



HAZARD MITIGATION PLAN

October 2015

Prepared by the
Hopi Hazard Mitigation Planning Team

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TABLE OF CONTENTS

Section 1: Introduction.....	1
1.1 Purpose.....	1
1.2 Background and Scope	1
1.4 Tribal Assurances	3
1.5 Plan Description.....	3
Section 2: Community Description.....	4
2.1 Section Changes.....	4
2.2 Introduction	4
2.3 Demographics.....	4
2.4 Economy.....	4
2.5 Topography/Climate	7
2.6 Water Resources.....	8
2.7 Traditional Culture and Archaeology	11
2.8 Land Use.....	12
2.9 Public Infrastructure	13
2.10 Emergency Medical Services.....	14
2.11 Development Trends.....	15
2.12 Cultural and Sacred Sites.....	15
Section 3: Planning Process	16
3.1 Section Changes.....	16
3.2 Points of Contact	16
3.3 Planning Team and Activities.....	16
3.4 Public and Stakeholder Involvement	18
3.5 Program Integration.....	18
Section 4: Risk Assessment.....	21
4.1 Section Changes.....	21
4.2 Risk Assessment.....	21
4.3 Hazard Profiles.....	27
4.3.1 Drought	27

4.3.2	<i>Flooding</i>	33
4.3.3	<i>Landslide and Rockfall</i>	41
4.3.4	<i>Severe Wind</i>	45
4.3.5	<i>Winter Storm</i>	48
Section 5: Mitigation Strategy		56
5.1	Section Changes	56
5.2	Goals and Objectives	56
5.3	Mitigation Actions/Projects	56
5.4	Capability Assessment	59
Section 6: Plan Maintenance		64
6.1	Section Changes	64
6.2	Monitoring, Evaluating and Updating	64
6.3	Monitoring Progress of Mitigation Activities	64
6.4	Incorporation into other Planning Mechanisms	65
6.5	Past and Continued Member and Stakeholder Involvement	66

Tables

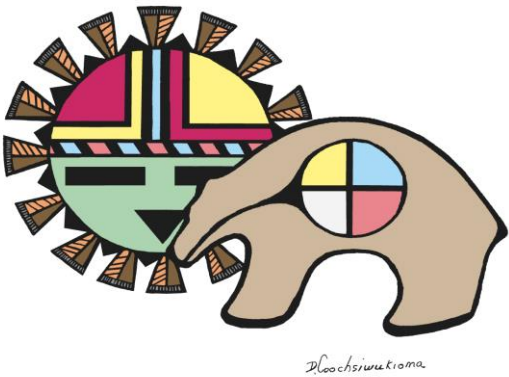
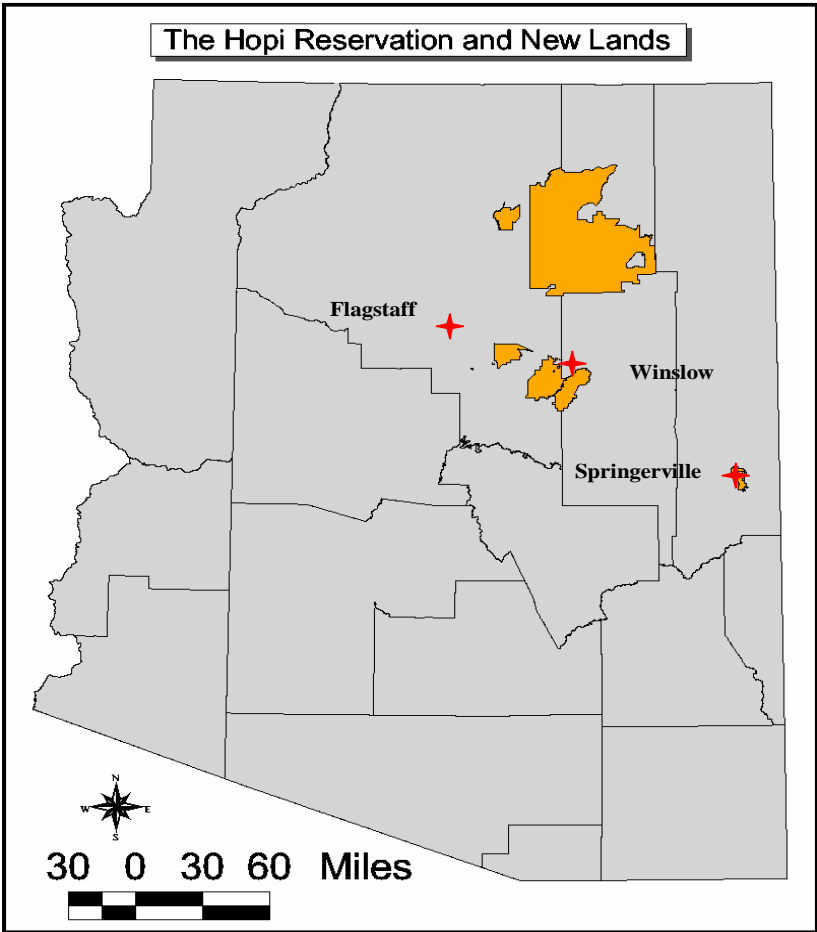
Table 2-1: Keams Canyon Average Monthly Climate (1948-2005)	7
Table 3-1: Planning Team	16
Table 3-2: Existing Plans, Studies, Reports	19
Table 4-1: Hazard Identification	21
Table 4-2: Executive Order Declarations	22
Table 4-3: Calculated Priority Risk Index (CPRI).....	23
Table 4-4: CPRI Values by Hazard	24
Table 4-5: Critical and Non-Critical Facilities	25
Table 4-6: Estimated Replacement Costs	25
Table 4-7: Drought Related Executive Order Declarations	28
Table 4-8: Vulnerability & Potential Losses due to Drought.....	30
Table 4-9: Flooding Related Executive Order Declarations	37
Table 4-10: Vulnerability & Potential Losses due to Flooding	38

Table 4-11: Vulnerability & Potential Losses due to Landslide & Rock Fall	42
Table 4-12: Vulnerability & Potential Losses due to Severe Wind	45
Table 4-13: Winter Storm Related Executive Order Declarations.....	49
Table 4-14: Vulnerability & Potential Losses due to Severe Winter Storm	53
Table 5-1: Current Mitigation Strategy	58
Table 5-2: Capability Assessment	60

Appendix

Appendix A - Planning Process Documentation.....	68
Appendix B - Public Involvement Documents	74
Appendix C - Assessment of Previous Plan's Mitigation Strategy.....	80

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SECTION 1: INTRODUCTION

1.1 Purpose

This Plan will guide and organize current and future efforts to effectively and efficiently mitigate hazards on the Hopi Main and Moenkopi District Reservations. This Plan is intended to help create disaster-resistant Reservations by reducing the threat of hazards to life, property, emergency response capabilities, economic stability, and infrastructure, while encouraging the protection and restoration of natural and cultural resources.

The hazards identified for this planning effort have affected the Reservations in the past and are likely to affect the Reservations in the future. These hazards include dam failure, drought, flooding, landslide/rockfall, severe wind and winter storm.

This Plan will enable the Hopi Tribe to apply for FEMA grants for further mitigation planning and mitigation projects. This eligibility will allow the Hopi Tribe to continue mitigation efforts to further ensure the protection of the people and property of the Reservations.

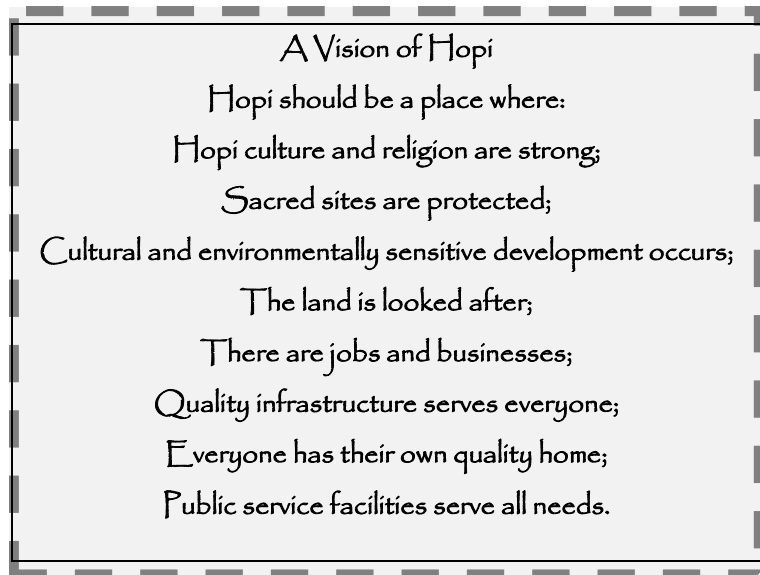
The main purpose and goals of this Plan are:

- Reduce the threats to public health and safety posed by hazards;
- Reduce structural damages caused by hazards;
- Reduce the environmental impacts of hazards, mitigation actions, and future development activities; and
- Reduce the costs resulting from disasters.

1.2 Background and Scope

Nationwide, billions of dollars are spent annually to help communities, organizations, businesses, and individuals recover from disasters. These monies only partially reflect the true cost of disasters, because additional expenses to insurance companies and nongovernmental organizations are not reimbursed by tax dollars. Many disasters are predictable, and much of the damage caused by these events can be alleviated or even eliminated.

Hazard mitigation is defined by FEMA as “any sustained action taken to reduce or eliminate long-term risk to human life and property from a hazard event.” The results of a three-year congressionally mandated independent study to assess future savings from mitigation activities



provides evidence that mitigation activities are highly cost-effective. On average, each dollar spend on mitigation saves society an average of \$4 in avoided future losses in addition to saving lives and preventing injuries (National Institute of Building Science Multi-Hazard Mitigation Council 2005).

Examples of hazard mitigation measures include, but are not limited to the following:

- Development of mitigation standards, regulations, policies, and programs
- Land use/zoning policies
- Strong building code and floodplain management regulations
- Dam safety program, seawalls, and levee systems
- Acquisition of flood prone and environmentally sensitive lands
- Retrofitting/hardening/elevating structures and critical facilities
- Relocation of structures, infrastructure, and facilities out of vulnerable areas
- Public awareness/education campaigns
- Improvement of warning and evacuation systems

Hazard mitigation planning is the process through which hazards that threaten communities are identified, likely impacts of those hazards are determined, mitigation goals are set, and appropriate strategies to lessen impacts are determined, prioritized, and implemented. This Plan documents the planning process employed by the Planning Team. The Plan identifies relevant hazards and risks, and identifies the strategy that will be used to decrease vulnerability and increase resiliency and sustainability.

This Plan was prepared pursuant to the requirements of the Disaster Mitigation Action of 2000 and the implementing regulations set forth in the Federal Register (hereafter, these requirements will be referred to collectively as the DMA2K). While the act emphasized the need for mitigation plans and more coordinated mitigation planning and implementation efforts, the regulations established the requirements that hazard mitigation plans must meet in order to be eligible for certain Federal disaster assistance and hazard mitigation funding under the Robert T. Stafford Disaster Relief and Emergency Act.

Information in this Plan will be used to help guide and coordinate mitigation activities and decisions for future land use. Proactive mitigation planning will help reduce the cost of disaster response and recovery to the community and its property owners by protecting structures, reducing exposure and minimizing overall community impacts and disruption. The community has been affected by hazards in the past and is thus committed to reducing future disaster impacts and maintaining eligibility for Federal funding.

1.3 Plan Objectives

- Assess and guide regulation of new development in areas that are vulnerable to hazards or ensure that development occurs in a manner so that risk is minimized;
- Protect or alter existing development in hazardous areas to make it less susceptible to damage;

- Ensure that the solutions to protect existing development are the most cost-effective available; protects or enhances cultural and natural resources and sensitive to wildlife and riparian habitats; and is consistent with applicable land use plans, regulations, and natural resources management;
- Ensure that the benefits of maintaining existing facilities outweigh their costs; if not redesign facilities to make them less susceptible to damage or implement other solutions at the site;
- Manage natural resources including floodplains, wetlands and other resources for multiple uses in line with the existing;
- Improve coordination and consistency between the Hopi Tribe and Navajo Nation and other jurisdictions, as appropriate, in management activities for floodplain areas;
- Increase public awareness of hazards and improve appropriate preparation for and response to such hazards;
- Increase Reservation-wide and Tribal responsibility and support for hazard mitigation for the Reservations; and
- Organize and Improve hazard warning and emergency response systems.

1.4 Tribal Assurances

The Hopi Tribe will comply with all applicable Federal statutes and regulations in effect for those periods when the Tribe receives grant funding per the DMA2K requirement §201.7(c)(6).

1.5 Plan Description

Tribal officials recognize that hazards pose a significant threat at varying degrees of magnitude and frequency, to the safety and economic stability of the Tribe and its residents. Tribal officials understand that not addressing the risk can result in increased costs, both in terms of financial and human losses. Accordingly, the Hopi Tribe has prepared the **2015 Hopi Tribe Hazard Mitigation Plan** (the Plan) with a desire to become more aware of the Tribe's vulnerability to those hazards and to develop mitigation strategies that reduce the risks associated with them.

This plan is arranged and prepared to satisfy Tribal level planning requirements mandated by the Disaster Mitigation Act of 2000 (DMA2K). DMA2K requirements are provided as appropriate in each section. The plan is divided into sections as follows:

- Section 1 – Introduction
- Section 2 – Community Description
- Section 3 – Planning Process
- Section 4 – Risk Assessment
- Section 5 – Mitigation Strategy
- Section 6 – Plan Maintenance

SECTION 2: COMMUNITY DESCRIPTION

2.1 Section Changes

- Maps and graphs that were determined to be irrelevant or to not contribute to the effectiveness of the Plan were removed.
- Extraneous detail was removed from the 'Economy' and 'Ecological Zones' sections and was updated in a more clear and concise manner.

2.2 Introduction

Hopi Indian Tribal Lands today encompass two Federal Trust lands reservations located in the high desert of northeastern Arizona on the Colorado Plateau. These two reservations were established by different means and like many Indian Tribes in the United States, fall short of the entire breadth of indigenous land claims and former land use. The Hopi people have a longstanding occupation within the Southwestern United States being descendants of the various archaeologically identified pre-historic cultures and complexes known as Anasazi, Mogollon, Sinagua, Salado, Hohokam and Haketaya. An occupational time span of over a millennium characterizes the nature of the oldest Hopi pueblo villages and their members. It is important for us to understand the nature of occupation for the Hopi people on their lands so that our planning effort reflects the current challenges and sensitivities pertinent to the unique Hopi communities.

The main Hopi Indian reservation has been more recently established following from the original 1882 Executive Order Reservation created by President Chester Arthur and finalized through the 1974 Navajo-Hopi Land Settlement Act to include over 1.6 million acres and recognition of Hopi land management units *District Six* and the *Hopi Partitioned Lands* under full control of the Hopi Tribe. Land management unit District Six encompasses 15 units at the core of the main reservation with most of the Hopi villages and communities listed here from east to west: Keams Canyon, Polacca, First Mesa Villages of Walpi, Sichomovi, and Tewa; Second Mesa Villages of Shungopavi, Mishongnovi and Sipaulovi; Kykotsmovi, and the Third Mesa Villages of Oraibi, Hotevilla and Bacavi. The Hopi Partitioned Lands make up the outer areas of the main reservation with a total of 36 numbered range units which includes various scattered home sites, ranch homes and the charter community of Yuwehloo Pahki Community established in March 27, 2000 in Range Units 567 & 568.

The second Hopi reservation was more currently established and recognized the longstanding occupation of the Hopi village of Moenkopi. The Moenkopi District was established through litigation of a Congressional Act of 1934 that expanded the Navajo Indian Reservation without due recognition of Hopi occupation and land use. The ceded land acquisition has re-established 61,604 acres for use by the Hopi Tribe and Moenkopi villages including important irrigation and agricultural uses.

2.3 Demographics

The Hopi Tribal population as of August 2014, of enrolled Hopi members total 13,990. Living on the Reservation: 7,769 and living off the Reservation: 6,221.

2.4 Economy

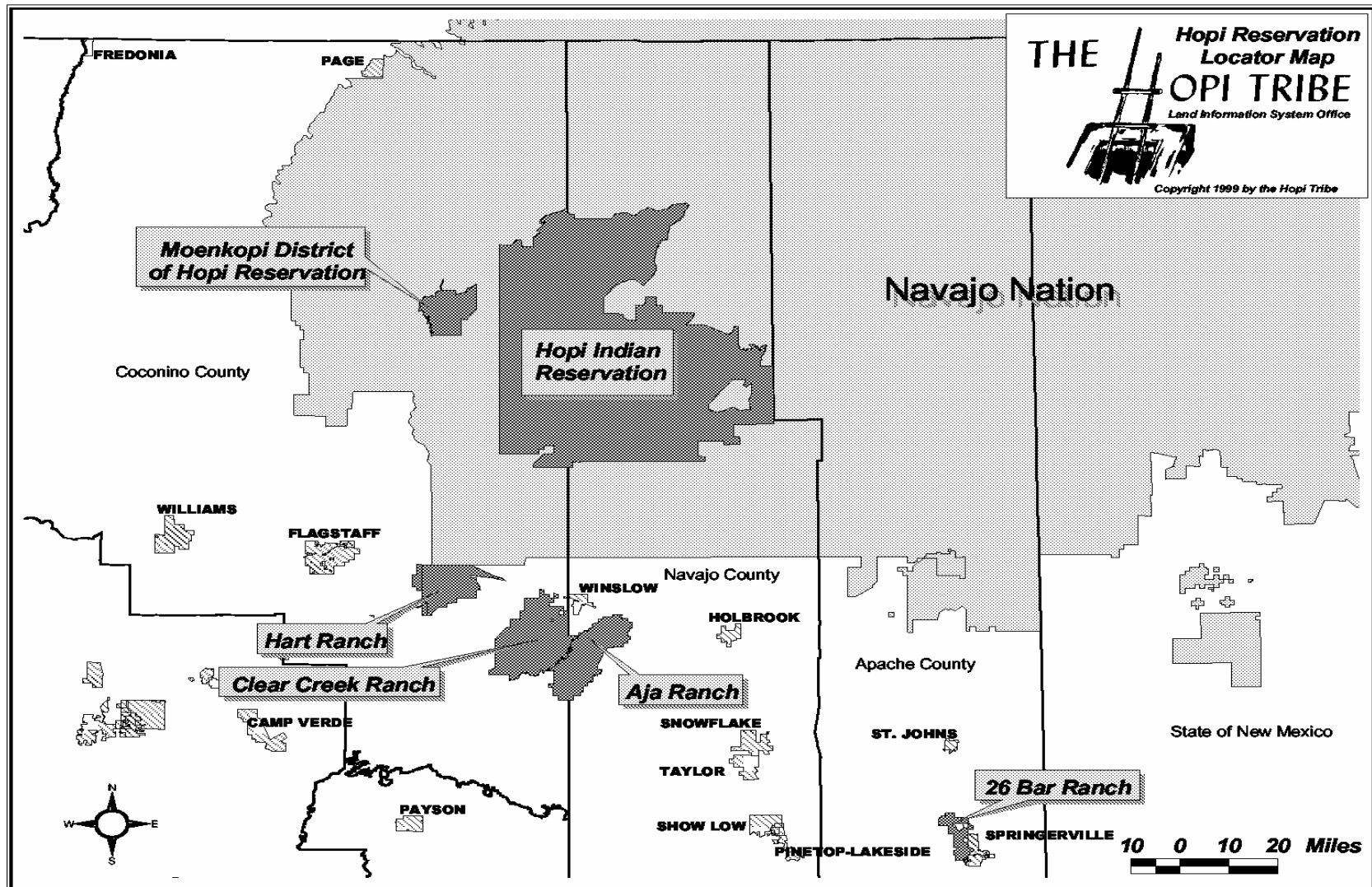
The Hopi Reservation economy consists of a formal and informal or traditional economy. The formal sector is defined as organized, business-like activity meant to create jobs and personal income. The informal economy consists of goods and services produced for household consumption or for exchange in social and cultural settings.

The annual monetary value of the formal economy on the Hopi Reservation is approximately \$44.8 million. This economy produces 2,941 reservation jobs. In addition, the Kayenta Mine is located on or adjacent to the Reservation provide another 24 Hopi jobs.

Tribal government operations are funded by about \$70 million in recurring annual revenue. About 95% of this revenue is derived from the three sources:

- Contracts, grants, awards and indirect costs recovery from the federal government and State of Arizona
- Coal royalties and water sales from the Peabody Coal; and
- Earning from financial investments

Other revenue sources include business leases and rents; fees, fines and forfeitures, and miscellaneous sources. The tribe also generates enterprise-type revenues from the Hopi Tribe Economic Development Corporation, which accounts for the following Hopi owned businesses: Hopi Cultural Center Motel and Restaurant, a motel in Sedona, Arizona, Hopi, and two shopping centers located in Flagstaff, Arizona, and a Truck Stop Center near Holbrook, Arizona.



Map 2-1: Hopi Reservations

2.5 Topography/Climate

The Hopi Reservation is located within the Great Basin Desert, on the Colorado Plateau, encompassing and extending beyond the southern edge of Black Mesa. Black Mesa consists of sandstone belonging to the Mesa Verde Group, underlain by Mancos Shale. The southern escarpment breaks off sharply to form the broad, flat Little Colorado River Valley. The southern scarp of Black Mesa forms discontinuous, finger-like projections called Antelope Mesa, First Mesa, Second Mesa, Third Mesa, Howell Mesa and Coalmine Mesa.

Five major washes cross the Hopi Reservation: Moenkopi, Dinnebito, Oraibi, Polacca, and Jeddito along with contributing channels of Keams Canyon and Wepo. All the five major washes are tributaries of the Little Colorado River, and flow in a generally northeast to southwesterly direction. While the majority of the flow of washes is ephemeral, intermittent and perennial reaches exist in some areas, primarily as a result of groundwater discharge.

The climate of the Hopi Reservation is semiarid, with precipitation ranging from 6 to 10 inches per year in the lower elevations, and 10 to 14 inches per year in the higher elevations. The majority of the precipitation occurs July through October. Snow accumulates most heavily in January and decreases steadily into May. The average seasonal snowfall is 14 inches. The climate is characterized by mild to hot summers, and cold winters. In summer the average temperature is 70°F, and the average daily maximum temperature is 87°F, as recorded at Keams Canyon.

Elevations within the planning area range between 4,500-7,500 feet above mean sea level.

Table 2-1: Keams Canyon Average Monthly Climate (1948-2005)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Max Temp (F)	43.3	49	55.3	64.7	73.4	84.9	89.1	85.4	79.3	68.6	54.7	44.5
Min Temp (F)	16.2	21.1	25.1	30.9	38.9	47.1	55.3	54.6	46.9	35.9	25.2	16.8
Precipitation (in)	.77	.80	.88	.56	.39	.30	1.20	1.62	.88	1.01	.68	.88
Snowfall (in)	1.4	2.4	1.8	0.4	0.0	0.0	0.0	0.0	0.1	0.7	3.2	10.1

Source: Western Regional Climate Center website (<http://www.wrcc.dri.edu/>), July 22, 2014.

Ecological Zones

The Hopi Reservation covers diverse ecological zones. These various ecological zones support plant communities that Hopi continue to harvest and manage for a number of needs and applications, since prehistoric times. As part of Hopi stewardship, plant resources are key to sustaining the many domestic and religious needs of Hopi society. Prior to widespread grazing land use, native vegetation supported wildlife such as small and big game, resident and migratory birds, insects, reptiles, amphibians, and many others that made up the source of annual gathering harvests for Hopi needs.

Ecological zones within the Hopi Reservation are classified based on climate, vegetation, and soil criteria. There are five zones: Semi-Desert Grassland, Mixed Grassland, Sagebrush-Grassland, Pinyon-Juniper Woodland, and Wetlands.

Semi-Desert Grassland occurs below 5,500 feet in elevation and receives average annual precipitation of 5-8 inches. It occupies 264,353 acres, or 17% of the Reservation. Vegetation in this

zone is predominantly grasses and is a nearly treeless area, with the exception of riparian areas, or where soil moisture is concentrated.

Mixed Grassland occurs between 5,500 and 6,200 feet in elevation, and receives average annual precipitation of 8-12 inches. It occupies 993,907 acres, or 64% of the Reservation. This zone is dominated by grasses when in good range condition.

Sagebrush-Grassland occurs between 6,200 and 7,000 feet and receives average annual precipitation of 12-15 inches. It occupies 285,738 acres, or 18% of the Reservation.

Pinyon-Juniper Woodland occurs between 6,500 and 7,500 feet elevation, and receives average annual precipitation of 15-17 inches. Pinyon-juniper canopy is the dominant feature. This zone occupies only 9,543 acres or less than 1% of the Reservation.

Wetlands are not elevation specific ecological zones; neither do they receive more or less precipitation than surrounding environments. However, they are characterized by the presence of water, for some or all of the year, hydric soils, and wetland vegetation. This zone occupies an estimated 8,000 acres, or less than 1% of the Reservation.

2.6 Water Resources

Paavahu, Water resources, are highly valued by the Hopi as a main source of life in a harsh and arid environment. The central focus in Hopi ceremonial life is the propitiation of moisture in its various forms. Moisture provides for the domestic and agricultural needs of Hopi people as well as the supernatural and spiritual essence of *Hopitutskwa*, the Hopi indigenous lands. As a valuable natural resource to the Hopi people, water must be protected and conserved so that we may all fulfill our ultimate stewardship responsibility: *the needs of our children and future generations for this life giving resource*.

Historically, Hopi people relied on a dense network of springs for their water. However, growing population and modern development have increased the demand for water beyond the capacity of these springs and compelled Hopi to look for alternative sources. The Hopi now rely primarily on subsurface aquifers for both human and livestock use.

Many growing communities in northeast Arizona use these same aquifers and the surface drainages of the Little Colorado River and its tributaries. Since the area's constrained water supply has to support a growing population, there is negotiation and litigation surrounding water use rights. Additionally, human impacts are compromising the quality of the region's water, both above and belowground. Since aquifers depend on infiltration of surface water for recharge, they are vulnerable to overuse, drought, contamination and harmful human activities. Source water for the Hopi Reservation is in dire straits for a variety of reasons.

Surface Water Resources

The surface water resources of the Hopi Reservation include the five major washes, *Jeddito*, *Polacca*, *Oraibi*, *Dinnebito*, and *Moenkopi*, which traverse the Hopi Reservation from a northeast to southwest direction. All of the Hopi washes are listed as impaired under the Hopi Tribe's Clean Water Action Plan Unified Watershed Assessment, due to sediment load, chemical contamination, and presence of coliform bacteria. The only known current utilization of surface water on the Hopi Reservation is for cattle watering through diversions to off-stream storage and cattle ponds on tributaries to the washes. Under the settlement proposal in the Little Colorado River Adjudication, the Hopi and Navajo Tribe would share in the waters of these washes equally, according to a formula regulating impoundment storage volumes.

Ground Water Resources

Perched aquifers - are sand deposits which lie within a confining soil and rock layer. These aquifers are easily contaminated by livestock, game, and human occupation. The Tuba City Landfill contaminates one of the perched zones and another is contaminated by the Thriftway/Sunwest gasoline station spills at Tuba City and Moenkopi. These aquifers may yield water to seeps, springs and windmills. They are limited in extent and poor in quality.

Quaternary Alluvial Deposits - sand and soil are deposited along the washes by fluvial action and wind. These deposits may contain water of variable quality and production. D.B. Stephens and Associates dug four wells into the alluvium in 1993 as part of the ongoing water source inventory conducted by the Hopi Water Resources Program. A well dug into the alluvium along upper Wepo Wash was very good in quality and production. A well dug into the alluvium near Polacca Airport was moderate in quality. Two wells dug into the alluvium along Oraibi Wash were moderate to poor in quality. Two boreholes attempted in the alluvium along upper and lower Dinnebito Wash were dry. A windmill near Polacca is dug into the alluvium and used for water hauling for drinking and livestock water. The quality is unknown.

Wepo Sandstone Aquifer - this uppermost aquifer is a rock unit high on the Hopi mesas near the Peabody Coal Company Black Mesa Mine lease. A few windmills are drilled into this aquifer, mostly on the Navajo Partitioned Lands. It is limited in extent and storage, and little is known about the quality of the water.

Toreva Sandstone Aquifer (T-Aquifer) - this aquifer outcrops along the edges of the Hopi Mesas, and supplies the springs traditionally used for drinking water supply and garden irrigation near the villages. Water supply wells have been drilled into this aquifer at First Mesa and a hand-dug well was drilled into it at Kykotsmovi early in the 20th Century. Water quality ranges from very good (potable) to poor (due to metals and bacterial contamination), production is fair. At Hotevilla and Bacavi, the water contains radioactive gas (radon) in excess of the proposed maximum contaminant level. The exact extent of the aquifer is unknown due to poor well logs at Hopi. This aquifer is easily contaminated by human occupation, due to its nearness to the ground surface in inhabited areas.

Dakota Sandstone Aquifer (D-Aquifer) - this aquifer consists of the Dakota Sandstone and Entrada Sandstone water-bearing units. It is extensively used for windmills in cattle watering. Some people may haul water from these windmills. The aquifer water quality ranges from very good to poor. Springs in the Keams Canyon area discharging from this aquifer may contain arsenic and other metals. Saline water from this aquifer may contaminate drinking water wells in the Polacca and Hopi High School areas due to poor well construction and/or natural inter-formational leakage and seepage. The Spider Mound well is thought to penetrate this aquifer and contains fluoride in excess of the MCL. The exact extent of this aquifer is unknown due to poor well logs at Hopi. Production ranges from poor to fair. The Entrada Sandstone is unsaturated in the south Oraibi basin.

Navajo Sandstone Aquifer (N-Aquifer) - this aquifer consists of the Navajo Sandstone, the Kayenta Mudstone and the Windgate Sandstone. It is the primary drinking water aquifer on the Hopi Reservation, being the source for all village wells, except Spider Mound. In many areas, the water is sufficiently pure to use in steam irons (nearly distilled water quality). The production rate is generally good, ranging from 20-600 gallons per minute. Contamination is possible from inter-formational leakage through faults and fractures in the overlying rock. The exact extent of this aquifer is unknown due to poor well logs at Hopi.

Coconino Sandstone Aquifer (C-Aquifer) - this aquifer consists of the Coconino Sandstone and Supai formations. It is known to underlie the Hopi Reservation. It extends throughout the Little Colorado River Basin and is used for drinking water supply in the nearby cities of Flagstaff, Winslow, Holbrook, St. Johns, and others. The quality ranges from very good (at Peabody) to very poor. The production rate is very good at Winslow and very poor at the Peabody Mine. An oil exploration well in the southern part of the Hopi Reservation (Oraibi Wash Basin) was once used for water supply. This aquifer is under intense investigation by Hopi Water Resources Program Staff and D.B. Stephens and Associates for water supply in the southern portion of the Hopi Reservation and at Moenkopi. Exploration wells may be drilled into this aquifer in the next several years at Moenkopi. Another study is soon to be published for the southern part of the aquifer by the US Geological Survey.

Muav Limestone and Redwall Limestone Aquifer – this aquifer is used for water supply in the City of Sedona and at the Hualapai and Havasupai Indian Reservations, but is nearly 4,000 feet deep at Hopi. It is not considered a viable or affordable source of water for Hopi.

The Hopi Tribe is engaged in a water rights adjudication of the Little Colorado River Basin. Due to court-ordered confidentiality rulings, and not to endanger the position of the Tribe in litigation and settlement activities, Tribal programs cannot utilize nor have access to a significant amount of technical data and analyses. Unfortunately, some of the most applicable information for resource planning purposes has been developed for the adjudication, at great expense to the Hopi Tribe and the Bureau of Indian Affairs acting as trustee for the Tribe, and is not available to programs for use in the development of projects.

Data suggests that the major surface water problem is sediment generated from extensive soil erosion. However, it has not been determined if this is a natural phenomenon or aggravated by improper management of soils. Most range soils are sandy loam, yet a significant percentage of sediment is clay, indicating that eroding Mancos shale could be a significant source of this sedimentation.

Hydro-geological data and analyses required for the delineation of aquifers and water bearing alluvial deposits is normally derived from well logs and pump tests. The Indian Health Service (IHS) and the Bureau of Indian Affairs (BIA) drilled wells for over 50 years without adequate well logs or pump tests. Since over 90% of the wells were not logged, little information is available to assist in locating new wells, estimating the cost of new wells in the proximate area, or determining water quality. A lack of data regarding a geological fault line that runs through the southeastern corner of the Hopi Reservation led to a number of wells being drilled that produced inferior water. Lack of data also inhibits the ability to plan for future water use on the reservation.

To date, little is known about the C-aquifer, the deepest feasible aquifer underlying the Hopi Reservation, extending south of Interstate 40. Data that is available for evaluating ground water resources is contained in databases that cannot be accessed without expensive sort-retrieve programming.

Water quality data is sparse and expensive to collect. The Hopi Tribe has invested a significant dollar amount in USGS data collection, with little return, in part because the USGS Water Wells database uses different locator identity information from that of the Tribe's.

Current data cannot directly link health problems to possible water contamination however, risk assessments for water contamination change as advances are made in technology. In most cases, acceptable levels of contamination are decreased as more information is learned. While this raises questions regarding current acceptable levels, this also directly conflicts with Hopi philosophy that any level of contamination is unacceptable.

The major implication of limited water data is that the Hopi Tribe is also unable to do good planning, due to the unavailability of data. More research is needed to avoid expensive mistakes, for example, in selection of well drilling locations.

2.7 Traditional Culture and Archaeology

The Hopi Reservations are a place rich in traditional cultural activity and archaeological sites. There are numerous Hopi shrines, sacred springs, eagle and snake gathering areas not only on the Hopi Reservation but throughout Hopi indigenous lands. Many of these places are still visited and used during the Hopi ceremonial cycles to fulfill traditional obligations. There are approximately 2,500 recorded archaeological sites on the reservation ranging from scatters of ceramics and stone tools to prehistoric villages. Hopi people have lived in this area for over a millennium.

Archaeological and cultural resources on the Hopi reservation encompass many sites and places that are extremely valuable to Hopi culture and history. The Hopi view archaeological sites as footprints, physical evidence, of indigenous occupation and believe that ancestral remains still physically and spiritually inhabit those places. Just as important are other sites labeled Traditional Cultural Properties (TCPs) such as petroglyph panels, religious shrines, resource collection areas, which are considered living elements of Hopi culture and identity. Many Hopi clans and religious societies still carry out responsibilities that center around archaeological sites and TCPs related to all Hopi villages. Unfortunately the full breadth of archaeological sites and TCPs affiliated with Hopi prehistory do not fall within the jurisdiction of Hopi stewardship and political control. The Hopi are culturally affiliated with many of the prehistoric cultures which have been labeled as Anasazi, Fremont, Sinagua, Mogollon, Hohokam, Salado, and others including Paleo-Indian remains being currently researched and identified.

The Hopi Tribe, through the establishment of the Office of Cultural Preservation (CPO) in 1982, works with four federal acts that address the protection of cultural properties on federal trust land: the *Native American Graves Protection and Repatriation Act* (NAGPRA) of 1990, *Archaeological Resources Protection Act* (ARPA) of 1976, *American Antiquities Act of 1906*, and the *National Historic Preservation Act* of 1945. While not specifically designed to protect cultural resources, the *National Environmental Policy Act* (NEPA) requires archaeological surveys to be performed for projects receiving federal funds, or requiring federal action. As a local measure, the Hopi Tribe enacted Ordinance No. 26, the *Ordinance for the Protection of Places and Objects of Sacred, Historical and Scientific Interest on the Hopi Reservation* in 1974. Ordinance No. 26 specifies its intent, which is:

To provide for the protection of places and objects of sacred, historical and scientific interest on the Hopi Reservation; To provide a means of enforcing these protective measures; and To provide for the licensing of all scientific and historical exploration or excavation on the Reservation.

Although numerous, these protective measures do not address all aspects of cultural resource protection. They each face significant obstacles in their implementation, through such limitations as insufficient monitoring and tribal prosecution capabilities. Also, conflicts often occur when protecting archaeological sites within the context of a living culture. A great number of issues therefore face cultural and archaeological resources, both from within the tribal government and external organizations.



Restoration of traditional Hopi architecture home in the village of Shungopavi on Second Mesa. Homes such as these represent great value to the community and continue the Hopi tradition and identity.



2.8 Land Use

Four major categories of land use can be identified on the Hopi Reservations, these are agricultural and range, recreational, industrial, and community mixed use which includes residential, institutional, and commercial uses all located in clustered configurations locally referred to as village and communities.

By far the most prevalent use of the Reservations trust land is agricultural and range land use, approximately 1,565,590 acres. The principal activity on this land is livestock grazing. In support of this use, the Hopi tribal government maintains a range management program with a maintenance budget for range improvements and infrastructure. Other activities for agricultural and range land include Hopi traditional corn agriculture, traditional gathering, low density rural residential (Navajo home sites in Hopi Partitioned Lands), and infrastructure rights-of-way.

In 1992, the Hopi Tribal Council designated the Blue Canyon Special Management Area, an area of approximately 36,860 acres located in the northwestern part of the reservation, dedicated to outdoor recreation and conservation purposes. It is currently the subject of watershed rehabilitation projects and traditional gathering.

There are four areas of industrial land use located on the tribal trust land. These are the Western Peabody Coal Mine lease located in the northeastern part of the Main Reservation, the solid waste facility on the main reservation, and the Hopi Winslow Property. These three areas total approximately 6,290 acres. Another area of industrial use (unmapped) is the former BIA dump located in the Moenkopi District near the Moenkopi villages.

The community mixed use category, approximately 14,600 acres, consists of areas of residential, commercial and public facilities development. It is within these areas that the bulk of the Hopi resident population lives. Public service facilities, specifically the Hopi Tribal government complex, the Hopi Veterans Memorial Center, Hopi Wellness and Conference Center, the Hopi Jr/Sr High School, and new IHS ambulatory health care center are just outside the community areas.

Contemporary Hopi people, like their ancestors, continue to live in the high desert of the Colorado Plateau of northeastern Arizona. While they retain many of their traditions particularly their religious beliefs and ceremonies, their modern life has changed in many dramatic ways from the

traditional Hopi life of just one hundred years ago. The twelve contemporary villages and communities reflect a growth in community settlement patterns. Instead of living in highly compact, multi-story pueblos, many Hopi families now live in single family detached houses laid out in cul-de-sac subdivisions. Many families, particularly in the First Mesa area, have moved from the mesa tops onto the lower flood plains and valleys. Many modern Hopi participate in the local and regional cash economy as well as grow crops and herd livestock for household consumption. A tribal constitution was adopted in 1936 and under its authority a tribal government was formed. Several villages have adopted elected forms of government to replace their former traditional oligarchies and others have not. Most Hopi people have come to understand the benefits and conveniences of the modern world with domestic water and wastewater systems, electricity, telephones, automobiles and other forms of technology. These are but a few of the changes that have occurred over the past hundred years and they point in the direction of continual change as the Hopi move into the second millennium of occupation on the high desert mesas of the Colorado Plateau.

Historic Land Use

The Hopi people, like their ancestors, have a longstanding agrarian way of life and developed a unique form of farming the arid lands that continues to sustain them. Since their ancestral occupation of the Greater Southwest and the local Hopi region, the Hopi brought with them a set of domesticated crops and farming methods that were adapted to the arid lands, ephemeral washes and soils to ensure an annual sustainable crop harvest. To complement these domestic crops was the knowledge of plant gathering, hunting and trapping wildlife resources, manufacturing construction materials, medicinal needs and other socio-cultural developments that formed the nexus of Hopi villages and their survival. The local ecosystems made available a variety of resources to be found along with more distant areas such as the ponderosa pine forests of the San Francisco Peaks area about eighty miles to the west. Life on the Colorado Plateau necessitated the use of even distant regional ecosystems and a large land base had provided the Hopi people with access to resources to continue their way of life and customs. Beyond farming within the lower floodplains and gardening the mesa tops and terraces, a large regional trade network of relationships with Eastern Pueblos (Zuni, Jemez, Rio Grande Pueblos, etc.) in what is now New Mexico, Hualapai and Havasupai near the Grand Canyon, Southern Paiute and other tribes formed an economy that the Hopi participated in and benefited from.

The local farming tradition is controlled by village traditional governments with village boundaries generally agreed to along with some resource collection boundaries. These village land use practices continue to exist into contemporary times.

The arrival of European and Old World explorers and settlers brought in another system of Spanish colonialism which was ended with the Pueblo Revolt of 1680 and subsequent conflicts with Spanish missionaries and conquistadores. They were driven from the Hopi region and never re-established rule over the Hopi villages again. Many productive tools and crops were brought by this Spanish and later Euro-American contact and trade. These have been added to the repertoire of the Hopi farmers and also began another form of economy and subsistence with livestock herds and work animals.

2.9 Public Infrastructure

Reservation infrastructure development and infrastructure land uses, with the exception of roads and range improvements for livestock, tend to be located in association with community mixed land use areas. Most village and community settlements have some public utilities—water, wastewater, electricity, and phone. Coal, wood, and propane are used for heating and cooking. Private utility

companies provide electricity, propane, and telephone service. A number of homes have solar power. Water and wastewater systems were developed with federal assistance in cooperation with villages and communities which in turn operate and maintain them. Despite the progress made, some villages still do not have water and wastewater systems in place including electricity and telephone.

This limited network of developed public service infrastructure, especially reliable electrical supply, is perceived as severely constraining to both economic development and new housing on the reservations. The only sources of electrical power are provided by Arizona Public Service from the Cholla Power Plant in Joseph City, AZ. Another source serving the Yu Wehloo Pahki (Spider Mound) Community and several residents in the Teesto area is provided by the Navajo Utility Authority (NTUA).

The existing infrastructure systems are not without problems. Water and wastewater service within villages is not comprehensive, and most villages systems are in dire need of upgrading. Many water systems cannot meet village needs, and most village wastewater system lagoons are poorly sited and severely overloaded. Septic systems are still a prevalent mode of wastewater treatment on the reservation, even in and around village areas.

There is currently a water contamination issue relating to high levels of Arsenic in Keams Canyon, First Mesa and Second Mesa, which has caused the US Environmental Protection Agency (USEPA) to enforce compliance with the Safe Drinking Water Regulations on the Bureau of Indian Affairs-Hopi Agency and the villages. To meet compliance, Reverse Osmosis (RO) systems have been installed and bottled water is distributed for human consumption.

To remedy this water problem, the Hopi-Tribe Water Resource Program and Indian Health Service-Office of Environmental Health have implemented the Hopi Arsenic Mitigation Project (HAMP), which entails the drilling of two (2) N-aquifer wells and water to be piped to the First and Second Mesa villages, and to Keams Canyon.

2.10 Emergency Medical Services

The emergency medical services are provided by the Hopi Emergency Medical Services. Hopi EMS is a full-time tribal EMS program based at the Hopi Health Care Center just west of Polacca. Hopi EMS operates from the Health Care Center and the Wildland Fire Building (Paawiki) located at Kykotsmobi Village to cover both the west and east areas of the Hopi Land, Tewa village, Spider Mound Community and several outlying Navajo Nation communities.

The Hopi EMS program provides both Basic and Advanced Life Support pre-hospital emergency care along with other services including vehicle extrication and high angle mesa rescue.

Currently the Hopi EMS program employs 10 basic EMTs and 10 paramedics, all of who hold local (Arizona Department of Health Services, Bureau of EMS & Trauma Systems) and national (National Registry of Emergency Medical Technicians) certifications. The Hopi EMS Basic EMTs receive their medical control through the Hopi Health Care Center while the Paramedics receive theirs through the Flagstaff Medical Center Pre-Hospital Care Program. The Hopi EMS program runs with 2-3 fully stocked ambulances staffed by ALS/BLS crews for 911 calls and inter-facility transports. The Hopi EMS is dispatched through the BIA/LES 911 dispatch system and is under the Department of Public Safety & Emergency Services of the Hopi Tribe.

2.11 Development Trends

The Tribe has developed and the Hopi Tribal Council has adopted the Hopi Tribal Council of the Hopi the Strategic Land Stewardship; an Integrated Resource Management Plan for the Hopi Tribe 2001. Both of these plans reflect the desire of the Tribal government to promote the Hopi economy, community growth quality infrastructure and the overall general welfare of the Reservation in a culturally and environmentally sensitive manner guided by Hopi values.

The plans provide guidance and actions that will help achieve the planning goals and objectives that are important to the environmentally sensitive and quality development of the Reservation for the future of the Hopi Tribe. The 2015 Hopi Tribe Hazard Mitigation Plan is conducive to the efforts of assessing the vulnerability of the Reservation to hazard events and will provide another tool to Tribal land use planning in determining quality development.

Any development of Tribal lands over the past several years has been guided by the oversight of the Tribal Council. The Tribe has been proactive in mitigation planning and will continue to do so for future development. The hazard profiles contain specific discussions regarding mitigation opportunities or perceived requirements regarding possible future growth and development of Tribal lands.

The Hopi Tribe values keeping the land in its pristine natural environment. It is unlikely that the tribe will experience significant grow in population and developed areas.

2.12 Cultural and Sacred Sites

In the previous Plan, there was little discussion of the tribe's cultural and sacred sites. Therefore, the discussion begins here with the Planning Team describing these sites in basic form, their upkeep and where additional information can be found.

Hopi Ordinance #26 provides for the protection of places and objects of sacred, historical and scientific interest on the Hopi Reservation. The Hopi Cultural Preservation Office sponsors The Hopi Cultural Advisory Team which is comprised of a group of tribal members. The team makes annual visits to all significant cultural and sacred sites to pay their respects as well as maintain and provide continued protection. Those sites will not be discussed in detail in this Plan, however can be found at the Hopi Cultural Preservation Office.

SECTION 3: PLANNING PROCESS

3.1 Section Changes

- This entire section was reformatted for improved clarity.
- A 'Program Integration' subsection was added. This requirement was not addressed in the Tribe's previous Plan.

3.2 Points of Contact

Primary Contact:

Public Health Emergency Preparedness
Velleda R. Sidney
The Hopi Tribe
P.O. Box 123
Kykotsmovi, AZ 86039
Office Phone: (928) 734-3664
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Secondary Contact:

Emergency Management Coordinator
Paul V. Saufkie
The Hopi Tribe
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Kykotsmovi, AZ 86039
Office Phone: (928) 734-3663
Email: psaufkie@hopi.nsn.us

The authorities responsible for adoption of the Plan include:

- Herman G. Honanie, Chairman
- Alfred Lomahquahu, Jr., Vice-Chairman
- Hopi Tribal Council

3.3 Planning Team and Activities

At the beginning of the update process, the Primary Point of Contact identified potential members for the Planning Team by extending invitations to, all Indian Tribal government department leads, tribal and public and private organizations and businesses, local utility companies and regional, federal and state organizations. These agencies included those such as: Hopi government departments and agencies; BIA agencies, CERT Teams, all Hopi villages/communities via their Community Service Administrator, the Hopi Health Care Center and the AZ Dept of Emergency and Military Affairs.

There was a good response to the invitations and the Planning Team members are listed below and those who participated in this update as well as the previous version of this Plan are indicated in **bold** print.

Table 3-1: Planning Team		
Name Title	Agency/Organization	Role/Responsibilities
Herman Honanie Hopi Chairman	Office of Chairman	Approve Executive Orders & major mitigation projects
Velleda Sidney PHEP, Coordinator	Hopi Public Health Emergency Preparedness	Plan update lead.

Betty Poley Supervisor Geodesist	Land Information Systems	Keep this plan updated with maps, tables and graphs.
Paul V. Saufkie	Dept. of Public Safety & EM Services – EM Coordinator	Assist in making revisions to the Plan & quarterly updates.
Edison J. Tu'tsi Director	Hopi Lands	Keep this plan updated with tribal lands pertaining to the hazards.
Wendell Honanie, Superintendent	Hopi BIA	Keep this plan updated with BIA policies.
Lance Honeyestewa Paramedic Supervisor	Hopi EMS	Provide hazard and response information.
Laverne Dallas Program Manager	Hopi Dept. of Health Services	Provide information on impacts to health from hazards.
Clayton Honyumtewa Director DNR	Dept. of Natural Resources (DNR)	Oversee Plan update.
Sam Yazzie	BIA Wildland Fire	Provide information on wind speeds and wildfire conditions.
Michael Poleahla Maintenance Technician	Spider Mound Community	Provide information on issues and damage impacts within the specific community.
Claude Pahona Maintenance Technician	Village of Tewa	Provide information on issues and damage impacts within the specific community.
Carlene Tenakhongva Staff Assistant	Chairman's Office	Keep the Chairman apprised of the plan update process.
Fred Shupla	Hopi Office of Community Planning & Economic Development	Provide information from other planning mechanisms that help guide this Plan update.
Roger Tungovia Director	Dept. of Public Safety and Emergency Services	Oversee Plan update.

Hazard mitigation planning for the Indian Tribe began in July 2014, with the first Planning Team Meeting. An overview of the current Plan was provided. The current hazards were analyzed as well as others that threaten the reservation. The hazards were also ranked and prioritized as well as new hazards added. Assignments were discussed and were sent to the Team after the meeting.

To better understand the mitigation planning process, representatives from the Hopi Tribe attended a Hazard Mitigation and THIRA Workshop as well as FEMA's G393 *Mitigation for Emergency Managers* two-day course in October 2014.

The Primary Point of Contact provided mitigation plan update presentations to the Hopi Emergency Response Team (HERT) at their monthly meetings. Some of the HERT members also serve on the mitigation planning team.

In January and April of 2015 the state planner assisting the tribe on this Plan, met with the Tribe's Mitigation Planning team and worked on compiling updated material in the Plan. At that time, detailed work of developing the various elements of the Plan by reaching out to specific subject matter experts in various areas was performed. These areas included: hazard profile, identification of capabilities, and mitigation strategy development and plan maintenance. Planning documentation such as agendas, minutes and sign-in sheets are in the Appendices of this Plan.

3.4 Public and Stakeholder Involvement

The term "public" is defined by the Tribe as, "All people that reside or visit within the exterior boundaries of the Hopi Reservation or any new acquired lands". Members of the community, not specifically participating on the planning team or employed by the community, can prove to be great assets to the hazard mitigation planning process. The Planning Team employed the following strategy to solicit public and stakeholder involvement and input to the planning process:

- Newspaper article was placed in the Hopi Tutuveni, December 6, 2014. The article explained the plan update process, the hazards being examined and the benefits of having a plan. It also gave contact information for questions or input.
- Bulletins explaining the planning process and need for a Plan were posted on March 9, 2015 at six locations among the villages across the Reservation. With the bulletins, a copy of the current Plan was placed there along with a notebook for questions and comments.
- There was one comment on the current Plan regarding rockfalls.

The Planning Team employed the following strategy to solicit public and stakeholder involvement and input to the Plan during the draft review period prior to submission to FEMA:

- A newspaper article was published in the Hopi Tutuveni on August 4, 2015. The article explained the importance of the plan and the most significant threats to the tribe. It also provided information on where to review the plan and contact information for comment/input.
- Bulletins and printed plans were placed at six locations across the Reservations for the period of July 20-August 17, 2015. This provided the public the opportunity to review and comment on the Plan update draft.
- There were no comments on the Plan update draft.

Copies of these documents and any comments, questions or input can be found in the Appendices of this Plan.

3.5 Program Integration

The Hopi Tribe encourages utilizing existing information and activities to integrate data, mitigation strategies and other resources that support the mitigation goals of this Plan. The Tribe believes this practice will ensure we are working toward common goals and assist in the effective implementation of this Plan as well as other plans.

Below is a list of current tribal resources either related to, referenced in, and/or parallel to the Plan. As appropriate, the Tribe will also reference the Plan when developing new plans to associate the Tribe's overall mitigation goals.

Table 3-2: Existing Plans, Studies, Reports

Plan/Study Name	Description Integration Characteristics	Plan/Study Author	Date Completed or Implemented
Hopi Wildland Fire Management Plan	Defines what the BIA Wildland Fire Agency will respond to and manage fires on the Reservations.	BIA Wildland Fire Mgmt Office	2005 Adopted by Tribe
Hopi Integrated Woodlands Management Plan for the Hopi Reservation	Sets management direction for the Hopi Indian Reservation woodland forest. The Plan is specific to woodland forest management as well as other natural resources with the forest ecosystem. Guides the proper protection of environment and land.	Hopi Dept .of Natural Resources, USDA Forest Service and BIA	2006
Hopi Emergency Response Plan	Defines how the responders and response teams will respond to disaster events. The plan outlines the intended protocols for managing disaster incidents. The Plan helps to define what the hazards are that most threaten the Reservation.	Hopi Emergency Response Team (HERT)	2005
Hopit Potskwaniat (Hopi Tribal Consolidated Strategic Plan)	Defines the vision for the Tribe's future and addresses specific needs to promote the welfare of the Hopi and Tewa people. It also provides a means to a better quality of life and provides a framework for organizing our efforts. Provides direction for all planning mechanisms to follow to ensure cohesive movement forward.	Hopi Tribe	2011
Hopi Tustsqua Makiwa'yta (Hopi Land Stewardship An Integrated Plan for the Hopi Reservation)	Defines the rules by which the Hopi are to utilize natural resources and provide conservation efforts for environmental health. Provides guidelines by which to use and protect the Hopi natural resources against hazards.	Dept. of Natural Resources	2001
Hopi Tunatya'at (Community and Economic Plan)	A guide that sets the standards for land and environmental use based upon Hopi values. Will help ensure minimal development in hazard-prone areas.	Community and Economic Development Office	2000
Ordinance #26 – Protection of places and objects of sacred, historical and scientific interest on the Hopi Reservation	Provides a means of enforcing these protective measures; and provide for the licensing of all scientific and historical exploration or excavation on the Reservation. Guides information to use when looking at potential projects that will protect the cultural and sacred sites and assets.	Cultural Preservation Office (CPO)	1974
Ordinance #47 – The Hopi Tribe Woodland Ordinance	Provides and adequate and flexible system for the protection and conversation of the woodland resource on the Hopi Reservation while providing an opportunity to utilize the resource. It regulates the taking and transporting of forest products, prescribes enforcement sanctions and	Hopi Tribe	1993

	establishes a woodland fund for rehabilitation and conservation efforts.		
Ordinance #48 – The Hopi Tribe Wildlife Ordinance	The purpose is to ensure the proper management and protection of the Hopi Wildlife Resource while providing the opportunity for the Hopi people to utilize the resource.	Hopi Tribe	1993
Hopi Drought Contingency Plan	Purpose of Plan is to assist the Tribe with early drought warning, preparedness, mitigation and responsiveness. Helps define drought issues and mitigation goals.	Hopi Tribe and contractor	2000
Emergency Action Plan for Pasture Canyon Dam	Assists the Tribe, BIA and others in safeguarding lives and reducing damage to property in the event of an emergency with the dam. Identifies roles and responsibilities that will help communities in planning emergency response activities. Plan to guide the emergency response notification and operation procedures that will be implemented to save lives, reduce damages to property and structures and minimize impacts to the environment during emergency situations affecting Pasture Canyon Dam.	BIA, U.S. Dept of Interior, DIA, Div of Water & Power	2012
Hopi Tribe Watershed Study	Assists with understanding the flood hazard as it pertains to the tribe.	Hopi Tribe	
Threat and Hazard, Identification and Risk Assessment (THIRA)	Designed to inform the community of and provide an understanding of risks and estimate capability requirements.	Hopi Tribe (In development)	

SECTION 4: RISK ASSESSMENT

4.1 Section Changes/Notes

- The hazard of Severe Wind has been added to this Plan.
- Note: when data or information deficiencies exist in this Plan, it is likely attributed to lack of resources/funding. Those and other deficiencies related to this Plan will be addressed as resources and funding become available.

4.2 Risk Assessment

Planning Area

The planning area referred to in this Plan is described in the Community Description section. The risk assessment for the Tribe was performed for the entire Reservation, with the information input and development being accomplished by the Planning Team and the appropriate subject matter experts, when necessary.

Hazard Identification/Profiles

The hazards identified in the previous plan, Drought, Flood, Landslide/Rock Fall, and Winter Storm have been analyzed and updated and now includes Severe Wind. Those considered but not profiled in the previous Plan are: Power/Utility Failures, Fuel/Resource Shortages, Hazardous Materials Incidents, Transportation Accidents, and Explosion/Fires were found to not be of significant enough nature to the Tribe for inclusion in this Plan. Dam Failure was carefully considered regarding Pasture Canyon Dam near the Village of Moenkopi. The Planning Team determined there was not a significant enough history of breach or failure to warrant including it in this Plan, however it will be considered at each revision of this Plan. The Tribe's Department of Land Operations maintains an emergency action plan for the tribe's only dam.

Information acquired from the identification process above was also utilized in determining the vulnerability of the Reservations assessment areas to each hazard. This information included the probability, the likelihood of the severity, the warning time, and the duration of the hazard situation. The estimated relative levels of vulnerability for each hazard assessment area were based on the following factors:

- Probability of damage resulting from a hazard event;
- Magnitude and/or severity of the hazard
- Warning time prior to the arrival of the hazard
- Duration of the hazard on the Hopi Reservation

The relative probability of hazard occurrence (span between hazards) is variable and mostly derived at this point from local historical accounts and emergency action events. The current vulnerability assessment is aided by mapping done previously by the Hopi Tribal programs that lends itself to illustrating the local understanding and prioritization of vulnerable areas.

Table 4-1: Hazard Identification	
2010 Plan Hazards	2014 Plan Hazards
Drought	Drought

Flood Landslide/Rockfall Winter Storm	Flood Landslide/Rockfall Severe Wind Winter Storm
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Below is a listing of the most recent hazard events and their impacts on the reservation. This information was provided by the Tribal Office of Emergency Management.

Table 4-2: Executive Order Declarations		
Declaration Date	Cause	Damages
June 26, 2014	Extreme Fire Danger State of Extreme Fire Danger	None
March 7, 2014	Protection Of Livestock/Calves Control of Livestock And Grazing; Ordinance 43, Section 108	None
August 13, 2013	For Hopi Reservation And Surrounding Areas Due to Heavy Rain; Rock And Mudslides, Flooding & Damages to Water & Sewer Systems	\$100,000
May 28, 2013	Extreme Fire Danger State of Extreme Fire	None
January 16, 2013	Severe Cold Weather Created Water Emergencies For First Mesa Consolidated Villages And Hopi Villages Due To Severe Cold Freezing Weather	\$60,000
September 12, 2012	For Upper And Lower Moenkopi Villages And Surrounding Hopi Reservations Heavy Rain Storms	\$15,000
July 12, 2012	Extreme Drought Conditions and Illegal Water Hauling State of Extreme Drought	\$10,000
June 11, 2012	Extreme Fire Danger High winds pose extreme wildfire threats	None
January 21, 2010	Emergency Situation and Natural Disaster Area Severe Winter Storms, Muddy Conditions, Damaged Roads	\$358,000

Hazard Ranking

For the purpose of ranking the identified hazards in this Plan, the Planning Team utilized the Calculated Risk Priority Index (CPRI), which is a tool used to assess hazards based on a system that considers probability, magnitude/severity, warning time, and duration. The CPRI value is obtained by assigning varying degrees of risk to each of the four categories for each hazard, and then calculating a value based on a weighting scheme. The CPRI uses the weighing criteria below.

Table 4-3: Calculated Priority Risk Index (CPRI)

CPRI Category	Degree of Risk			Assigned Weighting Factor
	Level ID	Description	Index Value	
Probability	Unlikely	<ul style="list-style-type: none"> Extremely rare with no documented history of occurrences or events. Annual probability of less than 0.001. 	1	45%
	Possible	<ul style="list-style-type: none"> Rare occurrences with at least one documented or anecdotal historic event. Annual probability that is between 0.01 and 0.001. 	2	
	Likely	<ul style="list-style-type: none"> Occasional occurrences with at least two or more documented historic events. Annual probability that is between 0.1 and 0.01. 	3	
	Highly Likely	<ul style="list-style-type: none"> Frequent events with a well documented history of occurrence. Annual probability that is greater than 0.1. 	4	
Magnitude/ Severity	Negligible	<ul style="list-style-type: none"> Negligible property damages (less than 5% of critical and non-critical facilities and infrastructure). Injuries or illnesses are treatable with first aid, no deaths. Negligible quality of life lost. Shut down of critical facilities for less than 24 hours. 	1	30%
	Limited	<ul style="list-style-type: none"> Slight property damages (greater than 5% and less than 25% of critical and non-critical facilities and infrastructure). Injuries or illnesses do not result in permanent disability, no deaths. Moderate quality of life lost. Critical facilities shut down for more than 1 day and less than 1 week. 	2	
	Critical	<ul style="list-style-type: none"> Moderate property damages (greater than 25% and less than 50% of critical and non-critical facilities and infrastructure). Injuries or illnesses result in permanent disability, at least 1 death. Critical facilities shut down for more than 1 week & less than 1 month. 	3	
	Catastrophic	<ul style="list-style-type: none"> Severe property damages (greater than 50% of critical and non-critical facilities and infrastructure). Injuries or illnesses result in permanent disability & multiple deaths. Shut down of critical facilities for more than 1 month. 	4	
Warning Time	Less than 6 hrs	Self explanatory.	4	15%
	6 to 12 hrs	Self explanatory.	3	
	12 to 24 hrs	Self explanatory.	2	
	More than 24 hrs	Self explanatory.	1	
Duration	Less than 6 hrs	Self explanatory.	1	10%
	Less than 24 hrs	Self explanatory.	2	

Less than 1 week	Self explanatory.	3	
More than 1 week	Self explanatory.	4	

The table below summarizes the CPRI values for the hazards identified in this Plan.

Table 4-4: CPRI Values by Hazard					
Hazard	Probability	Magnitude Severity	Warning Time	Duration	CPRI
Drought	Likely	Limited	24+ hours	More than one week	2.50
Flooding/Flash Flood	Likely	Limited	6-12 hours	Less than 24 hours	2.60
Severe Wind	Likely	Limited	6-12 hours	More than 24 hours	2.60
Wildfires	Likely	Critical	6-12 hours	More than one week	3.10
Note: Maximum value is 4.00					

Vulnerability Assessment

The vulnerability assessment builds upon the previously developed hazard information by identifying the community assets and development trends and intersecting them with the hazard profiles to assess the potential amount of damage that could be caused by each hazard event.

Some of the information may have changed slightly, however due to minimal changes in population and development there were no significant changes to record in this Plan. For the Plan, the following tasks were performed as a part of the vulnerability assessment and can be found in this section's hazard profiles.

Asset Inventory

For the purpose of this Plan, an asset is defined as:

Any natural or human-caused feature that has value, including, but not limited to people; buildings; infrastructure like bridges, roads, and sewer and water systems; lifelines like electricity and communication resources; or environmental, cultural, or recreational features like parks, dunes, wetlands, or landmarks.

Assets are identified by either critical or non-critical facilities and infrastructure. Critical facilities and infrastructure are those systems within the reservation whose incapacity or destruction would have a debilitating impact on the Tribe's ability to recover following a major disaster, or to defend the people and structures of the Tribe from further hazards. To identify facilities and infrastructure for this Plan, the Tribe utilized the following criteria:

- | | |
|---|-----------------------------------|
| 1. Telecommunications Infrastructure | 5. Transportation Networks |
| 2. Electrical Power Systems | 6. Water Supply Systems |
| 3. Gas and Oil Facilities | 7. Government Services |
| 4. Banking and Finance Institutions | 8. Emergency Services |

Other assets such as public libraries, schools, museums, parks, recreational facilities, historic buildings or sites, churches, residential and/or commercial subdivisions, apartment complexes, and

so forth, are classified as non-critical facilities and infrastructure, as they are not necessarily “critical”. They are however, very important to the Tribe and critical and non-critical should not be interpreted as meaning important and non-important.

The Planning Team performed a detailed asset inventory including collecting data such as the facility’s physical location, description, and replacement cost. Those data sets are compiled in a separate document that, for security reasons, will not be generally distributed to the public. The asset inventory was performed in the planning process for the prior Plan and will remain in the updated plan as there have been no significant changes.

Table 4-5: Critical and Non-Critical Facilities	
Facility Type	Indian Tribe Totals
Critical Facilities and Infrastructure	
Telecommunications Infrastructure	3
Electrical Power Systems	2
Gas and Oil Facilities	1
Banking and Finance Institutions	0
Transportation Networks	2
Water Supply Systems	7
Governmental Services	2
Emergency Services	2
Non-Critical Facilities and Infrastructure	
Cultural	1
Government Facilities	2

The table below summarizes the total replacement costs for Indian Tribe. Replacement costs were estimated using insurance and/or current market value estimates. Since there is unlikely to be damage to buildings as a result of drought, that hazard was not included in the analysis.

Table 4-6: Estimated Replacement Costs			
Community	Number of Facilities	Percent of All Facilities	Total Estimated Replacement Cost
Indian Tribe Total	22	100%	\$9,360,510

HAZUS Summary	Residential Building Count	Residential Building Value (x\$1000)	Residential Content Value (x\$1000)	Residential Potential Economic Impact (x\$1000)	Commercial Building Count	Industrial Building Count	Total Building & Content Exposure (x\$1000)	Total Estimated Loss (x\$1000)
Tribe Totals	76	\$8,865	\$4,435	\$13,300	0	0	\$13,300	
*Tribe Totals	93	\$9,300	4,650	\$13,950	-	-	\$13,950	
Flood								

High Risk	0	\$23	\$12	\$35	0	0	\$35	\$2
*High Risk	28	\$2,800	\$1,400	\$4,200	0	0	\$4,200	\$210
Wildfire								
High Risk	22	\$2,638	\$1,320	\$3,958	0	0	\$3,958	\$792
Medium Risk	54	\$6,227	\$3,115	\$9,342	0	0	\$9,342	\$467

Loss Estimations

In addressing the impacts of hazard events, vulnerability and losses, The Hopi Office of Facilities Management & Risk Management (OFRMS) retains a listing of tribal buildings & property that represents buildings currently utilized as general office functions Village Community Centers, and other buildings & property received from OFRMS reflects a 15% overall increase in replacement costs.

For potential loss estimates, the analysis was performed for the previous Plan and replacement costs were based on current Consumer Price Index (CPI) rates that are subject to change. Specialized systems and non-existing infrastructure utilities will increase cost, based on location and regulatory compliance.

The OFRMS has limited information from past experiences in relationship to actual cost for repairs based on records data from 1997 when CPI monies became available including storm related incidents that impact both mechanical and structural repairs.

The average costs of determining potential losses to Hopi Reservations village and community residential structures was derived from the HUD Hopi Tribal Housing Authority average construction costs for the Hopi Reservations. These potential loss estimates are based on replacement costs for structures within the hazard areas and are understood that they may or may not be close to actual replacement costs as there are many variables that can affect each individual structure.

Various records for residents of the Hopi villages and communities are derived from US Census 2000 records as well as Bureau of Indian Affairs Police census records.

The value of religious / non-profit and village government structures was derived from average renovation and repair records.

Like other parts of the Risk Assessment/Vulnerability Analysis, the loss estimations were not updated for this Plan as there has been minimal population growth or development within the tribal boundaries.

4.3 Hazard Profiles

4.3.1 Drought

Introduction/History

Drought is a normal, recurrent feature of climate, although many erroneously consider it a rare and random event. It occurs in virtually all climatic zones, but its characteristics vary significantly from one region to another. Drought is a temporary aberration; it differs from aridity, which is restricted to low rainfall regions and is a permanent feature of climate.

Drought is an insidious hazard of nature. Although it has scores of definitions, it originates from a deficiency of precipitation over an extended period of time, usually a season or more. This deficiency results in a water shortage for some activity, group, or environmental sector. Drought should be considered relative to some long-term average condition of balance between precipitation and evapotranspiration (i.e., evaporation + transpiration) in a particular area, a condition often perceived as “normal”. It is also related to the timing (i.e., principal season of occurrence, delays in the start of the rainy season, occurrence of rains in relation to principal crop growth stages) and the effectiveness (i.e., rainfall intensity, number of rainfall events) of the rains. Other climatic factors such as high temperature, high wind, and low relative humidity are often associated with it in many regions of the world and can significantly aggravate its severity.

Depending on its severity, a drought can have widespread impact on the human & natural environment and economy of the Hopi Reservations. These impacts are significant especially in such an arid environment and can be seen in short and long term losses. The Hopi Drought Contingency Plan provides a profile, vulnerability analysis and potential losses as well as mitigation, monitoring & maintenance, review and funding sources.

The Hopi Drought Contingency Plan provides an analysis and reports on precipitation indices. Drought Summary Based on 24-month SPI and SSWI, a regional indication identifies drought conditions for the Keams Canyon station located in the eastern portion of the Main Reservation providing readings of drought beginning in 1946, 1950, 1954, 1962, 1972, 1975, and 1989 of variable durations. A look at regional drought indicators may also present locations and information that would be pertinent to conditions on the reservation as Flagstaff, Tuba City, Ganado and Winslow stations are located within a 90 mile radius of the Hopi Reservations. The drought reporting from the Keams Canyon station on the Main Hopi Reservation for the most part coincides with La Niña weather patterns seen throughout the State. A Hopi Drought Plan Chart of Spatial Patterns of Drought illustration also represents our latest drought conditions beginning in 1996 through 2004. All of these illustrations and methods can be found in the Hopi Drought Monitoring Plan as part of the Hopi Drought Contingency Plan. No updated information available.

Official declarations and responses to drought from the tribal government are listed in the following table and highlight a more recent trend toward recognizing and mitigating the onset and impacts of drought. Such as livestock reduction and water hauling restrictions.

Table 4-7: Drought Related Executive Order Declarations

Declaration Date	Cause	Damages
Sept 2014	Extreme Fire Danger due to below average precipitation, severe drought Burning restrictions	None
May 2013	Extreme Fire Danger due to below average precipitation, severe drought Burning restrictions	None
July 2012	Extreme Drought and Illegal Water Hauling	\$10,000
October 2012	Extreme Fire Danger due to below average precipitation, severe drought Burning restrictions	None
June 2012	Extreme Fire Danger due to below average precipitation, severe drought Burning restrictions	None
July 2009	Extreme Fire Danger due to below average precipitation, severe drought Burning restrictions	None

Vulnerability

The Hopi Tribe, as a sovereign nation, is responsible for protecting and managing Tribal natural resources in accordance with established cultural and economic values. Reduction of the already limited water supply, over an extended period of time, could result in devastating impacts to the Hopi people. This vulnerability assessment has been derived by determining the current status of water supply and use, and projecting future demands on the water resources as found in the Hopi Drought Contingency Plan. The Hopi Drought Monitoring Plan Table, Assessment of drought Vulnerability, provides characteristics of various drought categories and their degree of vulnerability. The potential risk reduction actions are also part of this table. Our planning effort has only reaffirmed the importance of this Plan's continuing inclusion of drought hazard identification and mitigation for this arid environment. The current planning process has provided us with a prioritization of vulnerable areas as follows that draws on the information found in the Hopi Drought Plan and again, the plan vulnerability assessment provides more detail along with mitigation.

Priority Group 1: Primary Hopi Villages and Communities

- First Mesa Villages: Walpi, Sichomovi, Tewa and Polacca
- Keams Canyon Community
- Second Mesa Villages: Shungopavi, Sipaulovi, Mishongnovi
- Second Mesa Community

- Kykotsmovi Village
- Third Mesa Villages: Oraibi, Hotevilla and Bacavi
- Moenkopi District Hopi Villages: Upper Moenkopi and Lower Moenkopi

These villages and communities provide the primary source of potable drinking water and serve the needs of the Hopi population. Vulnerability is high in terms of distribution infrastructure inadequacies that are exacerbated during drought. These villages serve as key areas for water in any situation and drought demands readily exhibit inadequacies that may not be remedied during normal years. These villages also have local surface outcropping springs that come from the sandstone aquifers and are the historic sources of water for Hopi villages and are valuable assets. These springs are used for cultural, agricultural and domestic needs and are highly vulnerable to drought and can go dry in drought years. The following Existing Hopi Public Water Supply Systems illustration which does not take into account the new or non-tribal maintained water services in Yuweeloo Pahki, Keams Canyon, Hotevilla, and Bacavi.

The following is an excerpt from the *Hopi Strategic Land Use and Development Plan*, describing the Tribal Hydrologist assessment of water resources on Hopi:

Current per capita water use is estimated to be 40 gallons per person per day, or a reservation demand of 400 acre-feet per year. It is expected that this demand will increase to between 160 to 200 gallons per day as running water, modern appliances and light industry become more widespread across the reservation. Current projections estimate that both the increase in total gallons used per person and the growing population will create an annual demand of 3,800 acre-feet by 2020. This demand which includes both municipal and agricultural use is an almost 10-fold increase in water consumption in 20 years. Existing water supplies available on the Hopi Reservation cannot meet this projected demand.

Priority Group 2: Outlying Communities and Residences

- Yuweeloo Pahki Charter Community
- Hopi Partitioned Lands: Hopi Home sites & Navajo Accommodation Agreement Home sites

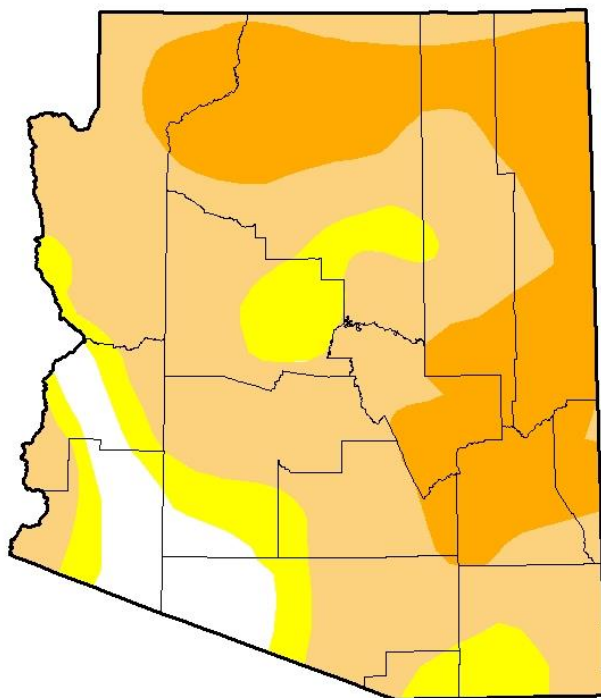
The outlying community of Yuweeloo Pahki is currently installing a new domestic water well and pump distribution system although water quality and treatment is still an issue for this as well as other established primary village systems. Water hauling and access to water sources provides a vulnerability situation if they are forced to compete with livestock and agricultural demands on domestic water systems.

Priority Group 3: Hopi District Six and Hopi Partitioned Lands Range Units

- Livestock & Agriculture
- Surface and Groundwater Infrastructure

The major land use of the Hopi Reservations is livestock grazing in various range units across the Reservations. Vegetation and water resources to support this economic activity are vulnerable to drought. A major focus of the Hopi Drought Contingency Plan was the cost estimation of drought impacts and mitigation for water resources and infrastructure supporting livestock grazing. The Hopi Drought Plan Table, Range Unit Carrying Capacity, Usability and Watering Facilities and Hopi Drought Range Well Locations Map help to illustrate the vulnerable areas in this section and current infrastructure.

U.S. Drought Monitor Arizona



May 26, 2015

(Released Thursday, May, 28, 2015)

Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	7.04	92.96	80.21	29.26	0.00	0.00
Last Week 5/19/2015	7.04	92.96	80.21	29.48	0.00	0.00
3 Months Ago 2/24/2015	7.12	92.88	81.78	27.79	4.94	0.00
Start of Calendar Year 12/30/2014	0.00	100.00	83.05	35.34	3.84	0.00
Start of Water Year 9/30/2014	0.00	100.00	84.58	37.92	3.76	0.00
One Year Ago 5/27/2014	0.00	100.00	98.17	76.28	7.69	0.00

Intensity

D0 Abnormally Dry	D3 Extreme Drought
D1 Moderate Drought	D4 Exceptional Drought
D2 Severe Drought	

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:

Brad Rippey

U.S. Department of Agriculture



<http://droughtmonitor.unl.edu/>

Table 4-8: Vulnerability & Potential Losses due to Drought

	Assessment Area	Estimated Vulnerability	Number of Structures	Structure Losses	Contents Losses	Location Comment
Priority Group 1	Yuhweeloh Pahki Charter Community	High	Public Water System	Costs and mitigation projects are detailed in the Hopi Drought Contingency Plan		Eastern Reservation
	Hopi Partitioned Lands Residences	High to Extreme	Dependent on Group 1, 2, &3			Outer Area of Reservations
Priority Group 2	Keams Canyon Community	High	BIA & Public Water System & Springs			Eastern Reservation - District Six
	First Mesa Villages of Walpi, Sichomovi & Tewa	High	(2) Public Water System & Springs			District Six
	Polacca Community	High	Public Water System			District Six below First Mesa

Table 4-8: Vulnerability & Potential Losses due to Drought

	Assessment Area	Estimated Vulnerability	Number of Structures	Structure Losses	Contents Losses	Location Comment
	Second Mesa Villages of Shungopavi, Sipaulovi & Mishongnovi	High	(3) Public Water System & Springs			District Six
	Second Mesa Community	High				District Six below Second Mesa
	Kykotsmovi Village	High	Public Water System			District Six below Third Mesa
	Third Mesa Villages of Oraibi, Hotevilla and Bacavi	High	(2) Public Water System & Springs			District Six
	Moenkopi District: Upper & Lower Moenkopi Villages	Extreme	(2) Public Water System & Springs			Moenkopi District
	Tribal Government & Services Facilities	Low	(2) Public Water Systems			Kykotsmovi & Other Villages
	Hopi Health Care Center Complex & EMS	Low				
	Hopi Walpi Housing	Low				
	First Mesa Elementary School	Low				
Priority Group 3	Livestock & Agriculture	High	8,000 Current Livestock and Animal Units Reservation-wide. (Voluntary reduction in 2006 results: 11,000 - 8,000)	\$4,398,400 Estimated Capital Livestock Value @ \$800.00 per head of livestock average		Livestock located in Hopi Partitioned Lands and District 6. \$550,000 Hopi Annual Economic Income from Livestock & Agriculture

Table 4-8: Vulnerability & Potential Losses due to Drought

	Assessment Area	Estimated Vulnerability	Number of Structures	Structure Losses	Contents Losses	Location Comment
	Surface water, Groundwater & Other Agricultural Infrastructure	Moderate	Range Unit Fencing. Windmill & Infrastructure (158) total. Springs (211) total. Earthen Tanks (556) total.	Range Unit Fencing \$2,000-5,000 per mile. Windmill & Infrastructure \$75,000 each. Earthen Tanks Repair Costs		Hopi Partitioned Lands, District 6 and Moenkopi District. \$900,000.00 Annual Tribal Maintenance Budget. See Appendix for Tribal Windmill Inventory.

The impact of drought on the Hopi Reservations has been detailed in the Hopi Drought Contingency Plan. The Hopi Tribe will expand on the impact of drought as required during the update and plan maintenance identified in the Drought Plan. This Plan will help to further refine and identify the Reservation-wide impact of drought hazard events and will be aided by mitigation planning grant funding to integrate these two documents.

Hopi Tribe Water Code

The instrument that is hereby referenced as the *Hopi Tribe Water Code* is made up of the following documents:

- Hopi Tribe Water Quality Standards
- Wellhead Protection Manual
- Standard Specification for Well Construction and Pump Installation

This Code was tribally adopted on October 14, 1997 with the passage of Tribal Council Resolution H-107-97. These documents were developed in accordance with principles of sound water management and protection, and incorporate conservation principles and practices in order to protect the source water and producing water supply for the residents of the Hopi Reservation and to safeguard health, resources, and property in the vicinity of existing and potential water supply wells and springs (2010 WRP Director).

4.3.2 Flooding

Introduction/History

Flooding on the Hopi Reservations is limited to storm events that bring significant rainfall and precipitation resulting in storm water run-off that fills the ephemeral washes and natural drainage channels of the Hopi Reservations.

There are three major precipitation zones across the reservation, which bisect diagonally from northwest to southeast. The lowest precipitation zone, which receives between six and eight inches annually, is found in the southwestern corner and western reaches of Moenkopi Wash on the Main Reservation, and across most of the Moenkopi District. The most prevalent precipitation zone, which receives between eight and ten inches annually, extends in a northwest to southeast band across the middle of the Main Reservation. Areas receiving between ten and twelve inches per year are found in areas of higher elevation on the reservation. Extremely limited areas receive between 12 and 14 inches per annum, and are found in the northeast and extreme east of the Hopi Partitioned Lands.

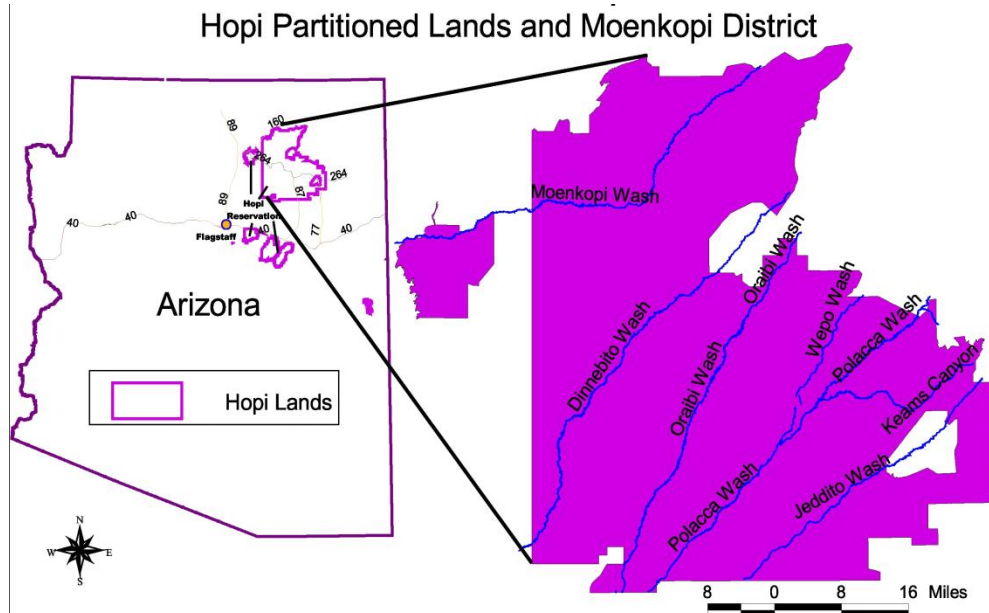
The major wash channels of the Hopi Reservations are listed here from east to west:

- Jeddito Wash
- Keams Canyon Wash
- Polacca Wash
- Wepo Wash
- Oraibi Wash
- Dinnebito Wash
- Moenkopi Wash flows in northwestern Main Reservation through the northern Moenkopi District

The precipitation map and illustrations of the major washes and drainages on the Hopi Reservations provide information on the general southwesterly flow of storm-water runoff from the higher elevations in the northeast with 12 to 14 inches of precipitation per annum to the lower southwestern area with only eight to ten inches of precipitation per annum.

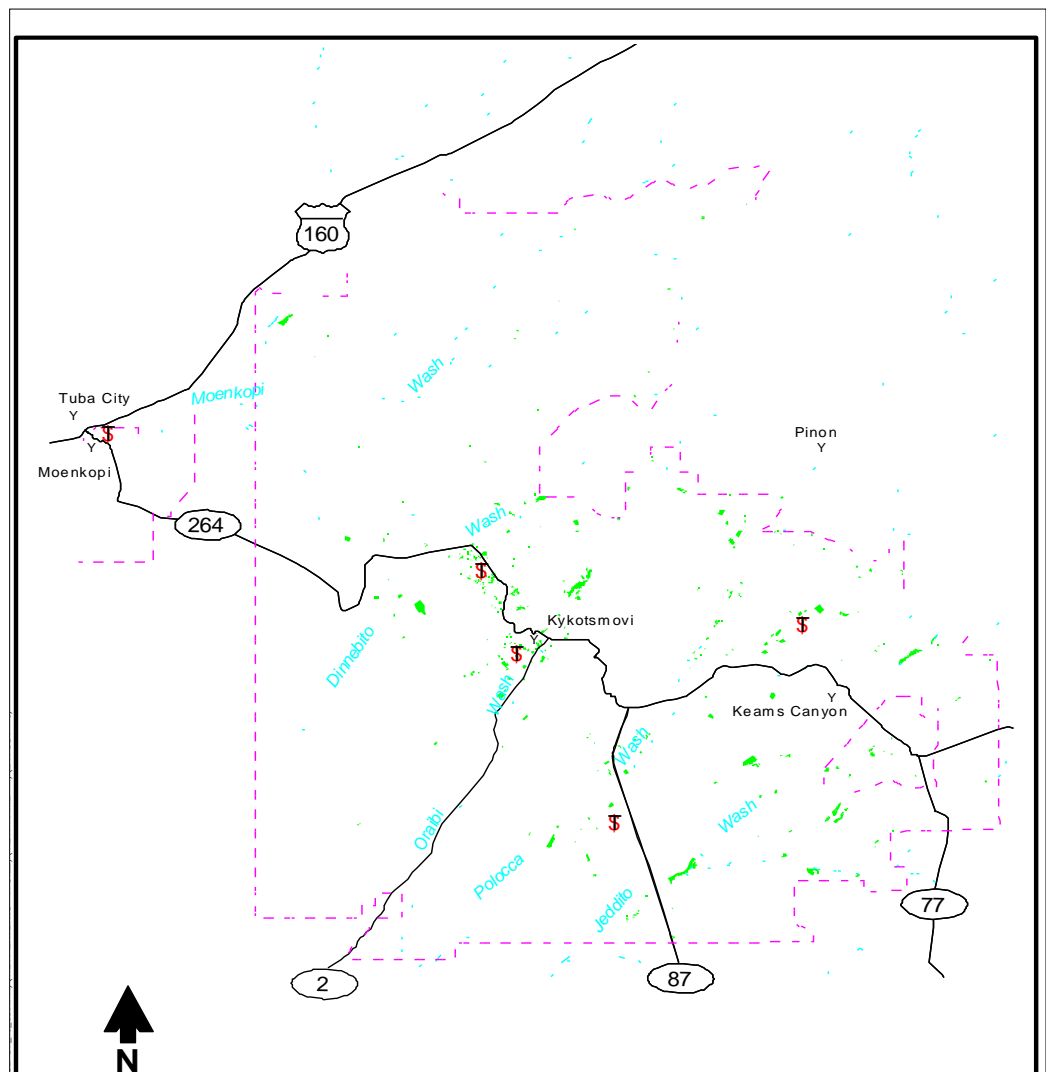
The main areas of flash flooding are within and along the major wash channels of the Hopi Reservations including slopes along the mesas where storm water can accumulate. The Hopi villages and residences were historically located above the floodplains that were fed by these major washes but more recent development (over the last 100 years) has led to potentially vulnerable site development. Roads and trails crossing these major washes are also highly vulnerable to flash flooding and washouts. Other areas such as the floodplains that were historically fed by these major wash channels are still prone to flooding if and when the flood waters overflow the channels or otherwise breach flood control installations such as dikes, dams or berms.

Many of the floodplain areas served by the major washes had been utilized by Hopi farmers in siting their fields of corn and other crops. Significant erosion and channel cutting have contributed to the intensity of flash flooding which previously was more of a surface flow over a larger floodplain area. Dikes, berms and dams constructed in the last 100 years have tried to control this surface floodplain flooding and major flash flooding from the major washes.

**FIGURE 18.0**

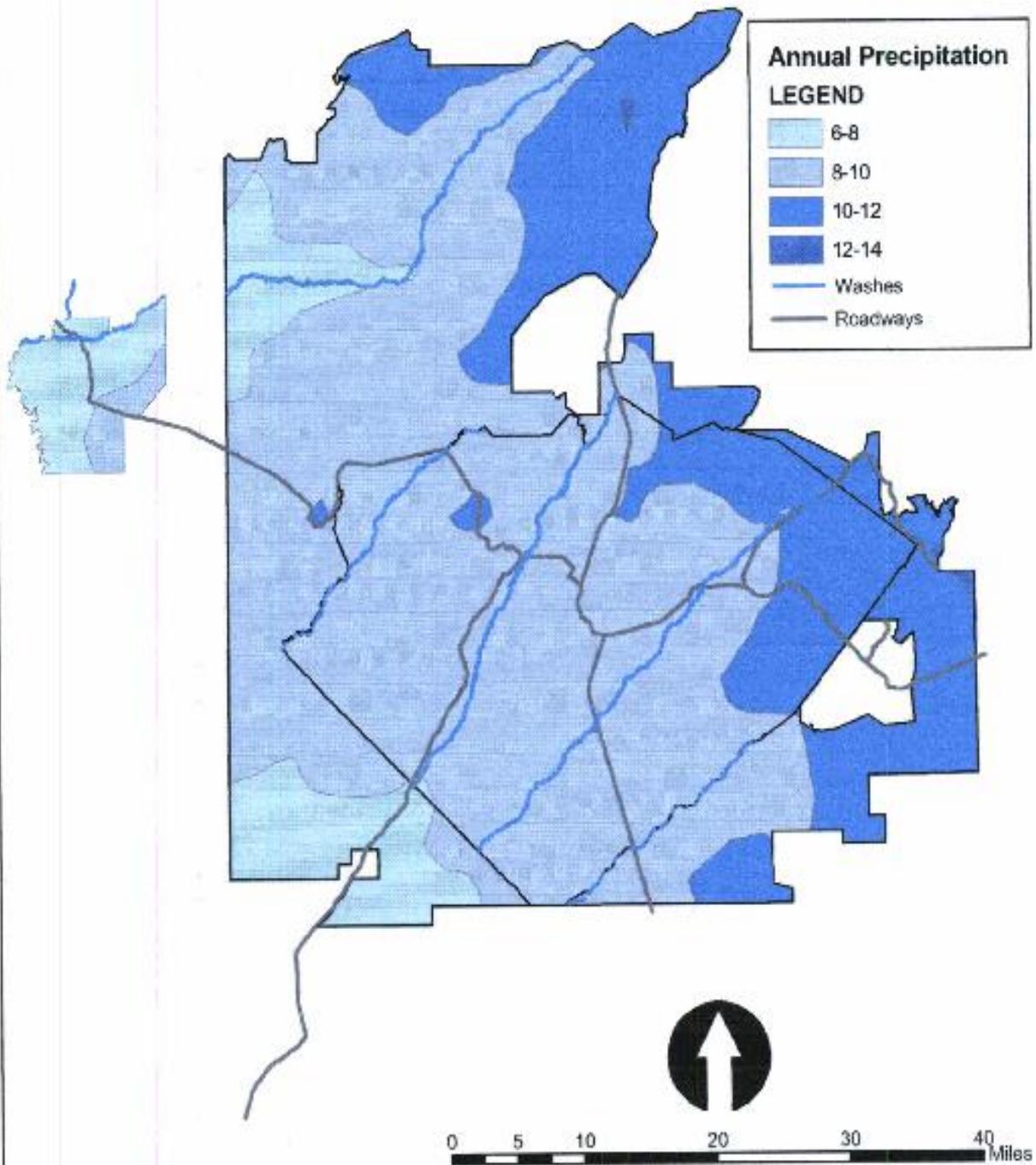
The major washes of the Hopi Reservations

General pattern of storm water run-off flow and main areas of water channeling and drainages across the Reservations. Gauging stations are indicated by ▲. Data was unavailable due to time constraints. Monitored by the US Geologic Survey and Hopi Water Resources Program.



PRECIPITATION

Hopi Tribe
Hopi Natural Hazards Mitigation Plan
Office of Natural Resources Planner



HOPÍ HAZARD MITIGATION PLAN
Prepared by the Office of Community Planning & Economic Development

FIGURE 18.0

Flash floods usually coincide with the two major precipitation seasons in the Hopi region, winter (Dec—March) and summer monsoon (late July—early Sept) seasons. These include a majority of the winter storm events and summer monsoon events that are capable of producing storm water run-off that have major impacts in the region.

Overall, the slopes and grades of the Hopi mesa canyon country and the topography of the Reservation provide ample evidence of the continuing hazard of storm events that lead to flash flooding in a very short duration. In many cases communities and travelers are unprepared, carrying away cars and lives along roadways and compromised bridges. The deteriorating and unmaintained dikes, dams and berms are leading to an event that can impact major critical facilities and homes within the developing floodplain areas below the Hopi mesas.

Vulnerability

A lack of regional flood plain mapping and identification of flood zones across Hopi Reservations has precluded us from being able to definitely identify key areas of vulnerability. The Planning Team has local knowledge of old flood control structures along with major flood problem areas so this had driven our vulnerable areas assessment. The need to develop and establish this flood plain and zone mapping is critical to the further definition of flash flood hazard vulnerability and mitigation measures for the Hopi Reservations.

Some flood mapping of major development areas have been established such as in the planning of the Hopi Health Care Center, Second Mesa Day School, First Mesa Elementary School, Hopi Veterans Memorial Center Wellness Center, Hopi Tribal Housing Authority Housing Developments, etc. These flood plain mapping data are available from the site authorities but not included in this Plan. The data is *site specific* and would only reflect flooding relative to the new sites (approximately 2-30 acres each) that are developed and not comprehensive reservation studies. The potential for further mapping will be addressed as funding and resources become available.

Priority Group 1: Primary Hopi Villages and Community Areas

- Keams Canyon Community
- Beaver & Twin Dams located and the top and midpoint of Keams Canyon
- Polacca Community
- First Mesa Villages: Walpi, Sichomovi, Tewa and Polacca
- Second Mesa Community
- Second Mesa Villages: Shungopavi, Sipaulovi, Mishongnovi
- Kykotsmovi Village
- Third Mesa Villages: Oraibi, Hotevilla and Bacavi
- Moenkopi District Hopi Villages: Upper Moenkopi and Lower Moenkopi
- Pasture Canyon Dam located within Pasture Canyon above Moenkopi Villages
- Tribal Government & Services Facilities
- Second Mesa Day School
- First Mesa Elementary School
- Hopi Health Care Center, Air Strip, & Emergency Medical Services
- Hopi Walpi Housing

Flash flooding and flooding in general can affect the new developments of these communities in the lower floodplain areas below the Hopi mesas. Another key vulnerability is the location of three dam structures above the communities of Keams Canyon and Moenkopi Villages. Other village infrastructure such as older constructed wastewater lagoons were located within the flood prone major washes or along mesa slopes that have lead to breaches or damages resulting in wastewater flows into the washes and Hopi farmlands. Lack of maintenance and planning of quality infrastructure has resulted in these poor development location choices as well as a lack of space within village communities themselves. Dikes, berms and dams have provided for some level of flood control yet the continuing lack of maintenance and engineering plans in their initial construction may outweigh any benefit as storm events continue to deteriorate them.

Many of the roads, highways and trails that access the Hopi villages and communities are impacted by flash flooding especially along the major washes and mesa slopes. An ongoing study funded by the Hopi Transportation Task Team and conducted by an outside consultant will provide inventory information on roads that have or can be impacted by flash flooding.

Priority Group 2: Hopi District Six and Hopi Partitioned Lands Range Units

- Blue Canyon Special Management Area (along Moenkopi Wash)
- Agriculture: Hopi Farmlands along Major Washes

Priority Group 3: Outlying Communities and Residences

- Yuweeloo Pahki Charter Community
- Hopi Partitioned Lands: Hopi Home sites & Navajo Accommodation Agreement Home sites

Table 4-9: Flooding Related Executive Order Declarations		
Declaration Date	Cause	Damages
August 2013	Heavy Rain Roadways damaged and impassable	\$30,000
September 2012	Heavy Rain Storms Roadways damaged and impassable	\$70,000
July 2010	Heavy Rain Storms Several homes flooded, damaged roads, water & sewer lines damaged telephone lines down	\$200,000
January 2010	Rain and Snow Storms Roads damaged and impassable	\$368,000

Potential Losses

The impacts of flash flooding and flooding in general are at this point focused on the areas that have historically been affected including areas within floodplain or mesa slopes. The potential losses are listed in following and impact various sectors of the Hopi Reservations.

Table 4-10: Vulnerability & Potential Losses due to Flooding

	Assessment Area	Estimated Vulnerability	Number of Structures	Structure Losses	Contents Losses	Location Comment
Priority Group 3	Yuhweeloh Pahki Charter Community	Low	20	None		
	Hopi Partitioned Lands Residences	Low	20	\$ 1,633,500	Undetermined	
Priority Group 1	Keams Canyon Community	Moderate	29			
	Beaver & Twin Dams within Keams Canyon	High	3	Unknown	In Keams Canyon above Keams Canyon Community	
	First Mesa Village of Walpi	High	10	\$ 250,000	Undetermined	
	First Mesa Village of Sichomovi	High	Unreported			
	First Mesa Village of Tewa	High	32	\$ 160,000	Undetermined	
	Polacca Community	Moderate				Included in First Mesa Administration
	Second Mesa Village of Shungopavi	High	2	\$ 216,690	Undetermined	
	Second Mesa Village of Sipaulovi	High	37	\$ 100,000	Undetermined	
	Second Mesa Village of Mishongnovi	High	87	\$ 3,089,000	Undetermined	
	Second Mesa Community	Moderate				
	Kykotsmobi Village	Moderate	36	\$ 1,910,000	Undetermined	
	Third Mesa Villages of Oraibi and Hotevilla	High				
	Third Mesa Village of Bacavi	High	9	\$ 288,000	Undetermined	
	Moenkopi District: Lower Moenkopi Villages	Moderate	7	\$370,000	Undetermined	

Table 4-10: Vulnerability & Potential Losses due to Flooding

	Assessment Area	Estimated Vulnerability	Number of Structures	Structure Losses	Contents Losses	Location Comment
	Moenkopi District: Moenkopi Villages	Moderate				
	Moenkopi District: Pasture Canyon Dam	High	2	Unknown. Will impact floodplain, Hwy 160 and Moenkopi Villages	Pasture Canyon above Moenkopi Villages See Reference to Pasture Canyon Emergency Action Plan	
Priority Group 1	Tribal Government & Services Facilities	Moderate	8	\$125,697 \$655,200 \$234,000 \$315,000	\$10,000 \$20,000 \$10,000 \$10,000	Zone I Keams Canyon Wash: Modular Buildings: Veterinary Clinic Tribal Court(Probation) Domestic Violence Tribal Prosecutor Zone II Second Mesa Steep Mesa Slope: Hopi Guidance Center Buildings (4)
	Hopi Health Care Center & EMS Ambulatory Facility	Moderate-High	2	\$30,000,000	Undetermined	
	Hopi Walpi Housing Complex	Moderate-High	74	\$6,777,484	Undetermined	
Priority Group 2	Agriculture: Hopi Farmlands along Major Drainages	High				Further Research & Study required to determine costs and potential losses (Will be addressed as resources/funding become available)
	Village Roads & Trails along Major Drainages & Slopes	High				
	BIA Routes along Major Drainages (Bridges & Crossings)	High				
	ADOT Hwy 264 Along Major Drainages (Bridges & Crossings)	Moderate-High				

Table 4-10: Vulnerability & Potential Losses due to Flooding

	Assessment Area	Estimated Vulnerability	Number of Structures	Structure Losses	Contents Losses	Location Comment
	Blue Canyon Special Management Area along Moenkopi Wash	High	Archaeological Sites, Wetlands, Rehabilitation Projects, Wildlife, Habitat Support Projects			

4.3.3 Landslide and Rockfall

Introduction/History

A landslide is the movement of rock, soil, and/or other debris down a slope that occurs when the materials comprising the slope can no longer resist gravity. In the case of the Hopi Reservations the known probable and usual occurrences are rock avalanches on the steep sloped sandstone mesas and canyons that comprise a large area of Hopi lands. Erosion can also occur along many of the lower floodplain areas as well as along the major drainage channels which can affect slope stability or even undercutting that may impact major roads or facilities.

Landslides encompass a wide range of slope movements, from small rock falls to debris flows to the failure of entire mesa sides and multiple landslides types can occur within a single event. In general, most steep slopes are at some risk of slope failure, and some soil/geologic formations are particularly susceptible to landslide activity, even on relatively gentle slopes. For example, when layers of sand and gravel lie above less permeable silt and clay layers, ground water can accumulate and zones of weakness can develop. This can be a cause of the local landslides / rockfalls in the Hopi mesas wherein sandstone formations (Mesa Verde Group) overlay siltstone and clay shale of the Mancos Shale Formation in the Cretaceous Geologic Unit.

The primary landslide & rockfall hazard areas that threaten public safety and structures on the Reservations occur along the Hopi mesa sandstone outcrops mainly affecting the primary Hopi villages and communities located along AZ State Highway 264.

The *Hopi Strategic Land Use and Economic Development Plan* provides a Reservations Slope map with an identification of grades from 5% on above 10% reflecting vulnerable areas along many of the high slopes of the sandstone mesas near villages and communities. These higher grade areas also show areas of steep-walled canyons and high country areas in the northern portion of the main reservation.

Landslides and rock fall can occur from natural conditions such as wind, erosion, and flooding but can be caused by human activity as well as poor planning. The natural geologic formations of the Hopi mesas and Reservations have attributed to problems and hazard events that have resulted in losses and injuries in the past. Mitigation actions by the Bureau of Indian Affairs occurred in the First Mesa Villages access road to the mesa top, stabilizing rock walls with anchoring and monitoring. The Arizona Dept of Transportation redesigned and constructed a portion of the major highway including a wide right of way drainage/ditch to capture falling rocks. These are mitigation projects that prioritize local health and safety after numerous concerns were issued from the reservation population. The effort will continue and mitigation efforts must be realized in these priority areas well in advance of loss of property or life.

Vulnerability

The vulnerability of the assessment areas is prioritized with the high grade slopes and known history of landslide & rock fall hazards known to occur. Almost 84% of the land within the reservation boundary is less than 5% slope. The most rugged areas are found in the northern one-third of the reservation while the southern two thirds are dominated by areas with gentle slopes under 10% and most under 5%. The predominant slope direction (43%) is westerly.

Priority Group 1: Primary Hopi Villages and Communities

- First Mesa Villages: Walpi, Sichomovi, Tewa and Polacca
- Second Mesa Villages: Shungopavi, Sipaulovi, Mishongnovi
- Third Mesa Villages: Oraibi, Hotevilla and Bacavi
- Moenkopi District Hopi Villages: Upper and Lower Moenkopi
- Agriculture: Hopi Mesa Terrace Gardens
- Village Roads & Trails
- Bureau of Indian Affairs Roads
- Arizona Department of Transportation Highway 264 & 77
- Keams Canyon Community
- Polacca Community
- Second Mesa Community
- Kykotsmovi Village

Landslide and rock fall hazards can impact many areas within the villages themselves. Affecting homes, infrastructure such as power lines, water & wastewater lines, village support structures (retaining walls), trails, roads and other sites such as cultural sites like springs that have been totally covered by rock falls.

Priority Group 2: Hopi District Six and Hopi Partitioned Lands Range Units

- Blue Canyon Special Management Area
- Surface and Groundwater Infrastructure

Priority Group 3: Outlying Communities and Residences

- Yuweeloo Pahki Charter Community
- Hopi Partitioned Lands: Hopi Homesites & Navajo Accommodation Agreement Homesites

Potential Losses

The impacts of landslides and rock fall focused on the areas that have historically been affected including areas along mesa escarpments and mesa slopes identified through the planning process identification. The potential losses are listed in the table below and impact various sectors of the Hopi Reservations including key critical facilities of the Tribe that lie within along areas of the major Hopi mesas and slope areas.

Table 4-11: Vulnerability & Potential Losses due to Landslide & Rock Fall						
	Assessment Area	Estimated Vulnerability	Number of Structures	Structure Losses	Contents Losses	Location Comment
Priority Group 3	Yuweeloo Pahki Charter Community	Low	2	\$ 66,000	Undetermined	
	Hopi Partitioned Lands Residences	Low	10	\$ 192,500	Undetermined	

Table 4-11: Vulnerability & Potential Losses due to Landslide & Rock Fall

	Assessment Area	Estimated Vulnerability	Number of Structures	Structure Losses	Contents Losses	Location Comment
Priority Group 1	Keams Canyon Community	Moderate	29	\$ 10,000 (3) structures only	Undetermined	
	First Mesa Villages of Walpi	High	27	\$ 681,000		
	First Mesa Village of Sichomovi	High	Unreported			
	First Mesa Village of Tewa	High	62	\$ 2,890,000	Undetermined	
	Polacca Community	Moderate				Included in First Mesa Village Administration
	Second Mesa Village of Shungopavi	High	14	\$608,040	Undetermined	
	Second Mesa Village of Sipaulovi	High	37	\$ 624,375	Undetermined	
	Second Mesa Village of Mishongnovi	High	52	\$ 969,000	Undetermined	
	Second Mesa Community	Moderate				
	Kykotsmovi Village	Moderate	21	\$ 74,000	Undetermined	
	Third Mesa Villages of Oraibi and Hotevilla	High				
	Third Mesa Village of Bacavi	High	2	\$ 168,000	Undetermined	
	Moenkopi District: Lower Moenkopi Village	Moderate	1	\$20,000		
	Moenkopi District: Upper Moenkopi Village	Moderate				

Table 4-11: Vulnerability & Potential Losses due to Landslide & Rock Fall

	Assessment Area	Estimated Vulnerability	Number of Structures	Structure Losses	Contents Losses	Location Comment
	Tribal Government & Services Facilities	Low	3	\$87,000	\$13,000	Kykotsmovi & Other Sites Appendix
Priority Group 2	Agriculture: Hopi Mesa Terrace Gardens	High	(3) Main Villages with Terrace Gardens			Further Research & Study required to determine costs & potential losses (Will be addressed as resources/funding become available)
	Village Roads & Trails	High	Undetermined			
	BIA Routes along Villages and Hopi Mesas	Moderate-High	Undetermined			
	ADOT Hwy 264 Along Hopi Villages & Mesas	Moderate-High	Undetermined			
	Beaver & Twin Dams in Keams Canyon	Moderate	Undetermined			

4.3.4 Severe Wind

Introduction/History

Severe winds result from extreme pressure gradients (such as the Santa Ana winds in southern California), or from thunderstorms. Thunderstorms occur in Arizona in all seasons, and are associated with cold fronts in the winter, monsoon activity in the summer, and tropical storms in the late summer or early fall. In Arizona, thunderstorms occasionally spawn tornadoes, which also cause severe wind damage. According to the National Climatic Data Center (NCDC), there were 234 tornadoes ranging from F0 to F3 on the Fujita scale recorded across Arizona between 1950 and 2013. The total property damage was approximately \$47.9 million with 3 fatalities and 147 injuries. The Fujita scale ranks tornados by wind speed. Since 1950 there have been three F3 tornadoes in Yavapai, Maricopa and Coconino Counties but none in Navajo County or on the Hopi Reservation.

In a microburst the wind speeds are highest near the location where a downdraft reached the surface, and are reduced as they move outward due to the friction of objects at the surface. Typical damage from microbursts includes uprooted trees, downed power lines, mobile homes knocked off their foundations, block walls and fences blown down, and porches and awnings blown off homes.

Thunderstorms are also capable of producing straight line winds at speeds of 75 mph or higher. As thunderstorms reach the mature stage, cold air downdrafts reach the ground and move outward from the storm, creating straight line surface winds. In the most extreme case, this would be a microburst or macroburst as discussed above. However, these winds tend to be sustained and are frequently responsible for generating dust storms and sand storms, reducing visibility and creating hazardous driving conditions.

In the past, wind events on the Hopi Reservation have caused structure roofs to be damaged and/or removed, power line damage and/or failure, land erosion that has exposed water lines, rock falls, transportation accidents due to low visibility and health issues for those who have respiratory problems.

Vulnerability

The majority of the Reservation is open and has many unpaved roads which create hazardous conditions to most residents and structures during wind events.

Power failures are of significant concern to the tribe as there are residents with health issues that require power to medical equipment. In the past, power failures have lasted up to 48 hours. Since those occurrences there have been no significant improvements to the systems and infrastructure so it is expected to happen in the future. Power failures happen on an average of once a year.

Potential Losses

Table 4-12: Vulnerability & Potential Losses due to Severe Wind

	Assessment Area	Estimated Vulnerability	Number of Structures	Structure Losses	Contents Losses	Location Comment
Priority	Yuhweeloh Pahki Charter Community	Low	20	\$ 300,000	Undetermined	

Table 4-12: Vulnerability & Potential Losses due to Severe Wind

	Assessment Area	Estimated Vulnerability	Number of Structures	Structure Losses	Contents Losses	Location Comment
Group 1	Hopi Partitioned Lands Residences	Low	66	\$ 1,270,500	Undetermined	
Priority Group 2	Keams Canyon Community	Low	29			
	First Mesa Village of Walpi	Moderate	80	\$ 2,406,000	Undetermined	
	First Mesa Village of Sichomovi	Moderate	136	\$ 3,994,000	Undetermined	
	First Mesa Village of Tewa	Moderate	200	\$1,330,000	Undetermined	
	Polacca Community	Low				
	Second Mesa Villages of Shungopavi	Moderate	150	\$4,721,643	Undetermined	
	Second Mesa Villages of Sipaulovi	Moderate	48	\$ 710,000	Undetermined	
	Second Mesa Village of Mishongnovi	Moderate	159	\$4,434,000	Undetermined	
	Second Mesa Community	Low				
	Kykotsmovi Village	Moderate	270	\$1,984,000	Undetermined	
	Third Mesa Villages of Oraibi & Hotevilla	Moderate				
	Third Mesa Village of Bacavi	Moderate	100	\$ 5,112,000	Undetermined	
	Moenkopi District: Lower Moenkopi Village	Moderate	34	\$680,000	Undetermined	
	Moenkopi District: Upper Moenkopi Village	Moderate				
	Tribal Government & Services Facilities	Moderate	8	\$87,000.00	\$13,000.00	Kykotsmovi & Other Sites
	Hopi Health Care Center & EMS Ambulatory Facility	Moderate	2	\$30,000,000	Undetermined	

Table 4-12: Vulnerability & Potential Losses due to Severe Wind

	Assessment Area	Estimated Vulnerability	Number of Structures	Structure Losses	Contents Losses	Location Comment
	Hopi Walpi Housing Complex	Moderate	74	\$ 6,777,484	Undetermined	
	New First Mesa Elementary School	Low	15	\$ 20,000,000	Undetermined	Structure and Housing Complex
	Hopi Reservation Roads: ADOT, BIA & Tribal	Moderate	Areas within Priority Areas	Undetermined		Further Study Required
Priority Group 3	Beaver and Twin Dams in Keams Canyon	Moderate	3	Unknown		Located in Keams Canyon
	Moenkopi District: Pasture Canyon Dam	Moderate	1	Unknown		Located above US Route 160 & Moenkopi Villages
	Surface water, Groundwater & Other Agricultural Infrastructure	Low	Range unit fencing Windmill & infrastructure (158) total Springs (211) total Earthen tanks (556) total	Range unit fencing \$2,000-5,000 per mile Windmill & infrastructure \$75,000 each Earthen tanks repair Costs		Located in Hopi Partitioned Lands, District 6, and Moenkopi District. \$900,000.00 Annual Tribal Maintenance Budget.

4.3.5 Winter Storm

Introduction/History

Severe winter storm events affecting the Hopi Reservations can be comprised of a mixture of meteorological conditions including heavy snowfall, heavy rainfall, blizzards, high winds, and hail and freezing temperatures. These conditions can immobilize many parts of the Hopi Reservations by simply affecting the main transportation corridors which in turn disrupts many other services including emergency and utility services. In considering that most of the Hopi Reservation areas are mostly rural in nature with limited paved roadways and a lack of centralized services within each community area, severe winter storms can have Reservations-wide impacts. As may be found in many Indian Nations, the Hopi Reservations are not financially capable of providing infrastructure and economies that can support mitigation and emergency responses to this type of hazard. Communications and utility services are often compromised and even small accumulations of ice can impact those major transportation routes. Extreme cold temperatures and prolonged exposure to cold affects homes and structures that are representative of the high percentage of low income & poverty level households & communities that define Hopi socio-economics.

The Hopi Reservations are located on the arid high desert of the Colorado Plateau and local weather and precipitation patterns present us with two main annual seasons of major precipitation: the winter season (Dec-Mar) and summer monsoon season (late July-early Sept). The winter season provides the Hopi Reservations with the major precipitation amounts that can result in blizzard conditions and immobilization of communities and services from heavy snow and rainfall.

The magnitude of these winter storm events vary from heavy snow and rainfall to freezing temperatures. They have also impacted the Reservations in different ways from snowbound isolation to inaccessible muddy conditions. In 2010 among other areas, the Hopi Reservations experienced one of the nastiest storms in the State's history. Much of the Reservations were covered with 5 – 8 foot snow drifts, making road travel impossible. They also experienced power outages, collapsed roofs and mud conditions resulting in disruptions and stuck vehicles. This storm was so severe, food, water and other supplies were airlifted in and even that operation was temporarily stalled due to heavy fog and clouding and other dangerous conditions.

Based on historical information/events and the location of the reservations, it is certain the Tribe will continue to experience a variety of winter storms. The severity and impacts of previous and future winter storm events have and will most likely continue to vary. Additionally, the impacts may be increased by the lack of quality infrastructure throughout the Reservations resulting in problems both for government and tribal facilities as well as private business and residents. The early historical accounts, prior to 1967, of severe winter storms resulted in requests for assistance from local BIA, county governments, public and private organizations and companies to provide aid though no official tribal executive declaration was prepared. This lack of tribal executive declarations in this early period and later has been mainly due to lack of information of sources of emergency aid and relief. The Hopi Tribe has always looked out for the best interest and emergency needs of their members and this planning effort allows us to be more fully capable of reaching those resources to assist them.

Table 4-13: Winter Storm Related Executive Order Declarations

Declaration Date	Cause	Damages
January 2013	Severe Cold freezing Weather Water issues	\$60,000
January 2010	Rain and Snow Storms Muddy and damaged roads impacting general transportation and emergency health services transport	\$358,000

Vulnerability

Winter storms on the Hopi Reservations can be either localized or large-scale events. The following three assessment areas can be exposed to severe winter storms to a similar degree. The biotic communities, elevations and precipitation zone mapping across the Reservations provide us with vulnerability assessment tools along with the condition of infrastructure and roads located in those areas. Lack of quality infrastructure to handle the impacts of severe winter storms plays a prominent role in the vulnerability of areas to these natural hazard events. This lack of quality infrastructure can be seen in undeveloped roads, old water & wastewater systems, lack of building codes, poor economic resources for buildings and homes, old agricultural infrastructure, under maintained roads, under maintained buildings, etc. that all represent why severe winter storms with significant precipitation can impact the Reservations. The following vulnerability assessment areas are listed according to prioritization. There are three priority groupings, based on the need for a response effort in the event of a severe winter storm. The highest priority are the outlying communities in the Hopi Partitioned Lands, second are the primary villages and communities and third is Hopi agriculture, livestock, and Water Infrastructure.

Priority Group 1: Outlying Communities and Residences

- Yuweh loo Pahki Community
- Hopi Partitioned Lands: Hopi Homesites & Navajo Accommodation Agreement Homesites

The Spider Mound Community roads received aggregate and gravel covering and construction of drainage culverts in 2008 to better the quality for the residents. The Hopi Partitioned Lands are particularly vulnerable in the quality of the roadways, mainly accessibility (mostly grade & drain under-maintained dirt roads) and lack of infrastructure & equipment to support the residents during severe winter storm events. Previous State responses to local emergencies have shown that “mudlifts” and “airlifts” are needed for isolated citizens and communities when medical, food, water, and fuel services are needed.

Priority Group 2: Primary Hopi Villages and Communities

- Keams Canyon Community
- First Mesa Villages: Walpi, Sichomovi, Tewa and Polacca Community
- Second Mesa Villages: Shungopavi, Sipaulovi, Mishongnovi
- Second Mesa Community
- Kykotsmovi Village
- Third Mesa Villages: Oraibi, Hotevilla and Bacavi

- Moenkopi District Hopi Villages: Upper and Lower Moenkopi

The proximity of the Hopi villages and communities alongside Arizona State Highway 264 allows for a low and moderate priority ranking for response, Moenkopi villages are located at the westernmost extent of Highway 264 near the junction of AZ State Highway 160 across from Tuba City. Yet, most of the mesa-top villages still have accessibility issues along AZ State Highway 264, BIA Routes, and villages roads and trails. Village and residential structures that can be affected by storm events is also part of why accessibility needs to be maintained along with upgrading of roads. Applicable Reservation-wide, structures themselves reflect the low economic status and lack of building codes susceptible to storm events. Mesa-top villages are supported by retaining walls along access routes, public areas, mesa slopes or other residential areas that often are compromised or deteriorate due to storm events.

Tribal facilities and property can be located within villages as well, key to the *critical facilities* that need to be addressed in storm events. Utilities such as water well pumping & distribution systems, wastewater systems (lagoons), electricity, and communication are also susceptible to storm event damages and the conditions they present. A newspaper article in the Hopi Tribal newspaper, *Tutuveni*, on April 14, 2005 highlights the Arizona Corporation Commission's deadline for a required assessment of the electric utility company, Arizona Public Service to increase reliability that affects most of the reservation, known to occur especially during winter storm events. The disabling of Tribal & government services, emergency medical & hospital services, home heating, local radio service & equipment damage, and other hampered services and equipment damages were testified to by local representatives who experience documented unreliable, "dirty power, spikes and surges."

Priority Group 3: Hopi District Six and Hopi Partitioned Lands Range Units

- Livestock & Agriculture
- Surface and Groundwater Infrastructure
 - Beaver and Twin Dams in Keams Canyon
 - Pasture Canyon Dam in Moenkopi area

These areas of vulnerability for the Hopi Reservations are the major land use of Hopi tribal members in traditional farming and livestock grazing. A number of the early historic winter storm accounts in 1941 and 1954 resulted in a shift for many livestock owners from sheep flocks to cattle herds. The shift was due to the impact of snow drift depths, lack of emergency feed, freezing temperatures and frozen water sources. Although the Hopi cattle herds at the time did suffer losses they were much less significant than those of the Hopi sheep flocks. Cattle were seen as being physically hardier and tolerated the snowstorms along with the ease to move from snowdrift packed, muddy or frozen areas so that clearer areas for grazing could be found. Today many of the range units are potentially vulnerable to severe winter storm events having older infrastructure and again poor quality accessibility with mostly under-maintained grade and drain dirt roads. Livestock grazing accounts for a majority of land use on the Hopi Reservations and severe winter storms can take a toll with a lack of accessibility, as well as prior maintenance, during times of heavy snow and rainfall to care for livestock and infrastructure with possible damage.

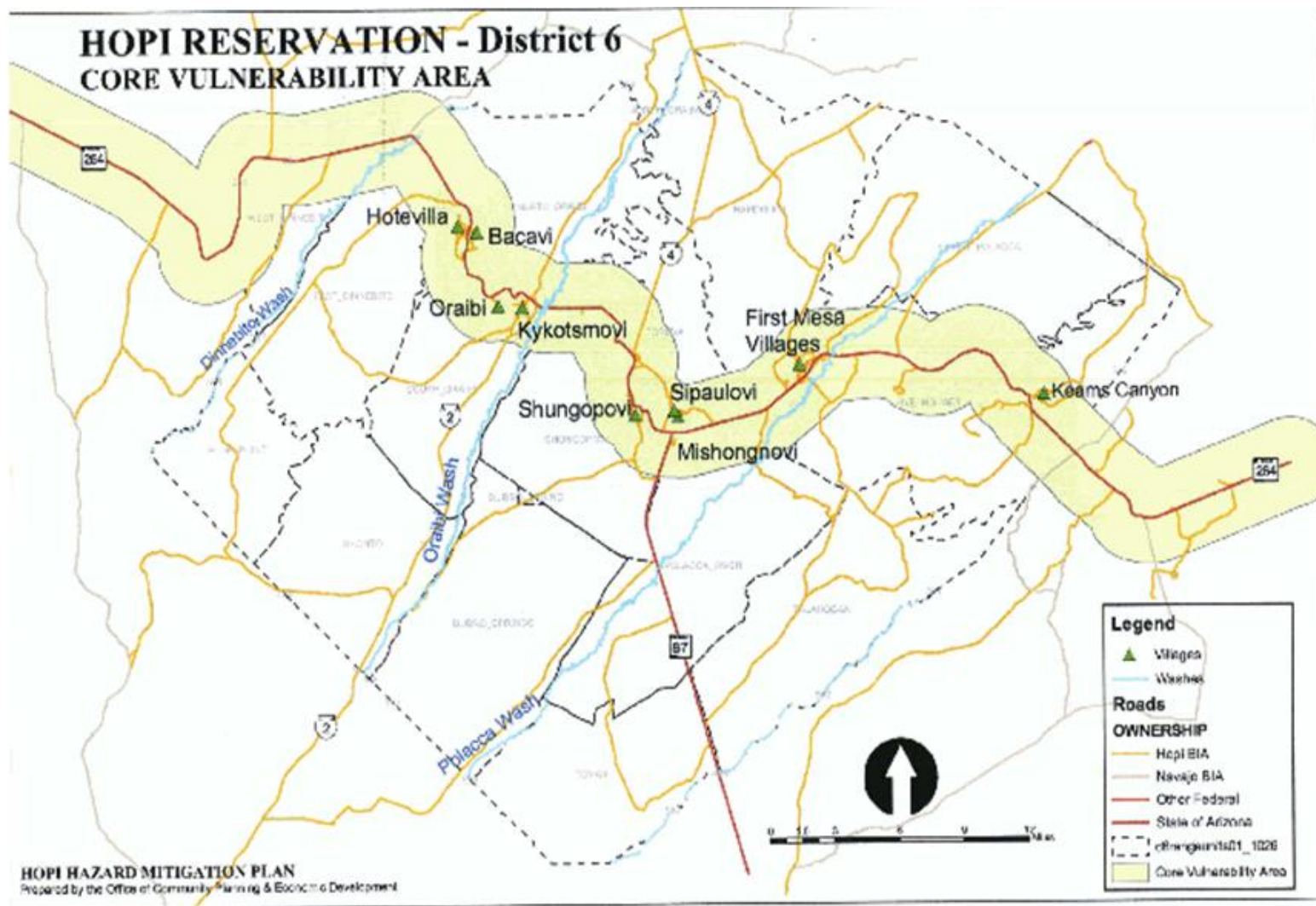
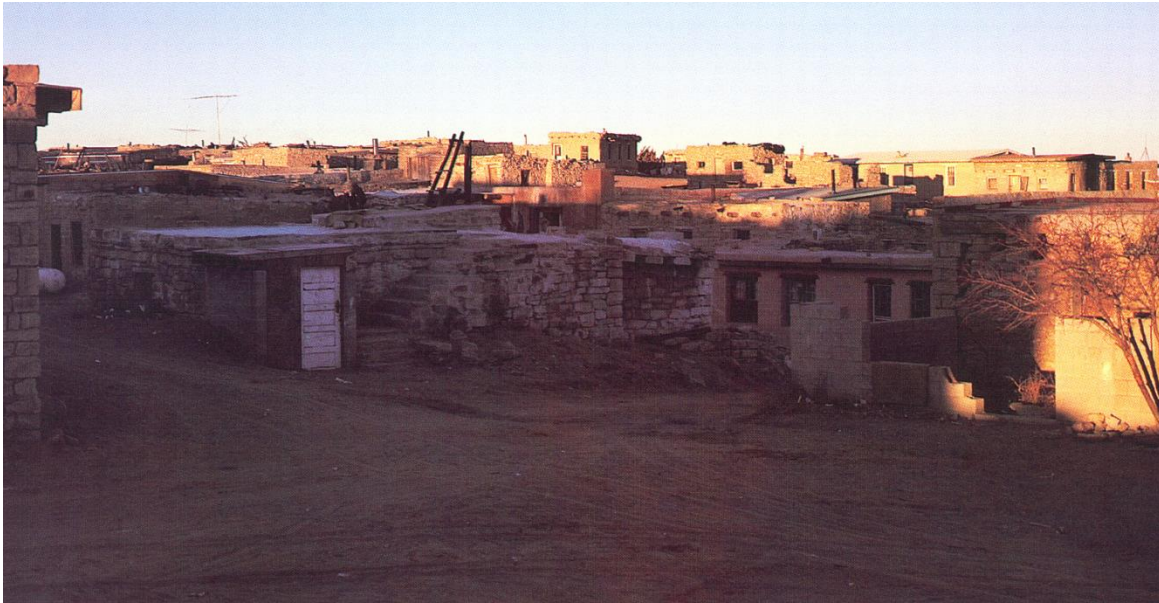


FIGURE 10.1

**Mesa-top Village Retaining Walls**

Mesa-top villages require road access support structures such as those pictured above along with areas that may require trail access or residential/village structure support as provided by these sandstone retaining walls below.



Potential Losses

There are many areas of losses that can occur from winter storm damages on the Reservations. Damage to roofing from heavy snow accumulations and rainfall depends on the quality of construction and loads. Frozen water facilities and distribution pipes have been known to occur especially at water spigots for water hauling. Any number of factors could combine at various degrees of severity to produce the total structural damages that may result from a winter storm.

Recovery from winter storms often requires assistance from emergency responders from public safety and tribal programs though they are limited in their funding and capability. The costs of these services can quickly add up for the governments or providers and they may not have a sufficient reserve in place to cover the costs.

Many of the local utilities may also be damaged with services hampered. Power outages that occur in one area will affect every community beyond that area since the electric transmission lines are *not looped* in the main Hopi Reservation. Extended outages may require community buildings be opened to help those in need or to share weather & public safety information.

The economic losses caused by a winter storm may frequently be greater than structural damages. This can be reflected in the accessibility issues and snow or rainfall damages to roads with employees and others unable to attend work or get to jobsites. Many times schools are unable to accommodate extra heating or damages to their structures along with student pickup on rural, impassable bus routes which can mire down buses with students. The Hopi Tribal offices are often in a state of uncertainty when major power outages occur in a different part of the reservation. These major power outages can affect the ability of the Tribe along with all other public health and safety services (police, fire & rescue, air landing strip, hospital, etc.). Overall, winter storms can result in significant human, economic and property losses & damages on the Reservations.

Table 4-14: Vulnerability & Potential Losses due to Severe Winter Storm

	Assessment Area	Estimated Vulnerability	Number of Structures	Structure Losses	Contents Losses	Location Comment
Priority Group 1	Yuhweeloh Pahki Charter Community	High	20	\$ 300,000	Undetermined	
	Hopi Partitioned Lands Residences	High	66	\$ 1,270,500	Undetermined	
Priority Group 2	Keams Canyon Community	Low	29			
	First Mesa Village of Walpi	Moderate	80	\$ 2,406,000	Undetermined	
	First Mesa Village of Sichomovi	Moderate	136	\$ 3,994,000	Undetermined	
	First Mesa Village of Tewa	Moderate	200	\$1,330,000	Undetermined	

Table 4-14: Vulnerability & Potential Losses due to Severe Winter Storm

	Assessment Area	Estimated Vulnerability	Number of Structures	Structure Losses	Contents Losses	Location Comment
	Polacca Community	Low				Included in First Mesa Village Administration
	Second Mesa Villages of Shungopavi	Moderate	150	\$4,721,643	Undetermined	
	Second Mesa Villages of Sipaulovi	Moderate	48	\$ 710,000	Undetermined	
	Second Mesa Village of Mishongnovi	Moderate	159	\$4,434,000	Undetermined	
	Second Mesa Community	Low				
	Kykotsmovi Village	Low	270	\$1,984,000	Undetermined	
	Third Mesa Villages of Oraibi & Hotevilla	Moderate				
	Third Mesa Village of Bacavi	Moderate	100	\$ 5,112,000	Undetermined	
	Moenkopi District: Lower Moenkopi Village	Moderate	34	\$680,000	Undetermined	
	Moenkopi District: Upper Moenkopi Village					
	Tribal Government & Services Facilities	Low	8	\$87,000.00	\$13,000.00	Kykotsmovi & Other Sites
	Hopi Health Care Center & EMS Ambulatory Facility	Moderate	2	\$30,000,000	Undetermined	
	Hopi Walpi Housing Complex	Moderate	74	\$ 6,777,484	Undetermined	
	New First Mesa Elementary School	Low	15	\$ 20,000,000	Undetermined	Structure and Housing Complex
	Hopi Reservation Roads: ADOT, BIA & Tribal	Moderate	Areas within Priority Areas	Undetermined		Further Study Required (Will be addressed as resources/funding become available)
Priority	Beaver and Twin Dams in Keams Canyon	Moderate	3	Unknown		Located in Keams Canyon

Table 4-14: Vulnerability & Potential Losses due to Severe Winter Storm

	Assessment Area	Estimated Vulnerability	Number of Structures	Structure Losses	Contents Losses	Location Comment
Group 3	Moenkopi District: Pasture Canyon Dam	Moderate	1	Unknown		Located above U.S. Route 160 & Moenkopi Villages
	Livestock & Agriculture	High	8,000 Current Livestock and Animal Grazing Units Reservation-wide (Voluntary reduction in 2006 results: 11,000- 8,000)	\$4,398,400 Estimated Capital Livestock Value @ \$800.00 per head of livestock average		Livestock located in Hopi Partitioned Lands and District 6. \$550,000 Hopi Annual Economic Income from Livestock & Agriculture
	Surface water, Groundwater & Other Agricultural Infrastructure	Moderate	Range Unit Fencing Windmill & Infrastructure (158) total Springs (211) total Earthen Tanks (556) total	Range Unit Fencing \$2,000-5,000 per mile Windmill & Infrastructure \$75,000 each Earthen Tanks Repair Costs		Located in Hopi Partitioned Lands, District 6, and Moenkopi District. \$900,000.00 Annual Tribal Maintenance Budget.

SECTION 5: MITIGATION STRATEGY

5.1 Section Changes

- The Local Capability Assessment, Local Assistance Prioritization Criteria and Local Mitigation Planning Coordination sections were omitted from the Plan. The previous Plan was based on and those topics were required under the State Plan requirements. This Plan is based on and those topics are not required under FEMA's official Tribal Multi-Hazard Mitigation Plan Review Crosswalk, April 2010.

5.2 Goals and Objectives

The goals and objectives from the previous Plan were reviewed and the Planning Team decided to refine them to provide clarity and ease of understanding for all. This was accomplished by developing one main, all encompassing goal and objectives to define main areas of focus for the activities that may benefit the tribe and its citizens. The new objectives look similar to the goals from the previous Plan. The current goal and objectives are:

Goal:

To reduce and/or eliminate the risk to the people and property of the Hopi Reservations from hazard events.

Objectives:

1. Protect the health and safety of our community members;
2. Protect existing and future structures and infrastructure;
3. Reduce environmental impacts and future development activities within hazard-prone areas;
4. Increase public awareness and education of hazard risks.

5.3 Mitigation Actions/Projects

Mitigation measures are activities identified by a jurisdiction, that when implemented, are intended to reduce and/or eliminate the community's exposure and risk to the particular hazard(s) being mitigated. This is intended to reduce response needs and shorten the recovery time/process.

The process for redefining the list of mitigation measures for this Plan was accomplished in steps. First, an assessment of the measures identified in the previous Plan was performed, wherein each was evaluated to determine the current status and disposition. Second, a new list of measures was developed by combining those deemed as 'keepers' from the previous Plan as well as new measures.

Current Mitigation Actions/Projects

Reviewing the previous Plan's mitigation strategy, the Planning Team realized there were several actions/projects that were too vague to understand what the projects was or was meant to accomplish. It was also discovered that many of them were representative of hazards not identified in the Plan. Therefore, considering this information and the results of the vulnerability analysis, the capability assessment, and the goals and objectives, the Planning Team formulated a list of measures for mitigation of the identified hazards within the community.

The mitigation measures developed for this Plan include the following information:

- **New or Existing** – Indicates if the measure is a carryover from the previous Plan or new in this Plan.
- **Hazard(s) Mitigated** – Indicates which of this Plan's identified hazards the measure will potentially mitigate against.
- **Project Name** – The identifying name or title of the measure.
- **Project Description** – Description of the proposed measure, may include reason for activity and/or phases of activity.
- **Estimated Cost** – An estimate of the cost related to implementing the proposed measure based on the knowledge about the project at the time of Plan development.
- **Lead Agency** – A lead agency that will be responsible for the measure's development and implementation.
- **Estimated Timeframe** – An implementation schedule was developed to specify the anticipated completion dates and/or timeframe.
- **Potential Funding Source(s)** – Potential sources of funding that might be available for implementation.

Although it is conceivable to think all nine mitigation measures in this Plan could be implemented concurrently as the responsibilities vary among agencies, we have made an effort to prioritize them. The mitigation measures were prioritized using a High, Medium and Low rating using the following criteria:

High Priority – Measure could likely lead to preservation of life.

Medium Priority – Measure could possibly or indirectly lead to preservation of life and property.

Low Priority – Measure could possibly improve quality of life now and in the future.

Table 5-1: Current Mitigation Strategy

New or Existing	Hazard(s) Mitigated	Description	Estimated Cost & Completion Date	Lead Agency	Potential Funding Source(s)
HIGH PRIORITY					
N	Severe Wind	Research building/utility codes for the Hopi Tribe to determine they adequately protect our people and property.	Ongoing	OCPED	N/A
N	Severe Wind	Continue to enforce Ordinance 55 that ensures buildings are constructed to a standard.	Ongoing	OCPED	N/A
E	Landslide/Rockfall	Monitor the roads near first, second & third mesa areas identified as potentials of slope and mesa erosion.	Ongoing	HDOT	N/A
E	Winter Storm	Conduct outreach program to have residents develop a 72- hour emergency kit.	Ongoing	DPSES, PHEP, Villages, DNR & DHHS	N/A
N	Winter Storm	Coordinate and identify alternative routes for emergencies.	2 years	HDOT	N/A
E	Flood	Identify the floodplains of Hopi land holdings.	Ongoing	DNR Planner	N/A
MEDIUM PRIORITY					
E	Flood	Identify possible improvements to low-water crossings and culverts on Indian Reservation Road. (IRR)	Ongoing	HDOT / DNR Programs	N/A
LOW PRIORITY					
E	Drought	Research and assess the need for a drought response plan.	Staff Time Ongoing	ORM/Land Operations	N/A

5.4 Capability Assessment

A capability assessment provides information that is helpful in assessing the Tribe's ability to mitigate against hazards. The Planning Team reviewed and evaluated the Tribe's resources and capabilities in the following areas:

- **Planning and Regulatory**
- **Administrative and Technical**
- **Financial**
- **Education and Outreach**

In the previous Plan only funding sources for mitigation were discussed. For this Plan three other capability/resource areas were explored (listed above). The tables list the capabilities/resources of primarily the Tribe itself. However, following the tables is a discussion of other funding sources that are known, applied for or previously utilized.

The capabilities and resources of the Hopi Tribe are summarized in the following tables.

Table 5-2: Capability Assessment

PLANNING and REGULATORY		
PLANS	Yes/No Year	Does the plan address hazards? Does the plan ID projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?
Capital Improvements Plan	No	
Community Wildfire Protection Plan	Yes	The Hopi Wildland Fire Management Plan. Addresses wildland fire.
Comprehensive/Master Plan	No	
Drought Contingency Plan	Yes	Addresses drought. Yes, it can be useful for mitigation measures.
Economic Development Plan	No	
Emergency Operations Plan	No	
Stormwater Management Plan	No	
Environmental Strategic Plan	Yes	More of a guidance document. Not instrumental in mitigation measures.
Strategic Land Use and Development Plan	Yes	
BUILDING CODES, PERMITTING, INSPECTIONS	Yes/No	What type of codes? Are codes adequately enforced?
Building Codes	No	
Site plan review requirements	No	
LAND USE PLANNING & ORDINANCES		Is the ordinance effective for reducing hazard impacts? Is the ordinance adequately administered and enforced?
Floodplain ordinance	No	
Subdivision ordinance	No	
Zoning ordinance	No	

ADMINISTRATIVE and TECHNICAL		
ADMINISTRATION	Yes/No	Describe capability. Is coordination effective?
Mutual aid agreements	No	
Planning Commission	No	
TECHNICAL STAFF	Yes/No FT/PT	Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective? Have skills/expertise been used to assess/mitigate risk in the past?
Community Planner	Yes	Director, Hopi Lands. Yes, knowledgeable on hazards and on the community itself.
Emergency Manager	Yes	Yes, trained and knowledgeable and continuing education and training. Fairly effective.

		Yes, again, knowledgeable on community and mitigation needs.
Engineer	Yes	Project Managers on staff at Community and Economic Development Dept
Floodplain Manager/Administrator	No	
GIS/HAZUS Coordinator	Yes	Director of Land Info Systems. Knowledgeable on local hazards and risks. Fair coordination.
Grant writer	Yes	Use dept staff as required.

FINANCIAL		
FINANCIAL	Yes/No	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Capital improvements project funding	No	
Community Development Block Grant	Yes	Used after 2010 disaster event.
Authority to levy taxes for specific purposes	No	
Impact fees for new development	No	
Incur debt through special tax bond	No	
Incur debt through general obligation bonds	No	
FEMA mitigation grant funding	Yes	Used after 2010 disaster event. This can be a source of future funding following a disaster (Hazard Mitigation Grant Program).

EDUCATION and OUTREACH		
PROGRAM / ORGANIZATION	Access / Eligibility (Yes/No)	Describe program/organization and how it relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Community Bulletins	Yes	This program will be used to keep the communities informed about hazards, risks and mitigation efforts.
Hopi Emergency Response Team (HERT)	Yes	This team's monthly meetings are used to delivery on-going mitigation updates and engage other individuals and departments in mitigation related activities.
Citizen groups focused on emergency preparedness, environmental protection, etc.	No	
Public education/information programs (fire safety, household preparedness, responsible water use, etc)	Yes	Structural Fire, Hopi Environmental Protection Office, (HEPO), Water Resources, and Department of Public Emergency Services, (DPSES) - (CERT).

From the previous Plan and now, there have been no significant changes in the capabilities/resources of the Tribe. Although plans may have been updated, there is no significant change with them or the Tribe's ordinances, codes and regulations. There has however, over time been a significant change in the government funding for programs including disaster response. Consequently there has been there is a growing need to consider better partnering with neighboring tribes, counties, local jurisdictions and the State.

The Hopi Office of Planning and Evaluation administers the land use planning input and control of a tribal regulatory measure as contained within the Hopi Tribal Planning Ordinance No. 55. This ordinance provides a *Land Development Review* within its regulations in *Chapter 4. Land Development Review*. The applicability section does identify projects and developments with exceptions to the review although mitigation of hazards should apply to these exceptions in order to identify vulnerable areas and provisions for mitigation. Most of the guidance and rules established in Ordinance 55 are conducive to developing and implementing mitigation strategies and actions.

In the past, the Hopi Reservations have received funding directly and indirectly from local and State governments for disaster relief. The Hopi Tribe has received funding from FEMA and looks to further the opportunity for disaster and mitigation funding with the acceptance of this Plan.

Local potential funding sources for pre-disaster mitigation activities and emergency response to disasters has been very limited. It is critical that the Hopi Tribal Council continue with the established Emergency & Disaster Response Contingency Fund so that responses to disaster events are not drawn out and unresponsive to the needs of the Hopi people. Coordination and planning should be well supported so the efficiency and organization is executed to the highest degree during these disaster events. The Hopi Tribe is faced with a major reduction of government financial revenues to continue the fund. Therein, planning and grant funding should be a priority for support from the Tribe due to this financial constraint, including the development of this Plan. As a result, financial support for hazard mitigation projects will largely rely on off-Reservation sources in the foreseeable future.

Upon receipt of a presidential disaster declaration, the Tribe will develop a Public Assistance Administration Plan and a Hazard Mitigation Grant Program Administration Plan. Both plans will be used to identify the roles and responsibilities of the Tribe in administering the FEMA Public Assistance (PA) and Hazard Mitigation Grant Programs (HMGP), and to outline staffing requirements and the policies and procedures to be used. A result of developing these plans will be to further focus Tribal resources on the importance of hazard management and mitigation planning.

Staff resources in several Tribal departments/programs, working under the auspices of the Council collectively provide hazard mitigation for the Tribe. The Tribe often hires consultants to conduct the necessary technical studies and analyses to determine both risk and mitigation alternatives.

Current financial resources available to the Tribe for hazard mitigation planning and projects include potential disaster and mitigation funds through FEMA are post-disaster Public Assistance and HMGP, and the annual Pre-Disaster Mitigation grant program. Potential sources of funds may include any of the previously mentioned resources and others such as the U.S. Department of Interior (Bureau of Reclamation, Bureau of Indian Affairs, U.S. Geological Survey, Bureau of Land Management), U.S. Army Corps of Engineers, U.S. Housing and Urban Development, U.S. Department of Health and Human Services (Indian Health Service), and the U.S. Department of Agriculture (U.S. Forest Service, Natural Resources Conservation Service).

In summary, the Hopi Tribe currently has in place regulatory mechanisms for mitigation of hazards, with most being directed at new construction and development. Staff resources and/or consultants are available for the identification, development and implementation of mitigation measures. Financially, the Tribe applies for Community Development Block Grants, obtains Capital Improvement Project funding, and has the authority to levy taxes for specific purposes, however, all of these mechanisms require political approval.

SECTION 6: PLAN MAINTENANCE

6.1 Section Changes

- The previous Plan was based on the State Plan requirements which did not include *Incorporation into Existing Planning Mechanisms* and *Continued Member and Stakeholder Involvement*. Those elements are now included in this Plan.

6.2 Monitoring, Evaluating and Updating

The responsibility for ensuring the plan maintenance and update procedures are performed belongs to the Department of Public Safety and Emergency Services. For evaluation purposes, the Planning Team shall review the Plan once a year, on or around the approval anniversary date.

Each evaluation shall include, but not be limited to the following:

- *Risk Assessment* – Analyze changes in the type, nature or magnitude of risks.
- *Goals and Objectives* – Ensure they address current and expected conditions.
- *Mitigation Strategy* – Review mitigation activity progress and available resources to implement.

The results of the evaluation shall be documented and kept with the Plan. The review documentation and any other related materials will be reviewed and considered during the next update process.

A summary of the evaluation shall also be presented as an informational item to the Hopi Emergency Response Team (HERT) on at least an annual basis as well as performing periodic presentations to the team to keep the Plan ‘alive’ and active. The evaluations of the previous were not performed as discussed in the Plan. This is due mostly to staff turn-over and lack of awareness of the Plan and the commitments within. We feel we now have a much better understanding and are currently educating several government departments on the Plan and will continue to do so in the future. The process has been modified to encourage adherence.

The Plan requires updating and re-approval from FEMA every five years. The plan update will adhere to the set schedule using the following procedure:

- One year prior to the plan expiration date, the Planning Team will convene to review and assess the Plan and areas for potential change.
- The Planning Team will update and/or revise the Plan according to the requirements in FEMA’s Tribal Plan Review Crosswalk and reproduce the Plan.
- The updated Plan will be presented to the Tribal Council for review and approval.
- The updated Plan will be submitted to FEMA for review, comment and approval.
- Once the Plan is determined ‘approvable’ by FEMA, the Plan will be presented to the Tribal Council for adoption via Tribal resolution.
- The signed resolution will be sent to FEMA.

6.3 Monitoring Progress of Mitigation Activities

The Hopi Hazard Mitigation Planning Team will discuss, on at least an annual basis, the Mitigation Strategy progress. Representatives of the Planning Team will report on the progress made by their

respective departments. Other departments or programs will be invited, as necessary to report or present data relative to the Plan or mitigation measures implemented by their departments. The implementation of mitigation measures will be monitored by the Planning Team on an on-going basis until implementation is complete. Due to the vague and/or unrelated nature of the previous Plan's mitigation measures, the monitoring was not executed as discussed. However, with a clearer and more concise Plan the probability of a better understanding, resulting in a higher level of success in implementing mitigation measures is likely.

For FEMA supported projects, progress reports are required on a quarterly basis throughout the project duration. The degree of quarterly reporting will be dependent upon the type of project, its funding source, and the associated requirements. At a minimum, the quarterly report shall address:

- Project Completion Status
- Project Challenges/Issues (If any)
- Budgetary Considerations (Cost Overruns or Underruns)
- Detailed Documentation of Expenditures

Upon completion of projects, a member of the Planning Team will visit the project location to view the final results. A closed project will also change status to "Completed" and will then be monitored for effectiveness in the intended area of mitigation. FEMA supported project closeouts will include an audit of the project financials as well as other guidelines/requirements set forth under the funding or grant rules, and any attendant administrative plans developed by the Tribe.

6.4 Incorporation into other Planning Mechanisms

In the past, this Plan has not been successfully incorporated with our other tribal efforts. The Plan was not highly publicized nor was it organized in a manner that lent itself to easily see the opportunity for integration/incorporation. However with the improved format of this Plan, there is likely to be greater opportunity to use the material in this Plan to inform other tribal efforts, projects and planning mechanisms. This Plan will be publicized and made available to all tribal members, departments and agencies. It will also be discussed regularly with community members and updates presented at the Hopi Emergency Response Team (HERT) meetings. We believe this will give the Plan improved on-going exposure resulting in a higher level of awareness of its benefits and how it may be utilized for current and future tribal ventures ensuring its members a sustained high quality of life for generations to come. It is our hope and intent that when plans, ordinances, regulations, etc., are developed, reviewed or updated, the information from this Plan will be used where appropriate. The responsibility of encouraging that practice will be owned by the Office of Emergency Management.

The plans the tribe will, as appropriate incorporate this Plan's information, data and mitigation practices into are as follows:

PLANS	LAND USE
Hopit Potsqwani'at Goals and Objectives 2001	
Hopi Tunatya'at : Strategic Land Use and Development Plan 2000	
Hopi Emergency Response Plan 2005	
Hopi Drought Contingency Plan 2000	

Hopi Water Code 1997	
Hopi Wildland Fire Management Plan 2005	
Hopi Integrated Woodlands Management Plan 2006	
Hopi Integrated Resources Management Plan 2001	

CODES AND REGULATIONS	EMERGENCY OPERATIONS
Ordinance 55: Hopi Tribal Planning	
Ordinance 26: Protection of place and objects of sacred historical and scientific interest on the Hopi Reservation	
Hopi Emergency Response Team ERP 2005	
Hopi Emergency Operations Structure (with Tribal Declaration)	
Hopi Incident Command Structure (at Incident Scenes)	
Hopi Risk Management—Emergency Evacuation Plan	
Hopi Environmental Protection Office—Leaking Underground Storage Tank Program	
BIA—Volunteer Structural Fire Response	
Community Emergency Response Team (CERT)	

PROGRAMS	LAND USE
Hopi Tribe Watershed Study 2009	
Hopi Solid Waste Program	
Hopi Cultural Preservation Office	
Hopi Environmental Protection Office	
Hopi Range Management Program	
Hopi Wildlife Ecosystem Management Program	
Hopi Resources Enforcement Services	

6.5 Past and Continued Member and Stakeholder Involvement

During the previous Plan cycle of 2010 to 2015 the Tribe has not been involved as is planned for the next five years. Having a more established program now and the development of this update has been a learning lesson for the Tribe on how they can be more involved with the community. Other than presenting at community meetings and schools some of the community events the program did participate in were a Community Family Night Out sponsored by the BIA. The event was for first responders and the public to learn and become more aware of how to protect themselves and the community. They also participated in the Domestic Violence Month Conference which was hosted

by tribal agencies and departments. The hosts set up booths with information to help educate the public on their programs and the hazard information was presented at that time.

The Tribe is committed to keeping the public informed about the reservations' risks and hazards and their resulting mitigation planning efforts. In order to accomplish this, the Planning Team will pursue the following opportunities for public involvement and dissemination of information whenever possible and appropriate:

- Continue to develop and disseminate flyers to the public via community bulletin boards. These flyers discuss a wide range of topics such as safe winter preparedness and driving tips, elder and functional needs care/preparation, National Preparedness Month information, Ready.gov, winterizing vehicles, emergency kits, etc. The intent is to continue to publish the flyers monthly and focus on seasonal topics.
- Educate the public on the risk and potential impacts of the hazards that threaten the community and their villages at fairs, educational events and special community events.
- Presentations will continue to be delivered to the Hopi Emergency Response Team (HERT) at their monthly meetings. The intention of the on-going updates is to keep the Plan 'alive' and engage other departments and individuals in the on-going mitigation efforts of the tribe.

The Tribe will continue to explore other opportunities to be more involved with the community and will attend them whenever possible.

Appendix A - Planning Process Documentation

Page 1 of 2

Susan Wood - FW: Hazard Mitigation Planning Meeting

From: Velleda Sidney <VSidney@hopi.nsn.us>
To: Susan Wood <Susan.Wood@azdema.gov>
Date: Tuesday, July 22, 2014 11:50 AM
Subject: FW: Hazard Mitigation Planning Meeting

From: Velleda Sidney <VSidney@hopi.nsn.us>
To: Susan Wood <Susan.Wood@azdema.gov>
Date: Tuesday, July 22, 2014 11:50 AM
Subject: FW: Hazard Mitigation Planning Meeting

This is what I sent out today.

From: Velleda Sidney
Sent: Tuesday, July 22, 2014 11:47 AM
To: Fred Shupla; Thana Leslie; Lorena naseyowma (lnaseyowma@frontiernet.net); 'stewartnicholas1975@gmail.com'; upper.moenkopi@yahoo.com; Kykotsmovi Village CSA; Gail Poley; 'bbnavakuku@yahoo.com'; Phyllis Wittsell; 'clydeq_ypc@hopitelcom.net'; 'lgrover9@yahoo.com'; 'csa@songoopavi.org'; Sipaulovi Village; Leigh Kuwanwisiwma; Leigh Kuwanwisiwma; Betty Poley; Phillip Onsaie; Ronald Honyumptewa; Willis N. Sequi; 'wendell.honanie@bia.gov'; Laverne Dallas; Laverne R. Dallas; 'dallasl@hotmail.com'; Edison Tu'tsi; Velta Honanie; Clayton Honyumptewa; Edgar Shupla; Gayle Honanie; Lionel Puhuyesva; Micah Lomaomvaya; 'Yazzie, Sam'
Cc: Roger Tungovia; Herman G. Honanie; Alfred Lomahquahu
Subject: Hazard Mitigation Planning Meeting

The next Hazard Mitigation Planning Meeting will be held on Wednesday, July 30, 2014 at the Hopi Rangers Enforcement Services Conference Room 9:00 AM – 12:00 PM

Again, we are in the process of revising and updating our Hazard Mitigation Plan which is due on July 2015 to FEMA. Our Office has coordinated with Ms. Susan Wood from Arizona Department of Emergency Management. Ms. Susan Wood is the Mitigation Expert and has updated our Department Staff on the revision process provided to us the most effective strategy to complete this process. Since 2005, the Hazards were identified and a Mitigation process was created for the Hopi Tribe to follow. Looking back almost 10 years now are our Hazards still the same or have they changed? Within these past years did our current 2010 Mitigation Plan fit to what has affected the Hopi Reservation? Is this plan effective or is there areas we need to strengthen.

For the past three meetings we have worked on the first three sections. I feel we have spent enough time on the description, history and new map making of the Hopi Reservation. I appreciate those that have contributed their ideas and suggestions to this portion of plan.

Now, the main focus of the Mitigation Plan is to identify all the Hazards we have in on our populated areas where life, safety, and property is threatened. We need you all present at this next meeting so that we can go through a "Risk Assessment" and that this process where you are all present will be written in to the 2015 Mitigation Plan.

Ms. Susan Wood is going to be present in this meeting and is already helping the Hopi Tribe to revise and update the plan. Ms. Wood will be there to provide us with a Power Point Presentation on the Process of

file:///C:/Users/woods.214854WOODS.001/AppData/Local/Temp/XPgrpwise/53CE5013A... 7/29/2014

Hazard Mitigation Planning Meeting



7/30/2014 @ 9:00 am – 12:00 pm

Hopi Rangers Enforcement Svcs Conference Rm.

Meeting called by: Velleda Sidney
Type of meeting: Planning
Facilitators: Velleda Sidney/Sue Wood
Note takers: Velleda Sidney/Sue Wood

Handouts: Agenda
Hopi Hazard Mitigation Plan
Sections for Update Packet

Agenda Items

Topic

- ☐ Hazard Mitigation Plan Update Process Overview
- ☐ The Hopi Plan Changes Overview
- ☐ Sections Requiring Update/Revision
 - Economy
 - Development History
 - Future Land Use/Development
 - Planning Team
 - Public and Stakeholder Involvement
 - Program Integration
 - Hazard Identification
 - Tribal Declarations
 - Goals and Objectives
 - Actions and Projects
 - Capability Assessment
- ☐ Next Steps
- ☐ Next Meeting

Hazard Mitigation Planning Meeting



8/26/2014 @ 9:00 am – 12:00 pm

Hopi Rangers Enforcement Svcs Conference Rm.

Meeting called by: Velleda Sidney
 Type of meeting: Planning
 Facilitators: Velleda Sidney
 Note takers: Velleda Sidney / Paul Sauflie

Handouts: Agenda

Hopi Hazard Mitigation Plan - Update

Sections for Update Packet

Agenda Items

Topic

- ☐ Update on Projects –
 - Letter all to listed on the Actions and Projects – 5.3
- ☐ Group Work Session -
 - Planning Team – 3.3
 - Actions and Projects – 5.3
 - Regulatory Tools Used by the Hopi Tribe – 5.4
- ☐ Sections Requiring Update/Revision
 - Tribal Sovereignty 2.2
 - Demographics 2.4
 - Existing Plans, Studies Reports Reviewed 3.6
 - Hopi Executive Order Declarations – 4.2
 - Development Trend Analysis – 4.2
 - Cultural & Sacred Sites - 4.2
 - Dam failure Event Related Hopi Tribal Executive Order – Declaration – 4.2
- ☐ Next Steps @ Next Meeting
 - Group Work Session -
 - Actions & Projects – Pertaining to the new identified Hazards – 5.3
 - Regulatory Tools Used by the Hopi Tribe – 5.4
- ☐ Next Meeting



JANICE K. BREWER
GOVERNOR

ARIZONA DEPARTMENT OF EMERGENCY AND
MILITARY AFFAIRS

Arizona Division of Emergency Management
5636 East McDowell Road, Building M5101, Phoenix,
Arizona 85008

Office: (602) 464-6225 FAX: (602) 464-6206

www.dem.azdema.gov/preparedness



Maj Gen MICHAEL T. MCGUIRE
THE ADJUTANT GENERAL

State Training Offering
MAG393: Mitigation for Emergency Managers

ERMA Event #1003789

Papago Park Military Reservation, Joint Information Center (JIC)
5636 E. McDowell Road, Phoenix, AZ 85008

October 7th and 8th, 2014
8:00AM – 5:00PM each day

*** Register On-Line through ERMA at www.erma.az.gov using the above event number ***

Description: This course is designed to train emergency managers and other interested individuals who have no specialized technical background, but can support mitigation efforts as advocates. The course provides training in how to perform mitigation activities fundamental to reducing and eliminating long-term risk from hazards. It addresses the important roles of the emergency program manager (or other local government representative) in mitigation: motivator, coordinator, and monitor in local implementation of the National Mitigation Strategy. The course provides activities and exercises that build the participants' abilities to: perform the tasks and responsibilities of the emergency manager's role, create long-term strategies for disaster-resistant communities, identify local mitigation opportunities, select mitigation solutions to hazard risk problems and find resources to carry out mitigation activities in a post-disaster environment. This is a required course for the Advanced Professional Series certificate.

Prerequisites: IS-393, Introduction to Mitigation is recommended. This online independent study course can be found at <http://training.fema.gov/IS/crslist.asp>.

Target Audience: Tribal and local government officials, emergency managers, community leaders in such efforts as voluntary organizations, businesses and industries, and other emergency service personnel.

Registration: *Participants must enroll no later than 14 days prior to the start of the course.* Enroll On-Line through ERMA at www.erma.az.gov. First time users will be required to create an account prior to enrollment. You must provide a valid email address and phone number for contact information.

Costs: Training is provided at no cost to eligible jurisdictions. ADEM will not provide any overtime, backfill, or travel-related reimbursements for this course.

For additional information or registration assistance, please contact:
ADEM Training Office – (602) 464-6225

ADEM reserves the right to deny attendance if student eligibility cannot be verified through information provided by the event host, or through information in your ERMA account

Course dates and location are subject to change.
Check your ERMA account prior to attending for the most current status of this event

ADEM State Training Announcement – Revised April 2014

HOPI EMERGENCY RESPONSE TEAM MEETING
Hopi Resource Enforcement Services
Conference Room
April 7, 2015
9:00 am to 12:00 noon

1. ADEM Tribal Liaison
2. HDOT Presentation – Michal Lomayaktewa
3. Social Services Executive Order Update - Roger
4. PHEP Update - PHEP Velleda
 - Mitigation plan update
5. Update on Structure Fire – Roger
6. Trainings/Exercise – DPSES Paul
7. CERT events – DPSES Paul
 - CERT Training update, wellness center conf. rm.
 - CERT Program Manager training, Holbrook April
8. Announcements
9. Other

Appendix B - Public Involvement Documents

ADS & ANNOUNCEMENTS

HOPI TRIBAL HOUSING AUTHORITY



**The Hopi Tribe is updating the
Hazard Mitigation Plan
March 2015**

The purpose of the *2010 Hopi Tribe Hazard Mitigation Plan* is to ensure our people and property are as safe as possible from the effects of future disasters and that the Hopi Tribe is eligible for Federal disaster recovery funds following a major disaster. A planning team made up of representatives from the Hopi Tribe's departments, agencies and villages is meeting regularly to perform the required five-year update of the Plan.

The Plan focuses on the Reservations' most threatening hazards (dam failure, drought, flood, landslide/rock fall, severe wind and winter storms) and provides a strategy to reduce or eliminate the risks from those hazards.

The planning team anticipates having a draft of the updated *2015 Hopi Tribe Hazard Mitigation Plan* soon, at which time the public will again be provided access to the Plan and the opportunity to comment.

You may view the Plan at the following locations and contact person:

- Keams Canyon-BIA Office – Velma Talayumptewa
- First Mesa Consolidated Villages – Sharon Grover
- Shungopavi Community Building – Vemene Mansfield
- Sipaulovi Community Building – Noreen Kootswatewa
- Hopi Tribal Complex-Department of Natural Resources – Veronica Silas
- Moenkopi-Lower Village of Moenkopi Community Building – Rhonda Loma

Please send your comment, questions or concerns about this Plan to:

Velleda Sidney
The Hopi Tribe
PHEP Office
P.O. Box 123
Kykotsmavi, AZ 86039
(928) 734-3662
vsidney@hopi.nsn.us

DATE POSTED: 3/9/15

Public comment on Landslide/Rock Fall:

Mr. Lloyd Ami from Polacca member of the Tewa Village called my desk phone wanted to share his comments and concerns regarding the 2010 Mitigation Plan the hazard for Landslide/Rock Fall and recommendations for the 2015 Mitigation Plan updates.

Mr. Ami is addressing the Polacca Mesa "Gap" area. He, rock continues to fall after heavy rain and snow storms and is he is concerned this being a hazard for loss of lives and safety of the people.

Mr. Ami suggested for the planning team to continue to work with a Yanter Company from Salt Lake City to stabilize the rocks and installment of embankments. Mr. Ami feels that the Yanter Company would be knowledgeable of the Polacca Mesa area because they have collected vibrations maps, and this company may have other useful records and documentation of the information collected during that time.

After 15+years after the stabilization and anchoring of rocks it continues to be very unstable and erosion is occurring causing the rocks to fall in large chunks after a storm or high winds pass through the area.

Mr. Ami is willing to work with Tewa CD to assist the staff with the knowledge his has regarding the Polacca Mesa "Gap" Project. There they can also include the Sichomovi and Walpi Community Development Offices to come together and work on small projects to start addressing the problem. Each project can build upon one another so the work on the Polacca Mesa can be continuous for the safety of the people.

Velleda's comments:

I recommend in the projects/action sections we can started with listing out a beginning phase to address the landslide/ rock fall hazard. This will include Community Development Office and Cultural Preservation office and the Hopi Department of Transportation since they now have the BIA 638 contract for Road Maintenance. To start a phase one for the next five years for the Polacca Area this will include all three villages to work together to start developing a plan. This cost will be paid with Transportation funds from the 638 contract and Village Allocation funds, the villages can start working on grant funding to cover their cost.

Next, we can do this same idea of phases for the other villages that have high landslide rock fall areas. We can work on this landside/rock fall projects in phase one, two and three for all villages.

Llyod Ami
P.O. Box 154
Polacca, Arizona 86039
(928) 737-2379; (928) 928-313-6100

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FREE

HOPi TUTUVENi

TUESDAY, August 4, 2015

Volume 23, Number 15

HOPi TUTUVENi | TUESDAY, AUGUST 4, 2015 7

The Hopi Tribe's 2015 Hazard Mitigation Plan FINAL REVIEW

The Mitigation planning team includes representatives from the Hopi Tribal departments/programs, local Agencies and Villages who met regularly to update the Hopi Hazard Mitigation Plan. The purpose of the plan is to ensure our people and property are safe from the effects of disaster events and to ensure the Hopi Tribe is eligible for Federal disaster recovery funds following a major disaster.

The plan focuses on the Hopi Reservation's most threatening natural hazards (dam failure, drought, flood, landslide/rock fall, severe wind and winter storms) and provides a strategy to reduce or eliminate the risks from those hazards.

The Final 2015 Hazard Mitigation Plan is ready for public view and gives the public the opportunity to comment. You may view the 2015 Hopi Mitigation Plan at the following locations:

- Keams Canyon-BIA Office
- First Mesa Consolidated Villages
- Shungopavi Community Building
- Sipaulovi Community Building
- Hopi Tribal Complex-Department of Natural Resources
- Lower Village of Moenkopi Community Building

Submit your comments to: Velleda Sidney, The Hopi Tribe-PHEP Office P.O. Box 123 Kykotsmovi, AZ 86039 or, vsidney@hopi.nsn.us for more information/questions regarding the Final Hazard Mitigation Plan



**The Hopi Tribe's
Hazard Mitigation Plan
July 2015**

The purpose of the *2010 Hopi Tribe Hazard Mitigation Plan* is to ensure our people and property are as safe as possible from the effects of future disasters and that the Hopi Tribe is eligible for Federal disaster recovery funds following a major disaster. A planning team made up of representatives from the Hopi Tribe's departments, agencies and villages were meeting regularly to perform the required five-year update of the Plan.

The revised Plan focuses on the Reservations' most threatening hazards (dam failure, drought, flood, landslide/rock fall, severe wind and winter storms) and provides a strategy to reduce or eliminate the risks from those hazards.

The planning team has finalized *2015 Hopi Tribe Hazard Mitigation Plan*. The public will can now view the Plan and you have the opportunity to comment.

You may view the Plan at the following locations and contact person:

- Keams Canyon-BIA Office – Velma Talayumtewa
- First Mesa Consolidated Villages – Sharon Grover
- Shungopavi Community Building – Vernene Mansfield
- Sipaulovi Community Building – Noreen Kootswatewa
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Please send your comment, questions or concerns about this Plan to:

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vsidney@hopi.nsn.us

Appendix C - Assessment of Previous Plan's Mitigation Strategy

Assessment of Previous Plan's Mitigation Measures					Status			Action			Explanation
Hazard	Description	Estimated Cost & Completion Time	Lead Agency	Potential Funding Source(s)	No Action	In Progress	Complete	Keep	Revise	Delete	
Drought	Community education outreach	On-going	Village CSA, CHR, IHS, PSEM, BIO	Part of in-place program budgets	X			X	X		Too vague, will revise and place in update to cover multiple hazards.
Drought	Incentive program to install water saving devices		RSWA, Facilities Mgmt, Village CSA, VUMC	IHS, Home Depot, Lowes, Water Resources Agency	X					X	Villages manage their own water systems & projects like these would be different village to village.
Drought	Installation of water meters and billing rates	On-going	Water Co., Coops, Village CSA	IHS	X					X	Again, villages manage their own water systems. Projects like these are up to the individual villages.
Drought	Assess/upgrade primary and village water systems. Perform village surveys to determine needs	Annually	Natural Resources Dept., IHS, Village CSA, BIA	IHS	X					X	Description too vague, no one recognized project.
Drought	Building of central water supply/storage for First and Second Mesas villages to alleviate arsenic in water sources	\$20M 10 years	IHS	IHS, EPA		X				X	This is not a drought issue, not sure what this project is.
Winter Storm	Installation of emergency generators at critical structures and communication towers	\$30,000 5 years???	Facilities/Risk Mgmt Dept., Village CSA	Hopi Tribe, BIA, IHS, Red Cross, Homeland Security	X					X	Was intended following 2010 Winter Storm event. Did not happen, unaware of future plans.
Winter Storm	Outreach program to have residents have one week of emergency supplies	Staff Time On-going	CRS, CHR, ASEM, BIO	Village General Funds, Community Block Grants	X			X			Started in 2012 reaching out to community through schools and family events.
Winter Storm	Strengthen/retrofit Tribal roof structures	\$50,000 On-going	Facilities/Risk Mgmt Dept., Villages	HUD, BIA, Tribal Contingency Funds, Tribal Housing			X			X	Project not feasible at this point. Will revisit and report on it.
Infestation	Partner with Dept of Agriculture & Land Mgmt for prevention treatment programs		Dept of Range Mgmt, IHS, Tribal Health Resources	Dept of Agriculture, IHS, CDC, Village General Funds						X	This hazard is not identified in this Plan.
Infestation	Education outreach addressing human infestations		CHR, Village CSA, IHS, ASEM, BIO	IHS, CDC, HEP						X	This hazard is not identified in this Plan.

Assessment of Previous Plan's Mitigation Measures					Status			Action			Explanation
Hazard	Description	Estimated Cost & Completion Time	Lead Agency	Potential Funding Source(s)	No Action	In Progress	Complete	Keep	Revise	Delete	
Flood	Create/implement maintenance program for dams/levees	\$50,000 Annually	BIA	BIA	X					X	The Safety of Damns program was not represented during update process. Unable to get more details on project as it is too vague.
Flood	Map/regulate development within floodplains	2 years???	Hopi Water Resources Program	Army Corp of Engineers, US Dept of Natural Resources	X			X	X		
Flood	Improve low-water crossings and culverts		Range/Land Mgmt, BIA	ADOT, Range/Land Mgmt	X			X	X		No funding available.
Landslide/Rock Fall	Monitoring of slope and mesa erosion to track vulnerable areas		Range/Land Mgmt & Planning, BIA	ADOT, BIA, USGS	X			X	X		
Landslide/Rock Fall	Develop land use guidelines for 'hot spots'	Monthly	Planning Dept	BIA Road, USGS	X					X	Will be covered in revision of previous project above.
Landslide/Rock Fall	Erect rock fences near inhabited areas/roadways. Site surveys needed prior to project.		Range/Land Mgmt, BIA	ADOT, Village General Funds	X					X	Again, will be addressed in future phases of previous project.
Severe Winds	Actions covered in above projects for Winter Storm and Flooding									X	Duplicate
Power/Utility Failure	Generator project (same as #1 Winter Storm)	\$40,000	VUMC, IHS, Village CSA	Dept of Homeland Security						X	This hazard is not identified in this Plan.
Power/Utility Failure	Educate selected village reps on CB communication. Introduce battery and/or crank phones. Establish radio clubs.		Village CSA, Tribal Health, HRES, BIA	Hopi Tribe, Villages						X	This hazard is not identified in this Plan.
Fuel/Resource Shortage	Educational outreach to supply/service businesses such as gas stations, food markets and building supply stores.	TBD	Tribal Office of Revenue, RSEM, BIO	Business Community/Organizations						X	This hazard is not identified in this Plan.

Assessment of Previous Plan's Mitigation Measures					Status			Action			Explanation
Hazard	Description	Estimated Cost & Completion Time	Lead Agency	Potential Funding Source(s)	No Action	In Progress	Complete	Keep	Revise	Delete	
HazMat	Educational community members, school age children, local agencies and Tribal government on handling the disposal of hazardous materials.	\$20,000	HEPO	EPA						X	This hazard is not identified in this Plan.
HazMat	Solid waste program to clean up illegal dumping issues, including metals, hazardous waste, medical waste, etc.	\$50,000	HEPO	EPA						X	This hazard is not identified in this Plan.
Transportation Accident	Annual safety inspections of brake systems, tire condition and safety belt and seat use.		Hopi PD, HRES, Risk Mgmt	BIA, HOPI PD, ADOT						X	This hazard is not identified in this Plan.
Transportation Accident	Defensive driving courses		Hopi PD, HRES, Risk Mgmt	BIA, HOPI PD, ADOT						X	This hazard is not identified in this Plan.
Transportation Accident	Installation of rumble strips and widening of shoulders		BIA, ADOT	BIA, ADOT						X	This hazard is not identified in this Plan.
Explosion/Fire	Establish official standards for installation of above ground fuel tanks. Development of environmental codes in addition to currently enforced Federal codes that address UST, LUST, AST, and other tanks for the safety of human health.	\$20,000	HEPO	EPA						X	This hazard is not identified in this Plan.