wash outs and threatens homes in lower areas. Sediment accumulates at the Apache Creek Bridge during high water events and the San Francisco River from the Village of Reserve to the Lower Frisco suffers from river bank erosion that threatens property along the river.

Village of Reserve

The Flood Plain Map #6, located in Appendix B, identifies two SFHAs within the Village of Reserve. The first borders Hwy 12 to the south and east. No homes appear to be located within the SFHA. The second area is in the southeastern corner of the Village of Reserve and includes a portion of the Reserve Municipal Sewer Plant. The entire Village of Reserve is also vulnerable to flash flooding.

Extent

Nationwide, hundreds of floods occur each year; making flooding one of the most common hazards in all 50 states and U.S. territories. Most injuries and deaths from flooding happen when people are swept away by flood currents and most property damage results from inundation by sediment-filled water. The majority of flood events in the U.S. involve inundation of floodplains associated with rivers and streams and shoreline inundation along lakes and coastlines.

Flash floods are aptly named: inundation can occur suddenly with high velocity stormwater flows. Although the duration of these events is usually brief, the damages can be quite severe. In the past, flash floods have affected many low-lying areas throughout Catron County and this is expected to continue. However, specific impacts depend on the location, duration, and quantity of rainfall and are therefore difficult to predict. Flash floods are more likely to occur in drainage ways that receive runoff from watersheds with steep slopes and narrow stream valleys. The uncontrolled San Francisco River runs through the Village of Reserve raising the level of potential damage.

Catron County and the Village of Reserve can anticipate three types of flooding riverine, flash flooding, and low area ponding.

Riverine flooding:

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

Parts of seven major drainage basins are within the two regional river basins in the county Carrizo Wash, North Plains, Rio Salado, San Agustin, Alamosa Creek, Gila, and San Francisco Basins. The San Francisco, Gila, and Tularosa Rivers typically flow perennially. During periods of low flow, most streamflow is derived from baseflow. The stream channels of the Rio Salado and Carrizo Wash Basins are commonly perennial in their upper reaches and ephemeral in their lower reaches. Largo Creek in the Carrizo Wash Basin is perennial downstream from Quemado Lake and ephemeral in the lower reaches (USGS, 1997). Each of the rivers and washes has the potential of causing flooding along its paths. The amount of water flowing through a river at any given time determines the river's depth. When a higher than normal amount of water finds its way into a river or stream, the height of the water relative to its path increases. When this occurs, the river will overflow its normal banks and flood the surrounding area to the water's present height. The height of the river's banks determines how far out a flood will spread. This type of flooding, like flash flooding, will begin at some point above where the flooding occurs.

Flash flooding

A flash flood is an extremely dynamic event in which a high volume of water moves through an area at high velocity during a very short time period. This type of flooding can be very difficult to predict and can occur with little or no warning. In many cases, flash floods can move through an area miles from where rain has occurred, thereby increasing the danger to people within the flood's path.

Photo credit: Dough Boykin, NM State Forestry

Flash floods are created as a result of rainfall. As rain water runs into small channels, it begins to collect. As these channels merge together, the amount of water increases and picks up speed and force. This collection of water becomes a wall of water that can wash vegetation, structures, and debris along with it. This debris then increases the amount of force available and increases the flood's destructive power.

Other factors that affect the dynamics of this type of flood include slope, width, and vegetation that are in place along the banks of the water course. The slope that a flash flood traverses has a definite relation to the overall speed in which the water will travel. The steeper the incline, the faster the water will travel. The incline on which the water moves affects the width of the flooding area. Generally, the faster the water moves the narrower will be the channel that is created, since the water digs the channel deeper as it flows. When the water flows on a shallower slope, the water tends to spread out more, which can decrease its potential to cause mass damage. However, it must still be considered dangerous. Finally, the type of vegetation located along the flood's path can prevent further erosion of the channel banks. A structure lying along a flood channel that has no surrounding vegetation is at risk of having its foundation undercut, which can cause structural damage, or in some cases, the building's complete collapse.

Locations downhill and downstream from burned areas are very susceptible to flash flooding and debris flows, especially near steep terrain. Rainfall that would normally be absorbed will run off extremely quickly after a wildfire, as burned soil can be as water repellant as pavement. As a result much less rainfall is required to produce a flash flood. As water runs downhill through burned areas it can create major erosion and pick up large amounts of ash, sand, rocks and burned vegetation. The force of the rushing water and debris can damage or destroy culverts, bridges, roadways, and buildings even miles away from the burned area. (http://www.weather.gov/riw/burn_scar_flooding).

The time required for a flash flood on a burn scar to begin depends on how severe the fire was and how steep the terrain is, combined with the rate of precipitation. Steep terrain combined with a severe burn scar and light precipitation can result in flash flooding within minutes of precipitation beginning. Areas of less severe burn damage and flatter terrain will be able to absorb more water leading to more time before flooding develops even in heavier precipitation. A general rule of thumb is that half an inch of rainfall in less than an hour is sufficient to cause flash flooding in a burn area, but this can be more or less depending on the factors above. The susceptibility to flash flood within the burned area is greatest during the first two years following the fire. The important point is that for any burn area it will take much less rainfall to result in flash flooding than it would have before the wildfire occurred. In fact, Thunderstorms that develop over burn areas can produce flash flooding and debris flows nearly as fast as National Weather Service radar can detect the rainfall. If heavy rainfall is observed even for a very short time there is the potential for flash flooding and/or debris flows. This depends on the severity of the wildfire that occurred as well as how much erosion occurs. It could take many years for vegetation to become reestablished and this is the main factor in slowing the precipitation run off that creates flash flooding and debris flows. Most burn areas will be prone to this activity for at least two years. Each wildfire burn area poses its own unique risk of flash flooding due to many factors including proximity to population centers, burn severity, steepness of terrain, and size of the burned area.

Basin ponding

Basin ponding is simply water's natural inclination to flow toward the lowest point. In areas that have no or inadequate storm drainage systems, the water will form a temporary pond at the area's lowest point. The extent to which this occurs depends on the amount of water flowing into the depression and the lack of systems to divert water away from it.

The extent of flooding associated with a one percent annual probability of occurrence—the base flood—is used as the regulatory boundary by a number of federal, state, and local agencies. Also referred to as

the Special Flood Hazard Area, this boundary is a convenient tool for assessing vulnerability and risk in flood-prone communities since many communities have maps that show the extent of the base flood and the likely depths that will be experienced. The base flood is often referred to as the 100-year flood. Since its one-percent probability of occurring in any one year implies a recurrence interval of 100 years, this is often mistaken to have a literal meaning of "once every 100 years." Experiencing a 100-year flood does not mean a similar flood cannot happen for the next 99 years; rather, it reflects the probability that over a long period of time, a flood of that magnitude should occur in only one-percent of all years. Smaller floods occur more often than larger (deeper and more widespread) floods. Maps 5 and 6 in Appendix B provide an overview of the County and Village flood zones.

The determination of the extent of the base flood for Catron County and the Village of Reserve is assumed to account for flash flooding events as well. Therefore, the base flood extent is used for this HMP as an approximation of the area that may be affected by a significant flash flood of that recurrence interval.

Table 7 shows a range of flood recurrence intervals and their probabilities of occurrence. Every year, a 10-year flood has a greater likelihood of occurring (10% chance) than a 100-year flood (one-percent chance).

Table 7: Flood Probability Terms

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

Source: Floods – Recurrence intervals and 100-year floods; USGS
http://ga.water.usgs.gov/edu/100yearflood.html

Vulnerability

No areas are identified in the unincorporated areas of Catron County and only a small portion of the Village of Reserve is located in the flood zone. Currently no homes or businesses have been identified in a flood zone, a portion of the waste water treatment plant is in a flood zone and portions of Highway 12 north of the Village of Reserve.

After the Whitewater-Baldy Fire few trees and ground cover are left on the burn scar providing little protection from any rain event, several smaller flood events during the regular monsoon seasons and the 2012 Pacific tropical storm season caused a microburst over the Whitewater-Baldy scar in the first days of October 2012, and also in the first several days of September 2013 devastating Catron County communities and landmarks.

Previous Occurrences

The National Oceanic and Atmospheric Administration (NOAA)'s Storm Events Database was used to gather historic information for flooding events in Catron County (Table 8). The Storm Events Database contains the records used to create the official NOAA Storm Data publication, documenting:

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

The database currently contains data from January 1950 to December 2016, as entered by NOAA's National Weather Service (NWS). Due to changes in the data collection and processing procedures over time, there are unique periods of record available depending on the event type. NCEI has performed data reformatting and standardization of event types but has not changed any data values for locations, fatalities, injuries, damage, narratives and any other event specific information.

The National Weather Service (NWS) reported heavy rain events in Catron County in September 2013. A deep upper level low pressure system that became relatively stationary over the Great Basin beginning on September 10th provided a steady stream of near record monsoon moisture over New Mexico. This unprecedented heavy rain event resulted in saturated ground over much of New Mexico and directly contributed to additional flooding due to strong to severe thunderstorms. Flooding and was reported from numerous locations throughout the county.

Catron County

The following tables summarize the flooding events that have been reported to the NWS since 1950.

Table 8: Flooding Events in Catron County

Location	Date	Event
Gila Cliff Dwellings	09/12-09/15/2013	Flooding along the Gila River caused closures of FR 614 into Lower Forks Campground and FR 528 into Grapevine Campground. Additional long duration heavy rainfall in the area forced the Gila River to rise 15 feet near the Gila Cliff Dwelling Monument with significant flooding. Access to monument and visitor center not possible. All campgrounds in the region closed, including Lower and Upper Scorpion. Five to 8 feet rapid water rise with debris in the Middle Fork Gila River near the Gila Cliff Dwellings Visitor Center. Observer never witnessed anything like it and was concerned flood would wipe out USGS gauge. Bridge did not get washed out. Search and rescue efforts initiated for 2 stranded hikers.
Pie Town	09/12-09/15/2013	A creek overflowed its banks into nearby ranch buildings northeast of Pie Town. Numerous roads washed out across northeastern Catron County including York Ranch Road.
Near the Village of Reserve	09/13-09/15/2013	Flooding along Tularosa Creek and nearby arroyos lead to flooding on Tularosa River.
Alma	09/14-09/15/2013	San Francisco River breached its banks and levees at Reserve, Elm, and Glenwood. Power outages occurred in the community of Wild Horse. 18 hunters were evacuated and another 18 hunters were stranded near the San Francisco River. An elk fence was washed away and nearby fields flooded at Alma. Mineral Creek measured a peak flow of

		868 cfs (4.39 feet) at 145am on the 15th which was 7 to 8 times higher than any other flow ever observed. US 180 closed due to water from Mineral Creek flooding roadway. NM 159 closed east of US 180 as well. Water in several homes in Alma.
Glenwood	09/14-09/15/2013	Catastrophic flooding in the Glenwood area. Whitewater Creek topped the US 180 bridge at Pleasanton. The San Francisco River at Glenwood rose to its 2nd highest crest ever observed at 29,900 cfs (18.7 feet) at 2am then fell sharply around sunrise. A flash flood emergency was posted for Glenwood. A levee at Circle Drive in Glenwood was breached flooding 16 residences with about 3 feet of water. A large metal barn was moved into the river bed. The Catwalk area northeast of Glenwood was completely destroyed. Whitewater Creek at the Catwalk measured a peak flow of 16,100 cfs (19.07 feet) at 1115pm on the 14th which was 5 to 6 times higher than any other flow ever observed. The suspended portion of the Catwalk area within the canyon was washed out. A 30 feet section of a concrete girder bridge was destroyed. The campground was completely covered in silt with minor damage. Trails within the park were destroyed.
Mogollon	09/14-09/15/2013	The road to the community of Mogollon was completely destroyed. All homes and business along the creek in Mogollon were flooded and damaged. Several vehicles were carried away, destroyed, and left in the bottom of the creek bed. The USFS delivered MREs, water, and sanitary supplies to Mogollon by foot and with 2 mules. Police records show one fatality directly associated with this event. A man was drowned in his vehicle as he attempted to evacuate Mogollon.

Table 9: Flash flood events since 1950 in Catron County

Location	Date	Damage to Property	Damage to Crops
Glenwood	9/21/1997	$0	$0
Glenwood	9/11/2002	$0	$0
Cruzville	7/27/2006	$0	$0
Apache Creek	8/13/2006	$0	$0
Glenwood	12/1/2007	$0	$0
Glenwood	1/27/2008	$10,000	$500
Quemado Arpt	7/15/2008	$25,000	$0
Quemado	7/22/2008	$15,000	$0
Luna	7/11/2011	$1,000	$0
Mogollon	8/26/2012	$10,000	$0
Mogollon	7/4/2013	$0	$0
Negrito Arpt	7/15/2013	$0	$0
Alma	7/26/2013	$0	$0
Alma	8/10/2013	$5,000	$0
Luna	8/11/2013	$0	$0
Mogollon	9/1/2013	$0	$0
Glenwood	9/3/2013	$0	$0

Alma	9/14/2013	$60,000	$0
Mogollon	9/14/2013	$1,500,000	$0
Pleasenton	9/14/2013	$1,000,000	$0
Glennwood	9/14/2013	$250,000	$0
Horse Spgs	7/31/2014	$10,000	$0
Total	**23 events**	**$2,661,000**	**500**

Table 10: Flooding from Heavy Rain since 1950 in Catron County

Location	Date	Damage to property	Damage to Crops
Mogollon	7/12/2013	$0	$0
Tres Lasgunas	9/12/2013	$20,000	$0
Pietown	9/13/2013	$50,000	$0
Aragon	9/13/2013	$50,000	$0
Total	**4 events**	**$120,000**	**$0**

Village of Reserve

Table 11: Flash Flood Events since 1950 in the Village of Reserve

Location	Date	Damage to Property	Damage to Crops
Village of Reserve	8/28/1998	$150,000	$0
Village of Reserve	8/10/1999	$0	$0
Village of Reserve	8/13/2006	$0	$0
Negrito Arpt	7/15/2013	$0	$0
Negrito Arpt	9/14/2013	$0	$0
Total	**5 events**	**$150,000**	**$0**

Table 12: Flooding from Heavy Rain in 1950 in the Village of Reserve

Location	Date	Damage to property	Damage to Crops
Reserve Negrito Arpt	1/27/2008	$25,000	$0
Reserve Negrito Arpt	1/22/2010	$5,000	$0
Reserve Negrito Arpt	9/12/2013	$0	$0
Reserve Negrito Arpt	9/14/2013	$100,000	$0
Total	**4 events**	**$130,000**	**$0**

NFIP

The National Flood Insurance Program (NFIP) aims to reduce the impact of flooding on private and public structures. It does so by providing affordable insurance to property owners, renters and businesses and by encouraging communities to adopt and enforce floodplain management regulations. These efforts help mitigate the effects of flooding on new and improved structures. Overall, the program reduces the socio-economic impact of disasters by promoting the purchase and retention of general risk insurance, but also of flood insurance, specifically.

Catron County has had limited participation in the NFIP since 2013 when a flood plain manager was hired for the County. Catron County adopted the Catron County Flood Damage Prevention Ordinance in June of 2012 to comply with NFIP. Currently the County has a new acting flood plain manager who is tasked with management of the program. The County Ordinance affirms their goal to participate in the NFIP and provide tools to mitigate flooding. The lack of a designated Flood Plain Manager or planning and zoning departments has limited participation. One of the objectives for the Flood Plain Manager within the next five years is to increase the participation of the County in the NFIP and update the NFIP with maps within the database for the County.

Repetitive Loss

Based on research through the State of New Mexico Floodplain Management Division no structures have been reported as a repetitive loss structure in Catron County or the Village of Reserve.

Future Probability

Flash flooding is an annual event in New Mexico. Wildfire and drought also increases the severity of flash flooding due to soils becoming hydrophobic, repelling or incapable of dissolving in water, resulting in increased runoff and erosion. Risk of flooding will remain high in Catron County as a result of the Whitewater-Baldy fire. Potential issues include increased flow velocity due to limited revegetation in the burn scar area, debris flow, additional sediment load as well as sediment build up in the waterways. A United States Geological Survey Report contained a combined probability and Volume Relative Hazard ranking of Post Wildfire Debris Flows as a result of the Whitewater-Baldy Fire. Depending on the specific basin within the watershed, the probability of a flood event includes the highest probability of occurrence as shown in Map 7 in Appendix B. Given the fact that numerous basins within the watershed have a high probability of occurrence, it is anticipated that the probability of a flood event occurring within the Catron County and the Village of Reserve within the next five years is near 100 percent.

Catron County

Due to the occurrence of both NWS reported events as well as events reported by the Catron County HMPT, there is a 100% probability of flash flooding due to the monsoon seasonal storm, burn scars or snow run-off effecting parts of Catron County within the next 5 years.

Village of Reserve

Due to the occurrence of both NWS reported events as well as events reported by the Catron County HMPT, there is a 100% probability of flash flooding due to the monsoon seasonal storms effecting the Village of Reserve within the next 5 years.

Severe Weather

Location

Catron County - All portions of Catron County are equally vulnerable to severe weather.

Village of Reserve - All of the Village of Reserve is equally vulnerable to severe weather

Extent

A winter storm is a combination of heavy snow, blowing snow and/or dangerous wind chills. A winter storm can be life threatening.

Blizzards are dangerous winter storms that are a combination of blowing snow and wind resulting in very low visibilities. While heavy snowfalls and severe cold often accompany blizzards, they do not always accompany a blizzard. Strong winds can sometimes pick up snow that has already fallen, creating a ground blizzard.

An ice storm is a storm which results in the accumulation of at least .25" of ice on exposed surfaces. They create hazardous driving and walking conditions. Tree branches and powerlines can easily snap under the weight of the ice.

Types of Winter Precipitation

Snow

Most precipitation that forms in wintertime starts out as snow because the top layer of the storm is usually cold enough to create snowflakes. Snowflakes are just collections of ice crystals that cling to each other as they fall toward the ground. Precipitation continues to fall as snow when the temperature remains at or below 0 degrees Celsius from the cloud base to the ground. Various types of weather events including snow are described below.

- **Snow Flurries**. Light snow falling for short durations. No accumulation or light dusting is all that is expected.
- **Snow Showers**. Snow falling at varying intensities for brief periods of time. Some accumulation is possible.
- **Snow Squalls**. Brief, intense snow showers accompanied by strong, gusty winds. Accumulation may be significant. Snow squalls are best known in the Great Lakes Region.
- **Blowing Snow**. Wind driven snow that reduces visibility and causes significant drifting. Blowing snow may be snow that is falling and/or loose snow on the ground picked up by the wind.
- **Blizzards**. Winds over 35mph with snow and blowing snow, reducing visibility to 1/4 mile or less for at least 3 hours. Precipitation falls as snow when the temperature remains at or below 0 degrees Celsius from the cloud base to the ground.

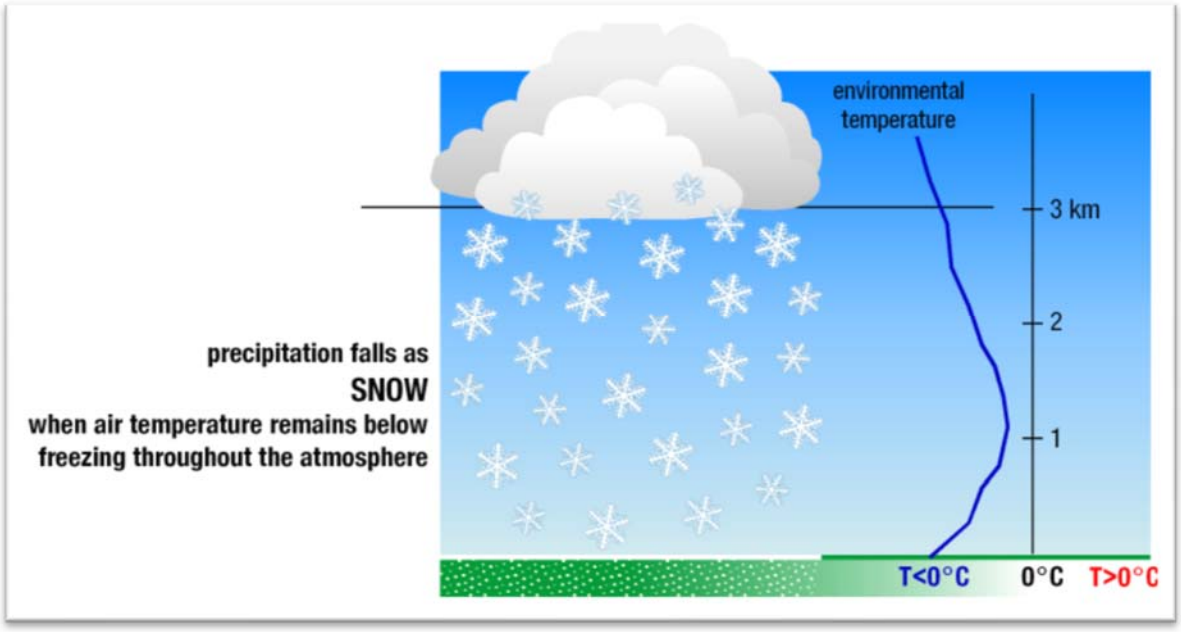

Figure 1: Snow Formation

Sleet

Sleet occurs when snowflakes partially melt while falling through a shallow layer of warm air. These slushy drops refreeze as they fall through a layer of freezing air above the surface, and eventually reach the ground as frozen rain drops that bounce on impact.

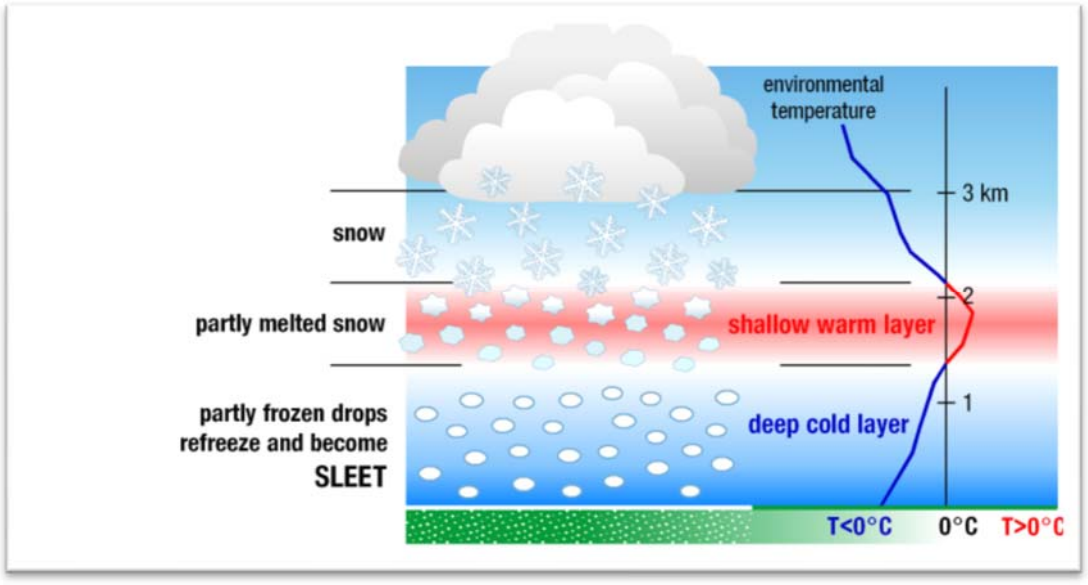

Figure 2: Sleet Formation

Freezing Rain

Freezing rain occurs when snowflakes descend into a warm layer of air and melt completely. When these liquid water drops fall through another thin layer of freezing air just above the surface, they don't have enough time to refreeze before reaching the ground. Because they are “supercooled,” they instantly refreeze upon contact with anything that that is at or below 0 degrees C, creating a glaze of ice on the ground, trees, power lines, or other objects. A significant accumulation of freezing rain lasting several hours or more is called an ice storm.

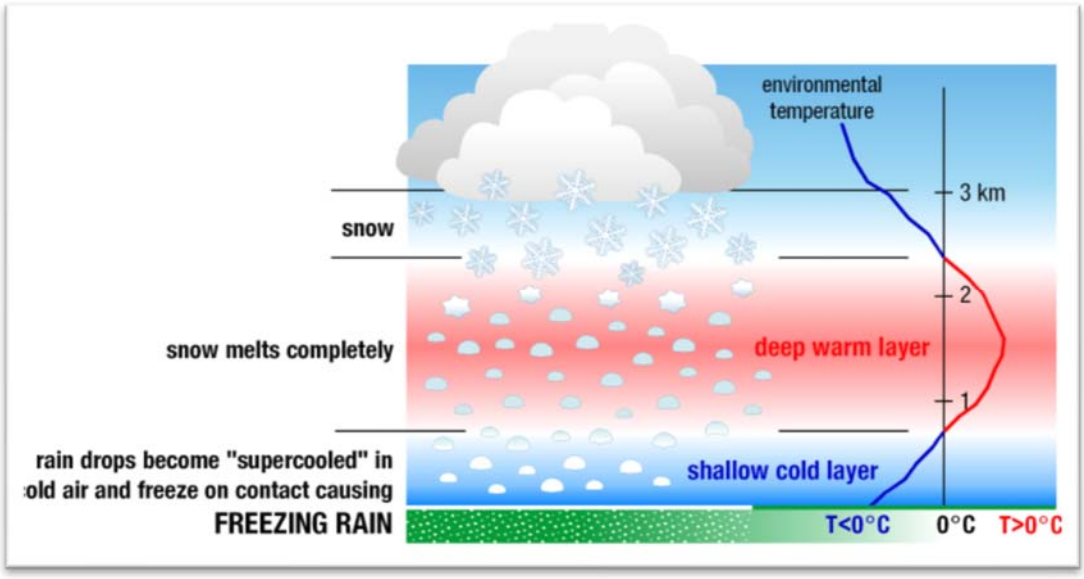

Figure 3: Freezing Rain Formation

The map below obtained from the National Weather Service provides an overview of the average annual snowfall in inches for the entire state of New Mexico. Looking specifically at Catron County, it can be seen that average annual snowfall can range from 1 to 40 inches per year and the Village of Reserve can expect a similar range of snowfall. Given the significant variety of terrain types, it is not unusual that there would be a large range of total snowfall within the County. As expected, larger amounts of snowfall will occur in the higher more mountainous areas of Catron County.

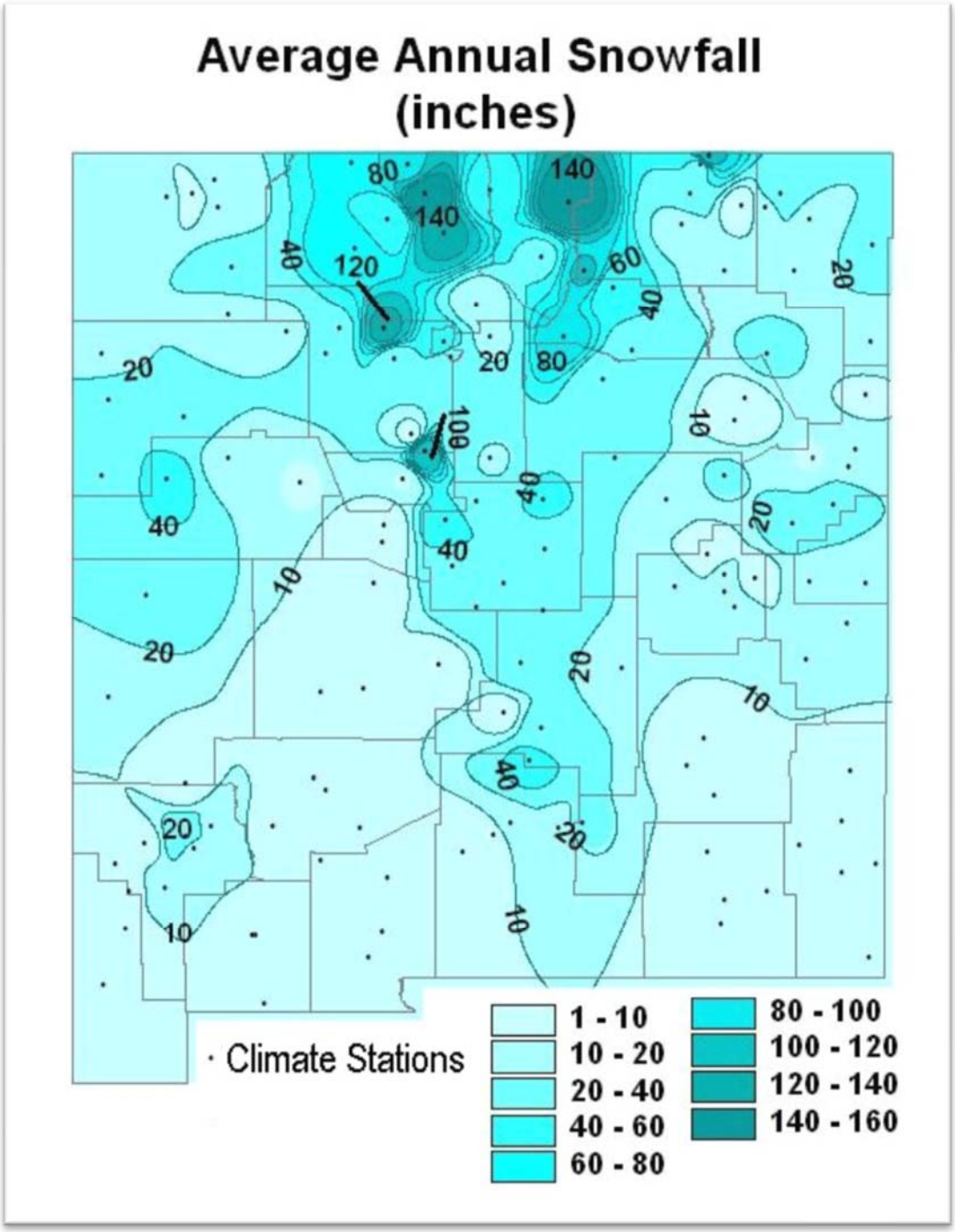

Figure 4: Average Annual Snowfall in New Mexico

Extreme cold events can vary widely across the country and in areas that don't experience cold temperatures as a normal part of winter weather, near freezing temperatures can even be considered extreme temperatures. In general, whenever temperatures drop below normal for a given location for an extended period of time is considered to be extreme. Wind during a cold weather event further

increases the severity of cold temperatures. Wind chill is the lowering of body temperature due to the passing of cold air over the skin. This increases the rate of heat loss from the body and increases the risk of adverse health effects including frostbite. The chart below from the National Weather Service provides an illustration of wind chill values based on the ambient temperature and wind speed.

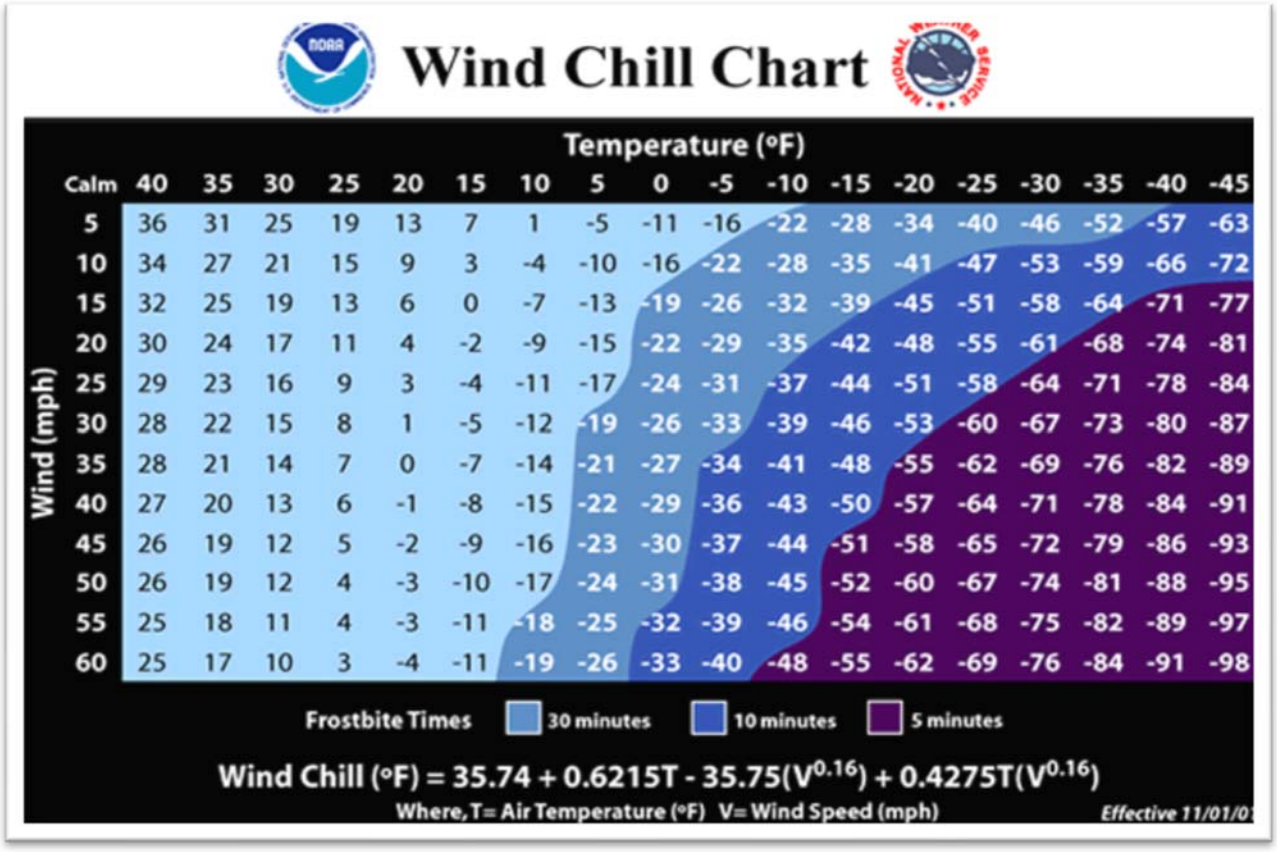

Figure 5: Wind Chill Chart (National Weather Service, 2011)

Catron County is susceptible to a full range of weather conditions, including winter storms/extreme cold. Due to the elevation and topography, winter weather is highly likely to threaten the population in Catron County. The record minimum temperature recorded at the Reserve Ranger Station is -23°F recorded in December 1978 and below zero temperatures have been recorded as recently as January 2013. Resulting wind chill could dip to as low as -69 degrees depending on the wind conditions during periods of extreme cold. The residents of the Village of Reserve are especially vulnerable to winter weather, due to their lack of local infrastructure and a high poverty rate. The Village of Reserve is expected to see the same range of severe weather conditions as Catron County. Most deaths are not a result of the winter storm itself but rather the result of traffic accidents, heart attack from shoveling snow, and hypothermia from prolonged exposure to cold temperatures. However, at least three hunters have been known to freeze to death due to fast onset severe winter storms in Catron County in the 1980's.

Vulnerability

Depending on the degree of preparedness, even small amounts of snow or unexpected low temperatures and wind can have devastating effects on animal health and survival, animal care businesses and personal life. Cold winter weather may be the disaster that causes the most animal deaths. Snow will often accumulate at a rate of 0.5 inches an hour. Snow falling at over 1 inch per hour will lead to rapid disruption. More than 2 inches per hour will invariably disrupt community activities altogether.

Heavy snowfall and blizzards can trap motorists in their cars and trap people and animals inside buildings. The loss of livestock during heavy snowfall and blizzards can be very high. Ice storms can break power lines, causing widespread blackouts. This can be a serious problem for dairy farmers, making it difficult for them to milk their cows. Intensive farm industries, such as swine and poultry operations, may suffer during these storms if their heating systems fail or if fuel cannot be delivered for power generators. Frozen water troughs and snow covering feed bunkers and pastures predisposes animals to malnutrition and dehydration. Fire during winter storms presents a great danger because water supplies may freeze and fire-fighting equipment may not be able to get to the fire. The water supply can be compromised due to frozen pipes and pipes that burst as they thaw. This can be localized to a building or an area of town. Large amounts of snow can also lead to localized flooding when warmer temperatures melt the snow in a short period of time.

Previous Occurrences

The National Oceanic and Atmospheric Administration (NOAA)'s Storm Events Database was used to gather historic information for severe winter weather events in Catron County (Table 13). Severe weather events are defined as:

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

The database currently contains data from January 1950 to December 2016, as entered by NOAA's National Weather Service (NWS). Few events were recorded in the database. However, during discussion of potential hazards in their communities, the HMPT reported nearly annual occurrences of severe weather that is both disruptive and potentially damaging to humans, wildlife, and property. Police records show three lives lost since 1982 as a direct result of hunters becoming lost and perishing in winter storms. Additionally, four hunters and ranch workers have perished due to carbon monoxide poisoning from inadequate heating sources utilized in an attempt to keep warm during severe winter storm events. The events reported in the NWS database, shown in Table 13, do not identify specific impacts to either Catron County or the Village of Reserve.

Table 13: Severe Winter Weather in Catron County

Location	Date	Event	Damage to Property	Damage to Crops
Southwest Mountains (includes Catron County)	12/7/2009	Blizzard	$0	$0
Southwest Mountains	12/29/2010	Blizzard	$0	$0
West Central Plateau (includes Catron County)	2/9/2011	Cold/Wind Chill	$0	$0
Total	**3 events**	**n/a**	**$0**	**$0**

Future Probability

Severe winter weather is an annual event in Catron County and the Village of Reserve. Most of Catron County communities lack local access to grocery stores, health care and supplies that may be needed in an extended period of severe winter weather. Provided the history of severe winter weather events actually reported and more recent low temperatures reported within Catron County, the probability of both Catron County and the Village of Reserve having an extreme weather event in the next five years is nearing 100 percent.

Catron County

There is a 100% probability of severe winter weather effecting the residents of Catron County within the next 5 years.

Village of Reserve

There is a 100% probability of severe winter weather effecting the residents of the Village of Reserve within the next 5 years.

Drought

Location

Catron County

All portions of Catron County are equally effected by drought.

Village of Reserve

All of the Village of Reserve is equally vulnerable to drought.

Extent

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

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

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

- **Agricultural** drought occurs when there is inadequate soil moisture to meet the needs of a particular crop at a particular time. Agricultural drought usually occurs after or during meteorological drought, but before hydrological drought and can affect livestock and other dryland agricultural operations.

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

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

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

Drought status is calculated using several indices that measure how much precipitation for a given period of time has deviated from historically established norms. The Palmer drought severity index

(PDSI) is used by the U.S. Department of Agriculture (USDA) to determine allocations of grant funds for emergency drought assistance (Figure 1) The Palmer index is based on the supply-and-demand concept of the water balance equation, taking into account more than the precipitation deficit at specific locations. The PDSI provides a measurement of moisture conditions that are "standardized" so that comparisons using the index can be made between locations and months.

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

*NDMC - National Drought Mitigation Center

Figure 6: Palmer Drought Severity Index

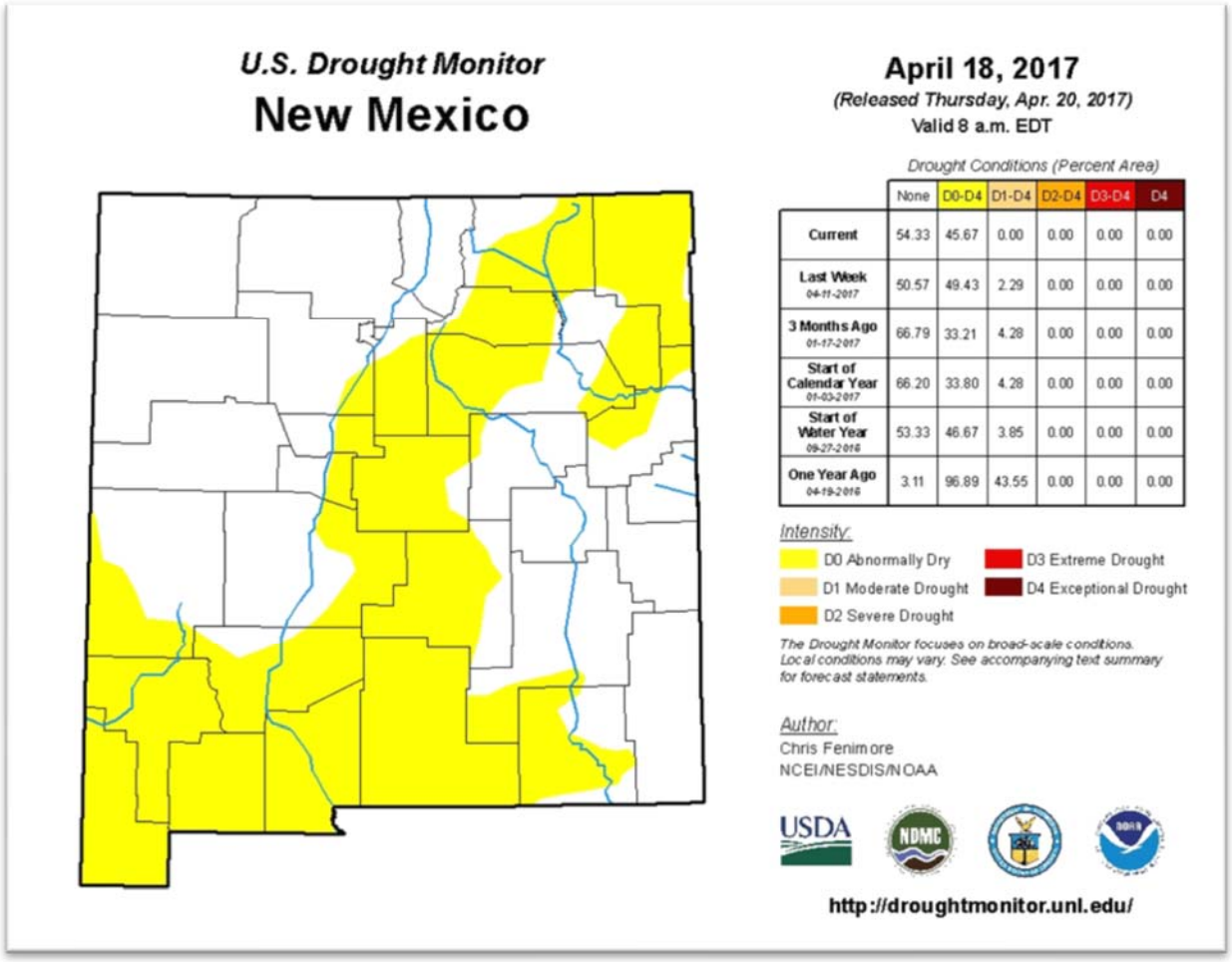

Figure 7: U.S Drought Monitor (Spring 2017)

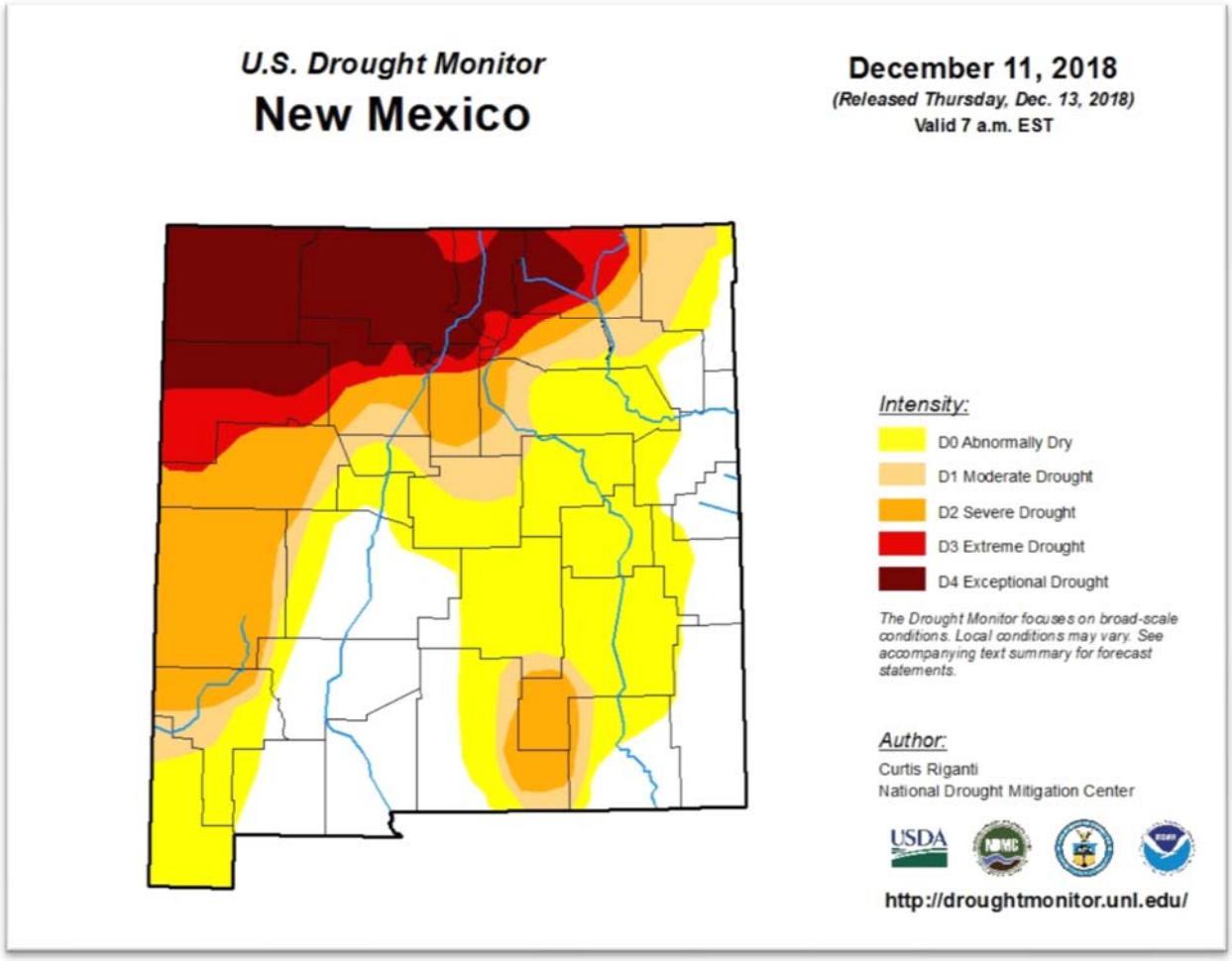

Figure 8: U.S Drought Monitor (Fall 2018)

The U.S. Drought Monitor, established in 1999, is a weekly map of drought conditions that is produced jointly by the National Oceanic and Atmospheric Administration, the U.S. Department of Agriculture, and the National Drought Mitigation Center (NDMC) at the University of Nebraska-Lincoln. The U.S. Drought Monitor website is hosted and maintained by the NDMC.

U.S. Drought Monitor maps come out every Thursday morning at 8:30 Eastern Time, based on data through 7 a.m. Eastern Standard Time (8 a.m. Eastern Daylight Time) the preceding Tuesday. The map is based on measurements of climatic, hydrologic and soil conditions as well as reported impacts and observations from more than 350 contributors around the country. Eleven climatologists from the partner organizations take turns serving as the lead author each week. The authors examine all the data and use their best judgment to reconcile any differences in what different sources are saying. Countries around the world have sought to emulate the U.S. Drought Monitor. We stress that it isn't a strictly quantitative product, and that the community of drought observers lends credibility to the state-of-the-art blend of science and subjectivity that goes into the map.

The U.S. Drought Monitor, a composite index that includes many indicators, is the drought map that policymakers and media use in discussions of drought and in allocating drought relief. The U.S. Department of Agriculture's Farm Service Agency used the U.S. Drought Monitor to distribute an estimated $1.64 billion from 2008 to 2011 through the Livestock Forage Disaster Program; $50 million in 2007 through the Livestock Assistance Grant Program; and additional funds through the Non-Fat Dry Milk Program in 2003 and 2004. The Internal Revenue Service also uses the U.S. Drought Monitor to determine the replacement period for livestock sold because of drought. As part of its response to the drought of 2012, the U.S. Department of Agriculture streamlined the process for secretarial disaster declarations, making declarations nearly automatic for a county shown in severe drought on the U.S. Drought Monitor for eight consecutive weeks (http://droughtmonitor.unl.edu).

In New Mexico, drought is a regular event. It visits the state in recurring cycles. Experts predict that drought conditions are likely to continue for the foreseeable future. Reviewing the two previous figures, drought conditions are seen as increasing in severity over time for Catron County. Drought increases the probability and severity of wildfire. Drought also increases the severity of flash flooding due to soils becoming hydrophobic, repelling or incapable of dissolving in water, resulting in increased runoff and erosion. The State of New Mexico has recorded periods of drought for the past few years. In every drought, agriculture is adversely impacted, especially in non-irrigated areas such as dry land farms and rangelands. Droughts impact individuals (farm owners, tenants, and farm laborers), the agricultural industry, other agriculture related sectors, and other industries such as tourism and recreation. There is increased danger of forest and wildland fires. Loss of forests and trees increases erosion, causing serious damage to aquatic life, irrigation, and power development by heavy silting of streams, reservoirs, and rivers.

Drought is nature's way of reminding us that we live in a desert. New Mexico is entering a second decade of a drought, which magnifies the challenge of balancing our limited water supplies with growing demand. A drought is caused by a variety of factors. Scientists who study climate changes believe that conditions in the North Atlantic Ocean and the Eastern Pacific Ocean play a significant role in determining the amount of precipitation that New Mexico and the rest of the country receive. Studies show current conditions in those two oceans are similar to conditions that existed during the severe drought of the late 1940s and 1950s in New Mexico.

Drought is a 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.

Concerns for drought conditions Catron County and the Village of Reserve has been established through meetings of the HMPT, public meetings, questionnaires, the National Oceanic and Atmospheric Administration, the National Weather Service, the U.S. Geological Survey, the New Mexico Drought Task Force, and New Mexico State University. Drought, as defined by the National Oceanic and Atmospheric Administration (NOAA), is a period of abnormally dry weather that persists long enough to produce a serious hydrologic imbalance. The severity of the drought depends upon the degree of moisture

deficiency, the duration, and the size of the affected area. Drought status is determined through use of the Palmer Drought Severity Index, the Standardized Precipitation Index, and the Surface Water Supply Index. In New Mexico, drought is known to occur every ten years on average. Drought will always be a concern in Catron County and Village of Reserve and based on the U.S. Drought Monitor maps, the County is progressing toward severe drought, a level D2 on the Palmer Drought Severity Index. If conditions continue to support this trend of increasing drought severity, Catron County and the Village of Reserve could continue to experience drought that could range anywhere from abnormally dry to exceptional drought conditions in the next five years.

Vulnerability

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

Previous Occurrences

The 2013 State of New Mexico Hazard Mitigation Plan, reported that according to the New Mexico Drought Plan, the state has experienced droughts since prehistoric times. Extended drought conditions in the region evidently led to the collapse of many early civilizations. Periods of drought since 1950 have been documented during 1950-1957, 1963-1964, 1976-1978, 1989, 1996, 1998-1999, 1999-2003, 2003-2006. A state-wide drought emergency was issued in 2003 by the Governor and the most recent Drought Executive Order was signed by Governor Martinez on May 11, 2012 (Executive Order 2012-006). This order summarized the drought conditions at that time, and declared a state of Emergency statewide due to the drought. NOAA has reported drought has been reported in and around Catron County consistently from 2011 to 2015. The most recent Us Drought Monitor indicates abnormally dry conditions in the southwest portion of Catron County.

The National Oceanic and Atmospheric Administration (NOAA)'s Storm Events Database was accessed to gather historic information for drought events in Catron County and Village of Reserve. No information was reported in the database. U.S. Drought Monitor Maps included in this document show increasing drought conditions from April 2017 to December 2018. Continued review of historical maps show that Catron County is susceptible to drought and has experienced varying drought conditions since 2000, the earliest year that the maps were available to review.

Future Probability

In New Mexico, Drought is a regular event. Experts predict that drought conditions are likely to continue for the foreseeable future. Drought increases the probability and severity of wildfire. Drought also increases the severity of flash flooding due to soils becoming hydrophobic, repelling or incapable of dissolving in water, resulting in increased runoff and erosion. Economically, prolonged drought can have devastating effects on agriculture and food supply.

Catron County

Drought in the southwest is inevitable and there is a 100% probability of drought effecting Catron County within the next 5 years. The recent drought maps for Catron County show that drought conditions are increasing and that the County is currently in a severe drought. The effects of a drought in Catron County can range from short term to extreme and widespread slowing of crop growth, fire risk, and water shortage.

Village of Reserve

Drought in the southwest is inevitable and there is a 100% probability of drought effecting the Village of Reserve within the next five years. The recent drought maps for Catron County, including the Village of Reserve, show that drought conditions are increasing and that the County and thus the Village of Reserve is currently in a severe drought. The effects of a drought in Village of Reserve can range from short term to extreme and widespread slowing of crop growth, fire risk, and water shortage.