City of Benson
City Council Communication

Regular Meeting **November 13, 2017**

To: Mayor and Council Agenda Item # 7

From: Keith Spangler, Fire Chief

Subject:

Discussion and possible action regarding Resolution 35-2017 of the Mayor and Council of the City of Benson, Arizona, Declaring the 2017 Cochise County Multi-Jurisdictional Hazard Mitigation Plan to be a public Document and Adopting said Plan as the City's Hazard Mitigation Plan

Discussion:

This document was put together from a collaborative effort between the Cochise County Emergency Management Office and multiple cities from Cochise County. It was headed up by a private company paid for from the Arizona Department of Emergency Management.

This document gives a general idea of what hazards each jurisdiction has and ways to mitigate the hazard before it can happen. If it does happen, the plan gives ways to handle the problem.

This is a working document. As funding becomes available, the proposed action to mitigate the hazard will be addressed.

Staff Recommendation:

Approval of Resolution 35-2017

RESOLUTION 35-2017

A RESOLUTION OF THE MAYOR AND COUNCIL OF THE CITY OF BENSON, ARIZONA, DECLARING THE 2017 COCHISE COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN TO BE A PUBLIC DOCUMENT AND ADOPTING SAID PLAN AS THE CITY'S HAZARD MITIGATION PLAN

WHEREAS, the City of Benson has experienced damage from natural and human-caused hazards such as flooding, wildfire, drought, thunderstorms/high winds, and hazardous materials incidents on many occasions in the past century, resulting in loss of property and life, economic hardship, and threats to public health and safety; and

WHEREAS, the Arizona Division of Emergency Management, Cochise County emergency management representatives, and other local jurisdictions in Cochise County that maintain and operate public safety assets have developed a planning document known as the Cochise County Multi-Jurisdictional Hazard Mitigation Plan (the "Plan"); and

WHEREAS, the Plan specifically addresses hazards, vulnerabilities, mitigation strategies, and plan maintenance procedures for the City of Benson; and

WHEREAS, the Plan is an update and replacement for the previous 2012 hazard mitigation plan for the City of Benson

WHEREAS, it is in the best interest of the residents of the City of Benson that the Plan be adopted as the City's official hazard mitigation plan.

NOW, THEREFORE, THE MAYOR AND CITY COUNCIL RESOLVE that:

1. The Cochise County Multi-Jurisdictional Hazard Mitigation Plan 2017, three copies of which are on file with the City Clerk's Office, is hereby declared to be a public document.

2. The Plan is hereby adopted as the City's official hazard mitigation plan.

3. Staff is hereby directed to take all actions necessary to give effect to the Plan, and to continue to coordinate with state, county and local emergency management officials to monitor the Plan's implementation, effectiveness and responsiveness

PASSED AND ADOPTED BY THE MAYOR AND COUNCIL OF THE CITY OF BENSON, ARIZONA, this 13th day of November, 2017.

_____
TONEY D. KING, SR., Mayor

ATTEST:

_____
VICKI L. VIVIAN, CMC, City Clerk

APPROVED AS TO FORM:

_____
MESCH CLARK ROTHSCHILD
By Gary J. Cohen
City's Attorney

Cochise County Multi-Jurisdictional Hazard Mitigation Plan

AUGUST 2017

Cochise County Emergency Services Department

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EXECUTIVE SUMMARY

Across the United States, natural and human-caused disasters have led to increasing levels of death, injury, property damage, and interruption of business and government services. The toll on families and individuals can be immense and damaged businesses cannot contribute to the economy. The time, money and effort to respond to and recover from these emergencies or disasters divert public resources and attention from other important programs and problems. With 30 federal or state declarations having occurred in Cochise County, the Planning Team members who participated in this planning effort recognize the consequences of disasters and the need to reduce the impacts of natural and human-caused hazards. The county and jurisdictions also know that with careful selection, mitigation actions in the form of projects and programs can become long-term, cost effective means for reducing the impact of natural and human-caused hazards.

Hazard Mitigation Plans are required to be updated every five years, to ensure communities remain eligible for potential future post-disaster grant funding opportunities. This 2017 Plan update marks the third time Cochise County and its jurisdictions have gone through the Hazard Mitigation planning process. Over the past year, Cochise County reconvened a multi-jurisdictional Planning Team comprised of multiple veteran and first-time representatives from each participating jurisdiction, various county and local departments and organizations, and State and Federal agencies. The result of that process is this 2017 Cochise County Multi-Jurisdictional Hazard Mitigation Plan (Plan) which will continue to guide the county and participating jurisdictions toward greater disaster resistance in full harmony with the character and needs of the community and region.

The Plan has been prepared in compliance with Section 322 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act or the Act), 42 U.S. C. 5165, enacted under Sec. 104 the Disaster Mitigation Act of 2000, (DMA 2000) Public Law 106-390 of October 30, 2000, as implemented at CFR 201.6 and 201.7 dated October, 2007. The Plan identifies hazard mitigation measures intended to eliminate or reduce the effects of future disasters throughout the county, and was developed in a joint and cooperative venture by members of the Cochise County Planning Team.

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SECTION 1: JURISDICTIONAL ADOPTION AND FEMA APPROVAL

Requirement §201.6(c)(5): *[The local hazard mitigation plan shall include…] Documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, County Commissioner, Tribal Council). For multi-jurisdictional plans, each jurisdiction requesting approval of the plan must document that it has been formally adopted.*

Requirement §201.6(d)(3): *A local jurisdiction must review and revise its plan to reflect changes in development ,progress in local mitigation efforts, and changes in priorities, and resubmit it for approval within five (5) years in order to continue to be eligible for mitigation project grant funding.*

1.1 DMA 2000 Requirements

1.1.1 General Requirements

The Cochise County Multi-Jurisdictional Hazard Mitigation Plan (the Plan) has been prepared in compliance with Section 322 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1988 (Stafford Act), 42 U.S.C. 5165, as amended by Section 104 of the Disaster Mitigation Act of 2000 (DMA 2000) Public Law 106-390 enacted October 30, 2000. The regulations governing the mitigation planning requirements for local mitigation plans are published under the Code of Federal Regulations (CFR) Title 44, Section 201.6 (44 CFR §201.6). Additionally, a DMA 2000 compliant plan that addresses flooding will also meet the minimum planning requirements for the Flood Mitigation Assistance program as provided for under 44 CFR §78.

DMA 2000 provides requirements for States, Tribes, and local governments to undertake a risk-based approach to reducing risks to natural hazards through mitigation planning[1]. The local mitigation plan is the representation of the jurisdiction's commitment to reduce risks from natural hazards, serving as a guide for decision makers as they commit resources to reducing the effects of natural hazards. Local plans will also serve as the basis for the State to provide technical assistance and to prioritize project funding.

Under 44 CFR §201.6, local governments must have a Federal Emergency Management Agency (FEMA)-approved local mitigation plan in order to apply for and/or receive project grants under the following hazard mitigation assistance programs:

- Hazard Mitigation Grant Program (HMGP)
- Pre-Disaster Mitigation (PDM)
- Flood Mitigation Assistance (FMA)

1.1.2 Update Requirements

DMA 2000 requires that local plans be updated every five years, with each plan cycle requiring a complete review, revision, and approval of the plan at both the state and FEMA levels. Cochise County and the incorporated communities of Benson, Bisbee, Douglas, Sierra Vista, Tombstone, and Willcox all currently have FEMA approved hazard mitigation plans. The Town of Huachuca City did not officially Adopt the 2012 Plan, but their intent is to be a formal Adoptee in 2017. This Plan is the result of a multi-jurisdictional update process performed by Cochise County and the incorporated communities of Benson, Bisbee, Douglas, Huachuca City, Sierra Vista, Tombstone, and Willcox. The result of the planning process is a single, multi-jurisdictional plan that updates the countywide Plan of 2012.

[1] FEMA, 2008, *Local Multi-Hazard Mitigation Planning Guidance*

1.2 Official Record of Adoption

Adoption of the Plan is accomplished by the governing body for each participating jurisdiction in accordance with the authority and powers granted to those jurisdictions by the State of Arizona. The officially participating jurisdictions in the Plan include:

County	Cities	Towns
• Cochise County	• City of Benson • City of Bisbee • City of Douglas • City of Sierra Vista • City of Tombstone • City of Willcox	• Town of Huachuca City

A digital copy of each official resolution of adoption are located in Appendix A of the Plan.

1.3 FEMA Approval Letter

The Plan was submitted to the Arizona Department of Emergency & Military Affairs (DEMA), the authorized state agency, and FEMA for review and approval. FEMA's approval letter is provided on the following page.

U.S. Department of Homeland Security
1111 Broadway, Suite 1200
Oakland, CA. 94607-4052

FEMA

August 18, 2017

Norman Sturm
Emergency Services Coordinator
Cochise County Office of Emergency Services
1415 Melody Lane, Building A
Bisbee, AZ 85603

Dear Mr. Sturm:
We have completed our review of the *Cochise County Multi-Jurisdictional Hazard Mitigation Plan,* and have determined that this plan is eligible for final approval pending its adoption by Cochise County and all participating jurisdictions. Please see the enclosed list of approvable pending adoption jurisdictions.

Formal adoption documentation must be submitted to the FEMA Region IX office by the lead jurisdiction within one calendar year of the date of this letter, or the entire plan must be updated and resubmitted for review. We will approve the plan upon receipt of the documentation of formal adoption.

If you have any questions regarding the planning or review processes, please contact Alison Kearns, Lead Community Planner, at (510) 627-7125 or by email at alison.kearns@fema.dhs.gov.

Sincerely,

Jeffrey D. Lusk
Division Director
Mitigation Division
FEMA Region IX

Enclosure

cc: Lucrecia Hernandez, State Hazard Mitigation Officer, Arizona Department of Emergency and Military Affairs
Susan Austin, Planning Branch Manager, Arizona Department of Emergency and Military Affairs

www.fema.gov

Status of Participating Jurisdictions as of August 18, 2017

Jurisdictions – Adopted and Approved

#	Jurisdiction	Date of Adoption

Jurisdictions – Approvable Pending Adoption

#	Jurisdiction
1	Cochise County
2	Benson, City of
3	Bisbee, City of
4	Douglas, City of
5	Huachuca City, Town of
6	Sierra Vista, City of
7	Tombstone, City of
8	Willcox, City of

www.fema.gov

SECTION 2: INTRODUCTION

2.1 Plan History

The last update to the Cochise County Multi-Hazard Mitigation Plan occurred in 2012. Beginning in the summer of 2016 through early 2017, Cochise County and the incorporated communities of Benson, Bisbee, Douglas, Huachuca City, Sierra Vista, Tombstone, and Willcox participated in a mitigation planning process that resulted in the development of an updated county-wide plan covering each participating jurisdiction. There have been other past hazard mitigation planning efforts over the years, both at the county and jurisdictional level. The history of those plans is captured below:

- *Cochise County Multi-Jurisdictional Multi-Hazard Mitigation Plan (2012)*
- *Cochise County Multi-Hazard Mitigation Plan (January 25, 2007)*
- *City of Benson Multi-Hazard Mitigation Plan (December 5, 2006)*
- *City of Bisbee Multi-Hazard Mitigation Plan (November 17, 2008)*
- *City of Douglas Multi-Hazard Mitigation Plan (January 24, 2007)*
- *City of Sierra Vista Multi-Hazard Mitigation Plan (January 25, 2007)*
- *City of Tombstone Multi-Hazard Mitigation Plan (August 27, 2010)*
- *City of Willcox Multi-Hazard Mitigation Plan (Final Draft – No Promulgation / FEMA Approval)*
- *Town of Huachuca City Multi-Hazard Mitigation Plan (January 25, 2007)*

2.2 Plan Purpose and Authority

The purpose of the Plan is to identify natural hazards and certain human-caused hazards that impact the various jurisdictions located within Cochise County, assess the vulnerability and risk posed by those hazards to community-wide human and structural assets, develop strategies for mitigation of those identified hazards, present future maintenance procedures for the plan, and document the planning process. The Plan is prepared in compliance with DMA 2000 requirements and represents a multi-jurisdictional update of the 2012 county-wide Plan.

Cochise County and all of the Cities and Towns are political subdivisions of the State of Arizona and are organized under Title 9 (cities/towns) and Title 11 (counties) of the Arizona Revised Statutes (ARS). As such, each of these entities is empowered to formally plan and adopt the Plan on behalf of their respective jurisdictions.

Funding for the development of the Plan was provided through a PDM planning grant obtained by the State of Arizona from FEMA. Michael Baker International was retained by Cochise County to provide consulting services in guiding the planning process and Plan development.

2.3 General Plan Description

The Plan is generally arranged and formatted to be consistent with the 2013 State of Arizona Hazard Mitigation Plan (State Plan) and is comprised of the following major sections:

Community Description – this section provides an overall description of the participating jurisdictions and the County as a whole.

Planning Process – this section summarizes the planning process used to update the Plan, describes the assembly of the planning team and meetings conducted, and summarizes the public involvement efforts.

Risk Assessment – this section summarizes the identification and profiling of natural and human-caused hazards that impact the County and the vulnerability assessment for each hazard that considers exposure/loss estimations and development trend analyses.

Mitigation Strategy – this section presents a capability assessment for each participating jurisdiction and summarizes the Plan mitigation goals, objectives, actions/projects, and strategy for implementation of those actions/projects.

Plan Maintenance Strategy – this section outlines the proposed strategy for evaluating and monitoring the Plan, updating the Plan in the next 5 years, incorporating plan elements into existing planning mechanisms, and continued public involvement.

Plan Tools – this section includes a list Plan acronyms and a glossary of definitions.

2.4 Overall Plan Update Process

The Plan is the result of a thorough update process that included a section by section review and evaluation of the 2012 Plan by the planning participants. Table 2.1 summarizes the review and analysis of each section of the 2012 Plans and generally describes what changes were or were not made and why. Additional details of that process are also discussed in the Plan sections as well.

Table 2-1: Summary of 2012 Plan review and 2017 Plan correlation

2012 Plan Section	2017 Plan Section	Review and Changes Description (2012 Plan to the 2017 Plan)
1	1	• No major changes occurred in this section, besides inclusion of an updated FEMA Approval Letter.
2	2	• No major changes occurred in this section, besides applicable updates to this table.
3	4	• Sections 3 & 4 were swapped, to place the community descriptions earlier in the plan document. • All other planning process details were updated, as applicable to this updated planning process.
4	3	• Sections 3 & 4 were swapped, to place the community descriptions earlier in the plan document. • Community descriptions updated as updated data allowed.
5	5	• Removed the Hazardous Materials profile and added in Earthquake. • Updated risk and vulnerability assessments, as improved data allowed. • Produced first time Hazus standard analysis for the hazards of flood and earthquake.
6	6	• Updated all parts of this section, as applicable to this updated planning process and past efforts over the last five years.
7	7	• Plan maintenance updated, as applicable to this updated planning process and past efforts over the last five years.
8	8	• Updated as necessary.
Appendixes	Appendixes	• Documentation updated, as applicable to this updated planning process. • Historical mitigation actions from 2007 and prior were migrated from Section 6 to Appendix D.

SECTION 3: COMMUNITY DESCRIPTIONS

3.1 General

The purpose of this section is to provide updated basic background information on Cochise County as a whole and includes information on geography, climate, population and economy. Abbreviated details and descriptions are also provided for each participating jurisdiction.

3.2 County Overview

3.2.1 Geography

Cochise County is located in the extreme southeastern corner of Arizona, sharing boundaries with the State of New Mexico on the east and Mexico on the south. According to the Cochise County Comprehensive Plan [2], the County was created by an Act of the 11th Territorial Assembly in 1881, and was named after the Chiricahua Apache Chief "Cochise". Much of the County was the homeland of the Chiricahua Apache until they were relocated to Florida and then eventually to Oklahoma and New Mexico. Cochise County is now one of only three counties in Arizona without an Indian Reservation. The County is currently comprised of 6,215 square miles, with the City of Bisbee serving as the County seat since 1929. The location of Cochise County, relative to other counties within the State of Arizona is depicted in Figure 3-1.

The County limits generally extend from longitude 109.05 to 110.47 degrees west and latitude 31.34 to 32.43 degrees north. Major roadway transportation routes through the County include Interstate 10, U.S. Highway 191, and State Routes 80, 82, 90, 92, 181 and 186. The Union Pacific Railroad (UPRR) has several lines servicing most of the County. Figure 3-2 shows all the major roadway and railway transportation routes and the airports within Cochise County.

The San Pedro River is the largest watercourse flowing through the County. Other regional watercourses include Babocomari River, San Simon River, and Whitewater Draw. The remaining watercourses are primarily ephemeral, with most being tributary to one or more of the regional rivers.

The geographical characteristics of Cochise County have been mapped into two terrestrial ecoregions[3], which are depicted in Figure 3-3 and described below:

- Chihuahuan Desert – this ecoregion is typical of the high altitude deserts and foothills and is found in much of the southeastern portion of Arizona. Elevations in this zone vary between 3,000 to 4,500 feet. The average temperatures for the Chihuahuan Desert tend to be cooler than the Sonoran Desert (see below) due to the elevation differences. However, like its lower elevation cousin, the summers are hot and dry with mild to cool winters.
- Sierra Madre Occidental Pine-Oak Forest – this ecoregion is predominant to mountainous regions in southeast Arizona with elevations generally above 5,000 feet. The average temperatures tend to be cool during the summer and cold in winter.

[2] Cochise County, 2003, *2003 Cochise County Comprehensive Plan*, adopted March 4, 2003.

[3] URS, 2004, *State of Arizona All Hazard Mitigation Plan* .

Figure 3-1
Vicinity Map

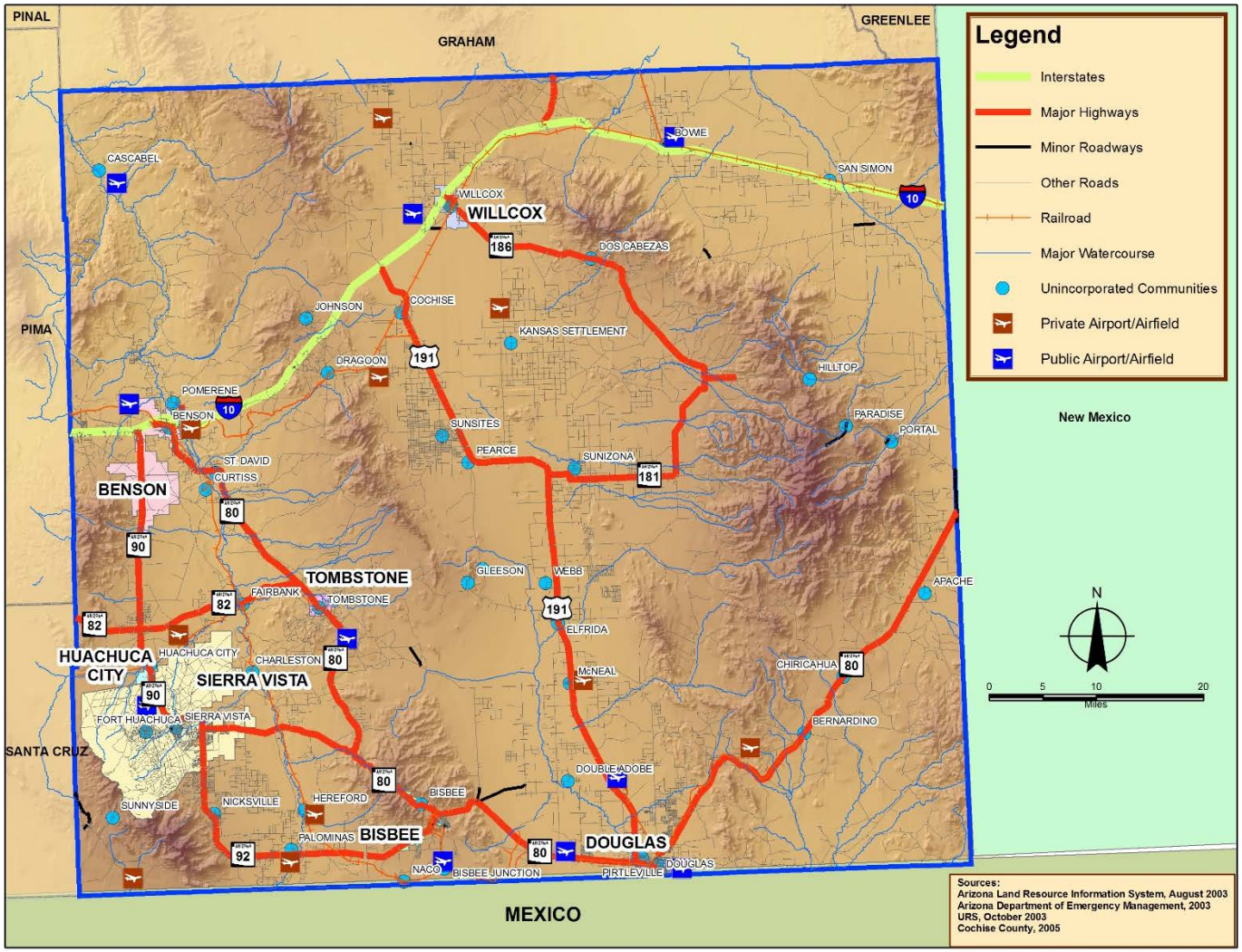


Figure 3-2
Transportation Routes Map

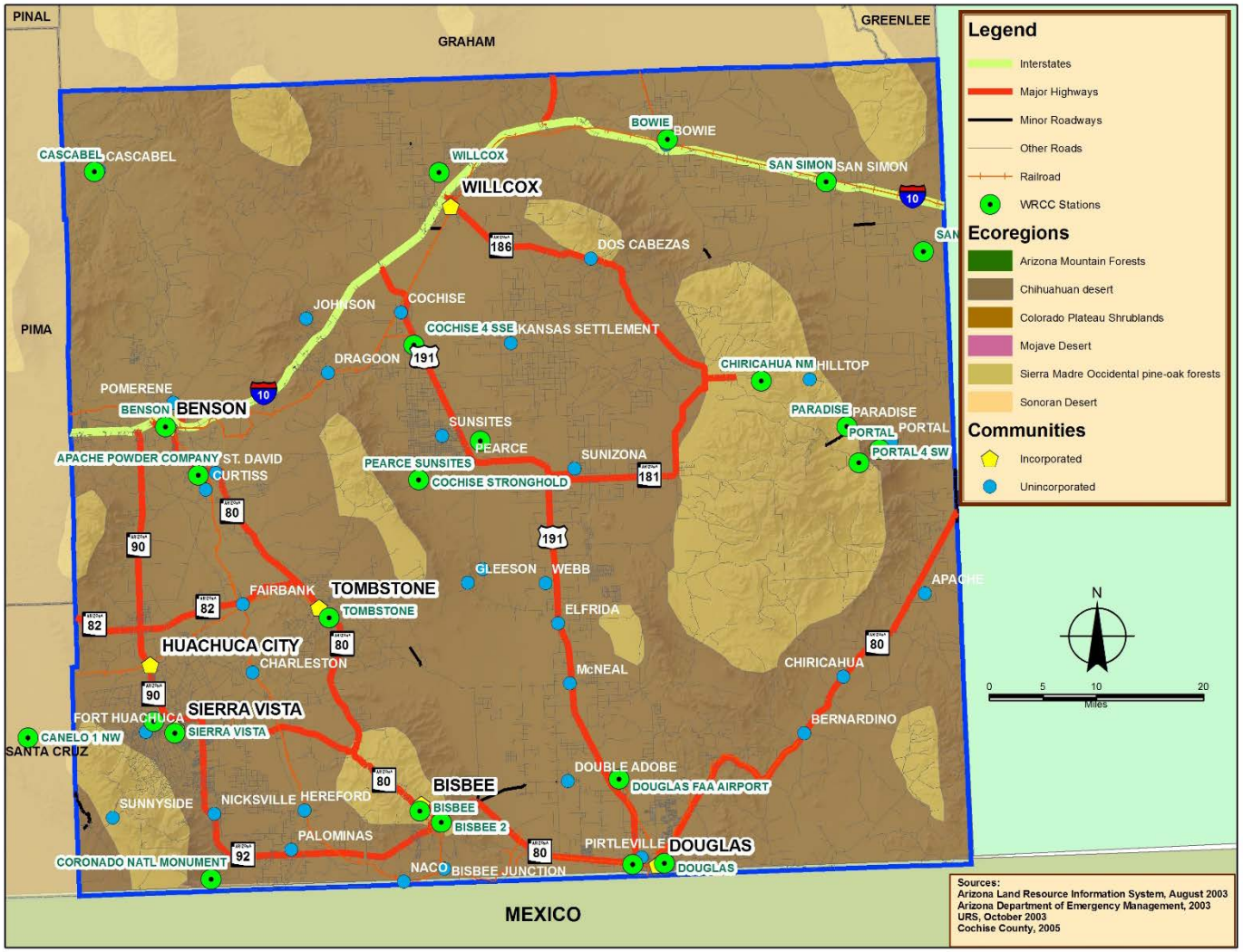


Figure 3-3
Terrestrial Ecoregions Map

3.2.2 History

Cochise County was carved out of Pima County by an act of the 11th Territorial Assembly on January 3, 1881. Tombstone, which was then touted to be the most cultured city in the entire West or Southwest, was the first town to incorporate and served as the county seat until 1929. Table 3-1 lists the incorporated communities within the county, and their founding and incorporation dates.

Table 3-1: Founding and incorporation dates for incorporated communities in Cochise County

Jurisdiction	Founding Date	Incorporation Date
Benson	1880	1924
Bisbee	1880	1902
Douglas	1901	1905
Huachuca City	1954	1958
Sierra Vista	1927	1956
Tombstone	1870's	1881
Willcox	1880	1915

Historic development of the County has primarily been precipitated by either mining or agriculture. In 1880, the then Southern Pacific Railroad opened in Benson and later in Willcox. Both communities became bustling railroad towns and destinations for acquisition of supplies and for shipping goods.

3.2.3 Climate

Climatic statistics for weather stations within Cochise County are produced by the Western Region Climate Center[4] and span records dating back to the early 1900's. Locations of reporting stations within or near Cochise County are shown on Figure 3-3.

Average temperatures within Cochise County range from below freezing during the winter months to over 100 degrees Fahrenheit during the hot summer months. The severity of temperatures in either extreme is highly dependent upon the location, and more importantly the altitude, within the County. Below are figures taken from three climate stations found in geographically different areas of Cochise County. Figures 3-4, 3-5, and 3-6 present graphical depictions of temperature variability and extremes throughout the year for the Douglas, Willcox, and Portal 4 SW Stations, respectively. The Portal 4 SW Station would be representative of typical Sierra Madre Occidental Pine-Oak Forest ecoregions. The Willcox and Douglas Stations would represent northern and southern extremes of the Chihuahuan Desert. In general, there is an approximate ten degree reduction in temperature between the lower Chihuahuan Desert and upper Sierra Madre Occidental Pine-Oak Forest elevation stations.

Precipitation throughout Cochise County is governed to a great extent by elevation and season of the year. From November through March, storm systems from the Pacific Ocean cross the state as broad winter storms producing mild precipitation events and snowstorms at the higher elevations. Summer rainfall begins early in July and usually lasts until mid-September. Moisture-bearing winds move into Arizona at the surface from the southwest (Gulf of California) and aloft from the southeast (Gulf of Mexico). The shift in wind direction, termed the North American Monsoon, produces summer rains in the form of thunderstorms that result largely from excessive heating of the land surface and the subsequent lifting of moisture-laden air, especially along the primary mountain ranges. Thus,

[4] Most of the data provided and summarized in this plan are taken from the WRCC website beginning at the following URL: http://www.wrcc.dri.edu/CLIMATEDATA.html.

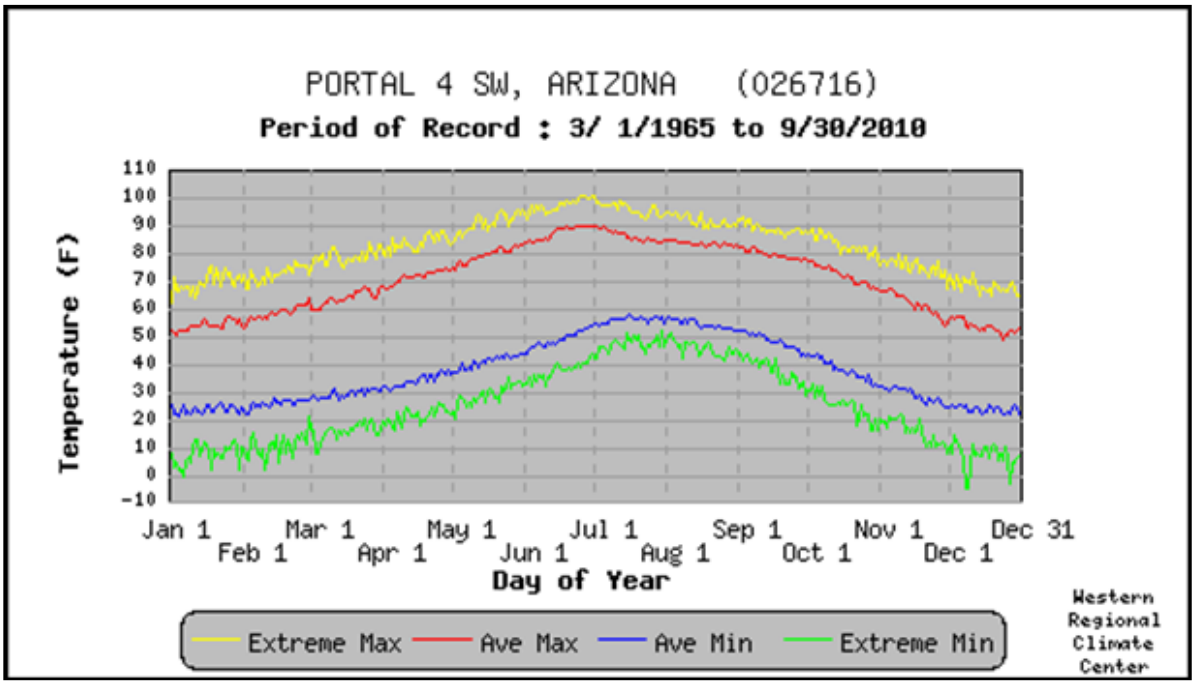


Figure 3-4
Daily Temperatures and Extremes for Portal 4 SW Station, Arizona

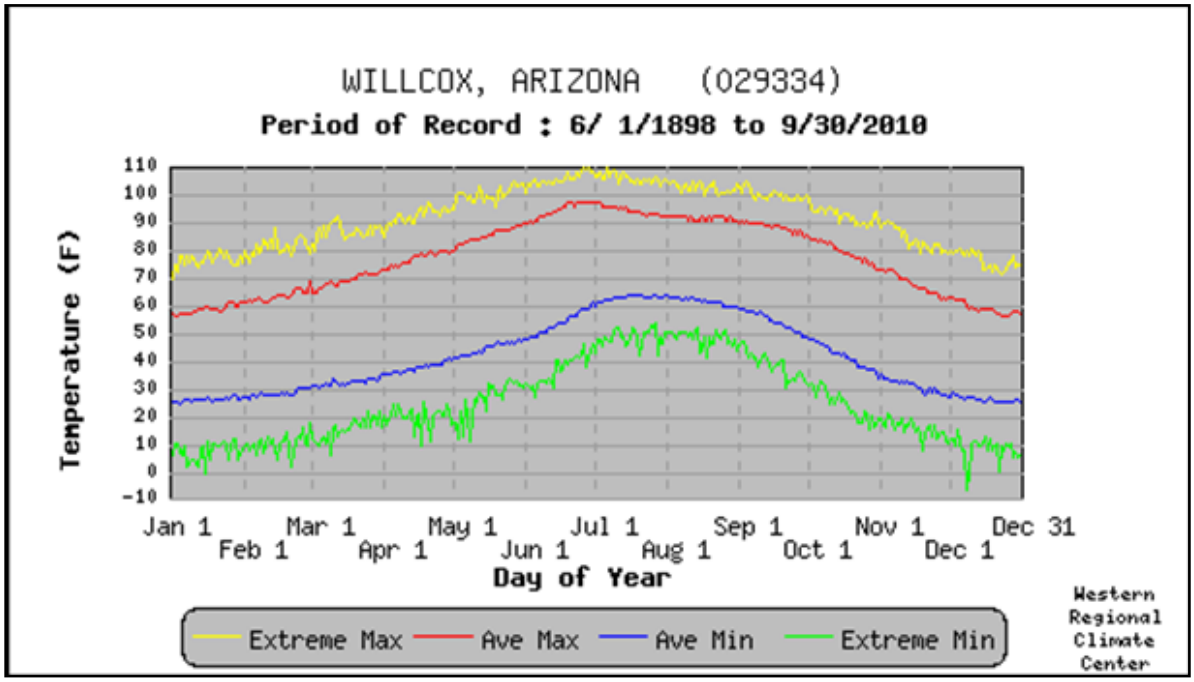


Figure 3-5
Daily Temperatures and Extremes for Willcox Station, Arizona

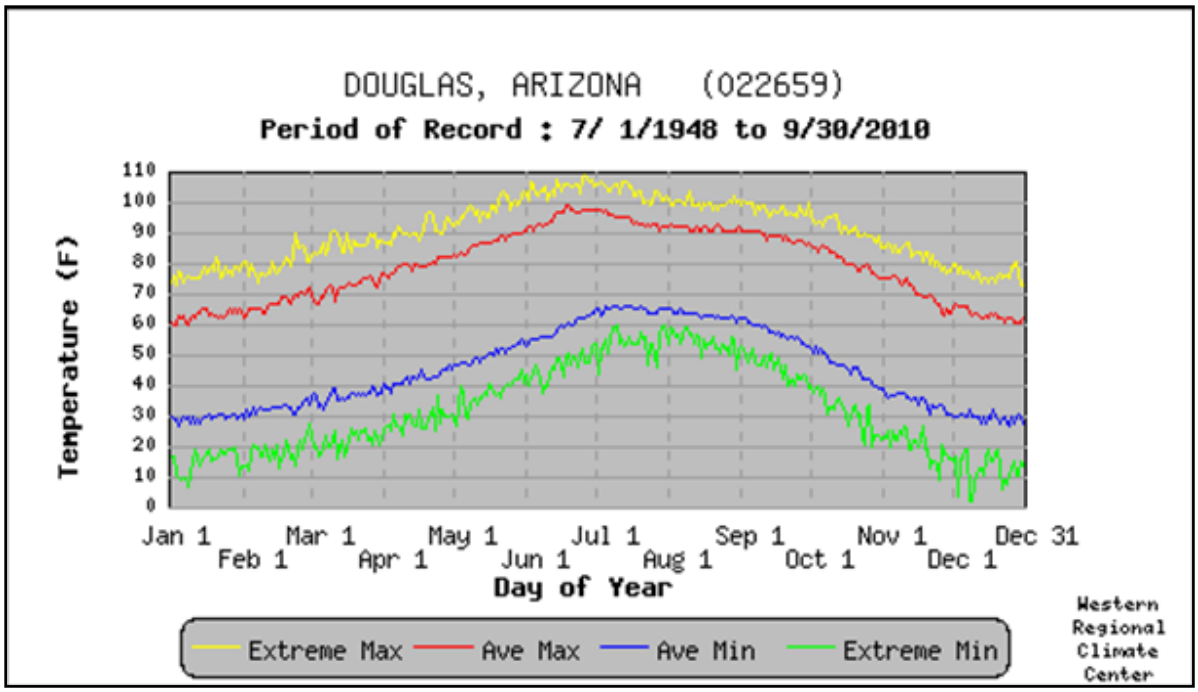


Figure 3-6
Daily Temperatures and Extremes for Douglas Station, Arizona

the strongest thunderstorms are usually found in the mountainous regions of the central southeastern portions of Arizona. These thunderstorms are often accompanied by strong winds, blowing dust, and infrequent hail storms[5].

Figures 3-7, 3-8, and 3-9 show tabular temperature and precipitation statistics for the Douglas, Willcox, and Portal 4 SW Stations. Statistics for other stations shown on Figure 3-3 may be viewed by accessing the WRCC website.

[5] Office of the State Climatologist for Arizona, 2004. Partially taken from the following weblink: http://geography.asu.edu/azclimate/narrative.htm

PORTAL 4 SW, ARIZONA (026716)

Period of Record Monthly Climate Summary

Period of Record : 3/ 1/1965 to 3/31/2013

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	54.0	58.3	64.2	71.6	79.5	87.8	86.5	83.6	79.8	72.3	61.7	53.5	71.0
Average Min. Temperature (F)	23.4	25.5	29.3	34.3	40.9	48.8	55.9	54.6	48.5	38.2	28.9	23.7	37.6
Average Total Precipitation (in.)	1.39	1.21	0.92	0.50	0.46	0.96	4.31	3.76	2.30	1.54	1.26	1.97	20.57
Average Total SnowFall (in.)	2.0	0.8	0.7	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.5	1.8	6.1
Average Snow Depth (in.)	0	0	0	0	0	0	0	0	0	0	0	0	0

Percent of possible observations for period of record.
Max. Temp.: 99.9% Min. Temp.: 99.8% Precipitation: 99.8% Snowfall: 98.8% Snow Depth: 96.5%
Check Station Metadata or Metadata graphics for more detail about data completeness.

Western Regional Climate Center, wrcc@dri.edu

Figure 3-7
Monthly Climate Summary for Portal 4 SW Station, Arizona

WILLCOX, ARIZONA (029334)

Period of Record Monthly Climate Summary

Period of Record : 06/01/1898 to 06/10/2016

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	58.7	63.2	69.3	77.3	85.5	94.4	94.5	91.6	88.7	79.5	67.9	59.0	77.5
Average Min. Temperature (F)	25.9	28.2	32.3	37.7	44.6	53.6	63.0	61.6	54.5	41.8	31.2	26.1	41.7
Average Total Precipitation (in.)	0.93	0.86	0.65	0.26	0.26	0.39	2.52	2.60	1.15	0.82	0.69	1.08	12.18
Average Total SnowFall (in.)	1.0	0.8	0.5	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.0	3.4
Average Snow Depth (in.)	0	0	0	0	0	0	0	0	0	0	0	0	0

Percent of possible observations for period of record.
Max. Temp.: 90.4% Min. Temp.: 90.3% Precipitation: 95.4% Snowfall: 95.2% Snow Depth: 94.6%
Check Station Metadata or Metadata graphics for more detail about data completeness.

Western Regional Climate Center, wrcc@dri.edu

Figure 3-8

Monthly Climate Summary for Willcox Station, Arizona

DOUGLAS, ARIZONA (022659)

Period of Record Monthly Climate Summary

Period of Record : 07/01/1948 to 06/09/2016

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	62.9	67.0	72.4	79.5	86.9	95.6	94.4	91.6	88.9	81.1	70.6	63.2	79.5
Average Min. Temperature (F)	29.6	32.6	36.8	42.3	50.1	58.8	64.9	63.2	57.6	46.0	35.0	29.4	45.5
Average Total Precipitation (in.)	0.75	0.64	0.48	0.24	0.28	0.46	3.63	3.02	1.48	0.92	0.56	0.98	13.44
Average Total SnowFall (in.)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average Snow Depth (in.)	0	0	0	0	0	0	0	0	0	0	0	0	0

Percent of possible observations for period of record.
Max. Temp.: 63.7% Min. Temp.: 63.7% Precipitation: 71% Snowfall: 64.3% Snow Depth: 64.3%
Check Station Metadata or Metadata graphics for more detail about data completeness.

Western Regional Climate Center, wrcc@dri.edu

Figure 3-9
Monthly Climate Summary for Douglas Station, Arizona

3.2.4 Population

As of July 2016, the total population for Cochise County is projected at 128,343 residents [6], which is 2.3% less than the 2010 Census of 131,346. A majority of the citizens still live in the incorporated communities of Cochise County. The largest incorporated community is Sierra Vista. Most of the six incorporated cities and one town are located on the western side of the County. The City of Douglas is considered a border city with a major port of entry to Mexico. The other non-incorporated communities and places located throughout the county are usually situated along a major highway and are mostly comprised of only one structure or landmark. Table 3-2 summarizes jurisdictional population statistics for the participating jurisdictions and un-incorporated Cochise County.

Table 3-2: Jurisdictional population and estimates for Cochise County

Jurisdiction	1990	2000	2010	2025	2040
Cochise County (Unincorporated)	97,624	117,755	131,346	137,033	148,998
Cities and Towns					
Benson	3,824	4,711	5,105	5,648	6,629
Bisbee	6,288	6,090	5,575	5,324	5,213
Douglas	12,822	14,312	17,378	17,370	18,138
Huachuca City	1,782	1,751	1,853	1,740	1,671
Sierra Vista	32,983	37,775	43,888	47,017	50,649

[6] Source: www.population.az.gov

Tombstone	1,220	1,504	1,380	1,333	1,333
Willcox	3,122	3,733	3,757	3,668	3,753

- *Figures for 1990, 2000, and 2010 from US Census Bureau*
- *Figures projected for 2020 to 2030: Source: Arizona Department of Economic Security, Research Administration, Population Statistics Unit, 12/01/06. SEAGO / DES Population Statistics approved June 6, 2007. City of Benson, 2012.*

3.2.5 Economy

Cochise County is attractive to a variety of businesses because of some of these features:

- Six (6) general aviation airports with available land.
- Robust fiber-optic infrastructure.
- Access to major east-west freeway (Interstate 10) from all communities.
- Multiple electric cooperatives with reliable and cost effective power and natural gas providers.
- Fertile agricultural land with year-round growing season.
- Proximity to the Mexican border with two international ports of entry.
- Rail access.
- Four (4) hospitals providing comprehensive healthcare.
- Higher education with campuses for Cochise College and the University of Arizona placed strategically throughout the County.
- Home of the U.S. Army Intelligence Center and the Army Network Enterprise Technology Command.

The largest employer in Cochise County has been and remains Fort Huachuca. The military, support staff and the contractors who support the Army Military Intelligence post consistently employ the largest percentage of the workforce in Cochise County.

Agriculture continues to be an important segment of the Cochise County economy. Once known as the cattle capitol of the nation, livestock continues to be important to the county economy. Primary irrigated crops are cotton, wheat, corn, grain, sorghum, and alfalfa hay. More recent diversification of agriculture in Cochise County has resulted in changes from the primary crops to apples, peaches, cherries, grapes, pistachios, pecans, lettuce, chili, and other vegetables. The area has a multitude of U-pick vegetable farms and orchards, including several organic farms. Greenhouse tomato and cucumber operations have been completed in the past few years with good success. The largest areas for these operations are the Sulphur Springs and San Simon Valleys.

Cochise County's business climate is enhanced by a year-round climate with an average temperature of 75 degrees Fahrenheit. The wide-open plains and mountain reaches provide a cool respite from searing summer heat in other parts of the state. The elevations of the towns offer mild summers and temperate winters and the landscape responds to the climate with beauty and abundance. Cochise County attracts over 300,000 visitors per year who come to experience the region's rich cultural history and myriad outdoor recreation opportunities.

Cochise County’s moderate Arizona climate offers a multitude of opportunities year-round for individuals and families to explore and enjoy. Outdoor activities include a number of both state and federally managed park areas, to include the Chiricahua National Monument and Coronado National Memorial, as well Kartchner Caverns State Park. The high elevation of the County makes these areas available and enjoyable to visit at any time. The natural wonders of Cochise County appeal to just about

everyone with birding areas that offer a glimpse of some of the most fascinating species in the world, hiking and camping areas with breathtaking vistas of the rugged High-Sonoran beauty, along with the history and careful preservation that make these areas a treasure.

The many historic sites and museums in Cochise County offer a history lesson opportunity to visitors and residents alike. The 11,000 year old Clovis and the Lehner-Mammoth Kill Site, where archeologists found mammoth bones, is probably the oldest representation of the county's past. Popular Native American history museums include the Amerind Foundation Museum or the Apache Warrior Cochise Mountain hideout, or "Cochise Stronghold". Cochise County is also rich in military history and there are numerous sites throughout the County that pay homage and tell a story about some of the extensive military history from the area, including the U.S. Army Military Intelligence Museum on Fort Huachuca. Finally, old west mining towns and ghost towns in Cochise County offer anyone a glimpse into a time period in U.S. history marked by legends and mysteries.

The County has identified seven planning areas for the unincorporated portion of the County. The following are summaries of each area taken from the various Area Plans published by the County[7].

Babocomari Area – the Babocomari Area is currently defined by the boundaries of the entire San Ignacio del Babocomari Land Grant east of Highway 90. The San Ignacio del Babocomari Land Grant (Babocomari or Land Grant) has been, largely and historically, a ranch that extends from the County's boundary with Santa Cruz County in the Huachuca Mountains along the Babocomari River, east for approximately 47 miles through Whetstone to the Presidential Estates, a residential community located east of the junction of SR 82 and SR 90.

J-Six/Mescal/Skyline Area – the plan area encompasses the land area of three discrete and neighboring communities: (1) the Mescal community located east of the Pima/Cochise County Line and north of State Route I-10 (the freeway); (2) the J-Six community located east of the County Line and south of the freeway; and (3) the Skyline community located west of State Route 90 and north and south of the I-10 freeway at around the Skyline Road exit.

Mid-Sulphur Springs Valley Area – this plan area includes the Pearce Townsite, Sunsites Townsite and surrounding rural areas. Exact boundaries are depicted on the *Mid-Sulphur Springs Valley Community Development Map* formally adopted by the Cochise County Board of Supervisors on November 15,1999.

Naco Area – the plan area boundaries encompass an area extending from one mile north of Purdy Lane, south to the Mexican Border, two miles east of Naco Highway and two miles west of Naco Highway. The area includes the Naco Townsite, the golf course, Country Club estates, some rural development along Purdy Lane, vacant land, State land, a scattering of businesses and land owned by Phelps Dodge. Boundaries are depicted on the *Naco Community Development Map* which was formally adopted by the Cochise County Board of Supervisors.

Southern San Pedro Valley – the plan area boundaries are coincident with the Palominas Fire District boundaries and are depicted on the *Southern San Pedro Valley Area Plan*.

St. David Area – the St. David Area Plan would affect properties included within the following Township, Range and Sections of the St. David area:

- Township 17, Range 20, Sections 13, 24, 25, 34, 35, 36
- Township 17, Range 21, Sections 13 through 36
- Township 18, Range 20, Sections 1, 2, 11, 12, 13, 14, 23, 24, 25, 26, 35, 36

[7] See the Appendix A for a bibliography of the seven area plans.

- Township 18, Range 21, Sections 1 through 36, except those portions of Sections 26, 27, 34 and 35 that lie within the Curtis Ranch Master Development Plan (MDP).

Tres Alamos Area – the plan area boundaries are specifically shown on the *Tres Alamos Area Plan Map*, adopted by the board. In general, the plan boundaries follow the San Pedro River north of I-10 to Cascabel and encompass a three to five mile wide swath.

3.3 Jurisdictional Overviews

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

3.3.1 Benson

Benson is located within the San Pedro Valley of Cochise County, Arizona at an elevation of 3,585 feet. Cochise County is located at the extreme southeastern corner of the state, and shares boundaries with the State of New Mexico on the east and Mexico on the south. According to the City's website[8], Benson serves as the western gateway to the scenic and historic attractions of Cochise County and has copyrighted the name "Home of Kartchner Caverns State Park." The Benson city limits currently occupy approximately 40.3 square miles. The location of Benson, relative to the State of Arizona, is depicted in Figure 3-2.

The heart of Benson is generally located at 110.30 degrees west and latitude 31.96 degrees north. Major roadway transportation routes through or near the City include Interstate 10 and State Routes 80 and 90. State Route 80, which is locally known as Fourth Street, serves as Benson's "Main" Street and connects Benson to Tombstone (19 miles to the southeast) and passes through St. David. State Route 90, which originates on the west end of Benson at Interstate 10 Exit 302, connects Benson to Sierra Vista and Fort Huachuca, 35 miles to the south. Kartchner Caverns State Park also lies south along State Route 90. The Union Pacific Railroad (UPRR) passes through the City, with the east-west line generally following the I-10 alignment, and a line extending south. Benson is serviced by both a public (Benson Municipal Airport) and private airport. Figure 3-10 shows all the major roadway and railway transportation routes, and airports within the vicinity of Benson.

The San Pedro River is the largest watercourse flowing through the City. Other significant watercourses flowing through or near Benson include: Cadillac, California, Middle Canyon, and Pacheco Washes.

Prominent land-holders within Benson are divided between Private Holdings and State Land. Figure 4-11 provides a visual depiction of the land ownership in Benson.

The 2002 General Development Plan [9] (General Plan) Technical Appendices also provide a wealth of information summarizing the economic and demographic characteristics of Benson.

According to the General Plan, Benson was founded in 1880 as a transportation hub for both rail and overland travelers. The city was incorporated in 1924 and has continued to moderately grow. A complete discussion of the history of Benson is provided in General Plan Technical Appendices. The following bullets summarize the highlights:

- 1880 – the original townsite was founded and named after Judge William A. Benson, who was friend to Charles Crocker, the president of the Southern Pacific Railroad.
- 1913 – the Southern Pacific Railroad moved their hub to Tucson which depressed the Benson economy. Ranching and agriculture picked up during this period.
- 1924 – Incorporation brought municipal water system, city-franchised electric power and a jail facility.
- 1926 – A new elementary school was constructed.
- 1929 – A new high school was constructed.

[8] City of Benson website as available at the following URL: http://www.cityofbenson.com/.

[9] WLB Group, 2002, *City of Benson General Development Plan and Technical Appendices*, adopted October 2002 by Resolution 2002-24.

- 1930 – Construction of the Sunset Trail through Bowie, Willcox and Benson, which spawned new vehicular traffic and the businesses to serve that need.
- 1950's – Construction of Interstate 10 and connection to State Routes 80 and 90 re-establish Benson as a major "hub" of transportation.

Benson has identified several key growth areas in the General Plan. Those areas are briefly summarized in the following paragraphs.

Master Planned Developments – The Whetstone Ranch and Sands Ranch are two residential communities proposed for the southern portion of Benson along State Route 90. Jointly, the full development of these areas could potentially add 18,500 dwelling units to the City's residential stock over a 20-year period. Both of these major growth areas are being designed to include a mix of land uses, commercial employment, institutional and recreational facilities that will allow the planned neighborhoods to become largely self-sufficient for day-to-day activities.

Western Gateway – This area just south of I-10 and west of SR 90, consists of approximately nine square miles of uncommitted lands that could be developed by extensions of the City's infrastructure already in place at the north end of SR 90.

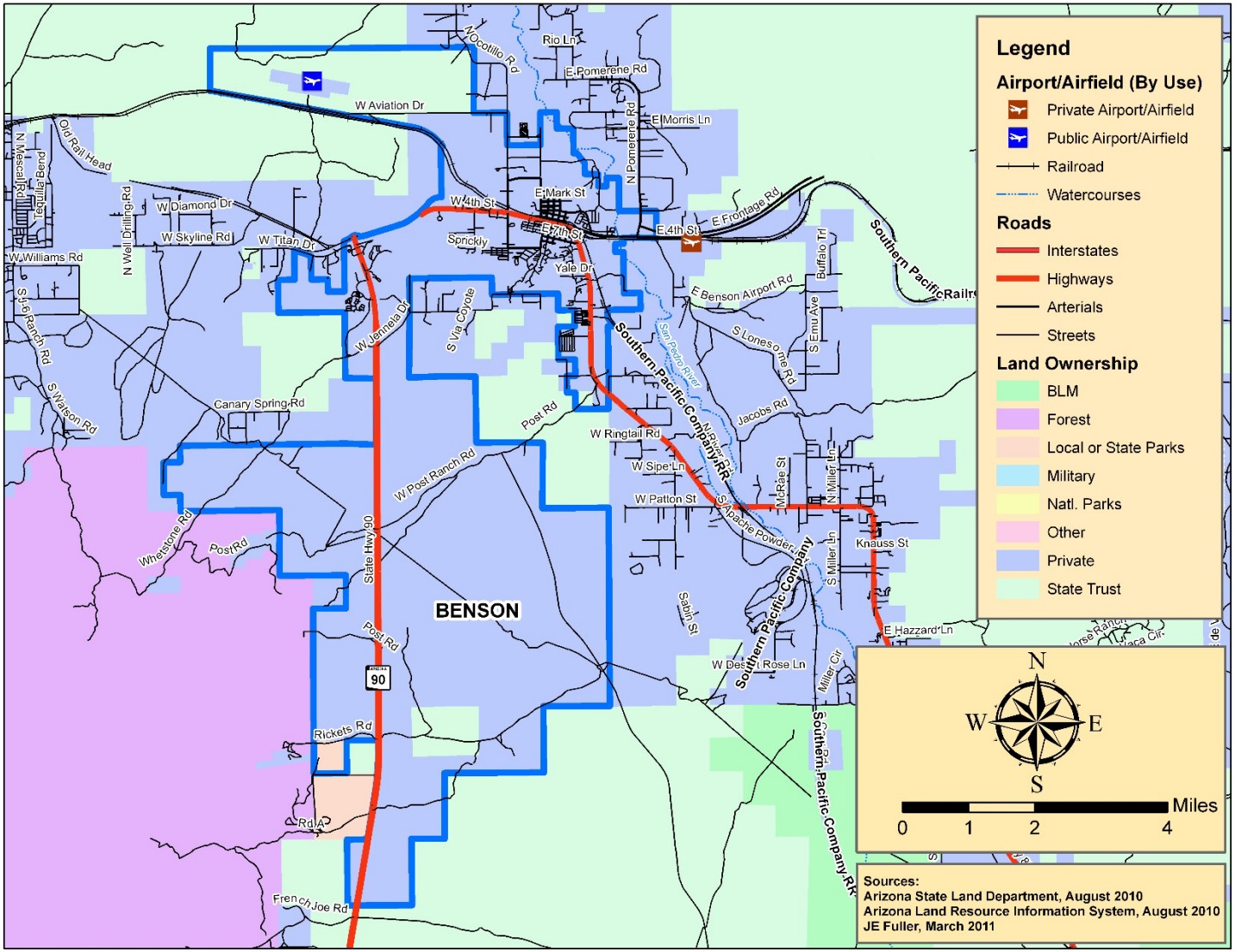


Figure 3-10
Land Ownership and Community Location Map for Benson

3.3.2 Bisbee

Bisbee is located in southern Cochise County, Arizona, approximately four miles north of the international border. The City, which serves as the county seat, is nestled into the foothills of the Mule Mountains at an elevation of 5,300 feet. Cochise County is located at the extreme southeastern corner of the state, and shares boundaries with the State of New Mexico on the east and Mexico on the south. According to the City's website[10], Bisbee serves as a well-known artist's community, with the local architectural and historic heritage well preserved. The Bisbee city limits are generally divided into three developed areas (Old Bisbee, Warren, and San Jose) that are somewhat isolated from each other, and jointly occupy approximately 5.0 square miles. The location of Bisbee, relative to the State of Arizona, is depicted in Figure 3-2.

The heart of Bisbee is generally located at longitude 109.89 degrees west and latitude 31.42 degrees north. Major roadway transportation routes through or near the City include State Routes 80 and 92. A spur of the Union Pacific Railroad (UPRR), now abandoned and decommissioned, once extended north from the main line tracks into the Warren and San Jose areas of the City. Bisbee is also serviced by the Bisbee Municipal Airport, which is located south of the City limits along Arizona Street. Figure 3-11 shows all the land ownership, major roadway transportation routes, and the airports within the vicinity of Bisbee.

The city is primarily drained by small to medium sized ephemeral washes that vary in character and geometry with each area of the city. In Old Bisbee, Mule Gulch and Brewery Gulch are the two primary watercourses. In the late 1890's and early 1900's, rapid growth into the canyons formed by these two watercourses situated much of the town directly in the floodplain. Culverts and other underground drainage structures were constructed to address the flooding, and are still functioning today. In other areas, the washes have substantially remained in a natural condition. There are no regional watercourses in the vicinity of Bisbee.

The 2003 General Plan Update[11] (General Plan) provides a wealth of information summarizing the economic and demographic characteristics of Bisbee.

The following history of development for Bisbee is published on the City website[12], and is reproduced without change.

> "In 1877 a reconnaissance detail of army scouts and cavalrymen was sent to the Mule Mountains to search the area for renegade Apaches. What civilian tracker Jack Dunn found instead were signs of mineralization indicating the presence of lead, copper and possibly silver. The first mining claim was staked in what would later become the City of Bisbee. The filing of this claim, and a multitude of others filed by George Warren, sent prospectors and speculators scurrying to the Mule Mountains in hopes of striking it rich. Numerous rich ore bodies were located and Bisbee soon became known as the "Queen of the Copper Camps"."
>
> "Bisbee continued to grow and prosper. With prosperity came an increased population and the need for sanitation, clean water, medical care, building codes and fire protection. On January 9, 1902 a city charter was approved and the City of Bisbee was incorporated. A temporary city council was formed and went to work on these sorely needed civic improvements. In 1910 the city was considered the largest in the territory, with over 25,000 people. The Cochise County seat was relocated from Tombstone to Bisbee in 1929."
>
> "During almost a century of mining, 8 billion pounds of copper, 102 million ounces of silver and 2.8 million ounces of gold along with millions of pounds of zinc, lead and manganese were produced. By 1974 ore reserves had been depleted and December brought the announcement of the impending closure of mining operations

[10] City of Bisbee website as available at the following URL: http://www.cityofbisbee.com/bisb_history.html/.

[11] The Planning Center, 2004, *City of Bisbee General Plan 2003*, Volume I – Data and Analysis.

[12] The City of Bisbee website as posted at the following URL: http://www.cityofbisbee.com/bisb_history.html.

in Bisbee. Phelps Dodge curtailed open pit operations that year and ceased underground operations in 1975. It appeared as though the queen was about to be laid to rest."

"With the departure of its industrial base, the real estate market in Bisbee collapsed as hundreds of homes went up for sale. The availability of cheap real estate drew retirees, "hippies" and eventually a new group of speculators. These new residents purchased property and slowly began to contribute to the renovation of the city."

"The Bisbee of today is a well-known artist's community whose architectural and historic heritage has been preserved. Located at the center of the natural and historic beauty of Cochise County, the city has transformed itself into the ideal spot for tourism. These benefits combined with "the most perfect year round climate" make it an attractive place to visit and a great place to call home."

Bisbee has identified two primary growth areas in the General Plan. Those areas are briefly summarized in the following paragraphs.

San Jose Growth Area – Most of the new growth in the City of Bisbee is currently taking place within this area. The San Jose area caters to a bi-national economy serving as the closest U.S. gateway to Naco, Mexico. Due to infrastructure availability, it is anticipated that the San Jose area will become the residential, commercial, and employment hub of Bisbee, offering commerce-oriented services and tourist opportunities to visitors from Mexico and the U.S.

Airport Growth Area – The Bisbee Municipal Airport is currently located in Cochise County and encompasses the area surrounding the Bisbee Municipal Airport. The City is considering the preparation of an area plan in order to identify:

- Airport compatible uses that will help sustain the airport,
- Infrastructure needs such as the upgrade of either Purdy Lane or Bisbee Junction Road,
- Impact to adjacent rural areas,
- Future expansion needs of the airport, and,
- Noise contours.

Currently, the Airport Growth Area constitutes primarily a development reserve area.

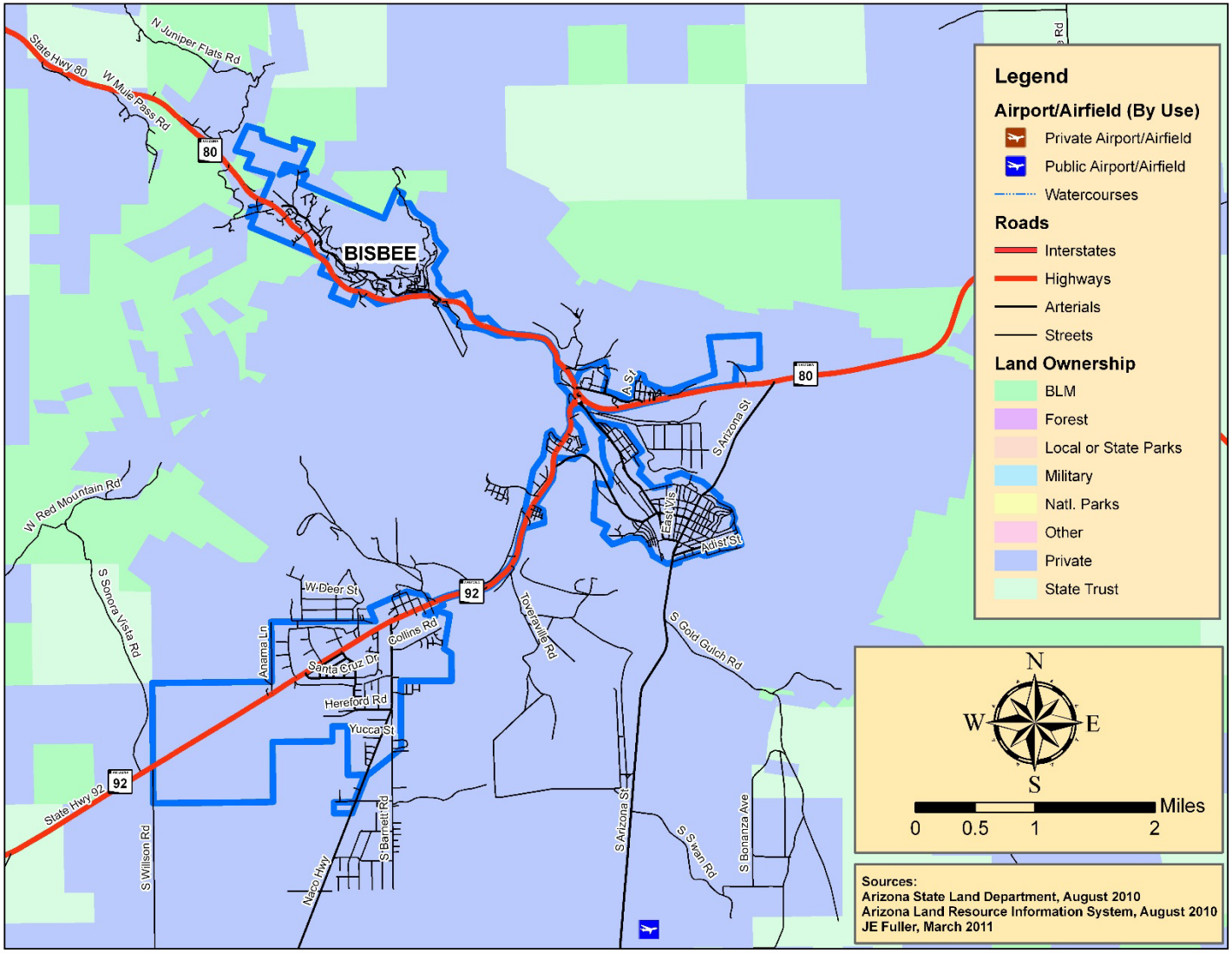


Figure 3-11
Land Ownership and Community Location Map for Bisbee

3.3.3 Douglas

Douglas is located in Cochise County and is primarily situated on the international border, across from Agua Prieta, Sonora, Mexico. A small, isolated portion of Douglas (approximately 0.4 square miles) is located north of the main city near the Bisbee-Douglas International Airport. The main part of the city, at an elevation of 3,990 feet, lies within the Sulphur Springs Valley. Douglas is also strategically located at the beginning of the Janos Highway, which provides the shortest paved route from the Western U.S. to Mexico City and Guadalajara. Cochise County is located at the extreme southeastern corner of the State of Arizona, and shares boundaries with the State of New Mexico on the east and Mexico on the south. The current city limits occupy approximately 8.8 square miles. The location of Douglas, relative to the State of Arizona, is depicted in Figure 3-2

The heart of Douglas is generally located at 109.54 degrees west and latitude 31.35 degrees north. Major roadway transportation routes through or near the City include U.S. Highway 191 and State Route 80. Douglas is also serviced by the Douglas Municipal Airport located on the east side of the City, and the Bisbee-Douglas International Airport located north of Douglas off of U.S. Highway 191. Figure 3-12 shows land ownership and all the major roadway and railway transportation routes and the airports within the vicinity of Douglas.

The City is primarily drained by small to medium sized ephemeral washes that drain the Sulphur Springs Valley. All washes ultimately discharge to Whitewater Draw, which is the largest watercourse in the area and is located just west of the city limits.

The City of Douglas General Plan 2002[13] (General Plan) also provides a wealth of information summarizing the economic and demographic characteristics of Douglas.

The following is a historic account of the development history for Douglas taken from a website for Tombstone, Arizona[14]:

> "The town was originally named Black Water. In the beginning, the water was so bad that many wouldn't look at it when taking a drink. In those days, water wasn't easy to come by and the town's people got used to it. Although, the city on the other side of the border from Douglas still holds the original name, Agua Prieta meaning black water."
>
> "In the 1880's and 1900's the land around Douglas was perfect for cattle. The open grassy valley became the spot for roundups. Ranchers would gather their cattle to brand and haul them out."
>
> "In the early 1900's, the Phelps Dodge Company discovered the Bisbee smelter was too small. It was also inconveniently located. The company began looking for a new spot to locate its smelter. Douglas was founded in 1901 as a mining site for a copper smelter. The town was then renamed after Dr. James Douglas, the president of Copper Queen Consolidated. It was Douglas, who developed some mining techniques that improved the process. Dr. Douglas also built his own railroad, after the Santa Fe Railroad raised their rates. His El Paso and Southwestern railroad line traveled from Bisbee to El Paso, along with the line from Bisbee and Nacozari, both of which came right through Douglas."
>
> "As the town grew, a hospital and homes were built for the many employees at the smelter. During the town's peak more than 375,000 tons of ore a day were brought to the smelter to be processed."
>
> "During the early beginning of Douglas, the town became known for its lawlessness. In the same year that the town was founded, in 1901, the Arizona Rangers were sent to Douglas to establish

[13] The Planning Center, 2002, *City of Douglas General Plan 2002.*

[14] Tombstone-Arizona website as found at the following URL: http://www.tombstone-arizona.us/Douglas/DouglasHistory.htm.

their headquarters. The rows of saloons in town were a problem and so were the cattle thieves. It took some time to get the town under control."

"From 1911 to 1935 the airport in Douglas served as an army airfield by helping smooth over border troubles with Mexico. In 1928, the first international airport in the United States opened in Douglas. The runway was part in the United States and part in Mexico. Famous pilots flew into the airport, such as Amelia Earhart. Commercial flights discontinued several years ago, although private flights are welcome."

"The smokestacks stopped in 1987, but Douglas continues to grow with the help of the sister city across the border, Agua Prieta. Both of the towns have turned to manufacturing and tourism and continue to prosper."

Douglas has identified four growth areas for the city, which are defined as:

- City Core (Central Business District)
- Mid-City
- Evolving Edge
- Future City

Detailed descriptions of each growth area can be found on pages 7-14 of the General Plan.

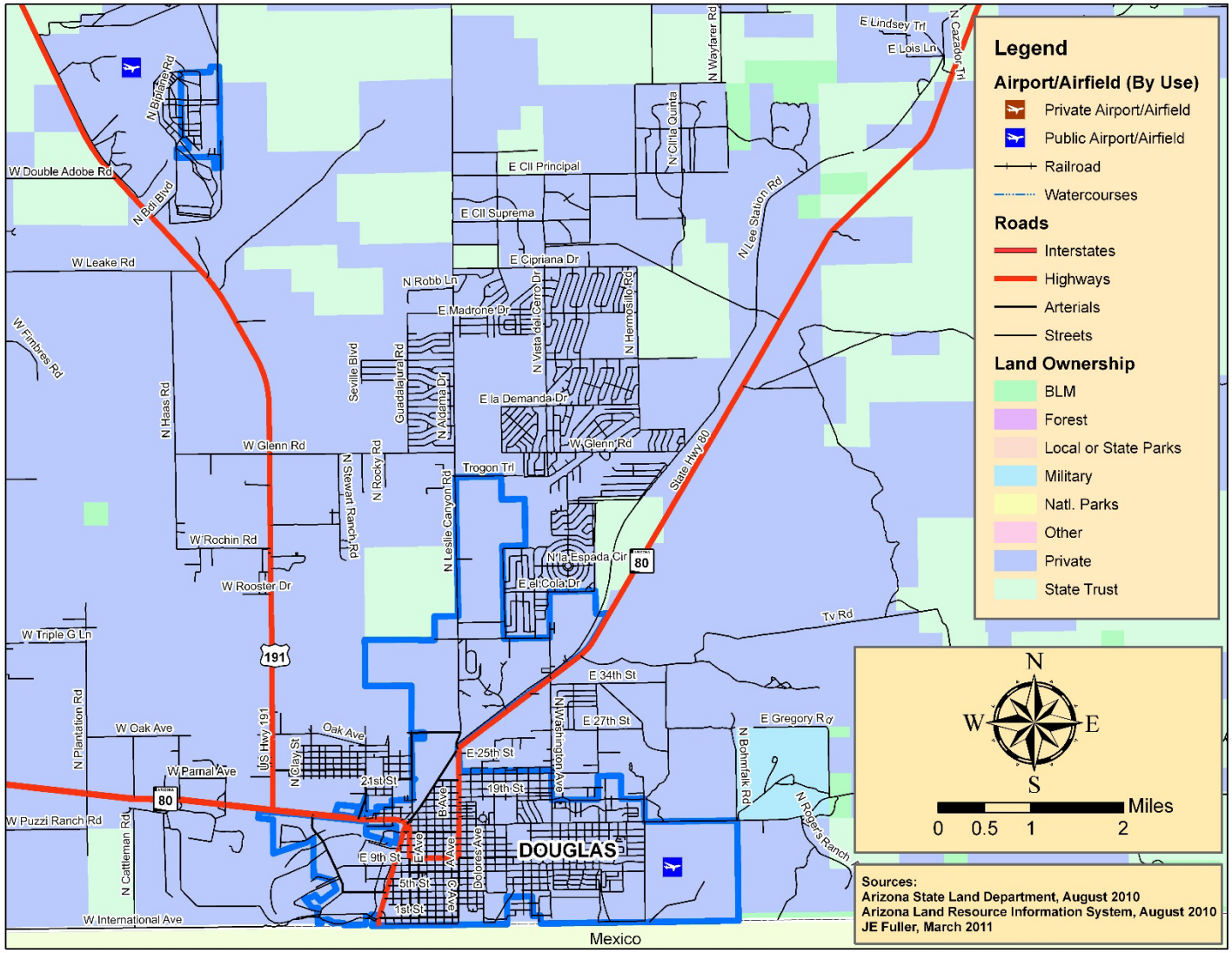


Figure 3-12
Land Ownership and Community Location Map for Douglas

3.3.4 Huachuca City

Huachuca City, which is also known as the Sunset City, is located in central-western Cochise County and is approximately a 65 mile drive southeast of Tucson, Arizona. Cochise County is located at the extreme southeastern corner of the State of Arizona, and shares boundaries with the State of New Mexico on the east and Mexico on the south. The town is situated at an average elevation of 4,320 feet, and shares a southern and eastern border with the Fort Huachuca Military Reservation and Sierra Vista city limits. The San Ignacio del Babocomari Land Grant borders the Town on the north. The Huachuca and Whetstone Mountains can be viewed south and northwest of the town. The current town limits occupy approximately 2.7 square miles. The location of Huachuca City, relative to the State of Arizona, is depicted in Figure 3-2.

The heart of Huachuca City is generally located at 110.33 degrees west and latitude 31.63 degrees north. State Route 90 is the only major roadway transportation route through the Town, with State Route 82 located approximately four miles north. An abandoned line of the Union Pacific Railroad (UPRR) passes just north of the town running east-west along the Babocomari River. Huachuca City is also serviced by the Sierra Vista Municipal Airport / Libby Army Airfield located within Fort Huachuca south of the town. Figure 3-13 shows land ownership and all the major roadway and railway transportation routes and the airports within the vicinity of Huachuca City.

The town is primarily drained by small to medium sized ephemeral washes that ultimately discharge to the Babocamari River on the north side of the Town. Huachuca Canyon and Slaughterhouse Wash are the largest ephemeral washes.

The Town of Huachuca City General Development Plan[15] (General Plan) also provides a wealth of information summarizing the economic and demographic characteristics of Huachuca City.

Huachuca City began to develop with the reopening of Fort Huachuca in 1954 and was originally established as stop on the now abandoned Southern Pacific Railroad. The town was then known as Huachuca Vista. The town incorporated in 1958 under the name of Huachuca City and has experienced small to moderate growth since that time.

Future growth of Huachuca City is limited on the north, east, and south, by either Fort Huachuca/Sierra Vista or the San Ignacio del Babocomari Land Grant. The most likely future growth areas will be the portion of Town situated west of State Route 90 and infill of currently developed areas of Town. Further descriptions of future land planning for the Town are provided in the Town's General Plan.

[15] ibid

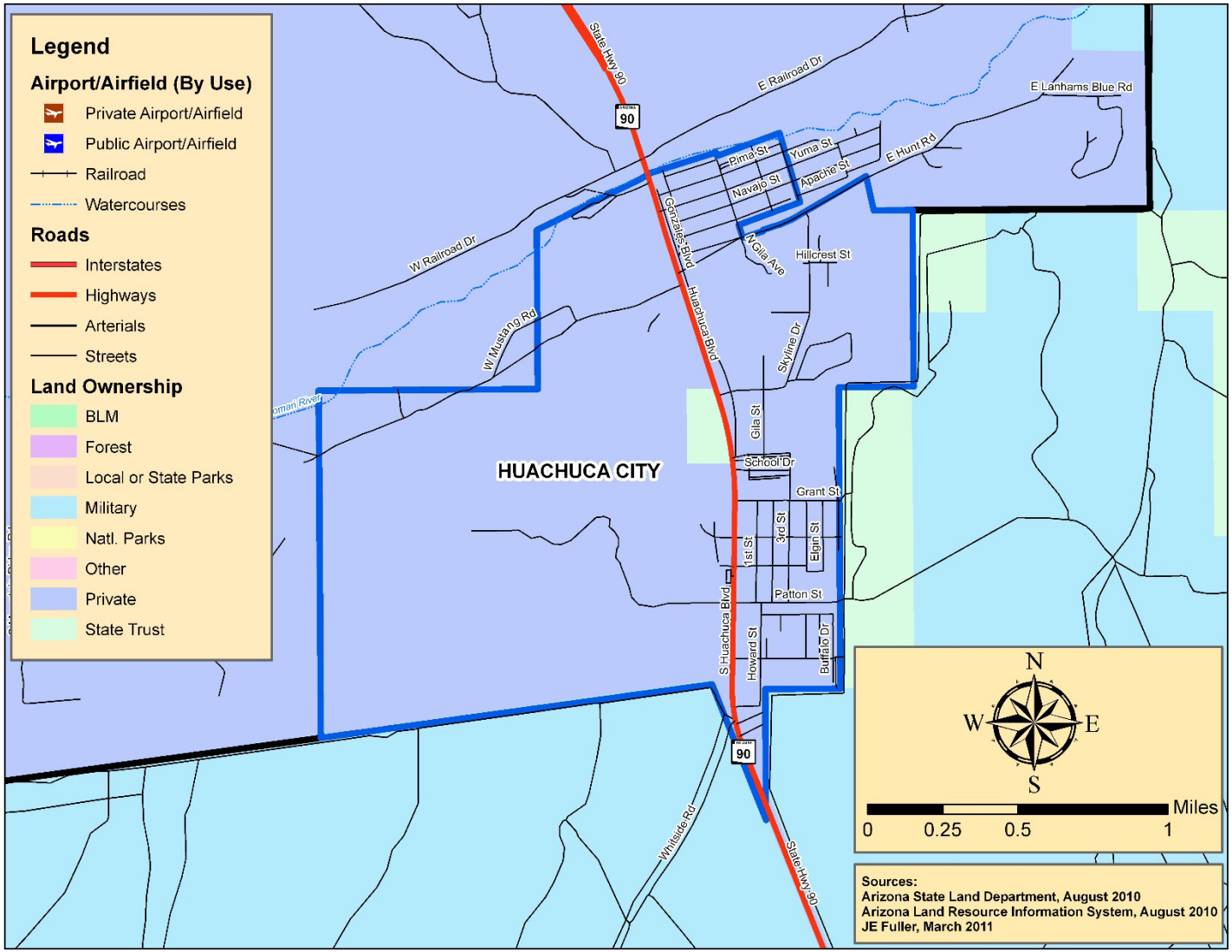


Figure 3-13
Land Ownership and Community Location Map for Huachuca City

3.3.5 Sierra Vista

Sierra Vista is located in central-western Cochise County and is the major population center of Southeastern Arizona. The city is located approximately 70 driving miles southeast of Tucson, Arizona. Cochise County is located at the extreme southeastern corner of the State of Arizona, and shares boundaries with the State of New Mexico on the east and Mexico on the south. The City is situated at an average elevation of 4,620 feet, and shares a northern border with Huachuca City. The Fort Huachuca Military Reservation is part of the incorporated limits of Sierra Vista. The city's name is Spanish for "Mountain View," which accurately describes the picturesque views offered by the nearby Huachuca and Whetstone Mountains located south and northwest of the city. The current city limits occupy approximately 151.3 square miles, of which 124 square miles is Fort Huachuca. The location of Sierra Vista, relative to the State of Arizona, is depicted in Figure 3-2.

The heart of the civilian portion of Sierra Vista is generally located at 110.30 degrees west and latitude 31.56 degrees north. Major roadway transportation routes through or near the City include State Routes 90 and 92. An abandoned Union Pacific Railroad (UPRR) line runs east-west, approximately five miles north of the city. Sierra Vista is also serviced by the Sierra Vista Municipal Airport/ Libby Army Airfield, which is located within Fort Huachuca. Figure 3-14 shows all the major roadway and railway transportation routes and the airports within the vicinity of Sierra Vista.

The city is primarily drained by small to medium sized ephemeral washes that vary in character and geometry with each area of the city. All of the washes convey runoff from the Huachuca Mountain piedmont areas to the San Pedro River located approximately two miles to the east of the city.

The majority of land within the City is Fort Huachuca Military Reservation. The remaining area is divided between private ownership and Arizona State Land. Figure 3-14 provides a visual depiction of the land ownership in and around Sierra Vista.

The Vista 2020 General Plan [16] (General Plan) also provides a wealth of information summarizing the economic and demographic characteristics of Sierra Vista.

According the General Plan:

> *"The history of Sierra Vista began with the establishment of Camp Huachuca in 1877. Over the years the military outpost became a Fort and served as the home of the famed Buffalo Soldiers of the 9th and 10th Cavalry. During World War II the mission of the Fort changed to an infantry training base. After the war, the Fort closed for a number of years and then reopened in 1954. Shortly thereafter, the community, which had been developing to the east of the Fort, incorporated as Sierra Vista. Several major commands, including the US Army's Network Enterprise Technology Command, Intelligence Center and School, and Electronic Proving Grounds currently operate on Fort Huachuca."*

[16] City of Sierra Vista, 2004, *City of Sierra Vista VISTA 2020 General Plan*.

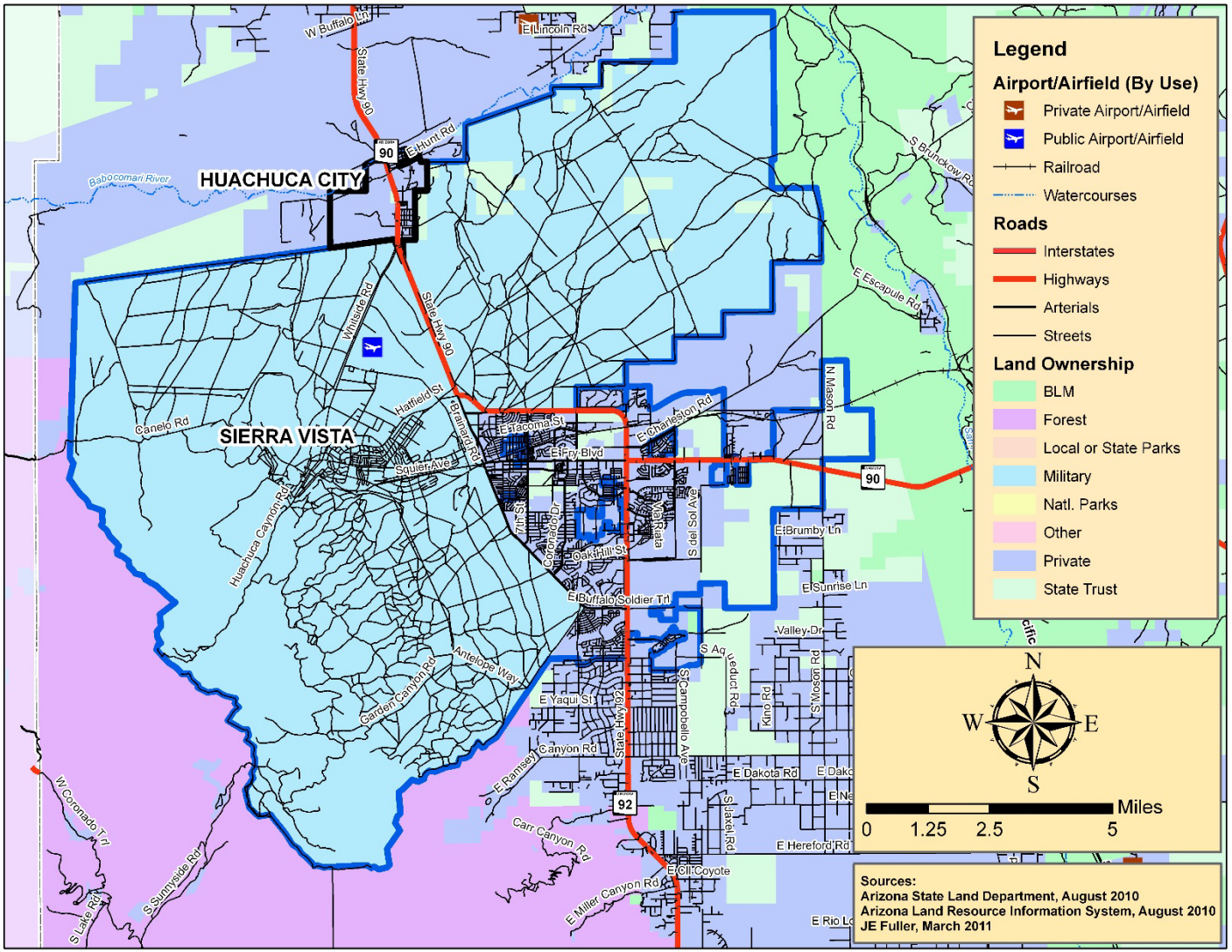


Figure 3-14
Land Ownership and Community Location Map for Sierra Vista

Sierra Vista has identified four primary growth areas in the General Plan as follows:

- State Trust Land, Section 2
- State Trust Land, Section 36
- Land currently owned by Castle and Cooke Arizona, Inc.
- Land currently owned by Bella Vista Ranches.

Section 2 includes 240 acres of undeveloped State Trust Land. The City has already invested in infrastructure in this section including Wilcox and Coronado Drives and a main sewer line. Additionally the City's new transit center will be located in this section. The current plan shows a mix of land use and multiple zoning designations. Section 36 includes 320 acres of mostly undeveloped State Trust Land. Again, the City has already invested in infrastructure within this section. The current plan shows a mix of land use and multiple zoning designations. Sections 2 and 36 are both prime locations for future development. Because of the location of the sections, development in these areas could help reduce sprawl. Additionally, because infrastructure is already in place, there will be reduced public improvement costs.

There are two large, privately owned land holdings in the City. The landowners, Castle & Cooke Arizona, Inc., and Bella Vista Ranches, have adopted land use plans that designate a mixture of residential, open space, commercial, and industrial uses.

3.3.6 Tombstone

Tombstone is located within the San Pedro Valley of Cochise County, Arizona at an elevation of 4,540 feet. Cochise County is located at the extreme southeastern corner of the state, and shares boundaries with the State of New Mexico on the east and Mexico on the south. The City of Tombstone, also known as "The Town too Tough to Die", is reknowned as Arizona's oldest mining camp and probably the most famous mining town in America. Once a mining boomtown, it traces its beginnings to 1877 when Ed Schieffelin, a prospector, left Ft. Huachuca to seek his fortune inspite of the fierce Apaches that roamed the area. Ed Schieffelin found his first claim and named it "Tombstone" and later named his second claim "Graveyard". Tombstone's city limits currently occupy approximately 4.21 square miles. The business district is located to the north and east of the historical district. The mining district occupies over nine square miles both within and outside the city limits. During the mining of 1879 through 1934, the production value of minerals in this area included 81% silver and 14% gold. The location of Tombstone, relative to the State of Arizona, is depicted in Figure 3-2.[17]

The heart of Tombstone is located at 110.06 degrees west and latitude 31.71 degrees north. Major roadway transportation routes through or near Tombstone include Interstate 10 and State Routes 80 and 82. State Route 80, which is locally known as Freemont Street, serves as Tombstone's "Main Street" and connects Tombstone to Benson (19 miles to the northwest) and passes through St. David. Tombstone is serviced by Tombstone Municipal Airport. Figure 3-15 shows all the major roadway, transportation routes, and airports within the vicinity of Tombstone.

Walnut Gulch is the only significant watercourse flowing through the undeveloped northeastern portion within the Tombstone's boundaries.

During the winter season, the population can increase to 2,000 people seeking a moderate climate relief from other parts of the country. Throughout the year, Tombstone experiences 2.5 million visitors that come to take part in the Town's history of the old west, celebrations and events.

Prominent land-holders within Tombstone are divided between private land holdings, State Land, and Bureau of Land Management. Figure 3-15 provides a visual depiction of the land ownership in Tombstone.

Tombstone's location along trade routes Interstate 10 and State Routes 80, and its historical significance as being a Registered Historical Landmark, supports a strong tourism industry and retirement community that is known to employ approximately 51% of the workforce. Some of Tombstone's historic buildings include: the Courthouse built in 1882 and is currently a state park; the Rose Tree Museum, three churches, Bird Cage Theatre, Crystal Palace Saloon, and Big Nose Kate's Saloon. Daily re-enactments of the towns past include: stagecoach tours, shoot-outs and the Helldorado Celebration held during October. are some of Tombstones' western heritage/events also include a re-enactment of the OK Corral, Helldorado and Six Gun City. Tombstone also serves as a bedroom community for Tucson and Sierra Vista.

According to the Chamber of Commerce, Tombstone began in 1877 by a mining prospector named Ed Schieffelin, whom discovered silver in this wild frontier. As news of the rich strike spread, people came from all over to seek their fortune. Huge fortunes were being made by both legitimate businesses and unlawful individuals, including thieves, gamblers, cattle rustlers, gunmen, and saloons and bordellos. The city was incorporated in 1881 and continued to grow rapidly until 1911, when the boomtown came to an end. After surviving the Great Depression and the removal of the County Seat to Bisbee in the 1930's, Tombstone became known as the "Town Too Tough To Die." The summary highlights of Tombstone's historic past include:

[17] Master Plan of City of Tombstone

- 1877 – Ed Schieffelin, a prospector, fearlessly risked of violent Apache attacks, and searched for and found a silver strike outside the current city limits.
- 1880 – Ed and his brother Al received $6,000,000 for their claims.
- 1883 – 7,000 people came to the mining district.
- Mid 1880s – 110 saloons were constructed along with the Crystal Palace, several newspapers; four churches; a public library; and a swimming pool.
- 1903 – Railroad line arrived connecting Tombstone to the rest of the United States and smelter in El Paso, Texas.
- 1911 – No longer economically feasible, mining operations ceased due flooding and water levels too high to obtain rich ores.
- 1910 through 1930s – Tombstone rapidly became known as a tourist stop, especially with help of Hollywood movies putting Tombstone back on the map.

The City of Tombstone development has been limited, with the latest annexation on record occurring with Tombstone Territorial Estates in the late 1970s. Based on surveys from Tombstone's citizens, as stated in the Master Plan, the overall theme desired by the community at large is to improve existing City services and provide basic goods and services such as a grocery store, medical clinic, fast food restaurants and encourage light industry.

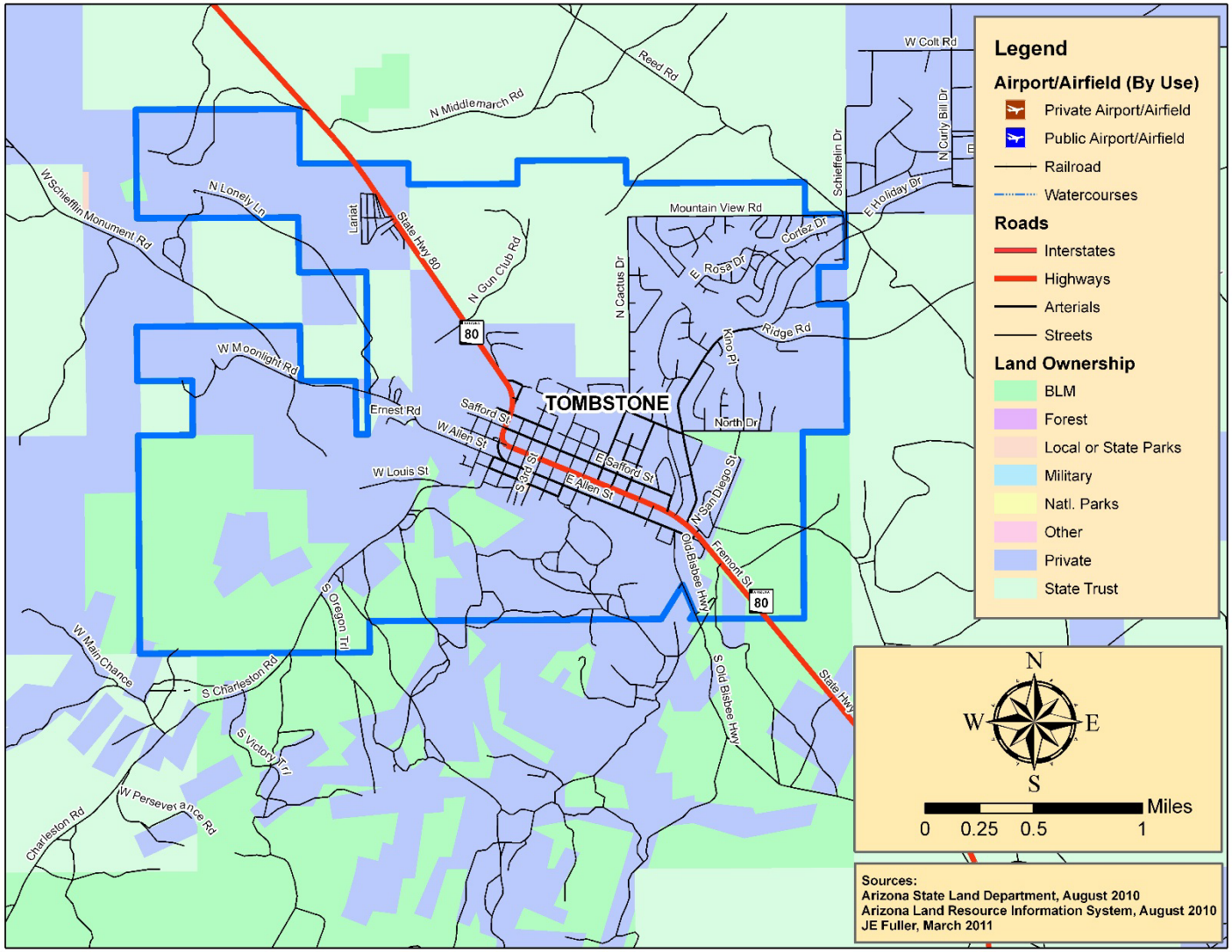


Figure 3-15
Land Ownership and Community Location Map for Tombstone

3.3.7 Willcox

Willcox is located in north-central Cochise County, Arizona. At an elevation of 4,167 feet, the city is nestled at the northern end of the Sulphur Springs Valley near the Dos Cabezas and Chiricahua Mountains. Cochise County is located at the extreme southeastern corner of the state, and shares boundaries with the State of New Mexico on the east and Mexico on the south. Willcox is known for extraordinary migratory bird viewing opportunities with the presence of the riparian lake system in the southern extent of the city. Willcox is situated about halfway between Phoenix, Arizona and El Paso, Texas on Interstate 10, and is about 80 miles east of Tucson. The Willcox city limits currently occupy approximately 6.0 square miles. The location of Willcox, relative to the State of Arizona, is depicted in Figure 3-2.

The heart of Willcox is generally located at 109.83 degrees west and latitude 32.26 degrees north. Major roadway transportation routes through or near the City include Interstate 10, U.S. Highway 191 and State Route 186. The Union Pacific Railroad (UPRR) passes through the City, with the east-west line generally paralleling the I-10 alignment, and a line extending south. Willcox is serviced by both a public (Cochise County Airport) and two private airstrips. Figure 3-16 shows all the major roadway and railway transportation routes, and airports within the vicinity of Willcox.

Willcox is located on the north edge of a regional closed basin lakebed in the Sulphur Springs Valley known as the Willcox Playa. Due to the relatively flat terrain, there are no major natural riverine watercourses within the City. Instead, drainage through the area is characterized by broad and shallow sheet flooding, ponding, and small, local, manmade drainage ditches and channels.

Land within Willcox is primarily owned by private entities with approximately 200 acres in State Trust Land. Figure 4-17 provides a visual depiction of the land ownership in Willcox.

The City of Willcox General Plan [18] (General Plan) Technical Appendices also provide a wealth of information summarizing the economic and demographic characteristics of Willcox.

Established in 1880 and incorporated in 1915, Willcox is the trade center for the northern portion of Cochise County. According to a website sponsored by a local real estate company[19]:

> *"Willcox was in the middle of the hustle and bustle of the old west. With the railroad going through the center of town it was an ideal location for the shipment of not only cattle but any type of goods produced in the area that were shipped throughout the United States. Incoming trains brought goods that were needed in the northern part of the county. Fort Bowie and the local mining community of Dos Cabezas had many of their supplies come in via the railroad."*

In the last ten years, Willcox has experienced minor but steady growth, with more of the same anticipated for the future. The General Plan has identified several key growth areas, which are briefly summarized in the following paragraphs.

Master Planned Developments – Master planned developments include the 5M site north of Ft. Grant Road where 250 homes, retail, offices and light industry are proposed. Phased construction of mixed uses allow the City and developer to work together, providing sequential additions to housing and businesses, local government revenues and investor profits, as the master plan proceeds toward build-out. Other planned developments, such as Ironwood Manor and future mixed-use projects on County lands near the City may also be designated as Growth Areas.

[18] Community Sciences Corporation, 2002, *City of Willcox General Plan*, adopted January 29, 2002.

[19] Website sponsored by Willcox Real Estate Company with a URL at: http://www.willcoxaz.net/willcoxarizona.html.

Downtown – Revitalization of downtown areas that can build upon the historic, tourist-attracting resources through the construction of infill housing, and developing a shuttle service and pedestrian pathways to enable visitors to enjoy the flavor of the Old West with shopping, museums, food/fun establishments and civic events. With municipal services in place, downtown Willcox is convenient to schools, churches, recreation and jobs, all within walking distance.

340 Interchange – Modernization of this interchange will facilitate commercial expansion by creating smoother traffic movements (especially for interstate trucks), reduce congestion and open prime frontages to vehicular access. Existing convenience and local shopping needs are likely to grow concentrically with internal circulation driveways and proper floodwater diversion. These improvements will also accommodate the development of hotels, restaurants, trucker services, etc., and the direct access to Interstate 10 may also inspire apartment development for commuters who use the Interstate.

Cochise Lake Neighborhood – The original master plan for this area could be revived and/or redesigned to develop a variety of housing types and prices that would appeal to broader range prospective homeowners. The neighborhood enjoys many outdoor living amenities such as golfing on the existing nine-hole municipal course, bicycling and walking trails, bird-watching, picnicking and parks.

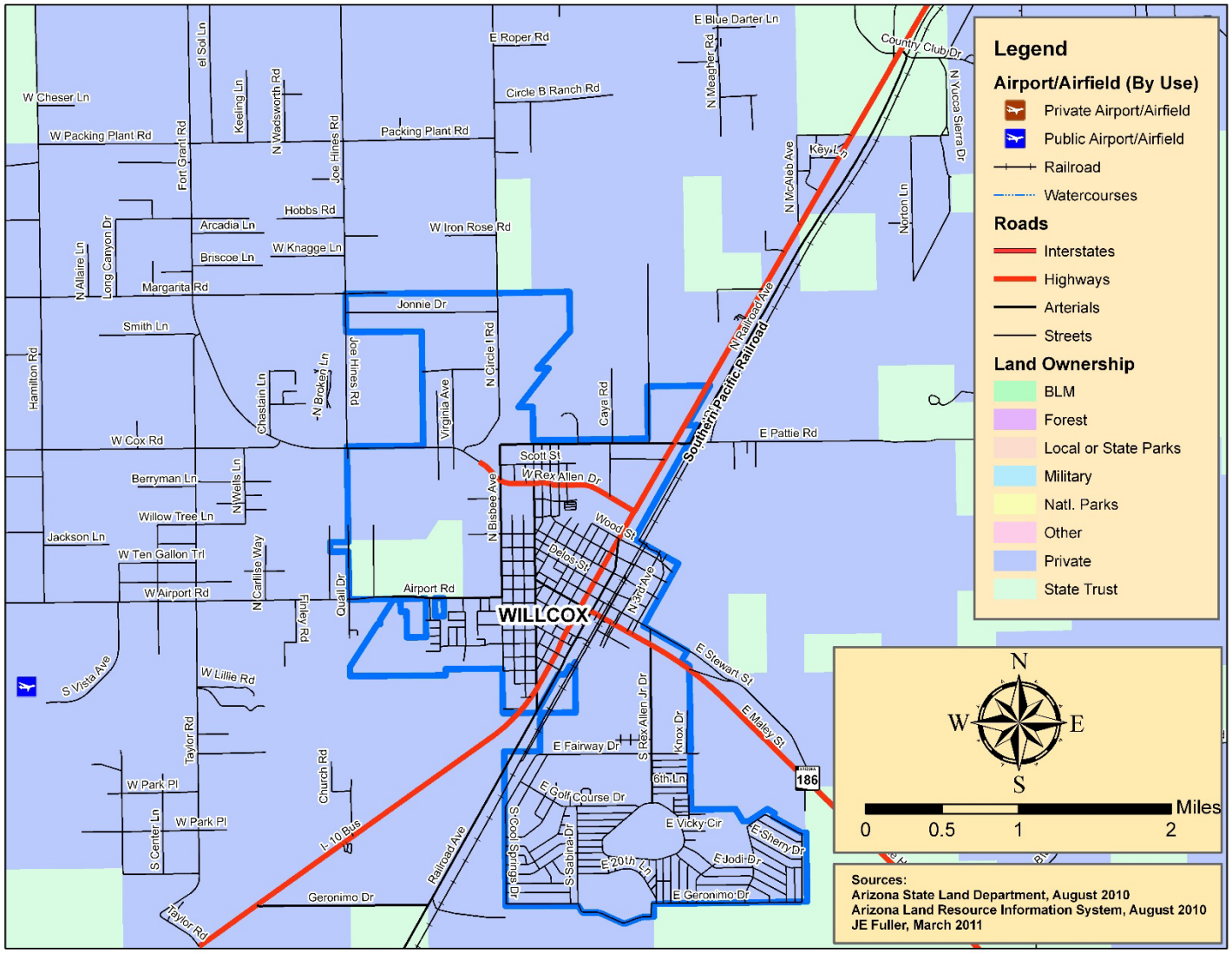


Figure 3-16
Land Ownership and Community Location Map for Willcox

SECTION 4: PLANNING PROCESS

§201.6 (b): *Planning process. An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:*
(1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;
(2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process; and
(3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

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

This section includes the delineation of various DMA 2000 regulatory requirements, as well as the identification of key stakeholders and planning team members within Cochise County. In addition, the necessary public involvement meetings and actions that were applied to this process are also detailed.

4.1 Planning Process Description

Cochise County applied for and received a PDM planning grant through DEMA to fund a multi-jurisdictional effort to review and update the 2012 Plan. Once the grant was received, the county then selected Michael Baker International (Michael Baker) to work with the participating jurisdictions and guide the planning process. An initial project kick-off webinar between Michael Baker and the county was convened in May 2016 to begin the planning process, outline the plan objectives, outline the anticipating meeting agendas for the planning efforts, and to discuss additional project needs/challenges, and other administrative tasks.

A total of four Planning Team meetings/webinars were conducted over the period of June through December 2016, beginning with the first meeting on June 1st, 2016. Throughout that period and for several months afterward, all the work required to collect, process, and document updated data, make changes to the Plan, and prepare the draft of the Plan was performed. Details regarding key contact information and promulgation authorities, the planning team selection, participation, and activities, and public involvement are discussed in the following sections.

4.2 Previous Planning Process Assessment

The first task of preparation for this Plan, was to evaluate the process used to develop the 2012 Plan. This was initially discussed by the county and Michael Baker prior to the county planning team kickoff meeting. The previous planning approach utilized in 2012 formed a single planning team comprised of representatives from all participating jurisdictions (including other agencies and organizations). This process worked well and it was agreed upon to follow a similar approach.

4.3 Primary Point of Contact

Table 4-1 summarizes the points of contacts identified for each participating jurisdiction that participated in the planning process.

Table 4-1: List of adopting jurisdictional points of contact		
Jurisdiction	Primary Contact	Additional Jurisdictional Representatives
Cochise County	Norm Sturm / Brad Simmons	Karen Riggs, Keith Collins, Kim Mulhern, Mike Izzo, Paul Esparza
City of Benson	Brad Hamilton	Keith Spangler
City of Bisbee	Andy Haratyk	Lorena Valdez
City of Douglas	Lynn Kartchner	Mario Navo
Town of Huachuca City	Tammy Mitchell	Jim Theis, Kelly Norris
City of Sierra Vista	Alan Humphtey / Jing Luo	Sharon Flissar
City of Tombstone	David Bruster	Pat Kelly
City of Willcox	Estaban Vasquez	Gale Robinson, Galo Galovale

4.4 Planning Team

The role of the Planning Team was to work with the county and planning consultant to perform the coordination, research, and planning element activities required to update the 2012 Plans. Attendance by each participating jurisdiction was strongly encouraged for every Planning Team meeting and webinars as the meetings were structured to progress through the planning process. Steps and procedures for updating the 2012 Plans were presented and discussed at each Planning Team meeting, and assignments were normally given. Each meeting built on information discussed and assignments given at the previous meeting.

It was stressed during the planning process that these primary jurisdictional points of contact needed to help serve the role as a liaison between the Planning Team and the local jurisdictional leadership/staff. The Planning Team understood this role would include:

- Conveying information and assignments received at the Planning Team meetings to their jurisdictions.
- Engaging local leadership and staff to ensure a collective community voice as assignments/information were requested.
- Soliciting jurisdictional-wide input as decisions were made and draft documents were prepared for review.
- Ensuring that all requested assignments were completed fully and returned on a timely basis.
- Arranging for review and official adoption of the Plan.

4.4.1 Planning Team Assembly

At the beginning of the planning process, Cochise County organized and identified members for the Planning Team by initiating contact with, and extending invitations to, all incorporated communities within the county limits, as well as other agencies, organizations, DEMA, and Michael Baker. The county and local jurisdictions then helped to expand this list throughout their jurisdictions as the planning process proceeded. The participating members of the Planning Team that contributed during the planning process are summarized in the following Table. Other entities participating are discussed in Section 4.4.3.

Table 4-2: Planning Team	
Name	Jurisdiction / Organization
Alan Humphrey	Sierra Vista
Alex Gradillas	Tombstone
Allen Etheridge	Nat. Park Serv
Andrew Atkinson	BLM
Andy Haratyk	Bisbee

Table 4-2: Planning Team

Name	Jurisdiction / Organization
Brad Hamilton	Benson
Brad Simmons	Cochise County
Carlos DeLetorre	Douglas
Carrie Dennet	AZ Forestry
Daisy Kinsey	Forest Service
David Bruster	Tombstone
Doug Ruppel	Forest Service
Estaban Vasquez	Willcox
Eugene Beaudoin	AZ Forestry
Gale Robison	Willcox
Galo Galovale	Willcox
Jim Theis	Huachuca City
Jing Luo	Sierra Vista
Karen Riggs	Cochise County
Karl Sommerhouser	Nat. Park Service
Keith Collins	Cochise County
Keith Spangler	Benson
Kelly Norris	Huachuca City
Kevin Kugler	MBI
Kim Mulhern	Cochise County
Kraig Fullen	Douglas
Lorena Valdez	Bisbee
Lynn Kartchner	Douglas
Mario Navo	Douglas
Mike Garner	MBI
Mike Izzo	Cochise County
Norm Sturm	Cochise County
Pat Kelly	Tombstone
Paul Esparza	Cochise County
Sandra Espinoza	AZDEMA
Sharon Flissar	Sierra Vista
Stephen McCann	Ft. Huachuca
Susan Austin	AZDEMA
Tammy Mitchell	Huachuca City
Tom (Duke) Jones	AZDEMA
Vi Hillman	BLM

4.4.2 Planning Team Activities

The Planning Team activities are documented below. Agendas and sign-in sheets for these meetings are included in Appendix B. Following each Planning Team meeting, the Point of Contacts for each jurisdiction were encouraged to convene meetings with their local jurisdictional leadership and staff, as needed, to work through the assignments.

Planning Team Kick-Off Meeting: 6/1/2016: The newly re-formed Planning Team met in person for 2 hours in Bisbee to initiate the 2017 hazard mitigation planning process. The meeting focused on a number of topics and discussions, including: project/process overview, purpose and benefits, proposed project approach and schedule, jurisdictional participation requirements, hazard discussions, a five-year plan review, requests for data/studies/information, and public outreach efforts. Planning Team members left with assignments to be completed and information to be disseminated across their respective jurisdictions.

Planning Team Webinar - 9/19/2016: The Planning Team met for a webinar to ask questions and to be provided with updates on the planning process and on the in-progress risk and vulnerability assessment. Main topics of discussion related to continual jurisdictional and public outreach efforts relating to this Plan update. This included the on-going risk perceptions public survey that was being conducted as part of this planning process. A discussion and review of Critical Infrastructure and Key Resources (CIKR) was also held, where jurisdictions were instructed on the CIKR update process to use in the on-going assessment work that was underway.

Planning Team Webinar - 11/7/2016: The Planning Team met for another webinar to update everyone on the current project status and to answer any questions. The main intent of the meeting was to roll out the draft Risk Assessment section of the plan for the Planning Team's review and comment. In addition, the consultants walked participants through a numbers of plan sections that required their direct input and review, included but not limited to: jurisdictional capabilities, methods for Plan incorporation into existing planning mechanisms, and past and future plans for continued jurisdictional public involvement. The final discussion related to the final Planning Team workshop, which would be focused on drafting and finalizing those mitigation actions / projects that would be included in this 2017 Plan update. Planning Team members were encouraged to utilize the now drafted risk assessment materials, in coordination with each participant's own experiences, to begin internal discussions relating to the identification of mitigation actions / projects for their jurisdiction. A number of potential resources were shared with participants relating to ideas for mitigation actions / projects. Final discussions related to continued jurisdictional and public involvement and pending public comment opportunities.

Planning Team Hazard Survey – December 2016: The Planning Team participated in an online survey following the drafting of the Risk Assessment section of the Plan. This survey allowed jurisdictions to evaluate the results of the risk and vulnerability assessment and to rank their respective hazards as they specifically affect their specific jurisdiction. It also provided the Planning Team with an opportunity to provide comments on the draft Plan section.

Planning Team Mitigation Strategy Workshop - 12/12/2016: The Planning Team met for their fourth and final time to focus on the updated Plan's Mitigation Strategy and related actions / projects. This 2 hour, in-person workshop in Bisbee focused mainly on the updated Mitigation Strategy, but numerous topics were covered to ensure all jurisdictions had provided all requested information requested throughout the planning process. The Planning Team individually and collectively discussed potential mitigation projects to incorporate into this updated Plan and also completed reporting on past actions / projects identified in the 2012 Plan document. Final topics that were discussed included future Plan monitoring processes and conversations relating to education and communication of this Plan both across internal jurisdictions as well as with the public at large

4.4.3 Agency/Organizational Participation

The planning process used to develop the 2017 Plan included participation from several agencies and organizations which operate within or have jurisdiction over small and large areas of Cochise County. These agencies/organizations included:

- Arizona Department of Forestry and Fire Management
- Arizona Division of Emergency Management
- Fort Huachuca U.S Army Garrison
- National Park Service
- U.S. Bureau of Land Management
- U.S. Forest Service

Opportunities for participation in the planning process by organizations such as schools, non-profits, and businesses was also extended using general public notices across county and local community websites and social media accounts. Examples are included in Appendix C.

An integral part of the planning process included coordination with agencies and organizations outside of the participating jurisdiction's governance to obtain information and data for inclusion into the Plan or to provide more public exposure to the planning process. Much of the information and data that is used in the risk assessment is developed by agencies or organizations other than the participating jurisdictions. In some cases, the jurisdictions may be members of a larger organization that has jointly conducted a study or planning effort like the development of a community wildfire protection plan or participation in an area association of governments. Examples of those data sets include the FEMA floodplain mapping, community wildfire protection plans, severe weather statistics, hazard incident reports, and Arizona Emergency Response Commission. The resources obtained, reviewed and compiled into the risk assessment are summarized at the end of this Plan Section and at the end of each subsection of Section 5.3 of this Plan. Jurisdictions needing these data sets obtained them by either requesting them directly from the host agency or organization, downloading information posted to website locations, or engaging consultants.

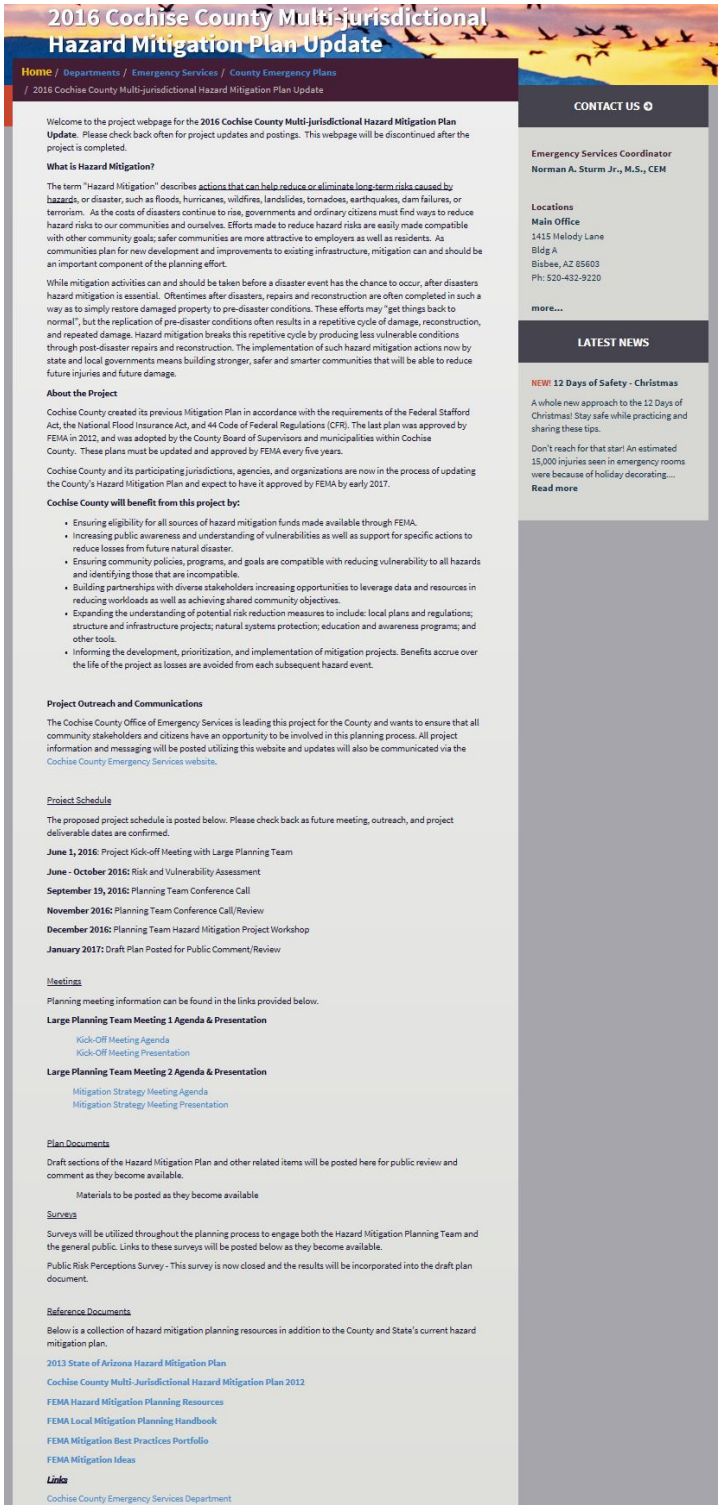
4.5 Public Involvement

An important component to the success of the mitigation planning process involved ongoing public, jurisdiction, and stakeholder participation. Public outreach provided the planning team with a clearer perspective of local

concerns and ensured a higher degree of mitigation success by developing community feedback from those directly affected by policy decisions.

A broad range of public and private stakeholders were invited to participate in the development of the 2017 Cochise Hazard Mitigation Plan Update. The public was primarily directed to planning and reference materials that were available on the project website (developed on the Cochise County emergency services website, with local jurisdictions providing a link to the project website from their own websites). This occurred through individual jurisdictional communications as well as the previously mentioned social media tools and website postings. The most valuable information obtained from the public came from four surveys, which were distributed at regular intervals throughout the planning process. These surveys solicited feedback about a number of topics relating to hazard risk perception, disaster preparedness, mitigation strategies, and the final draft version of the Plan document itself.

Creating and analyzing surveys plays an integral role in better understanding a community's asset, needs and goals moving forward with hazard resiliency. In order to gain a better picture of regional risk, the State of Arizona's CPRI Evaluation was shared with community representatives. Over 175 responses were analyzed to evaluate the impacts of each specific hazard on participating communities. The results of the CPRI are shown in the hazard risk profiles in Section 5.3. Further explanation of the CPRI Evaluation process and procedure is included in Section 5.2.2 of this plan.



2016 Cochise County Multi-jurisdictional Hazard Mitigation Plan Update

Home / Departments / Emergency Services / County Emergency Plans / 2016 Cochise County Multi-jurisdictional Hazard Mitigation Plan Update

Welcome to the project webpage for the **2016 Cochise County Multi-jurisdictional Hazard Mitigation Plan Update**. Please check back often for project updates and postings. This webpage will be discontinued after the project is completed.

What is Hazard Mitigation?

The term "Hazard Mitigation" describes actions that can help reduce or eliminate long-term risks caused by hazards, or disaster, such as floods, hurricanes, wildfires, landslides, tornadoes, earthquakes, dam failures, or terrorism. As the costs of disasters continue to rise, governments and ordinary citizens must find ways to reduce hazard risks to our communities and ourselves. Efforts made to reduce hazard risks are easily made compatible with other community goals; safer communities are more attractive to employers as well as residents. As communities plan for new development and improvements to existing infrastructure, mitigation can and should be an important component of the planning effort.

While mitigation activities can and should be taken before a disaster event has the chance to occur, after disasters hazard mitigation is essential. Oftentimes after disasters, repairs and reconstruction are often completed in such a way as to simply restore damaged property to pre-disaster conditions. These efforts may "get things back to normal", but the replication of pre-disaster conditions often results in a repetitive cycle of damage, reconstruction, and repeated damage. Hazard mitigation breaks this repetitive cycle by producing less vulnerable conditions through post-disaster repairs and reconstruction. The implementation of such hazard mitigation actions now by state and local governments means building stronger, safer and smarter communities that will be able to reduce future injuries and future damage.

About the Project

Cochise County created its previous Mitigation Plan in accordance with the requirements of the Federal Stafford Act, the National Flood Insurance Act, and 44 Code of Federal Regulations (CFR). The last plan was approved by FEMA in 2012, and was adopted by the County Board of Supervisors and municipalities within Cochise County. These plans must be updated and approved by FEMA every five years.

Cochise County and its participating jurisdictions, agencies, and organizations are now in the process of updating the County's Hazard Mitigation Plan and expect to have it approved by FEMA by early 2017.

Cochise County will benefit from this project by:

- Ensuring eligibility for all sources of hazard mitigation funds made available through FEMA.
- Increasing public awareness and understanding of vulnerabilities as well as support for specific actions to reduce losses from future natural disaster.
- Ensuring community policies, programs, and goals are compatible with reducing vulnerability to all hazards and identifying those that are incompatible.
- Building partnerships with diverse stakeholders increasing opportunities to leverage data and resources in reducing workloads as well as achieving shared community objectives.
- Expanding the understanding of potential risk reduction measures to include: local plans and regulations; structure and infrastructure projects; natural systems protection; education and awareness programs; and other tools.
- Informing the development, prioritization, and implementation of mitigation projects. Benefits accrue over the life of the project as losses are avoided from each subsequent hazard event.

Project Outreach and Communications

The Cochise County Office of Emergency Services is leading this project for the County and wants to ensure that all community stakeholders and citizens have an opportunity to be involved in this planning process. All project information and messaging will be posted utilizing this website and updates will also be communicated via the Cochise County Emergency Services website.

Project Schedule

The proposed project schedule is posted below. Please check back as future meeting, outreach, and project deliverable dates are confirmed.

June 1, 2016: Project Kick-off Meeting with Large Planning Team

June - October 2016: Risk and Vulnerability Assessment

September 19, 2016: Planning Team Conference Call

November 2016: Planning Team Conference Call/Review

December 2016: Planning Team Hazard Mitigation Project Workshop

January 2017: Draft Plan Posted for Public Comment/Review

Meetings

Planning meeting information can be found in the links provided below.

Large Planning Team Meeting 1 Agenda & Presentation

Kick-Off Meeting Agenda
Kick-Off Meeting Presentation

Large Planning Team Meeting 2 Agenda & Presentation

Mitigation Strategy Meeting Agenda
Mitigation Strategy Meeting Presentation

Plan Documents

Draft sections of the Hazard Mitigation Plan and other related items will be posted here for public review and comment as they become available.

Materials to be posted as they become available

Surveys

Surveys will be utilized throughout the planning process to engage both the Hazard Mitigation Planning Team and the general public. Links to these surveys will be posted below as they become available.

Public Risk Perceptions Survey - This survey is now closed and the results will be incorporated into the draft plan document.

Reference Documents

Below is a collection of hazard mitigation planning resources in addition to the County and State's current hazard mitigation plan.

2013 State of Arizona Hazard Mitigation Plan

Cochise County Multi-Jurisdictional Hazard Mitigation Plan 2012

FEMA Hazard Mitigation Planning Resources

FEMA Local Mitigation Planning Handbook

FEMA Mitigation Best Practices Portfolio

FEMA Mitigation Ideas

Links

Cochise County Emergency Services Department

CONTACT US

Emergency Services Coordinator
Norman A. Sturm Jr., M.S., CEM

Locations
Main Office
1415 Melody Lane
Bldg A
Bisbee, AZ 85603
Ph: 520-432-9220

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A whole new approach to the 12 Days of Christmas! Stay safe while practicing and sharing these tips.

Don't reach for that star! An estimated 15,000 injuries seen in emergency rooms were because of holiday decorating....
Read more

Another public survey distributed was used to assess the community's risk perception. A total of 258 responses were collected from June through October of 2016. The results showed that the publics' greatest perceived risks are Flood / Flash Flood and Wildfire and the two lowest perceived risks are Building Collapse / Mine Subsidence and Earthquake. The survey also indicated that the most concerning scenario impacting the community would be not having access to clean water during a disaster. A little more than half of respondents stated they did not have a preparedness kit and about half stated that they felt they had taken actions to make their home or neighborhood more resilient to hazards. A large number of survey participants stated that they were not sure if they were

located in a FEMA designated floodplain and a large majority selected internet or social media is the most effective way to receive hazard mitigation information. A copy of this risk perception survey, which includes analysis of all responses, can be found in Appendix C of this Plan.

A third survey was distributed to the public in order to solicit feedback about hazard mitigation strategies. A total of 210 responses were collected between January and February 2017. Results showed that survey respondents felt that the top two categories for hazard mitigation tools were as follows;

- Education & Awareness Programs (Incentivizing drought tolerant landscaping, hosting informational workshops / events, and educating the public about risks)
- Local Planning and Regulations (Building codes, local zoning and land use codes, identification / mapping of hazards area, stormwater management planning)

This survey also gave respondents the opportunity to come up with any mitigation projects or actions they would like to see implemented. There were over 75 responses to this question and ideas ranged from acquiring flooding prone structures to implementing a regional emergency evacuation plan. The planning team has gained invaluable public input due to these surveys, and their thoughts and ideas are weighed heavily in the mitigation strategy section of this plan. Appendix C includes a copy of this mitigation strategy survey along with a summary of all responses.

The final survey was utilized to solicit public comments on the draft HMP document. This survey and the draft HMP document were posted to the project website. The Planning Team then leveraged their own jurisdictional website and social media accounts to inform the public of this 30-day review and comment period. Documentation of many of these efforts can be found in Appendix C. A total of 2 comments were received and reviewed by the Planning Team for incorporation into the final draft HMP. Interested citizens were also encouraged to participate in the local community adoption process which, depending upon the jurisdiction, may have included a public meeting and a formal public hearing.

Additional public involvement tools successfully utilized as part of this planning process are documented below:

- Throughout the planning process jurisdictions were asked to help inform their communities about this planning process when opportunities presented themselves. Forms were provided to the planning team to help document these interactions, which are included in Appendix B, when available.
- The County Public Information Officer (PIO) leveraged all available tools to message the public at key project milestones, utilizing Facebook, Twitter, Facebook groups, the previously mentioned website, and emails to existing contact lists which included: elected officials, appointed officials, local news reporters, and community leaders.
- The County Emergency Manager utilized his regular 'Daily Brief' email to inform listserve participants of major milestones throughout the planning process.
- The Sierra Vista Herald included an article about the project and planning process.

4.6 Reference Documents and Technical Resources

Over the course of the update planning process, numerous other plans, studies, reports, and technical information were obtained and reviewed for incorporation or reference purposes. The majority of sources referenced and researched pertain to the risk assessment and the capabilities assessment. To a lesser extent, the community descriptions and mitigation strategy also included some document or technical information research. The following Table provides a reference listing of the primary documents and technical resources reviewed and used in the Plan. Detailed bibliographic references for the risk assessment are provided at the end of each hazard risk profile in Section 5.3. Other bibliographic references are provided as footnotes.

Table 4-5: List of resource documents and references reviewed and incorporated in the plan update process

Referenced Document or Technical Source	Resource Type	Description of Reference and Its Use
Arizona Daily Star	Article	Source for building collapse hazard and tunnels located in Douglas.
Arizona Department of Commerce	Website Data and Community Profiles	Reference for demographic and economic data for the county. Used for community descriptions
Arizona Department of Emergency Management	Data and Planning Resource	Resource for state and federal disaster declaration information for Arizona. Also a resource for hazard mitigation planning guidance and documents.
Arizona Department of Water Resources	Technical Resource	Arizona State Drought Preparedness Plan (2015) and Arizona Drought Monitor Report (July 2016). Resource for data on drought conditions and statewide drought management (AzGDTF), and dam safety data. Used in risk assessment.
Arizona Geological Survey	Technical Resource	Resource for earthquake, fissure, landslide/mudslide, subsidence, and other geological hazards. Used in the risk assessment.
Arizona Land Subsidence Group	Technical Resource	Resource for fissure and subsidence data. Used in the risk assessment.
Arizona Model Local Hazard Mitigation Plan	Hazard Mitigation Plan	Guidance document for preparing and formatting hazard mitigation plans for Arizona.
Arizona State Land Department	Data Source	Source for statewide GIS coverages (ALRIS) and statewide wildfire hazard profile information (Division of Forestry). Used in the risk assessment.
Arizona Wildland Urban Interface Assessment (2004)	Report	Source of wildfire hazard profile data and urban interface at risk communities. Used in the risk assessment.
Arizona Workforce Informer	Website	Source for employment statistics in Arizona.
Bureau Net (2011)	Website Database	Source for NFIP statistics for Arizona.
Cochise County Multi-Jurisdictional Hazard Mitigation Plan (2012)	Hazard Mitigation Plan and GIS Data	FEMA county-wide approved hazard mitigation plan
Cochise County Community Wildfire Protection Plan (2014)	CWPP	Prepared by the Bureau of Land Management (BLM) Gila District Office; the Coronado National Forest (CNF) Douglas and Sierra Vista Ranger Districts; the US Fish and Wildlife Service; and the National Park Service (NPS) Chiricahua National Monument, Fort Bowie National Historic Site, and Coronado National Memorial
Cochise County Multi-Hazard Mitigation Plan	Hazard Mitigation Plan	FEMA approved hazard mitigation plan that together with the other Cochise County jurisdiction's mitigation plans, formed the starting point for the update process. See Section 2.4 for further discussion
Cochise County GIS	GIS Data	Source for county-wide GIS data and supplemental flood hazard data sets. Used for maps and risk assessment.
City of Benson Multi-Hazard Mitigation Plan (2006)	Hazard Mitigation Plan	FEMA approved hazard mitigation plan that together with the other Cochise County jurisdiction's mitigation plans, formed the starting point for the update process. See Section 2.4 for further discussion
City of Bisbee 2004 General Plan Update	General Plan	Source for history, demographic and development trend data for the city.
City of Bisbee Multi-Hazard Mitigation Plan (2008)	Hazard Mitigation Plan	FEMA approved hazard mitigation plan that together with the other Cochise County jurisdiction's mitigation plans, formed the starting point for the update process. See Section 2.4 for further discussion
City of Douglas Multi-Hazard Mitigation Plan (2007)	Hazard Mitigation Plan	FEMA approved hazard mitigation plan that together with the other Cochise County jurisdiction's mitigation plans, formed the starting point for the update process. See Section 2.4 for further discussion
City of Sierra Vista Multi-Hazard Mitigation Plan	Hazard Mitigation Plan	FEMA approved hazard mitigation plan that together with the other Cochise County jurisdiction's mitigation plans, formed the starting point for the update process. See Section 2.4 for further discussion
City of Tombstone Multi-Hazard Mitigation Plan (2010)	Hazard Mitigation Plan	FEMA approved hazard mitigation plan that together with the other Cochise County jurisdiction's mitigation plans, formed the starting point for the update process. See Section 2.4 for further discussion
City of Willcox Multi-Hazard Mitigation Plan (Final Draft)	Hazard Mitigation Plan	FEMA approved hazard mitigation plan that together with the other Cochise County jurisdiction's mitigation plans, formed the starting point for the update process. See Section 2.4 for further discussion
Douglas Dispatch, August 2011	Article	Source for building collapse information and criminal tunneling.

Table 4-5: List of resource documents and references reviewed and incorporated in the plan update process

Referenced Document or Technical Source	Resource Type	Description of Reference and Its Use
Earth Fissure Risk Zone Investigation Report (AMEC, 2006)	Hazard Data	Source of fissure risk data and historic fissure and subsidence events. Used in the risk assessment. Used in the risk assessment.
InciWeb - Incident Information System (2011)	Wildfire Data	Source wildfire incident information for historical hazard and profile information, specifically for Horseshoe 2 and Monument Fire..
Environmental Working Group's Farm Subsidy Database (2009)	Website Database	Source of disaster related agricultural subsidies. Used in the risk assessment.
Federal Emergency Management Agency	Technical and Planning Resource	Resource for HMP guidance (How-To series), floodplain and flooding related NFIP data (mapping, repetitive loss, NFIP statistics), and historic hazard incidents. Used in the risk assessment and mitigation strategy.
HAZUS-MH	Technical Resource	Based data sets within the program were used in the vulnerability analysis.
National Center for Environmental Information	Technical Resource	Online resource for weather related data and historic hazard event data. Used in the risk assessment.
National Integrated Drought Information System (2007)	Technical Resource	Source for drought related projections and conditions. Used in the risk assessment.
National Response Center	Technical Resource	Source of traffic related HAZMAT incidents and rail accidents. Used in the risk assessment.
National Weather Service	Technical Resource	Source for hazard information, data sets, and historic event records. Used in the risk assessment.
National Wildfire Coordination Group (2010)	Technical Resource	Source for historic wildfire hazard information. Used in the risk assessment.
Office of the State Climatologist for Arizona	Website Reference	Reference for weather characteristics for the county. Used for community description.
Standard on Disaster/Emergency Management and Business Continuity Programs (2000)	Standards Document	Used to establish the classification and definitions for the asset inventory. Used in the risk assessment.
State of Arizona MHMP (2013)	Hazard Mitigation Plan	The state plan was used a source of hazard information and the state identified hazards were used as a starting point in the development of the risk assessment.
U.S. Census Bureau	Technical Data	TIGER/Line shapefile for 2010 Cochise County census block data was used to obtain block boundaries, population, and housing units
Town of Huachuca Multi-Hazard Mitigation Plan (2007)	Hazard Mitigation Plan	FEMA approved hazard mitigation plan that together with the other Cochise County jurisdiction's mitigation plans, formed the starting point for the update process. See Section 2.4 for further discussion
USACE Flood Damage Report (1978)	Technical Data	Source of historic flood damages for 1978 flood. Used in the risk assessment.
USACE Flood Damage Report (1994)	Technical Data	Source of historic flood damages for 1993 flood. Used in the risk assessment.
U.S. Forest Service	Technical Data	Source for local wildfire data. Used in the risk assessment.
U.S. Geological Survey	Technical Data	Source for geological hazard data and incident data. Used in the risk assessment.
Western Regional Climate Center	Website Data	Online resource for climate data used in climate discussion of Section 4
World Wildlife Fund (2010)	GIS Data	Terrestrial ecoregions database used in the general county description.
Zillow Real Estate Values	Website Reference	Obtained home value indexes for incorporated and unincorporated areas of Cochise County to use for residential values in vulnerability assessment.

SECTION 5: RISK ASSESSMENT

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

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

(ii) A description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community. The plan should describe vulnerability in terms of:

(A) The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas;

(B) An estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(i)(A) of this section and a description of the methodology used to prepare the estimate;

(C) Providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

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

One of the key elements to the hazard mitigation planning process is the risk assessment. In performing a risk assessment, a community determines "what" can occur, "when" (how often) it is likely to occur, and "how bad" the effects could be[20]. According to DMA 2000, the primary components of a risk assessment that answer these questions are generally categorized into the following measures:

Hazard Identification and Screening

Hazard Profiling

Assessing Vulnerability to Hazards

The risk assessment for Cochise County and participating jurisdictions was performed using a county-wide, multi-jurisdictional perspective, with much of the information gathering and development being accomplished by the Planning Team. This integrated approach was employed because many hazard events are likely to affect numerous jurisdictions within the County, and are not often relegated to a single jurisdictional boundary. The vulnerability analysis was performed in a way such that the results reflect vulnerability at an individual jurisdictional level, and at a countywide level.

5.1 Hazard Identification and Screening

Hazard identification is the process of answering the question; *"What hazards can and do occur in my community or jurisdiction?"* For this Plan, the list of hazards identified in the 2012 Plan were reviewed by the Planning Team with the goal of refining the list to reflect the hazards that pose the greatest risk to the jurisdictions represented by this Plan. The Planning Team also compared and contrasted the 2012 Plan list to the comprehensive hazard list summarized in the 2013 State Plan[21] to ensure compatibility with the State Plan. The following table summarizes the hazards profiled in the 2012 Plan, the 2013 State Plan, and this updated 2017 Plan.

[20] National Fire Protection Association, 2000, *Standard on Disaster/Emergency Management and Business Continuity Programs*, NFPA 1600.

[21] ADEM, 2013, *State of Arizona Hazard Mitigation Plan*

Table 5.1. Summary of Initial Hazard Identification Lists

2012 Cochise County Plan Hazard List	2013 State Plan Hazard List	2017 Cochise County Plan Hazard List
• Building Collapse/Mine Subsidence • Drought • Fissure • Flood/Flash Flood • Hazardous Materials Incidents • Severe Wind • Wildfire	• Dam Failure • Disease • Drought • Earthquake • Extreme Heat • Fissures • Flooding/Flash Flooding • Hazardous Materials Incidents • Landslides/Mudslides • Levee Failure • Severe Winds • Subsidence • Terrorism • Wildfires • Winter Storms	• Building Collapse/Mine Subsidence • Drought • Earthquake • Fissure • Flood/Flash Flood • Severe Wind • Wildfire

The review included an initial screening process to evaluate each of the listed hazards based on the following considerations:

- Experiential knowledge on behalf of the Planning Team with regard to the relative risk associated with the hazard
- Documented historic context for damages and losses associated with past events (especially events that have occurred during the last plan cycle)
- The ability/desire of Planning Team to develop effective mitigation for the hazard under current DMA 2000 criteria
- Compatibility with the state hazard mitigation plan hazards
- Duplication of effects attributed to each hazard

The following table summarizes the federal and state disaster declarations that included Cochise County with data provided from FEMA, USDA, NCEI, and ADEM- Recovery Section.

Table 5.2. State and Federally Declared Natural Hazard Events that Included Cochise County

2017 State Plan Hazard Categories	Arizona Declared Events That Included Cochise County January 1966 to February 2017					
		Total Expenditures		Recorded Losses		
	No. of Declarations	State	Federal	Fatalities	Injuries	Damage Costs ($)
Drought	4	$ 217,452	$ -	0	0	$300,000,000
Flooding / Flash Flooding	9	$ 36,127,314	$ 303,670,820	23	112	$906,150,000
Severe Wind	1	$ 3,002,390	$ 89,017	0	2	$30,365,000
Wildfire	16	$ 5,685,834	$ -	0	0	$0

- Expenditures are reported as is and no attempt has been made to adjust costs to current dollar values.
- Only a portion of the reported expenditures were spent in Cochise County.
- Damage Costs are reported as is and no attempt has been made to adjust costs to current dollar values.
- There have been no additional declarations since the 2012 plan update

Source: FEMA, USDA, NCEI, DEMA, February 2017

The culmination of the review and screening process by the Planning Team resulted in a revised list of hazards that will be carried forward with this Plan. The Planning Team chose to eliminate Hazmat, which was included in the 2012 Plan. This is because only natural hazards are required to be addressed in this Plan and a separate county hazardous materials plan exists and is updated annually. The Planning Team also agreed to include a hazard section for Earthquake.

The Planning Team has selected the following list of hazards for profiling and updating based on the above explanations and screening process. Revised and updated definitions for each hazard are provided in Section 5.3 and in Section 8.2:

- Building Collapse / Mine Subsidence
- Drought
- Earthquake
- Fissure
- Flooding/Flash Flooding
- Severe Wind
- Wildfire

5.2 Vulnerability Analysis Methodology

5.2.1 General

The following sections summarize the methodologies used to perform the vulnerability analysis portion of the risk assessment. For this Plan, the vulnerability analysis was revised or updated to reflect the new and updated hazard categories, the availability of new data, or differing loss estimation methodology. Specific changes are noted below and/or in Section 5.3.

For the purposes of this vulnerability analysis, hazard profile maps were developed for Mine Subsidence/Building Collapse, Earthquake, Fissure, Flooding/Flash Flooding, and Wildfire to map the geographic variability of the probability and magnitude risk of the hazards as estimated by the Planning Team. Hazard profile categories of HIGH, MEDIUM, and/or LOW were used and were subjectively assigned based on the factors discussed in the Probability and Magnitude sections below. Within the context of the county limits, the other hazards do not exhibit significant geographic variability and will not be categorized as such.

Unless otherwise specified in this Plan, the general cutoff date for new hazard profile data and jurisdictional corporate limits is the end of December 2016.

5.2.2 Calculated Priority Risk Index (CPRI) Evaluation

One aspect to the vulnerability analysis (VA) is to assess the perceived overall risk for each of the Plan hazards using a tool developed by the State of Arizona called the Calculated Priority Risk Index[22] (CPRI). The CPRI value is obtained by assigning varying degrees of risk to four (4) categories for each hazard, and then calculating an index value based on a weighting scheme. The following table summarizes the CPRI risk categories and provides guidance regarding the assignment of values and weighting factors for each category.

[22] ADEM, 2003, *Arizona Model Local Hazard Mitigation Plan*, prepared by JE Fuller/ Hydrology & Geomorphology, Inc.

Table 5.3. Calculated Priority Risk Index (CPRI) Categories and Risk Levels

CPRI Category	Degree of Risk			Assigned Weighting Factor
	Level ID	Description	Index Value	
Probability	Unlikely	▪ Extremely rare with no documented history of occurrences or events. ▪ Annual probability of less than 0.001.	1	45%
	Possible	▪ Rare occurrences with at least one documented or anecdotal historic event. ▪ Annual probability that is between 0.01 and 0.001.	2	
	Likely	▪ Occasional occurrences with at least two or more documented historic events. ▪ Annual probability that is between 0.1 and 0.01.	3	
	Highly Likely	▪ Frequent events with a well-documented history of occurrence. ▪ Annual probability that is greater than 0.1.	4	
Magnitude/ Severity	Negligible	▪ Negligible property damages (less than 5% of critical and non-critical facilities and infrastructure). ▪ Injuries or illnesses are treatable with first aid and there are no deaths. ▪ Negligible quality of life lost. ▪ Shut down of critical facilities for less than 24 hours.	1	30%
	Limited	▪ 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 and there are no deaths. ▪ Moderate quality of life lost. ▪ Shut down of critical facilities for more than 1 day and less than 1 week.	2	
	Critical	▪ 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 and at least one death. ▪ Shut down of critical facilities for more than 1 week and less than 1 month.	3	
	Catastrophic	▪ Severe property damages (greater than 50% of critical and non-critical facilities and infrastructure). ▪ Injuries or illnesses result in permanent disability and multiple deaths. ▪ Shut down of critical facilities for more than 1 month.	4	
Warning Time	Less than 6 hours	Self explanatory.	4	15%
	6 to 12 hours	Self explanatory.	3	
	12 to 24 hours	Self explanatory.	2	
	More than 24 hours	Self explanatory.	1	
Duration	Less than 6 hours	Self explanatory.	1	10%
	Less than 24 hours	Self explanatory.	2	
	Less than one week	Self explanatory.	3	
	More than one week	Self explanatory.	4	

As an example, assume that survey participants are assessing the hazard of flooding, and have decided that the following assignments best describe the flooding hazard for their community:

- Probability = Likely
- Magnitude/Severity = Critical
- Warning Time = 12 to 24 hours
- Duration = Less than 6 hours

That individual's CPRI for the flooding hazard would then be:

CPRI = [(3*0.45) + (3*0.30) + (2*0.15) + (1*0.10)]

CPRI = 2.65 (with 4.0 being the highest possible rating)

For the 2017 Plan Update, the CPRI assessment was conducted utilizing an online survey, which was distributed to community representatives in order to solicit feedback. This resulted in 175 completed responses from across all participating jurisdictions. CPRI Tables are included in each hazards' section with scores averaged based on the responses from all participating community representatives. It should be noted that these Index Values are presented as an average of the collective responses received from each jurisdiction and should provide a more holistic opinion from each jurisdiction, as compared to past Plan updates.

It is noted that this process differed from that following during past plan updates. Previously, the CPRI values were agreed upon by one or two jurisdictional representatives. For this plan update, both jurisdictional representatives and community members were asked to complete this evaluation. The results of which were then averaged. This average risk perception value varies (in some instances greatly) for many hazards as compared to the 2012 values. In some cases, it may seemingly contradict what the historical, vulnerability, and/or loss estimation information presents. The Planning Team found value in this exercise as it helps to identify misconceptions regarding some of the hazard risks facing these communities, which can help identify opportunities for public outreach and education.

5.2.3 Asset Inventory

A detailed critical asset inventory was performed for the 2012 Plan to establish a fairly accurate baseline data-set for assessing the vulnerability of each jurisdiction's assets to the hazards previously identified. The asset inventory from the 2012 Plan was reviewed and updated by all participating jurisdictions as part of the 2017 Plan update process.

Critical facilities and infrastructure are systems, structures and infrastructure within a community whose incapacity or destruction would:

- Have a debilitating impact on the defense or economic security of that community.
- Significantly hinder a community's ability to recover following a disaster.

Following the criteria set forth by the Critical Infrastructure Assurance Office (CIAO), the State of Arizona has adopted eight general categories[23] that define critical facilities and infrastructure:

1. Communications Infrastructure: Telephone, cell phone, data services, radio towers, and internet communications, which have become essential to continuity of business, industry, government, and military operations.
2. Electrical Power Systems: Generation stations and transmission and distribution networks that create and supply electricity to end-users.

[23] Instituted via Executive Order 13010, which was signed by President Clinton in 1996.

3. **Gas and Oil Facilities:** Production and holding facilities for natural gas, crude and refined petroleum, and petroleum-derived fuels, as well as the refining and processing facilities for these fuels.
4. **Banking and Finance Institutions:** Banks, financial service companies, payment systems, investment companies, and securities/commodities exchanges.
5. **Transportation Networks:** Highways, railroads, ports and inland waterways, pipelines, and airports and airways that facilitate the efficient movement of goods and people.
6. **Water Supply Systems:** Sources of water; reservoirs and holding facilities; aqueducts and other transport systems; filtration, cleaning, and treatment systems; pipelines; cooling systems; and other delivery mechanisms that provide for domestic and industrial applications, including systems for dealing with water runoff, wastewater, and firefighting.
7. **Government Services:** Capabilities at the federal, state, and local levels of government required to meet the needs for essential services to the public.
8. **Emergency Services:** Medical, police, fire, and rescue systems.

Other assets such as public libraries, schools, businesses, museums, parks, recreational facilities, historic buildings or sites, churches, residential and/or commercial subdivisions, apartment complexes, businesses, and so forth, are typically not classified as critical facilities and infrastructure unless they serve a secondary function to the community during a disaster emergency (e.g. - emergency housing or evacuation centers). As a part of the update process, each community was tasked with identifying other assets that should be considered as being critical. Each community was also tasked with making any needed changes to the geographic position, revision of asset names, updating replacement costs, etc. to bring the dataset into a current condition. The updated asset inventory is attributed with a descriptive name, physical address, geospatial position, and an estimated building/structure and contents replacement cost for each entry to the greatest extent possible and entered into a GIS geodatabase.

The following table summarizes the facility counts provided by each of the participating jurisdictions in this Plan.

Table 5.4. Asset Inventory Structure Counts by Category and Jurisdictions

	Communications Infrastructure	Electrical Power Systems	Gas and Oil Facilities	Banking and Finance Institutions	Transportation Networks	Water Supply Systems	Government Services	Emergency Services	Educational [a]	Cultural [a]	Business [a]	Flood Control [a]	Residential [a]	Recreational [a]
County-Wide Totals	**150**	**41**	**36**	**20**	**14**	**44**	**72**	**64**	**48**	**14**	**11**	**0**	**22**	**0**
Benson	3	6	10	0	3	12	6	4	6	2	5	0	0	0
Bisbee	3	2	5	4	1	5	11	0	0	0	0	0	0	0
Douglas	4	0	2	7	0	0	8	7	0	0	0	0	0	0
Huachuca City	1	0	1	0	0	1	4	1	1	1	0	0	0	0
Sierra Vista	25	9	2	0	1	4	12	12	0	0	0	0	0	0
Tombstone	2	0	0	1	0	8	7	3	4	9	104	0	22	0
Willcox	7	3	7	4	1	6	6	6	4	1	3	0	0	0

	Communications Infrastructure	Electrical Power Systems	Gas and Oil Facilities	Banking and Finance Institutions	Transportation Networks	Water Supply Systems	Government Services	Emergency Services	Educational [a]	Cultural [a]	Business [a]	Flood Control [a]	Residential [a]	Recreational [a]
Unincorporated Cochise County	105	21	9	4	8	8	22	31	33	1	3	0	0	0

NOTES: a – Assets listed under these categories have been determined to be critical per the definition of this Plan by the corresponding jurisdiction.

5.2.4 Loss Estimations

Loss estimates for this Plan reflect best available data utilizing: current hazard map layers, an updated asset database, Hazus 3.2, and/or the use of Census 2010 block level data for estimating exposures and losses when possible.

Several of the hazards profiled in this Plan will not include quantitative exposure and loss estimates. The vulnerability of people and assets associated with some hazards are nearly impossible to evaluate given the uncertainty associated with where these hazards will occur as well as the relatively limited focus and extent of damage. Instead, a qualitative review of vulnerability will be discussed to provide insight to the nature of losses that are associated with the hazard. For subsequent updates of this Plan, the data needed to evaluate these unpredictable hazards may become refined such that comprehensive vulnerability statements and thorough loss estimates can be made

5.2.5 Development Trend Analysis

This 2017 Plan assessed the most recent County GIS data sets relating to development and growth areas when conducting the risk and vulnerability assessment. The updated analysis focused on the potential risk associated with projected growth patterns and their intersection with the Plan identified hazards.

5.3 Hazard Risk Profiles

The following sections summarize the risk profiles for each of the Plan hazards identified in Section 5.1. For each hazard, the following elements are addressed to present the overall risk profile:

- Description
- History
- Probability and Magnitude
- Vulnerability
- Sources
- Profile Maps (if applicable)

Much of the 2012 Plan data has been updated, incorporated and/or revised to reflect current conditions and Planning Team changes. County-wide and jurisdiction specific profile maps are provided at the end of the section (if applicable).

5.3.1 Building Collapse / Mine Subsidence

Description

Building collapse can occur as the result of many different hazards, whether natural or man-made, such as earthquake, liquefaction, explosives, structural design, etc. Within the scope of this Plan, building collapse has great potential due to subterranean activities that have taken place in the past and present. "Building Collapse" as a hazard will incorporate buildings, roadways, infrastructures that may be exposed or vulnerable to failure due to the collapse or implosion of subterranean cavities. The following are some of the causes that have the potential of causing building collapse in Cochise County:

- Mine Subsidence - occurs when the ground surface moves as result of collapse or failures of underground mine workings. Underground mining is used when minerals are deep beneath the surface and/or when ore grade or quality is sufficient to justify more targeted mining. In order to get to the ore bodies, a vertical shaft, horizontal access shaft, or inclined passage way must be drilled and/or excavated to remove ore and waste, and supply ventilation. Once the ore body is exposed, several levels of horizontal tunnels called drifts and crosscuts are created to provide access to mining areas called stopes. The area actually being mined at any given time is called the face. Broken rock is hauled from the face by trains, loaders, or trucks that go directly to the surface, or to the shaft where it is hoisted to the surface and sent to a processing facility.
- Underground Infrastructure Erosion - occurs in stormwater channels built underground during the turn of the century which are inadequate to carry necessary amount or volume of water without causing major deterioration and erosion of channel walls and supports.
- Criminal Tunneling - occurs when organized crime along the US/Mexico border desires to transport humans and contraband across the border in subterranean tunnels to evade capture. The tunnels are typically structurally crude and dangerous due to the lack of proper structural support, and especially when unsuspecting surface construction or vehicular traffic causes additional static and dynamic loading to the prism above the tunnels. In some instances, these tunnels may inadvertently intercept storm runoff and divert the flows to areas not designed to carry flood waters.

The secondary effects which results from the three definitions mentioned above are:

- 1) *Sinkhole subsidence* occurs in areas overlying underground voids or openings that are relatively close to the ground surface. This type of subsidence is fairly localized and usually recognized by an abrupt depression evident at the ground surface as overburden materials collapse into the void. Sinkhole subsidence is probably the most common type of subsidence that occurs and has been responsible for extensive damage to many structures throughout the years.
- 2) *Subsidence troughs* over abandoned tunnels/mines usually occur when the overburden sags downward due to the failure of remnant mine pillars, or by punching of the pillars into a soft mine roof or floor. The surface effect is a large, shallow, yet broad, depression in the ground that is usually elliptical or circular in shape. Subsidence is normally greatest at the center of the trough and it continually decreases until the limit of the surface area is reached. Structures near the center of the trough can experience damage caused by the compression of the ground surface, and structures near the edges can be damaged by tension or stretching of the surface. Ground movement within a subsidence trough can result in damage to buildings, roadways, bridges, railroads, underground pipelines and utilities, and practically any other structure or feature that may be present.[24]

[24] Energy and Environmental Profile of the U.S. Mining Industry, 2000: http://www1.eere.energy.gov/industry/mining/pdfs/overview.pdf

History

Tombstone - Historic, underground mining activities have occurred throughout Cochise County leaving many abandoned mine shafts and tunnels. Many of these mines are located in remote hillside areas. The City of Tombstone, however, is an exception. Within the city limits much stope mining has occurred and many of the city's treasured historic structures have been constructed directly over the top of these abandoned mine workings. The six-block historical district of Tombstone sits on top of numerous subterranean mines/shafts in and around the city as represented in Map 1. Numerous foundations of buildings are placed directly on top of voids of tunnels and open mineshafts. To compound this hazard, the construction of most of Tombstone's historic buildings do not conform with current local building codes. There is an added concern that a minor earthquake may trigger a catastrophic mine subsidence event, although it is recognized by the Planning Team that the frequency of earthquakes are rare. The following are recorded subsidence events for that have occurred within the City of Tombstone:

- In July 1997, the City suffered a subsidence event on East Toughnut Street, between South 4th Street and South 5th Street developing inch wide cracks in a depression approximately 55 feet in diameter and one foot deep causing a street closure and threatening the City's main sewer line, which run down the center of East Toughnut Street. The eventual sag broke open exposing a hole at least 25 feet deep, also taking an adobe wall and breaking a secondary sewer line. The portion of the street suffering the subsidence was closed to vehicular traffic, which appeared to cure the problem. (Tombstone Multi-Hazard Mitigation Plan, 2009)

- On January 2, 1998, another collapse occurred and within a few days widened to six to eight feet in diameter with a secondary sewer line broken and discharging raw effluent in the Old Goodenough Mine and by default into the City's ground water. A state of emergency was declared by then Mayor Delmas (Gene) Harper and $10,000 was allocated shortly thereafter to repair the sewer line and rectify the matter (McCracken, 1998).

Bisbee - According to the City of Bisbee General Plan, Old Bisbee experienced multiple flooding events around the turn of the century due to the rapid growth and development of the natural floodplains along the canyons formed by the Mule and Brewery Gulches. Multiple attempts at flood control facilities failed to adequately control the frequent summer monsoon events that threatened the city. Finally in December 1908, a contract was awarded to El Paso and Southwestern Railroad Company to construct a new, underground concrete channel that would convey the flood waters more effectively. A portion of this channel would run behind the buildings on the south and parallel to Main Street, and connect to an inlet located on the street surface that collects water flows from Brewery Gulch, and continue in the underground channel along Naco Road. This 100 year-old channel, Mule Gulch Channel, continues to function today to divert water to protect the downtown area of Old Bisbee. A more recent U.S. Army Corps of Engineer study that was completed after the 1986 flood, revealed that the channel was undersized and severely deteriorated which posed a high probability of failure. Subsequent studies by the Corps and the City of Bisbee revealed that the channel was undersized, severely deteriorated and poses a high probability of failure. In 1999, the City of Bisbee solicited emergency funding from the state and federal government after monsoon rains caused flooding and damaged the channel. With $1.4 million in funding obtained, the City began construction of the initial phase of channel rehabilitation in April 2001. On January 18, 2001, a portion of a parking lot in the historic district collapsed into the underground channel. A rotted support beam of the covered channel shattered, dropping a section of the Busy Bee parking lot into the Mule Gulch drainage channel. Fortunately, no one was hurt in the recent collapse. The Mule Gulch Drainage Channel restoration project along Tombstone Canyon-Main Street was completed in 2002 (The Planning Center, 2003).

Douglas – Along the U.S and Mexico border, over 37 smuggling tunnels have been found during the period of October 1, 2008 through June 30, 2011 in the Tucson Sector which includes Nogales, Douglas and Naco. During the period of October 1, 2009 to September 30, 2010, one tunnel was located in

Douglas. Many of the tunnels were discovered by roads collapsing (Douglas Dispatch, 2011). Other smuggling tunnel events for Douglas are listed below:

- In 1990, a 270-foot elaborate tunnel with lighting and a hydraulic system that authorities valued at more than $1 million was discovered running between the town of Agua Prieta (in the Mexican state of Sonora) and Douglas, Arizona. An investigation revealed that more than a metric ton (2,250 pounds) of cocaine had been smuggled through that tunnel from Mexico into the United States.
- In August 2011, a tunnel collapsed in Douglas, Arizona leading from a rental house 25 feet south of the house. An entry on the Mexico side of the border could not be located. The rental house is just a few feet from the international border and east of the Douglas Port of Entry on C Avenue and International Street. The discovery was made by a nearby resident who entered the house and found a 14 inch diameter hole in the floor.(Arizona Star, August 26, 2011)

Probability and Magnitude

The probability and magnitude of building collapse will vary greatly depending on ground surface stability and development activities. The state of the mines in Tombstone will continue to degrade over time. Earthquakes may also serve as a trigger or cause of a mine collapse that could cause major damage to the structures, but significant seismic activity is deemed unlikely due the long re-occurrence interval reported by the USGS and AZGS.

A Main Street portion of the Mule Gulch drainage channel has been rehabilitated, but there are several reaches of the Tombstone Canyon structure that remain in need of repair and threaten nearby homes and businesses.

The tunneling efforts for human and drug trafficking will likely continue along the border, however, the greatest majority of tunneling activity occurs in Nogales.

One way to estimate the risk of building collapse is to map the limits of the underground voids or hazard areas, estimate their corresponding limits of influence due to a collapse, and determine the structure and population exposure. At the time of this writing, the Planning Team chose to map the underground mine workings currently threatening the City of Tombstone's historical district. Data for the other hazard areas was unavailable for this Plan, but could potentially be included with the next update. The following two classes of hazard risk were assigned by the Planning Team:

HIGH Hazard = Areas of potential mine collapse risk based on the known and mapped existence of underground mine works.

LOW Hazard = All other areas outside the delineated limits

As was demonstrated in the 2012 Plan, Map 5.1 displays a city-wide map of the City of Tombstone, which shows the location and hazard classifications for each mine delineated location.

Vulnerability – CPRI Results

Building collapse CPRI results for each jurisdiction are summarized in the following table.

Table 5.5. CPRI Results by Jurisdiction for Building Collapse/Mine Subsidence

Participating Jurisdiction	Probability	Magnitude/ Severity	Warning Time	Duration	CPRI Score
Benson	1.95 (Possible/Unlikely)	2.0 (Limited)	3.58 (< 6 hours/12-24 hours)	2.37 (< 24 hours/< 1 week)	2.25

Participating Jurisdiction	Probability	Magnitude/ Severity	Warning Time	Duration	CPRI Score
Bisbee	2.02 (Possible/Likely)	2.29 (Limited/Critical)	3.51 (6-12 hours/< 6 hours)	2.27 (< 24 hours/< 1 week)	2.35
Douglas	1.6 (Unlikely/Possible)	1.5 (Negligible/Limited)	3.2 (6-12 hours/< 6 hours)	1.5 (<6 hours/< 24 hours)	1.80
Huachuca City	1.42 (Unlikely/Possible)	1.71 (Negligible/Limited)	3.65 (6-12 hours/<6 hours)	1.71 (<6 hours/<24 hours)	1.87
Sierra Vista	2.04 (Possible/Likely)	2.04 (Limited/Critical)	3.61 (6-12 hours/< 6 hours)	1.83 (<6 hours/< 24 hours)	2.25
Tombstone	1.83 (Unlikely/Possible)	1.67 (Negligible/Limited)	3.67 (6-12 hours/< 6 hours)	1.67 (< 6 hours/<24 hours)	2.04
Willcox	1.31 (Unlikely/Possible)	1.38 (Negligible/Limited)	3.69 (6-12 hours/<6 hours)	1.69 (< 6 hours/<24 hours)	1.14
Unincorporated Cochise County	2.07 (Possible/Likely)	2.07 (Limited/Critical)	3.9 (6-12 hours/< 6 hours)	2.17 (< 24 hours/< 1 week)	2.35
				County-wide average CPRI =	2.00

Based on the CPRI Evaluation, the City of Bisbee and those living and working in Unincorporated Cochise County believe that they are most at risk from a Building Collapse / Mine Subsidence event. As demonstrated in the table above, the probability of this event occurring in these two jurisdictions is more likely and the magnitude of event impacts would be more significant.

Vulnerability – Loss Estimations

The estimation of potential losses due to building collapse was conducted during the 2012 Plan update by intersecting the human and facility assets with the building collapse/mine subsidence hazard limits depicted on Map 1. As stated previously, building collapse data was only readily available for the City of Tombstone. Therefore, the results of this analysis are expected to underestimate the exposure of people and infrastructure within Cochise County.

Since no common methodology is available for obtaining losses from the exposure values, estimates of dollar losses attributable to this hazard are not made. Exposure estimates to all facilities located within the high hazard area are based on the proximity of mine subsidence areas located directly beneath historical buildings. Most of the assets located within high hazard mine subsidence areas such as the Nellie Cashman Restaurant, Old Firehouse, Big Nose Cave Saloon, Crystal Palace and the Library are subject to unstable foundations due to the subterranean voids below the ground surface within the City of Tombstone. Other impacts to both buried and above ground utilities are likely in the event of a mine subsidence event.

The City of Bisbee may suffer underground infrastructure erosion from building collapse during a significant rainstorm causing the drainage channel to fill with large volumes of rushing water. The City of Douglas could be impacted from criminal tunneling anywhere along the border, and not fixed to any particular locations. This area will continue to be vulnerable to a moving hazard as the criminal element will determine the location of the next underground tunnel. It should be noted that the Planning Team recognizes that the probability of a building collapse occurring at multiple (or all) locations at the same time is essentially zero. Accordingly, the loss estimates presented below are intended to serve as a collective evaluation of the potential exposure to building collapse events.

In summary, $20.0 million in City of Tombstone critical facilities (nearly 10% of all the critical facilities in Tombstone) are estimated to be exposed to a high building collapse/mine subsidence hazard. An

additional $5.1 million in 2010 Census City of Tombstone residential housing units (over 3% of all the residential housing units in Tombstone) are estimated to be exposed to a high building collapse/mine subsidence hazard. Regarding human vulnerability, a total City of Tombstone population of 31 people, or 2.22% of the total Tombstone population, are potentially exposed to a high building collapse/mine subsidence hazard event. Multiple deaths and injuries are plausible and a portion of the exposed population is subject to displacement depending on the event magnitude. Based off of the CPRI Evaluation, it seems that the general public underestimates the risk presented by this hazard and additional outreach and education may be warranted.

Vulnerability – Development Trend Analysis

Since the 2010 Census, there has been a population decline in both the County and Tombstone. Development of the high hazard areas indicated on the map at the end of this section has been very limited, particularly since the 1997 and 1998 events. Future development of those areas will require extensive geotechnical investigations to ensure the stability and longevity of any structures.

High risk areas within Bisbee are generally not subject to future development except for simple repairs and renovations. Any future development of significance will require a structural evaluation of the current drainage channel to determine the adverse impacts of structural loading on the nearly 100 year old system. A failure modes evaluation and analysis may be warranted with a larger re-development of the area.

Sources

Arizona Division of Emergency Management, 2013, *State of Arizona Multi-Hazard Mitigation Plan, 2013 Update*

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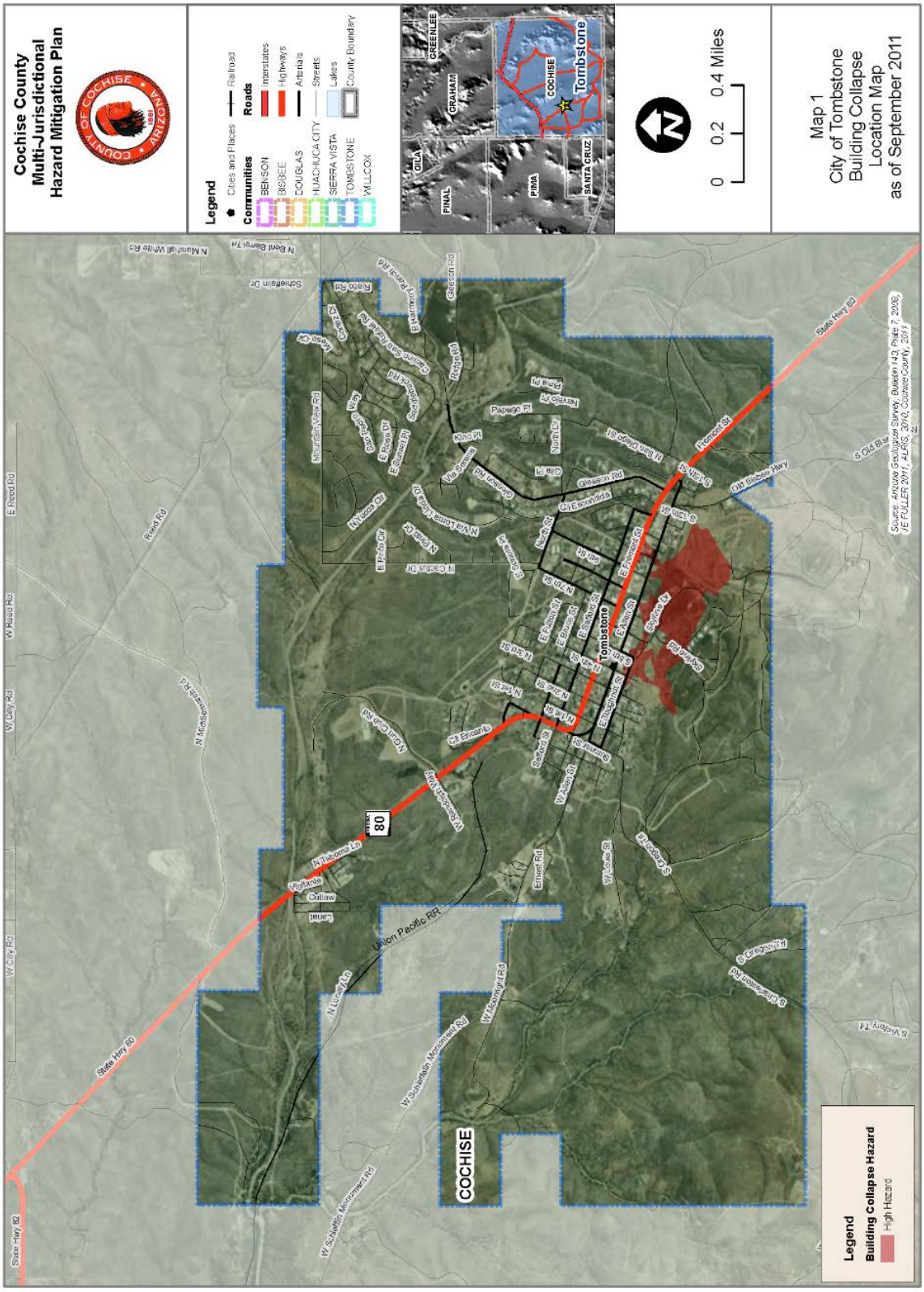
McCracken, K., 1998, *Subsidence Mitigation in Tombstone, Arizona*, paper presented at the 20th Annual Conference of the Association of Abandoned Mine Land Programs, Albuquerque, NM, Sept 28th-Oct 1st, 1998.

The Planning Center, 2004, *City of Bisbee General Plan Update 2003, Volume 1*.

Profile Maps

Map 5.1 – Potential Building Collapse Hazard Map - City of Tombstone (2012 HMP Plan)

Map 5.1. City of Tombstone Building Collapse



5.3.2 Drought

Description

Drought is a normal part of virtually every climate on the planet, including areas of high and low rainfall. It is different from normal aridity, which is a permanent characteristic of the climate in areas of low rainfall. Drought is the result of a natural decline in the expected precipitation over an extended period of time, typically one or more seasons in length. The severity of drought can be aggravated by other climatic factors, such as prolonged high winds and low relative humidity (FEMA, 1997).

Drought is a complex natural hazard which is reflected in the following four definitions commonly used to describe it:

- Meteorological – drought is defined solely on the degree of dryness, expressed as a departure of actual precipitation from an expected average or normal amount based on monthly, seasonal, or annual time scales.
- Hydrological – drought is related to the effects of precipitation shortfalls on streamflows and reservoir, lake, and groundwater levels.
- Agricultural – drought is defined principally in terms of naturally occurring soil moisture deficiencies relative to water demands of plant life, usually arid crops.
- Socioeconomic – drought associates the supply and demand of economic goods or services with elements of meteorological, hydrologic, and agricultural drought. Socioeconomic drought occurs when the demand for water exceeds the supply as a result of weather-related supply shortfall. It may also be called a water management drought.

A drought's severity depends on numerous factors, including duration, intensity, and geographic extent as well as regional water supply demands by humans and vegetation. Due to its multi-dimensional nature, drought is difficult to define in exact terms and also poses difficulties in terms of comprehensive risk assessments.

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

Droughts may cause a shortage of water for human and industrial consumption, hydroelectric power, recreation, and navigation. Water quality may also decline and the number and severity of wildfires may increase. Severe droughts may result in the loss of agricultural crops and forest products, undernourished wildlife and livestock, lower land values, and higher unemployment.

History

According to the 2015 Arizona State Drought Preparedness Plan, Arizona has been in a state of long-term drought for approximately 21 years and most major reservoirs are only 50% full. A drought emergency declaration has been in effect since 1999. In the year 2015 alone, 10 disaster designations were issued by the U.S. Department of Agriculture. The following figures depict recent precipitation data from NCEI regarding average statewide precipitation variances from normal. Between 1849 and 1905, the most prolonged period of drought conditions in 300 years occurred in Arizona (Jacobs, 2003). Another prolonged drought occurred during the period of 1941 to 1965. The period from 1979-1983 appears to have been anomalously wet, while the rest of the historical records shows that dry conditions are most likely the normal condition for Arizona. Between 1998 and 2007, there have been more months with below normal precipitation than months with above normal precipitation. The following

figure shows the decreasing trend of precipitation, as compared to the baseline (using data from 1901 – 2000).

In August 2011, the USDA declared Cochise County and 4 other Arizona counties as primary natural disaster areas due to damage and losses caused by ongoing drought and related disasters that began January 1st and continue.

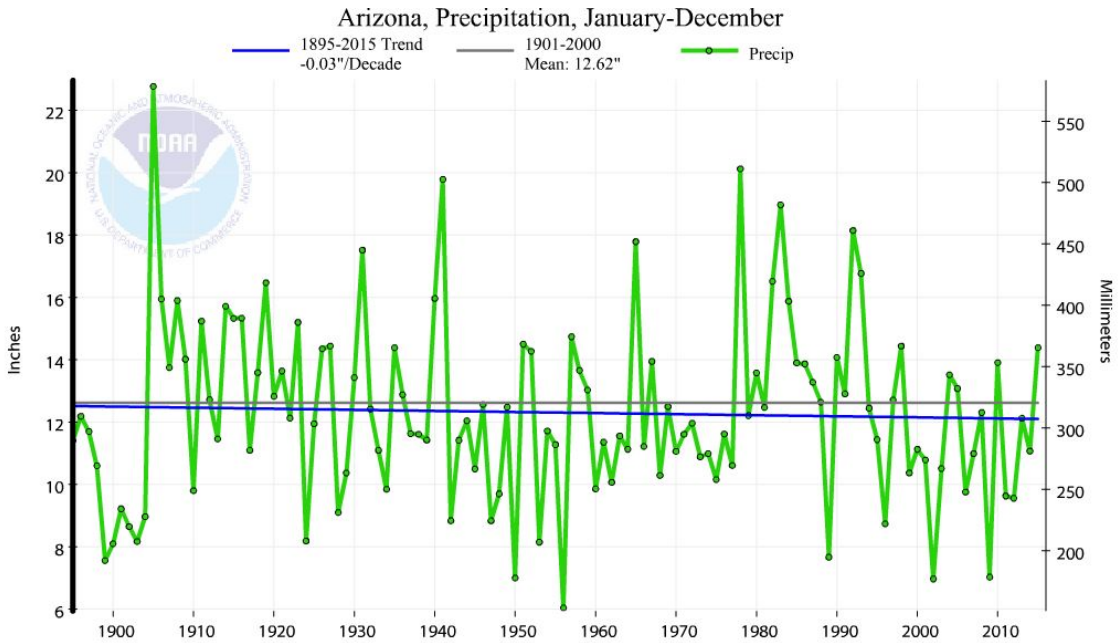


Figure 5.1. Average Statewide Precipitation Variances from a Normal Based on 1895-2015 Period

Probability and Magnitude

There is no commonly accepted return period or non-exceedance probability for defining the risk from drought (such as the 100-year or 1% annual chance of flood). The magnitude of drought is usually measured in time and the severity of the hydrologic deficit. There are several resources available to evaluate drought status and even project expected conditions for the very near future.

The National Integrated Drought Information System (NIDIS) Act of 2006 (Public Law 109-430) prescribes an interagency approach for drought monitoring, forecasting, and early warning (NIDIS, 2007). The NIDIS maintains the U.S. Drought Portal[25] which is a centralized, web-based access point to several drought related resources including the U.S. Drought Monitor (USDM) and the U.S. Seasonal Drought Outlook (USSDO). The USDM, shown in the following figure, is a weekly map depicting the current status of drought and is developed and maintained by the National Drought Mitigation Center. The USSDO, shown in Figure 4, is a six month projection of potential drought conditions developed by the National Weather Service's Climate Prediction Center. The primary indicators for these maps for the Western U.S. are the Palmer Hydrologic Drought Index and the 60-month Palmer Z-index. The Palmer Drought Severity Index (PSDI) is a commonly used index that measures the severity of drought for agriculture and water resource management. It is calculated from observed temperature and precipitation values and estimates soil moisture. However, the Palmer Index is not considered to be consistent enough to characterize the risk of drought on a nationwide basis (FEMA, 1997) and neither of the Palmer indices are well suited to the dry, mountainous western United States.

[25] NIDIS U.S. Drought Portal website is located at: http://www.drought.gov/portal/server.pt/community/drought.gov/202

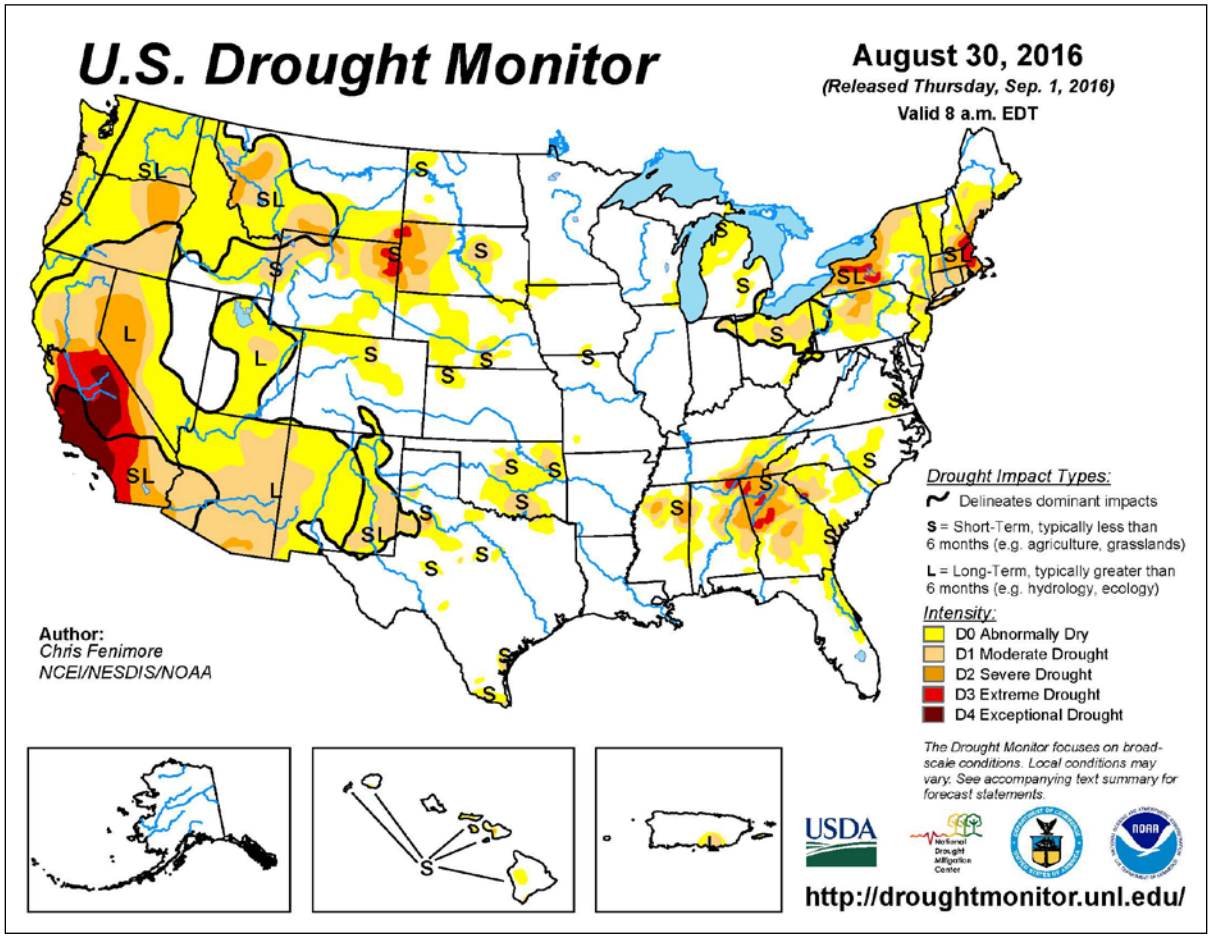


Figure 5.2. U.S. Drought Monitor Map for August 30, 2016

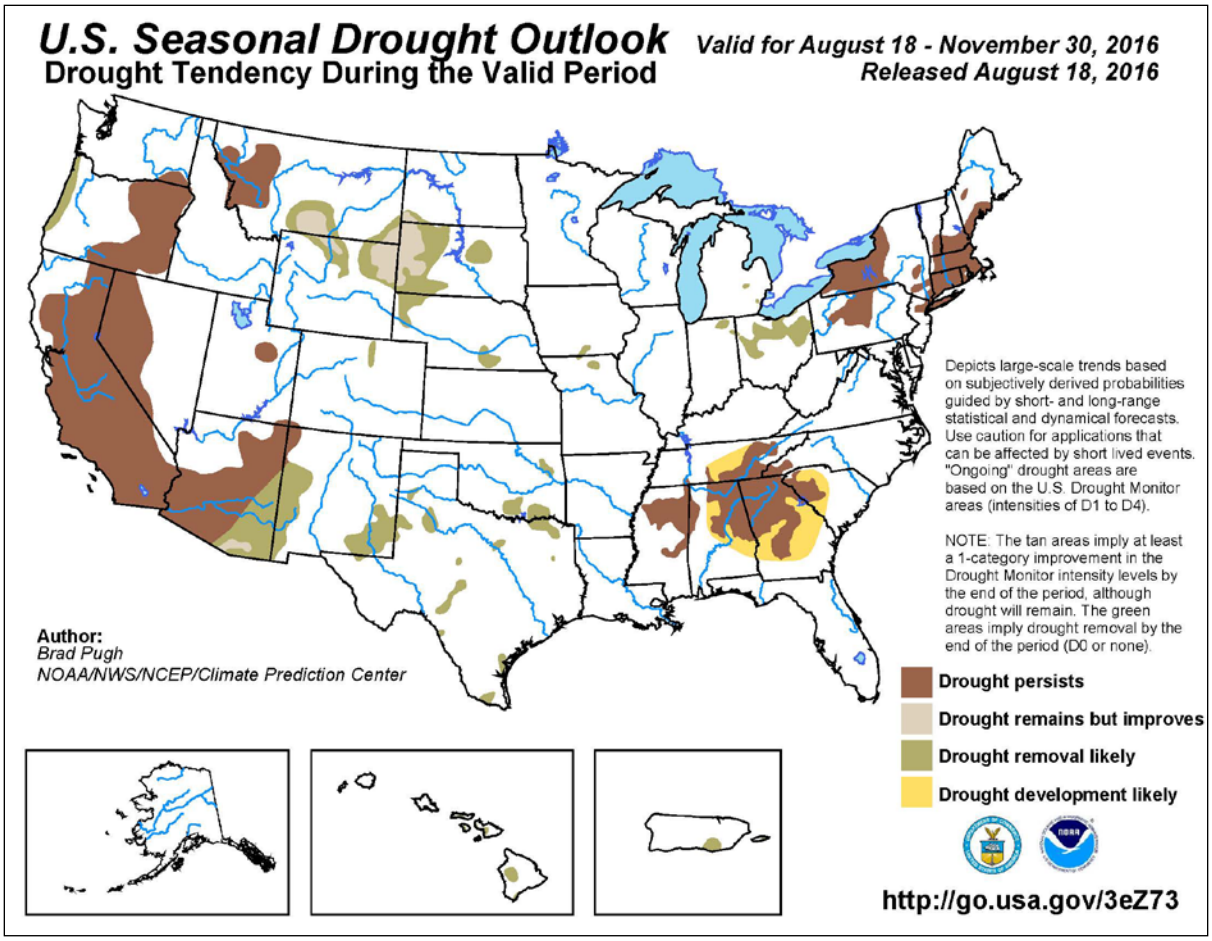
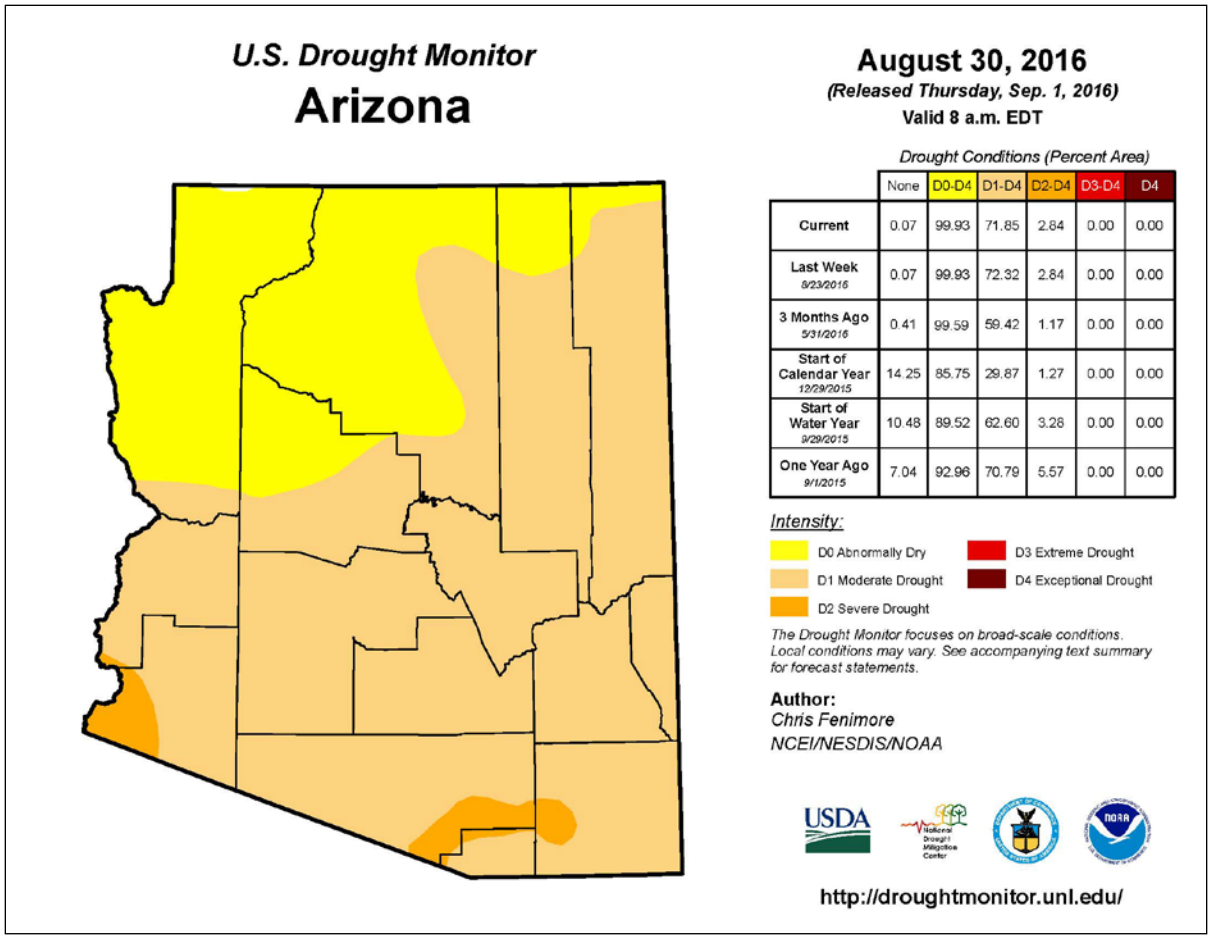


Figure 5.3.U.S. Seasonal Drought Outlook

Source: http://www.cpc.ncep.noaa.gov/products/expert_assessment/seasonal_drought.pdf

In 2003, Governor Janet Napolitano created the Arizona Drought Task Force (ADTF), led by ADWR, which developed a statewide drought plan. The plan includes criteria for determining both short and long-term drought status for each of the 15 major watersheds in the state using assessments that are based on precipitation and stream flow. The plan also provides the framework for an interagency group which reports to the governor on drought status, in addition to local drought impact groups in each county and the State Drought Monitoring Technical Committee. Twice a year this interagency group reports to the governor on the drought status and the potential need for drought declarations. The counties use the monthly drought status reports to implement drought actions within their drought plans. The State Drought Monitoring Technical Committee uses the Standardized Precipitation Index (SPI) for the short-term drought status and a combination of the SPI and streamflow for the long-term drought status. The following two figures present the most current short and long term maps available as of the writing of this plan.

The current drought maps are in general agreement that Cochise County is in a moderate drought condition (with a portion of the western county still considered severe) and that long term conditions are expected to remain abnormally dry.



	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.07	99.93	71.85	2.84	0.00	0.00
Last Week 8/23/2016	0.07	99.93	72.32	2.84	0.00	0.00
3 Months Ago 5/31/2016	0.41	99.59	59.42	1.17	0.00	0.00
Start of Calendar Year 12/29/2015	14.25	85.75	29.87	1.27	0.00	0.00
Start of Water Year 9/29/2015	10.48	89.52	62.60	3.28	0.00	0.00
One Year Ago 9/1/2015	7.04	92.96	70.79	5.57	0.00	0.00

Figure 5.4. Arizona Short Term Drought Status Map

Source: Arizona Drought Monitor Report - August 2016:
http://droughtmonitor.unl.edu/data/pdfs/20160830/20160830_AZ_trd.pd

The majority of domestic water for Cochise County is supplied by wells that tap into various groundwater sources. The primary sources of water for some private wells are small, shallow microbasins that are heavily dependent on rainfall and runoff. During times of drought, these microbasins can be rapidly over-drafted, leaving some wells dry or significantly impaired. Deeper aquifers are impacted by drought through reduction of surface waters flowing in the perennial streams and cienegas, and a general lowering of the groundwater table. Conditions are compounded when more demand is placed on these aquifers once the shallower microbasins begin to dry up.

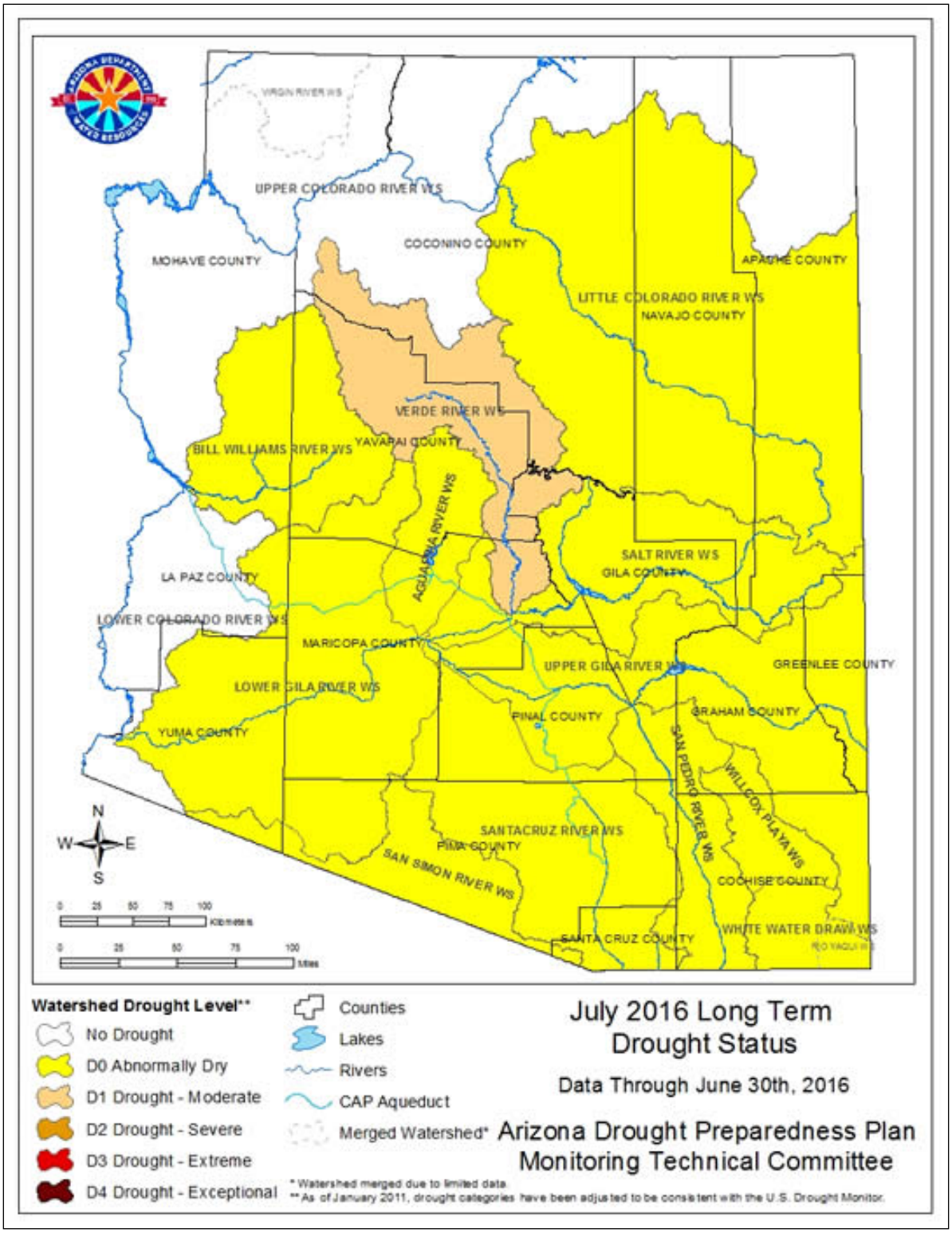


Figure 5.5. Arizona Long Term Drought Status Map

Source: ADWR, 2011, Arizona Drought Monitor Report - July 2016

In areas such as the San Pedro River Valley, lowering of the groundwater due to drought and increased domestic demands also impacts the ecology of the riparian corridor. The following are examples of the impacts reported (Garfin, 2005):

- "A water resources consultant reports that a highly unusual die off of cottonwood trees has occurred. He reports that 50% of cottonwood trees, with up to 8 ft. girths, in a riparian area in Texas Canyon, between Willcox and Benson, AZ, died during the past year. Cottonwoods love to have their roots in the water. These big ones (probably 100+ years old) definitely survived previous droughts."
- "The range-and-agricultural area, near McNeal, AZ looks like a lunar landscape. The rangelands in the area are absolutely devastated. Leafless mesquite trees throughout the landscape. Mesquite are usually quite flush with leaves this time of year. It takes a lot of drought to kill mesquite. Caveat: because I do not visit this area regularly, I cannot determine when various impacts occurred. The southern part of the basin (known as Whitewater Draw) has had chronic water table declines, due in part to drought."

Another major impact that is believed to be strongly influenced by drought is the formation of giant desiccation cracks (GDC) within the County. Giant desiccation cracks usually occur in clay-rich soils and are similar to mud cracks or large soil cracks, but on a much larger scale. It is widely believed that earth fissures in the County are the result of subsidence due to groundwater pumping, but GDC are different than fissures. In general, earth fissures from groundwater pumping are longer, straighter, and deeper than GDCs. According to the Arizona Geological Survey (AZGS), the increase in GDC formation is strongly believed to be linked to climatic conditions (i.e. – drought) as well as subsidence, with a marked increase in reports of giant desiccation cracking since 1998 (Harris, 2004). This also happens to coincide with the current drought cycle.

Vulnerability – CPRI Results

Drought CPRI results for each community are summarized in the following table.

Table 5.6. CPRI Results by Jurisdiction for Drought

Participating Jurisdiction	Probability	Magnitude/ Severity	Warning Time	Duration	CPRI Score
Benson	3.32 (Likely/Highly Likely)	2.21 (Limited/Critical)	1.21 (< 24 hours/12-24 hours)	3.68 (< 1 week/> 1 week)	2.71
Bisbee	2.61 (Possible/ Likely)	2.2 (Limited/Critical)	1.54 (> 24 hours/12-24 hours)	3.59 (< 1 week/> 1 week)	2.42
Douglas	2.3 (Possible/Likely)	2.2 (Limited/Critical)	2.0 (12-24 hours)	3.2 (> 1 week/< 1 week)	2.32
Huachuca City	2.74 (Possible/Likely)	2.26 (Limited/Critical)	2.39 (12-24 hours/6-12 hours)	2.97 (< 24 hours/< 1 week)	2.57
Sierra Vista	3.17 (Likely/Highly Likely)	2.26 (Limited/Critical)	1.39 (> 24 hours/12-24 hours)	3.43 (<1 week/> 1 week)	2.66
Tombstone	2.33 (Possible/Likely)	2.17 (Limited/Critical)	1.83 (12-24 hours/> 24 hours)	3.5 (> 1 week/< 1 week)	2.32
Willcox	2.56 (Possible/Likely)	2.06 (Limited/Critical)	1.81 (> 24 hours/12-24 hours)	3.31 (> 1 week/< 1 week)	1.22
Unincorporated Cochise County	3.03 (Likely/Highly Likely)	2.31 (Limited/Critical)	1.21 (> 24 hours/12-24 hours)	3.97 (> 1 week/< 1 week)	2.64
				County-wide average CPRI =	2.36

Based on the CPRI Evaluation, the City of Benson, Sierra Vista and those living or working Unincorporated Cochise County are perceived to be the most at risk from a Drought. Although, as described earlier, drought has cross-regional impacts and all communities within Cochise County could ultimately suffer consequences of drought impacts if their neighboring communities are affected.

Vulnerability – Loss Estimations

No standardized methodology exists for estimating losses due to drought and drought does not generally have a direct impact on critical and non-critical facilities and building stock. A direct correlation to loss of human life due to drought is improbable for Cochise County. Instead, drought vulnerability is primarily measured by its potential impact to certain sectors of the County economy and natural resources including:

- Crop and livestock agriculture
- Municipal and industrial water supply
- Recreation/tourism
- Wildlife and wildlife habitat

Sustained drought conditions will also have secondary impacts to other hazards such as fissures, flooding, subsidence and wildfire. Extended drought may weaken and dry the grasses, shrubs, and trees of wildfire areas, making them more susceptible to ignition. Drought also tends to reduce the vegetative cover in watersheds, and hence decrease the interception of rainfall and increase the flooding hazard. Subsidence and fissure conditions are aggravated when lean surface water supplies force the pumping of more groundwater to supply the demand without the benefit of recharge from normal rainfall.

From 1995 to 2014, Cochise County farmers and ranchers received $15.3 million in disaster related assistance funding from the U.S Department of Agriculture (USDA) for crop and livestock damages (EWG, 2016). $2.3 million was paid in 2014, which is a funding magnitude not seen since 2005. This warrants additional tracking as newer data is made available. Over $10 million of those funds were received during the time period of 1999 to 2005, which corresponds to the most severe period of the current drought cycle for Cochise County. According to the University of Arizona Cooperative Extension, most cattle ranchers in 2002/2003 found themselves forced to give up grazing lands early in the summer due to lack of forage. When faced with the choice of buying feed for the cattle or selling the animals at a loss, most went to auction. On a statewide basis, it is estimated that the 2002 losses associated with the discounted sell-off of cattle herds cost Arizona ranchers approximately $400 million (Kattnig, n.d.). According to the USDA, Cochise County ranchers accounted for approximately 3.5% of the total cash receipts for the state in 2002 (USDA, 2004). Assuming that the losses experienced by Cochise County ranchers correlates to the percentage of cash receipts respective to state-wide losses, then it is feasible to estimate that $14 million of those losses are directly attributable to Cochise County ranchers.

Estimates of economic losses incurred by public and private entities having to adjust or compensate for drought related domestic water supply shortages are difficult to estimate. The University of Arizona has performed an urban water sensitivity analysis for various areas in Arizona through the Climate Assessment Project for the Southwest (CLIMAS). According to one of the CLIMAS documents, domestic and agricultural water use during periods of drought will force an increased reliance upon non-renewable groundwater by 30 to 50% (U of A, 2000). The implications of a sustained aquifer overdraft at these rates would be significant, resulting in increased pumping costs and negative impacts to the San Pedro River riparian ecosystem.

Other direct costs such as increased pumping costs due to lowering of groundwater levels and costs to expand water infrastructure to compensate for reduced yields or to develop alternative water sources, are a significant factor but very difficult to estimate due to a lack of documentation. There are also the intangible costs associated with lost tourism revenues, and impacts to wildlife habitat and animals.

Typically, these impacts are translated into the general economy in the form of higher food and agricultural goods prices and increased utility costs.

Vulnerability – Development Trends

Population projections show a decline across most all of Cochise County and its jurisdictions. Any future population growth will require additional surface and ground water to meet the demands of potable, landscape, and industrial uses. It is unlikely that significant growth will occur in the ranching and farming sectors given the continued constraints on water rights, grazing rights, and available range land.

Drought planning should be a critical component of any domestic water system expansions or land development planning. The ADTF is also working cooperatively with water providers within the State to develop System Water Plans that are comprised of three components:

- *Water Supply Plan* – describes the service area, transmission facilities, monthly system production data, historic demand for the past five years, and projected demands for the next five, 10 and 20 years.
- *Drought Preparedness Plan* – includes drought and emergency response strategies, a plan of action to respond to water shortage conditions, and provisions to educate and inform the public.
- *Water Conservation Plan* – addresses measures to control lost and unaccounted for water, considers water rate structures that encourage efficient use of water, and plans for public information and education programs on water conservation.

The combination of these requirements will work to ensure that future development in Cochise County will recognize drought as a potential constraint.

Sources

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Profile Maps - No profile maps are included/applicable.

5.3.3 Earthquake

Description

An earthquake is the motion or trembling of the ground produced by sudden displacement of rock usually within the upper 10 – 20 miles of the Earth's crust. Earthquakes can affect hundreds of thousands of square miles, cause damage to property measured in the tens of billions of dollars, result in loss of life and injury to hundreds of thousands of people, and disrupt the social and economic functioning of the affected area. Most property damage and earthquake-related deaths are caused by the failure and collapse of structures due to ground shaking which is dependent upon amplitude and duration of the earthquake (FEMA, 1997).

Earthquake Mechanics

Regardless of the source of the earthquake, the associated energy travels in waves radiating outward from the point of release. When these waves travel along the surface, the ground shakes and rolls, fractures form, and water waves may be generated. Earthquakes generally last a matter of seconds but the waves may travel for long distances and cause damage well after the initial shaking at the point of origin has subsided.

Breaks in the crust associated with seismic activity are known as "faults" and are classified as either active or inactive. Faults may be expressed on the surface by sharp cliffs or scarps or may be buried below surface deposits.

"Foreshocks," minor releases of pressure or slippage, may occur months or minutes before the actual onset of the earthquake. "Aftershocks," which range from minor to major, may occur for months after the main earthquake. In some cases, strong aftershocks may cause significant additional damage, especially if the initial earthquake impacted emergency management and response functions or weakened structures.

Factors Contributing to Damage

The damage associated with each earthquake is subject to four primary variables:

- The nature of the seismic activity
- The composition of the underlying geology and soils
- The level and quality of development of the area struck by the earthquake
- The time of day

Seismic Activity: The properties of earthquakes vary greatly from event to event. Some seismic activity is localized (a small point of energy release), while other activity is widespread (e.g., a major fault shifting or slipping all at once). Earthquakes can be very brief (only a few seconds) or last for a minute or more. The depth of release and type of seismic waves generated also play roles in the nature and location of damage; shallow quakes will hit the area close to the epicenter harder, but tend to be felt across a smaller region than deep earthquakes.

Geology and Soils: The surface geology and soils of an area influence the propagation (conduction) of seismic waves and how strongly the energy is felt. Generally, stable areas (e.g., solid bedrock) experience less destructive shaking than unstable areas (e.g., fill soils). The siting of a community or even individual buildings plays a strong role in the nature and extent of damage from an event.

Development: An earthquake in a densely populated area which results in many deaths and considerable damage may have the same magnitude as a shock in a remote area that has no direct impacts. Large magnitude earthquakes that occur beneath the oceans may not even be felt by humans.

Time of Day: The time of day of an event controls the distribution of the population of an affected area. On work days, the majority of the community will transition between work or school, home, and the commute between the two. The relative seismic vulnerability of each location can strongly influence the loss of life and injury resulting from an event.

Types of Damage

Often, the most dramatic evidence of an earthquake results from the vertical and/or horizontal displacement of the ground along a fault line. This displacement can sever transportation, energy, utility, and communications infrastructure potentially impacting numerous systems and persons. These ground displacements can also result in severe and complete damages to structures situated on top of the ground fault. However, most damage from earthquake events is the result of shaking. Shaking also produces a number of phenomena that can generate additional damage

- Additional ground displacement
- Landslides and avalanches
- Liquefaction and subsidence
- Seismic Seiches

Shaking: During minor earthquake events, objects often fall from shelves and dishes rattle. In major events, large structures may be torn apart by the forces of the seismic waves. Structural damage is generally limited to older structures that are poorly maintained, poorly constructed, or improperly (or not) designed for seismic events. Un-reinforced masonry buildings and wood frame homes not anchored to their foundations are typical victims of earthquake damage.

Loose or poorly secured objects also pose a significant hazard when they are loosened or dropped by shaking. These "non-structural falling hazard" objects include bookcases, heavy wall hangings, and building facades. Home water heaters pose a special risk due to their tendency to start fires when they topple over and rupture gas lines. Crumbling chimneys may also be responsible for injuries and property damage.

Dam and bridge failures are significant risks during stronger earthquake events, and due to the consequences of such failures, may result in considerable property damage and loss of life. In areas of severe seismic shaking hazard, shaking Intensity levels of VII or higher (see following Table 8) can be experienced even on solid bedrock. In these areas, older buildings especially are at significant risk.

Ground Displacement: Ground displacement can also occur due to shaking, resulting in similar damages as mentioned previously.

Landslides and Avalanches: Even small earthquake events can cause landslides. Rock falls are common as unstable material on steep slopes is shaken loose, but significant landslides or even debris flows can be generated if conditions are ripe. Roads may be blocked by landslide activity, hampering response and recovery operations. Avalanches are possible when the snowpack is sufficient.

Liquefaction and Subsidence: Soils may liquefy and/or subside when impacted by the seismic waves. Fill and previously saturated soils are especially at risk. The failure of the soils has the potential to cause widespread structural damage. The oscillation and failure of the soils may result in increased water flow and/or failure of wells as the subsurface flows are disrupted and sometimes permanently altered. Increased flows may be dramatic, resulting in geyser-like water spouts and/or flash floods. Similarly, septic systems may be damaged creating both inconvenience and health concerns.

Seiches: Seismic waves may rock an enclosed body of water (e.g., lake or reservoir), creating an oscillating wave referred to as a "seiche." Although not a common cause of damage in past Arizona earthquakes, there is a potential for large, forceful waves similar to a tsunami ("tidal waves") to be generated on the large reservoirs. Such a wave would be a hazard to shoreline development and pose a significant risk on dam-created reservoirs. A seiche could either overtop or damage a dam leading to downstream flash flooding.

Environmental impacts of earthquakes can be numerous, widespread, and devastating, particularly if indirect impacts are considered. Some examples of impacts are listed below:

- Induced flooding and landslides
- Poor water quality
- Damage to vegetation
- Breakage in sewage or toxic material containments

History

Arizona experiences more earthquakes than most states in the nation. Being in such close proximity to California and Mexico, which both experience a significant amount of earthquakes, increases Arizona's risk and vulnerability to earthquake hazards. Many times earthquakes that are felt in Cochise County when the epicenter is located in nearby Mexico.

According to the United State Geological Survey (USGS), from 1830 to 2016 a total of 15 earthquake epicenters have occurred in Cochise County with a maximum magnitude of 6.9. The following table shows details of earthquake events that have taken place within the county:

Table 5.7. Earthquake Events in Cochise County (1830-2016)

Year (City)	Number of Events	Max Magnitude
1830 (San Pedro)	1	6.9
1887	1	4.9
1888	1	5
1893	1	4.9
1899	2	4.9
1934 (Pearce)	1	4.9
1938(San Simon)	1	4.9
1958(Paul Spur)	1	4.9
1961	1	2.6
1962	2	2.9
1989 (San Bernardino)	3	3.1

The largest recorded earthquakes in Arizona have occurred in San Pedro, San Bernardino, and just north of Flagstaff. The San Pedro event had an epicenter about 25 miles west of Tucson and caused massive

damage to build structures. The southeastern and southwestern corners of the state are where the greatest intensity of earthquakes have occurred. Active faults in Arizona, California, and Mexico have generated large earthquakes that have damaged structures within Arizona's borders. The Sonoran earthquake in 1887 had a magnitude of 7.2 and occurred along the Pitaycachi fault in Mexico. The epicenter for this event was located approximately 40 miles south of Douglas, Arizona.

The town of Duncan (Greenlee County), which is located near Cochise County, has experienced two significant earthquake events in 1939 and in 2014. The 1939 event was estimated to be a magnitude 5.0 and is used as the model in this report for analyzing future impacts countywide. Hazus analysis used the same epicenter as the Duncan earthquake, along with an estimated worst-case scenario magnitude, to identify loss estimations. This process is further explained in a following section.

The following figure, provided by the Arizona Earthquake Information Center, shows earthquake epicenters and faults that have occurred in Cochise between 1830 and 2016.

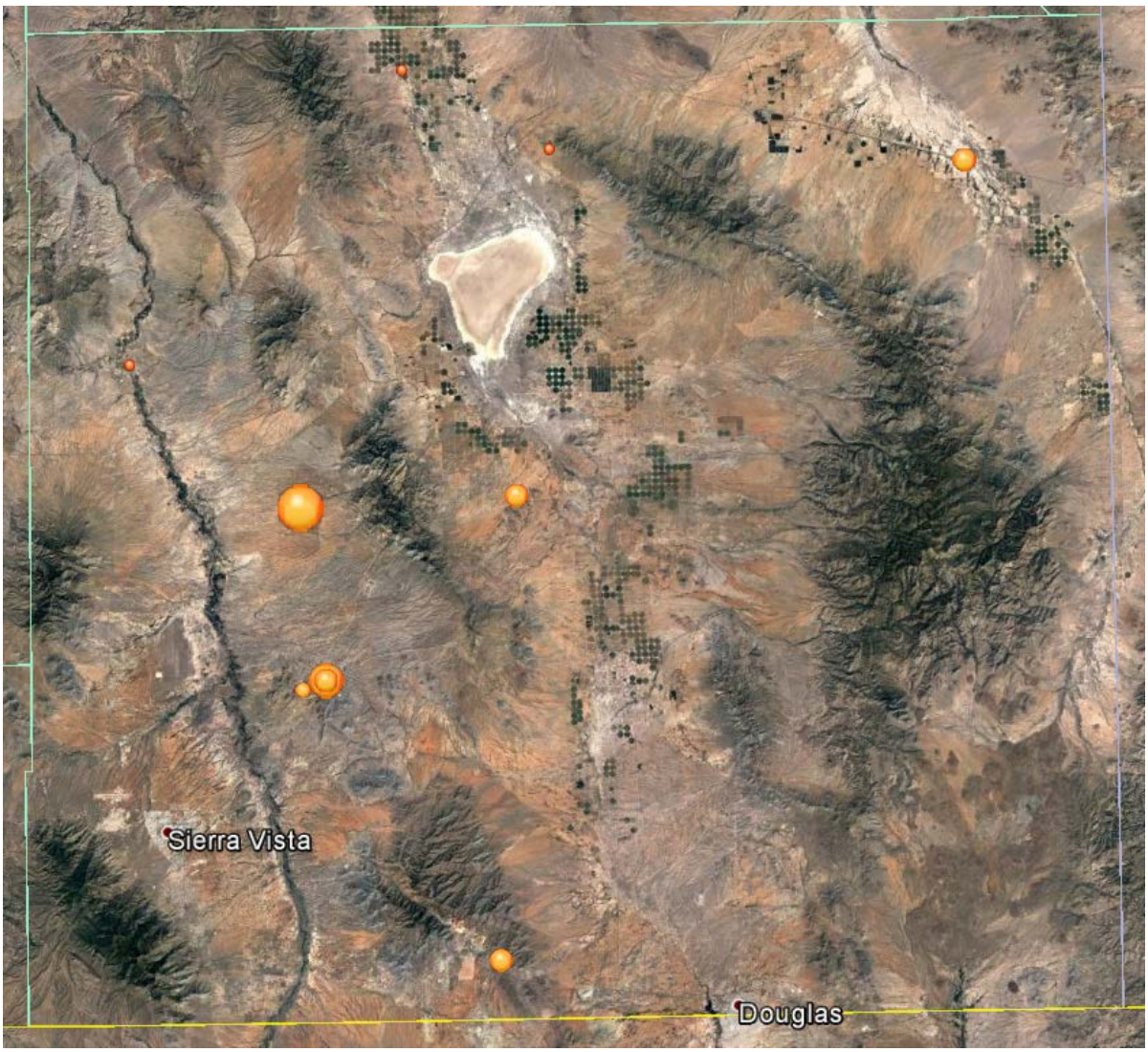


Figure 5.6.Earthquake Epicenters in Cochise County

Probability and Magnitude

The impact an earthquake event has on an area is typically measured in terms of earthquake intensity. Intensity is most commonly measured using the Modified Mercalli Intensity (MMI) Scale based on direct and indirect measurements of seismic effects.

Another way to express an earthquake's severity is to compare its acceleration to the normal acceleration due to gravity. Peak ground acceleration (PGA) measures the strength of ground movements in this manner. PGA represents the rate in change of motion of the earth's surface during an earthquake as a percent of the established rate of acceleration due to gravity. PGA can be partly determined by what soils and bedrock characteristics exist in the region. Unlike the Richter scale, PGA is not a measure of the total energy released by an earthquake, but rather of how hard the earth shakes at a given geographic area (the intensity). PGA is measured by using instruments including accelerographs and correlates well with the Mercalli scale.

When the peak ground acceleration nears 0.04 – 0.092g, an earthquake can be felt by people walking outside. As PGA nears 0.19 – 0.34g the intensity is considered to be very strong. At this level, plaster can break off and fall away from structures and cracks in walls often occur. PGA magnitudes of 1.24g are considered to be very disastrous. This magnitude of ground acceleration represents an earthquake of roughly 6.9 to 8.1 on the Richter Scale.

The Richter Scale is the most commonly used scale for measuring earthquake magnitudes and potential impacts. Because the public and policy makers are most familiar with the Richter Scale, this plan will use the Richter Scale coupled with PGA for the hazard risk assessment.

A detailed description of the Modified Mercalli Intensity Scale as it relates to PGA, the Richter Scale, and damage effects is shown in the following table.

Table 5.8. Modified Mercalli intensity scale

SCALE	INTENSITY	DESCRIPTION OF EFFECTS	PGA (g)	RICHTER SCALE MAGNITUDE
I	Instrumental	Detected only on seismographs	< 0.0017	< 4.2
II	Feeble	Some people feel it	0.0018 – 0.014	
III	Slight	Felt by people resting; like a truck rumbling by		
IV	Moderate	Felt by people walking	0.015 – 0.039	
V	Slightly Strong	Sleepers awake; church bells ring	0.040 – 0.092	< 4.8
VI	Strong	Trees sway; suspended objects swing; objects fall off shelves	0.093 – 0.18	< 5.4
VII	Very Strong	Mild alarm, walls crack, plaster falls	0.19 – 0.34	< 6.1

SCALE	INTENSITY	DESCRIPTION OF EFFECTS	PGA (g)	RICHTER SCALE MAGNITUDE
VIII	Destructive	Moving cars uncontrollable, masonry fractures, poorly constructed buildings damaged	0.34 – 0.65	< 6.9
IX	Ruinous	Some houses collapse, ground cracks, pipes break open	0.65 – 1.24	
X	Disastrous	Ground cracks profusely, many buildings destroyed, liquefaction and landslides widespread	> 1.24	< 7.3
XI	Very Disastrous	Most buildings and bridges collapse, roads, railways, pipes and cables destroyed, general triggering of other hazards	> 1.24	< 8.1
XII	Catastrophic	Total destruction, trees fall, ground rises and falls in waves	> 1.24	> 8.1

Earthquakes are extremely difficult to predict and their occurrence rate is determined in one of two ways. If geologists can find evidence of distinct, datable earthquakes in the past, the number of these ruptures is used to define an occurrence rate. If evidence of ruptures is not available, geologists estimate fault slip rates from accumulated scarp heights and estimated date for the oldest movement on the scarp. Because a certain magnitude earthquake is likely to produce a displacement (slip) of a certain size, we can estimate the rate of occurrence of earthquakes of that magnitude.

Recurrence rates are different for different assumed magnitudes thought to be "characteristic" of that fault type. Generally, a smaller magnitude quake will produce a faster recurrence rate, and for moderate levels of ground motion, a higher hazard risk. Future earthquakes are assumed to be likely to occur where earthquakes have produced faults in the geologically recent past. Quaternary faults are faults that have slipped in the last 1.8 million years and it is widely accepted that they are the most likely source of future large earthquakes. For this reason, quaternary faults are used to make fault sources for future earthquake models.

Vulnerability – CPRI Results

Earthquake CPRI results for each community are summarized in the following table:

Table 5.9. CPRI Results by Jurisdiction for Earthquake

Participating Jurisdiction	Probability	Magnitude/ Severity	Warning Time	Duration	CPRI Score
Benson	2.05 (Possible/Likely)	2.05 (Limited/Critical)	3.63 (6-12 hours/< 6 hours)	2.37 (< 24 hours/< 1 week)	2.32
Bisbee	2 (Possible)	2.51 (Limited/Critical)	3.57 (6-12 hours/< 6 hours)	2.24 (< 24 hours/< 1 week)	2.41

Participating Jurisdiction	Probability	Magnitude/ Severity	Warning Time	Duration	CPRI Score
Douglas	1.6 (Unlikely/Possible)	1.7 (Negligible/Limited)	3.6 (6-12 hours/< 6 hours)	2 (< 24 hours)	1.97
Huachuca City	1.48 (Unlikely/Possible)	1.81 (Negligible/Limited)	3.61 (6-12 hours/< 6 hours)	1.81 (< 6 hours/< 24 hours)	1.93
Sierra Vista	1.87 (Unlikely/Possible)	2.26 (Limited/Critical)	3.61 (6-12 hours/< 6 hours)	1.69 (< 6 hours/< 24 hours)	2.23
Tombstone	1.5 (Unlikely/Possible)	1.5 (Negligible/Limited)	3.33 (6-12 hours/< 6 hours)	1.67 (< 6 hours/< 24 hours)	1.79
Willcox	1.94 (Unlikely/Possible)	1.88 (Negligible/Limited)	3.5 (6-12 hours/< 6 hours)	1.81 (< 6 hours/< 24 hours)	1.27
Unincorporated Cochise County	2.1 (Possible/Likely)	2.34 (Limited/Critical)	3.9 (6-12 hours/< 6 hours)	1.97 (< 6 hours/< 24 hours)	2.43
				County-wide average CPRI =	2.04

Based on the CPRI Evaluation, the City of Bisbee and those living or working in Unincorporated Cochise County have the most perceived risk from an Earthquake event. As shown in the table above, the assumed probability of this event occurring in these two jurisdictions is more likely and the magnitude of earthquake impacts are thought to be more significant.

Vulnerability – Loss Estimations

The earthquake analysis was conducted using Hazus 3.1. Standard analysis was utilized as no improved datasets were available to help further refine the loss estimation results. In order to estimate earthquake loss in and near Cochise County, major historical events were researched. Previous records indicate that the Duncan area, which is near Cochise County, has experienced large earthquake events in 1939 and 2014. Duncan is located approximately 40 miles northeast of City of Wilcox. For the Hazus earthquake analysis, the scenario modeled utilized that 1939 historical event as the event epicenter with a magnitude of 6.9 (equaling the largest historical event that has occurred within Cochise County, in 1830 near San Pedro). This scenario was used as it could represent a "worst case scenario": a large earthquake event with an epicenter very near the county. The losses were then estimated in Hazus at the census tract level.

The Hazus model estimates that about 156 buildings will be at least moderately damaged and that none will be damaged beyond repair. Most expected damage will be to single family residential structures. Casualty and injury estimates predict that Cochise County could suffer what Hazus deems 'Severity Level 1' for Single Family and Other-Residential residential structures. Severity Level 1 means that injuries will require medical attention but hospitalization is not needed. It is estimated that no persons will seek temporary shelter after this earthquake event.

Total building-related losses are expected to be $3.48 million; 72% of which would be sustained by residential structures. The total economic loss for this scenario is estimated to be $3.74 million based on the region's current inventory. No major damages are expected for critical facilities, transportation, or utility lifelines. The maps at the end of this section present some of the data produced as part of the Hazus analysis (shown at the Census tract level): Modeled PGA, Total Estimated Losses, and Estimated Displaced Households.

The modeled scenario shows the greatest estimated losses to occur in the northeastern portion of the County, which put Wilcox and unincorporated areas at the highest risk. This data contrasts greatly from what the risk perception results from the CPRI Evaluation suggest, pointing out a potential opportunity for public outreach and educational efforts relating to the risk that earthquakes pose.

Vulnerability – Development Trends

It is reasonable to expect that future earthquakes as large as 7.2 will occur in or nearby Cochise County. Earthquakes strike with little to no warning and they are capable of having multiple impacts on an area. After-effects from an earthquake can include impacted roadways, downed power and communication lines, fires, and damages to structures (especially poorly built, or those already in disrepair). Earthquakes are not a seasonal hazard, and thus can be experienced year round. This fact presents its own set of planning and preparedness concerns.

Standard building codes have the opportunity to provide the planning area with reasonable guidance for development throughout unincorporated and incorporated areas. Contractors and builders should be aware of applicable codes and regulations designed to reduce losses sustained by new and existing construction due to seismic hazards. As development grows in the planning area, it will be important for citizens to consult with local building codes as modern building codes generally require seismic design elements for new construction.

It should be assumed that all development increases the risk to the planning area from the threat of earthquakes. As population and development continue to expand in the planning area, continued enforcement of the unified construction code has great potential to mitigate increasing vulnerability and development pressure.

The following figure shows that Cochise County has some of the highest chances for experiencing the most severe ground shaking across the State. Jurisdictions that could be most impacted include: Bisbee, Huachuca City, and Sierra Vista, in addition to unincorporated areas shown as being covered by the darker red in the following figure.

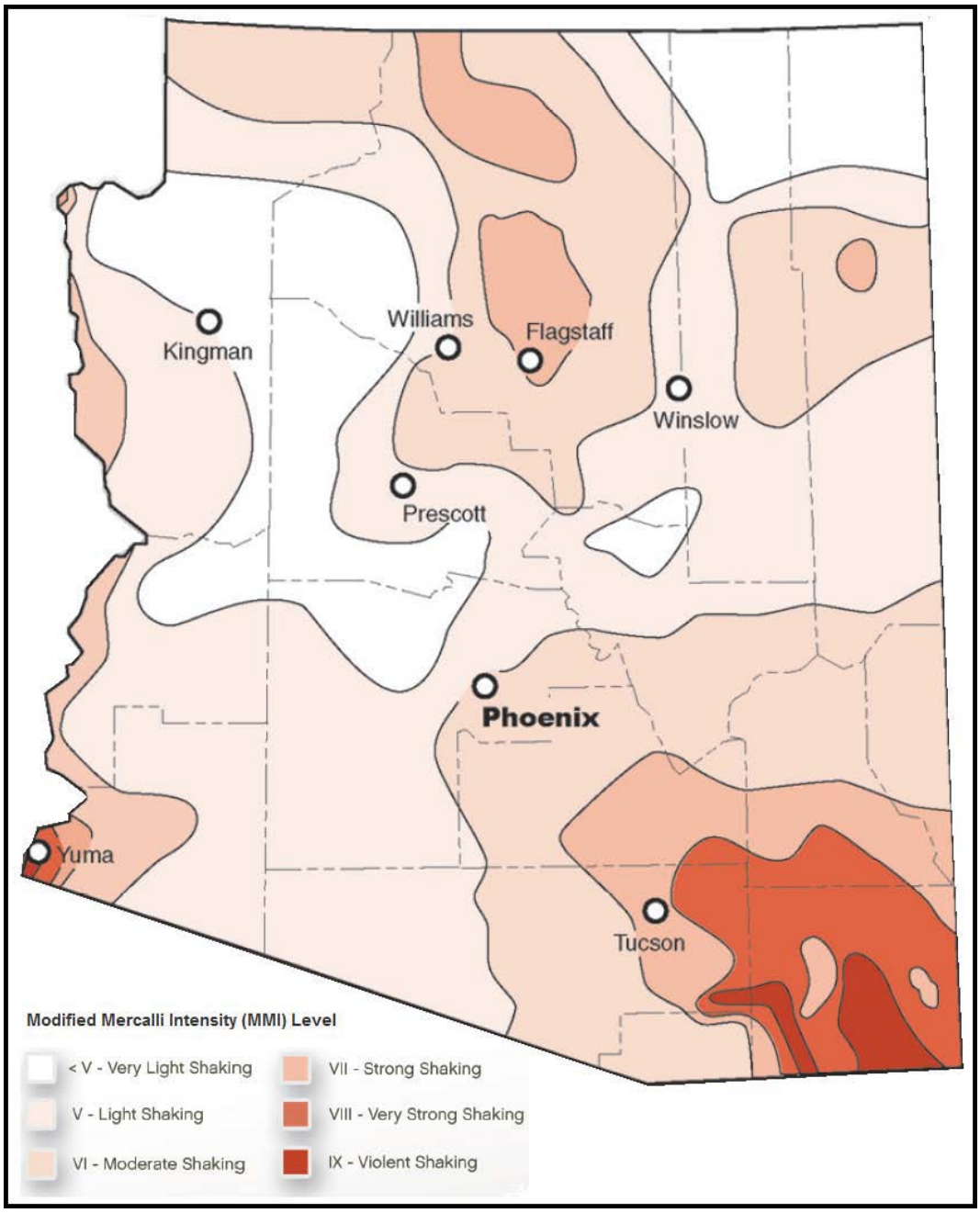


Figure 5.7. Areas of Increased Earthquake Risk

Sources

USGS, Earthquake Hazards Program, 2016, website located at: https://earthquake.usgs.gov/

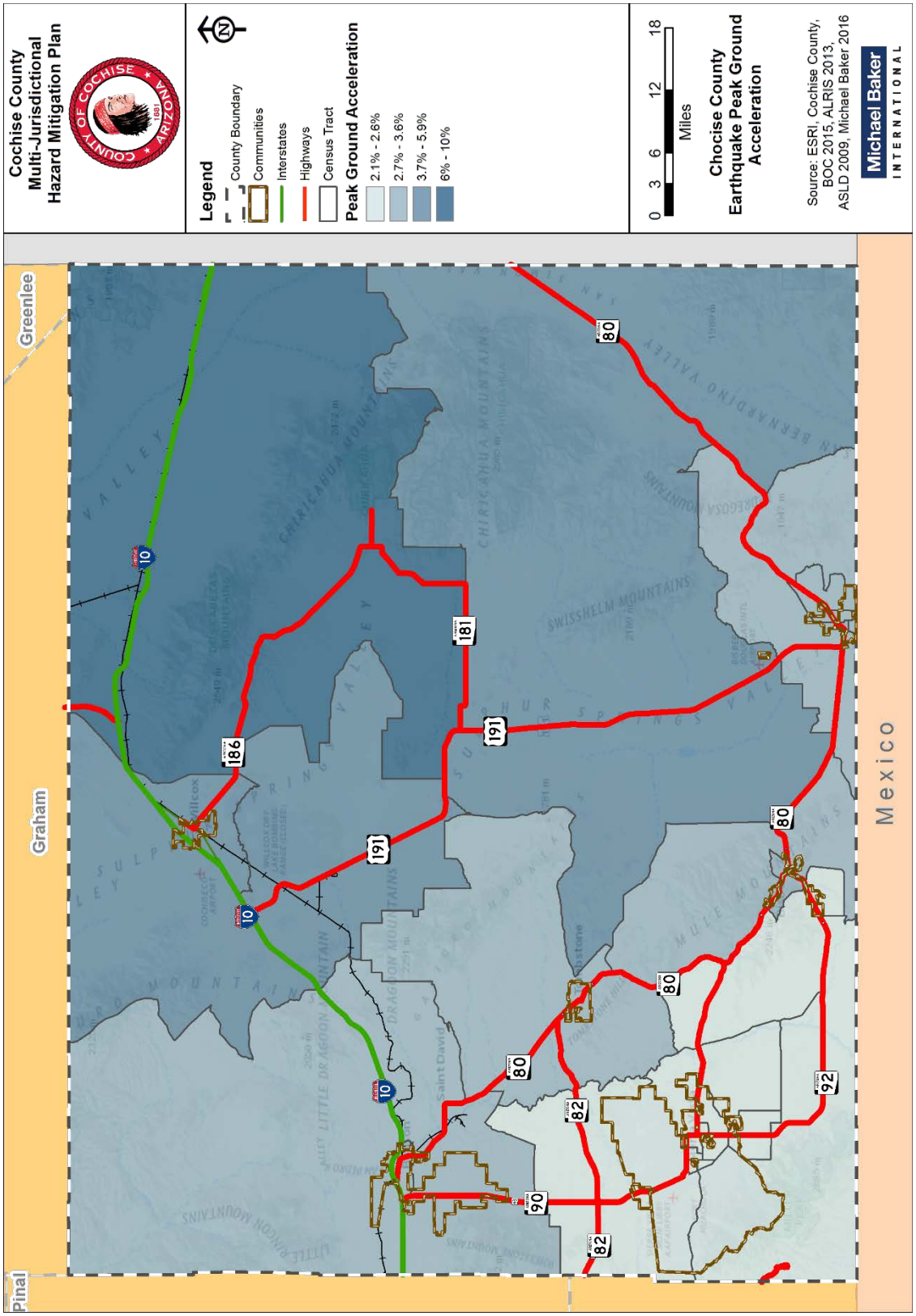
Profile Maps

Map 5.2 – Earthquake Peak Ground Acceleration

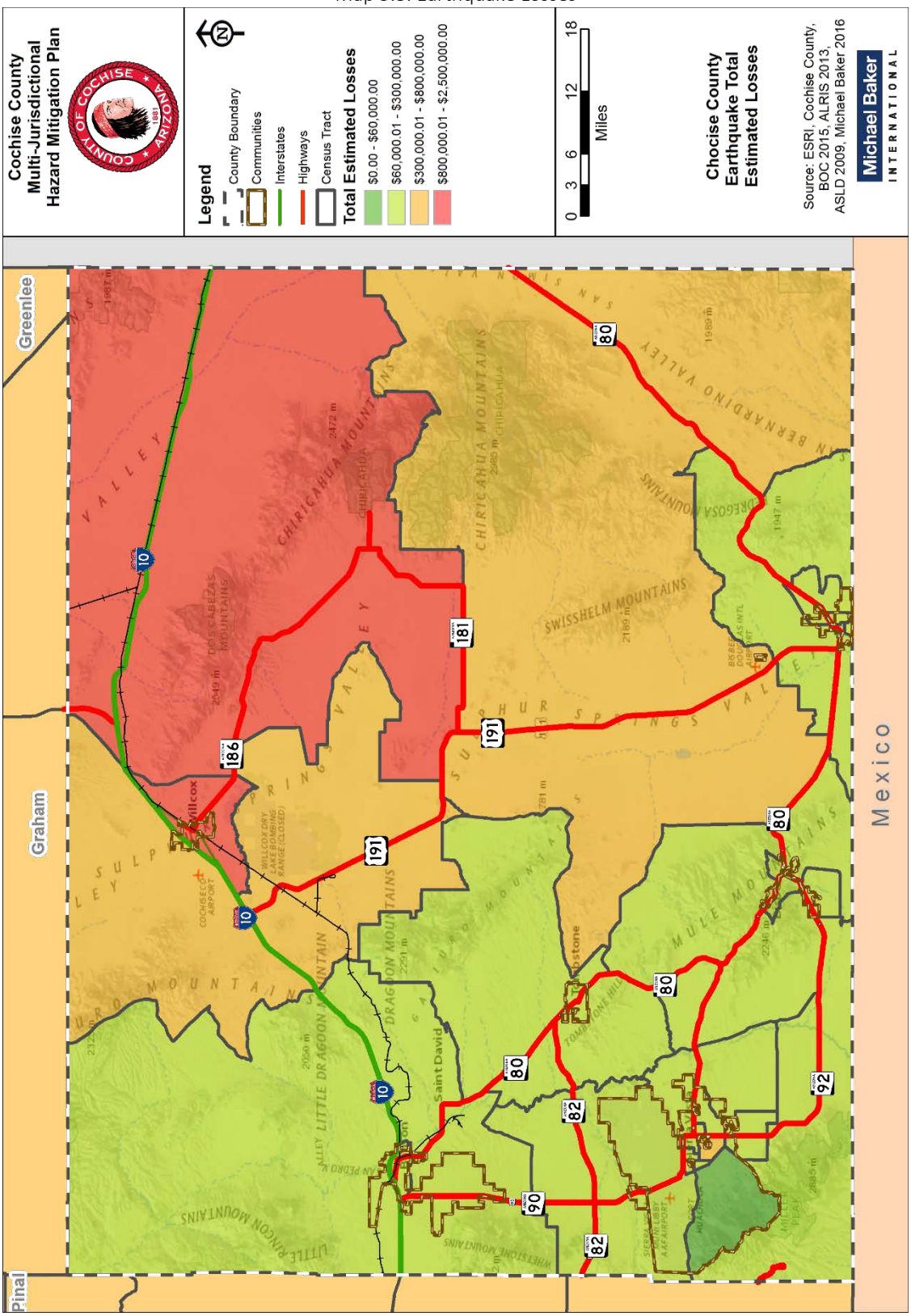
Map 5.3 – Earthquake Total Estimated Losses

Map 5.4 – Displaced Households

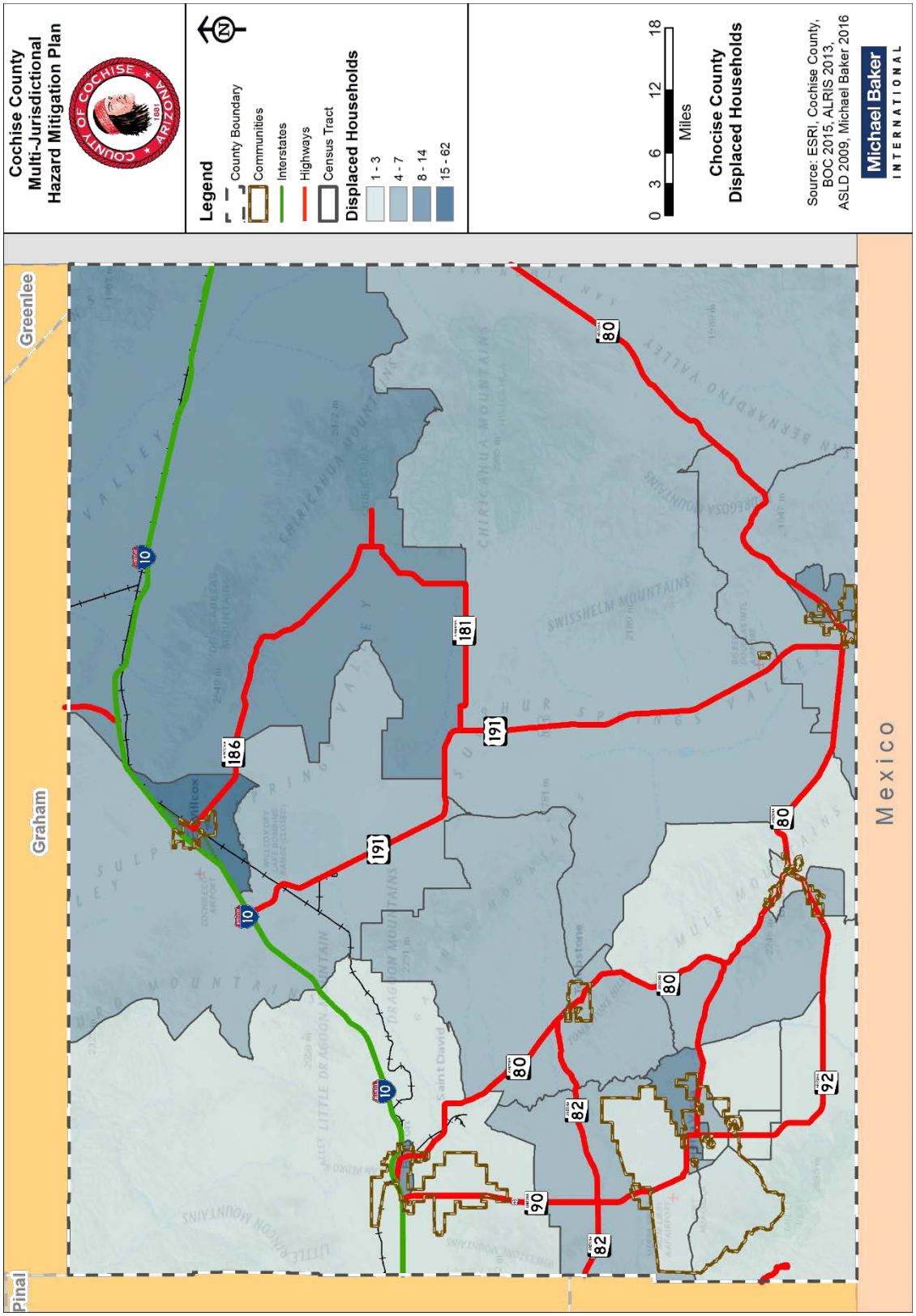
Map 5.2. Earthquake Peak Ground Acceleration



Map 5.3. Earthquake Losses



Map 5.4. Displaced Households



5.3.4 Fissure

Description

Earth fissures are linear cracks, seams, or separations in the ground surface that extend from the groundwater table or bedrock, and are caused by tensional forces related to differential land subsidence as described in the following figure. In many cases, fissures form as a direct result of subsidence caused by groundwater depletion. The surface expression of fissures ranges from less than a yard to several miles long and from less than an inch to tens of feet wide. Earth fissures occur at the edges of geologic basins, usually parallel to mountain fronts, or above local bedrock highs in the subsurface, and typically cut across natural drainage patterns.

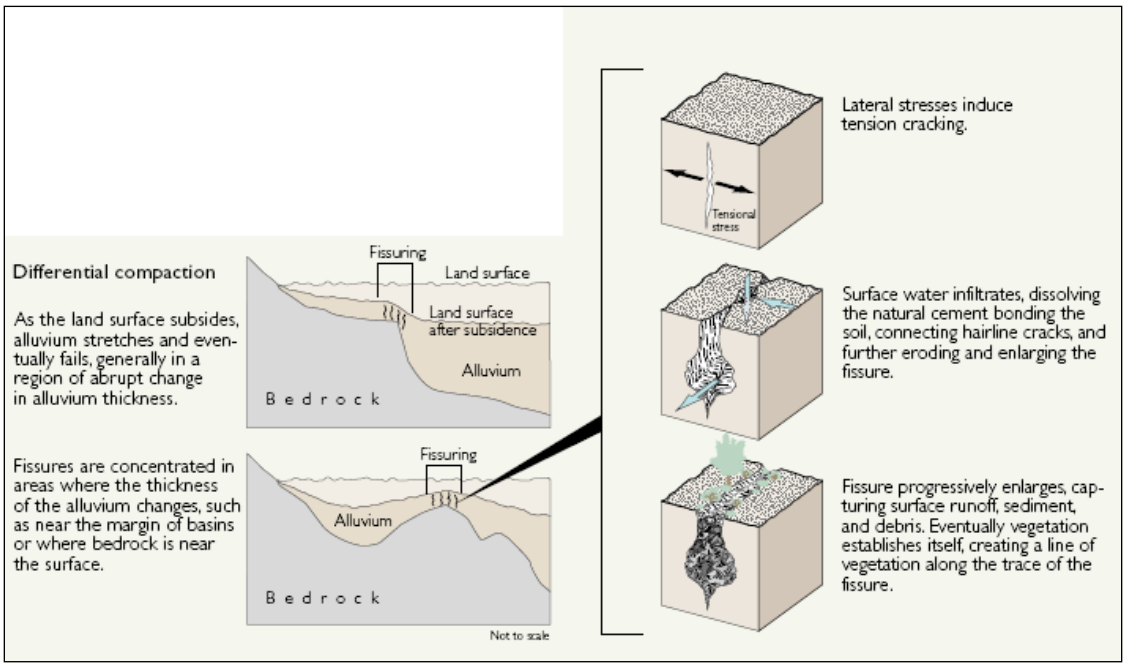


Figure 5.8. Fissure Development

(Source: AZGS, 2010)

Fissures can alter flood patterns, break buried pipes and lines, cause infrastructure to collapse, provide a direct conduit to the groundwater table for contaminants, and even pose a life safety hazard for both humans and animals.

History

In Arizona, fissures were first noted near Picacho in 1927. The number of fissures has increased dramatically since the 1950s due to the accelerated depletion of groundwater. Initially the heaviest use of groundwater was for agricultural irrigation. More recently, however, exponential population growth has dramatically increased domestic demands. The risk posed by fissures is also increasing as the population expands into the outlying basin edges and mountain fronts where fissures are more likely to manifest.

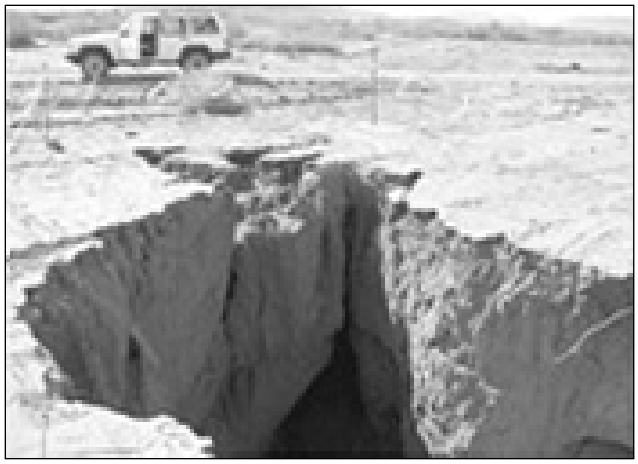


Figure 5.9. Earth Fissure in Cochise County

(Source: Todd Shipman, AZGS)

Several fissure case histories documented by the Arizona Geological Survey (AZGS) for the Cochise County area are summarized below.

- Area south of Kansas Settlement to Birch Road
  - Over 720 fissure segments
    - 323 continuous earth fissures totaling 47,683 feet.
    - 394 discontinuous earth fissures totaling 50,797 feet
    - 3 reported, unconfirmed earth fissures totaling 1,537 feet
- Area south of the unincorporated community of Cochise to Dragoon Road
  - At least 221 fissure segments totaling 30,832 feet.
    - 119 continuous earth fissures totaling 13,499 feet.
    - 93 discontinuous earth fissures totaling 7,323 feet.
    - 9 reported, unconfirmed earth fissures totaling 10,010 feet.

Most recently, an earth fissure in an area west of 191 has grown considerably in August 2011. Between August 5 through August 19th, the east segment extended another 239 feet causing great alarm to local residents that travel this area regularly (see photo to right). The earth fissure west of Highway 191 has been growing larger due to recent monsoon rains. Cracks are reported to range from six to eight feet deep and in some areas six to eight feet wide. It is also reported to be at least one-quarter mile long and a minimum three feet wide. Cracks began opening in July and progressively become worse over time. Local residents are becoming frustrated while being trapped at their homes due to accessibility problems. Arizona Geological Survey is not certain if it's desiccation cracks or an earth fissure. There is also a concern that underground electrical and phone lines may become compromised due to this evolving event. Emergency vehicles are unable to access the area which in itself is a hazard.

Recently developed earth fissure near Willcox. (Arizona Geology, 2011)

Probability/Magnitude

There are no methods of quantifiably predicting the probability and magnitude of earth fissures. The locations of potential fissures or extension of existing fissures may be predictable in specific areas if enough information about the subsurface material properties and groundwater levels are available. It is a fair assurance that continued groundwater depletion will result

in more fissures. The magnitude of existing and new fissures is dependent upon several variables including the depth to groundwater, type and depth of superficial material present, amount and rate of groundwater depletion, groundwater basin depth, depth to bedrock, volume and rate of runoff due to precipitation entering the fissure, and human intervention.

The Arizona Geological Survey has mapped known and suspected fissure lineaments for certain locations in Cochise County, with the latest update of GIS data having a version date of January 2016. These locations are indicated on the Maps at the end of this section. Four types of earth fissure classifications are depicted. The "Continuous" and "Discontinuous" depict two different surface expressions of earth fissures. The “Reported/Unconfirmed” lines represent approximate locations of previously reported, but cannot be re-located, and therefore their existence cannot be confirmed for various reasons. The “Confirmed/Unsurveyed” lines represent fissures that need additional evaluations.

Vulnerability – CPRI Results

Fissure CPRI results for each community are summarized in the following table:

Table 5.10. CPRI Results by Jurisdiction for Fissure

Participating Jurisdiction	Probability	Magnitude/ Severity	Warning Time	Duration	CPRI Score
Benson	2.53 (Possible/Likely)	1.89 (Negligible/Limited)	3.37 (6-12 hours/< 6 hours)	2.58 (< 24 hours/< 1 week)	2.47
Bisbee	2.22 (Possible/Likely)	2.12 (Limited/Critical)	3.22 (6-12 hours/< 6 hours)	2.34 (<24 hours/< 1 week)	2.35
Douglas	2.1 (Possible/Likely)	1.5 (Negligible/Limited)	3.5 (6-12 hours/< 6 hours)	2.2 (< 24 hours/< 1 week)	2.14
Huachuca City	1.48 (Unlikely/Possible)	1.81 (Negligible/Limited)	3.39 (6-12 hours/< 6 hours)	1.87 (< 6 hours/< 24 hours)	1.9
Sierra Vista	2 (Possible)	1.91 (Negligible/Limited)	3.61 (6-12 hours/< 6 hours)	1.78 (< 6 hours/< 24 hours)	2.19
Tombstone	1.5 (Unlikely/Possible)	1.33 (Negligible/Limited)	3.83 (6-12 hours/< 6 hours)	1.5 (< 6 hours/<24 hours)	1.8
Willcox	2.38 (Possible/Likely)	1.88 (Negligible/Limited)	3.56 (6-12 hours/< 6 hours)	2.12 (< 24 hours/< 1 week)	1.31
Unincorporated Cochise County	2.66 (Possible/Likely)	2.1 (Limited/Critical)	3.93 (6-12 hours/< 6 hours)	2.52 (< 24 hours/< 1 week)	2.67
				County-wide average CPRI =	2.1

Based on the CPRI Evaluation, the City of Benson and those living or working in Unincorporated Cochise County feel they would be most at risk from a Fissure event. As demonstrated in the table above, the probability of this event occurring in these two jurisdictions is believed to be more likely and the magnitude of impacts more significant.

Vulnerability – Loss Estimations

The Arizona Land Subsidence Group (ALSG) prepared a white paper in 2007 (ASLG, 2007) that summarizes fissure risk and various case studies. The following figure is an excerpt from that report listing various types of damages that either have or could occur as a result of fissures:

Table 1. Hazards Directly Associated with Earth Fissures	
• Cracked or collapsing roads • Broken pipes & utility lines • Damaged or breached canals • Cracked foundation/separated walls • Loss of agricultural land • Livestock & wildlife injury or death	• Severed or deformed railroad track • Damaged well casing or wellhead • Disrupted drainage • Contaminated groundwater aquifer • Sudden discharge of ponded water • Human injury or death

(After Pewe, 1990; Bell & Price, 1993; and Slaff, 1993)

Figure 5.10. Damages Associated with Earth Fissures

Recorded losses in Cochise County due to fissures primarily involve damages to roadways. Other infrastructure such as pipelines, and other miscellaneous improvements are noted to be in proximity of fissures, but no records of damages were noted in the research. According to the ALSG:

> *"The problems encountered with subsidence and earth fissures in Arizona will increase as groundwater continues to be withdrawn at unsustainable levels. More damage to structures and infrastructure can be expected with ever increasing economic losses, and, more importantly, a burgeoning threat to human health and safety, too." (ASLG,2007)*

The estimation of potential exposure to fissure risk was accomplished by intersecting the County's parcel data with existing fissure data. The following table displays the total number of impacted parcels that intersect with fissure lines, for each participating jurisdiction. The maps at the end of this section show these identified fissure locations.

Table 5.11. Impacted Parcels (Fissures)

Jurisdiction	Parcels
Benson	0
Tombstone	0
Willcox	0
Bisbee	0
Douglas	0
Sierra Vista	0
Huachuca City	0
County	287

There are no commonly accepted methods for estimating potential fissure related losses and no loss estimates will be made in this Plan. No critical facilities are predicted to be impacted by fissure lines in Cochise County. The primary vulnerability at this time, is where the fissure lineaments intersect roadways or other transportation corridors. The vulnerability lies both with the road improvements themselves, safety of travel, and the potential impact to utilities that often share the right-of-way or roadway alignments.

Vulnerability – Development Trends

There are several fissures located in areas that have potential for development and future growth. Most of these impacted areas are within unincorporated districts, but there are parts in the northern part of Willcox that could also be affected. Another concern is that several roadways intersect the fissures and

the potential for damages and threat to public safety is uncertain. Monitoring of the fissures and regular maintenance of the roadway within the fissure areas will be necessary activities.

Sources

Arizona Division of Emergency Management, 2013, State of Arizona Multi-Hazard Mitigation Plan, 2010.

Arizona Geological Survey, 2016, Webpage entitled: Arizona's Earth Fissure Center, http://www.azgs.az.gov/EFC.shtml

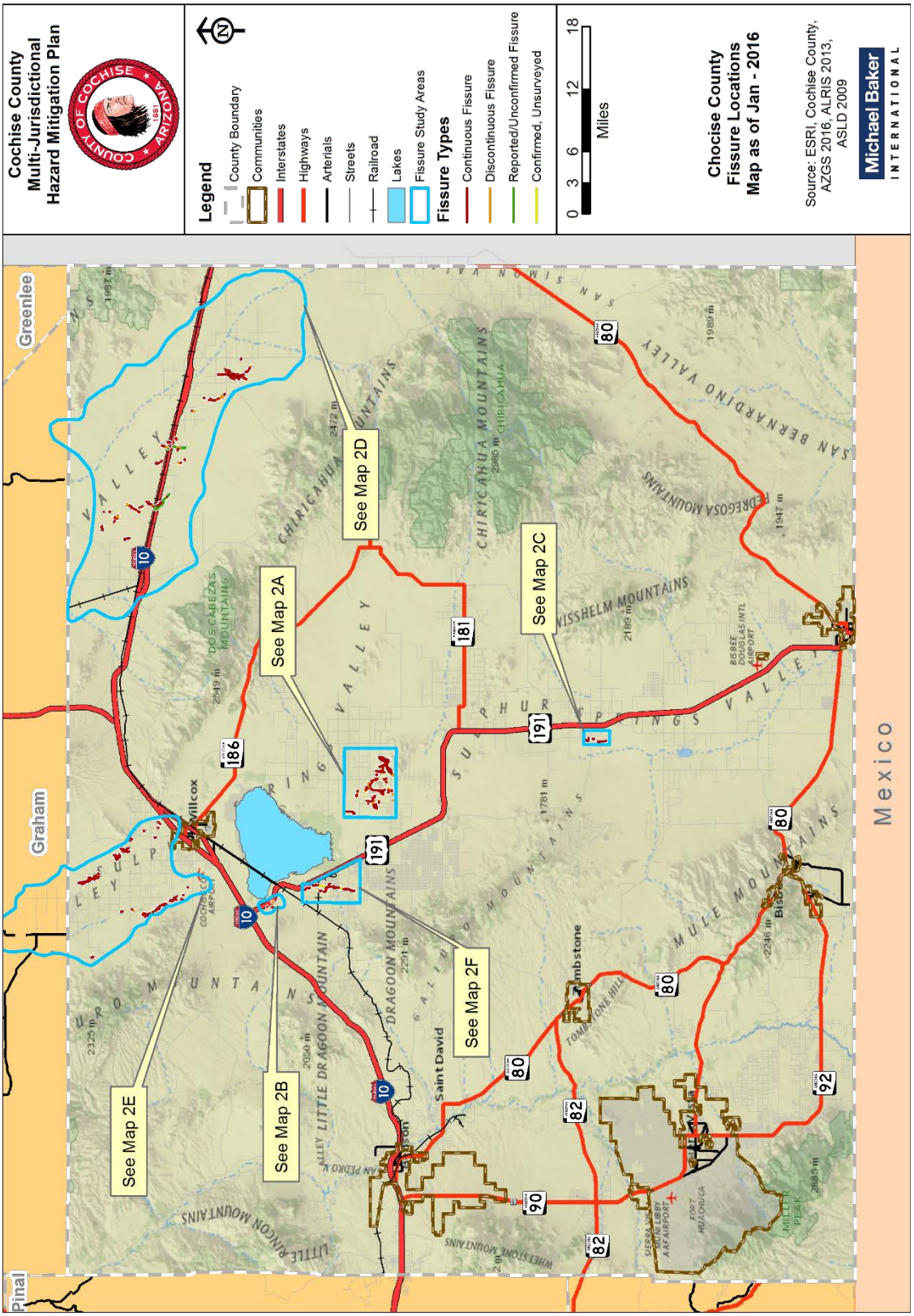
Arizona Land Subsidence Group, 2007. Land subsidence and earth fissures in Arizona: Research and informational needs for effective risk management, white paper, Tempe, AZ, http://www.azgs.az.gov/Earth%20Fissures/CR-07-C.pdf

Profile Maps

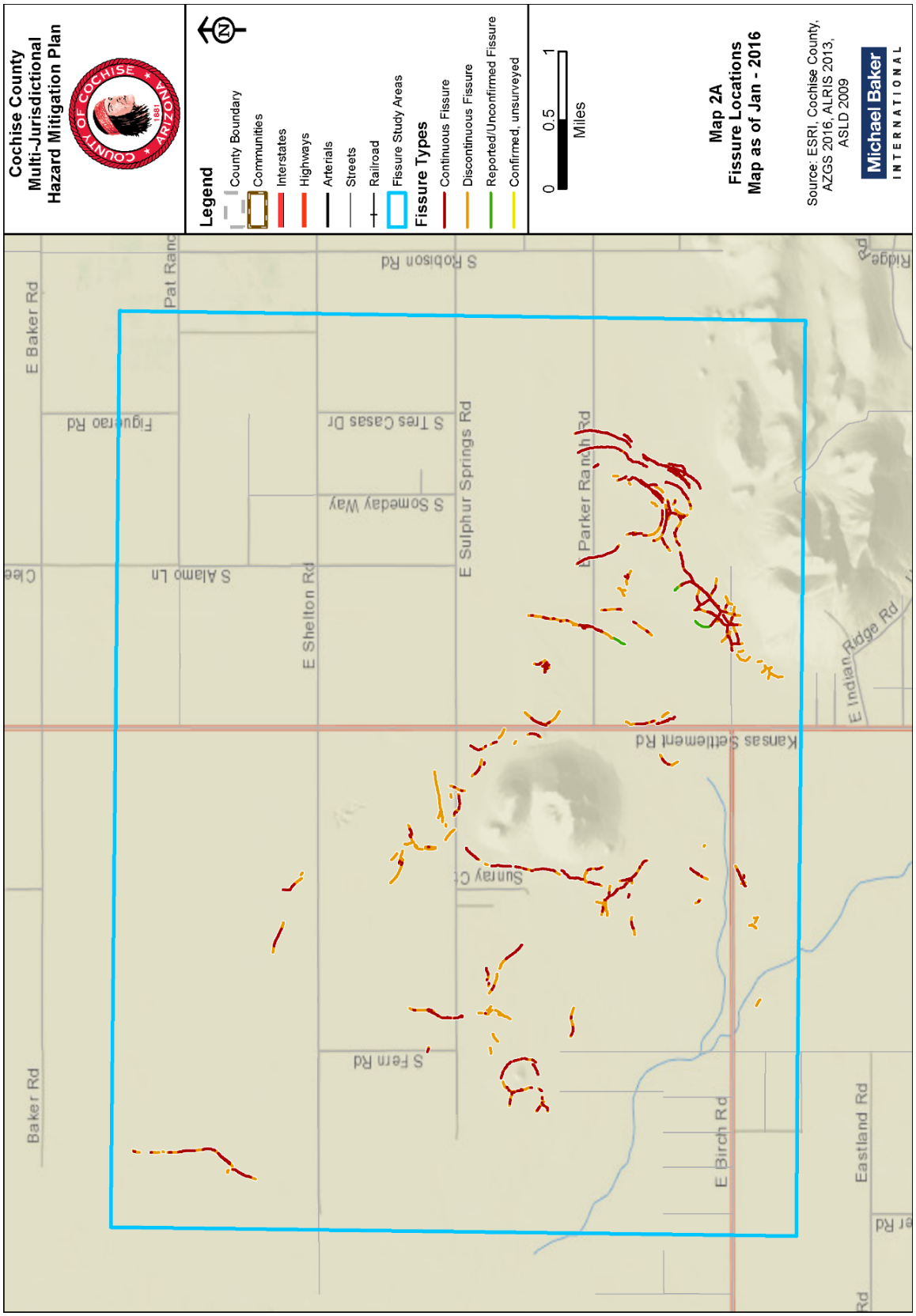
Map 5.5 – Fissure Locations Countywide

Map 5.6 through 5.11 – Fissure Hazard Map – Fissure Locations

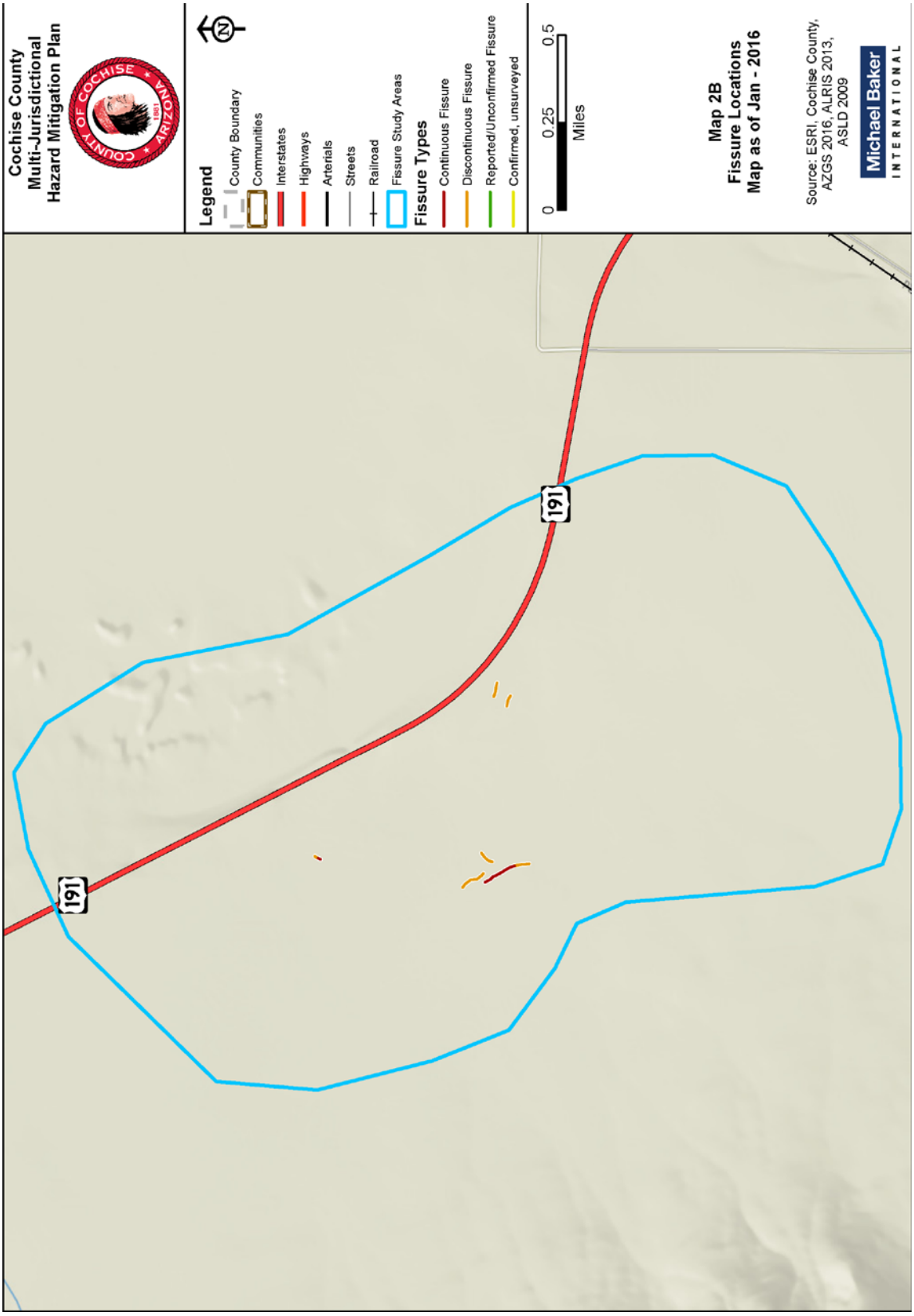
Map 5.5. Cochise County Fissure Locations



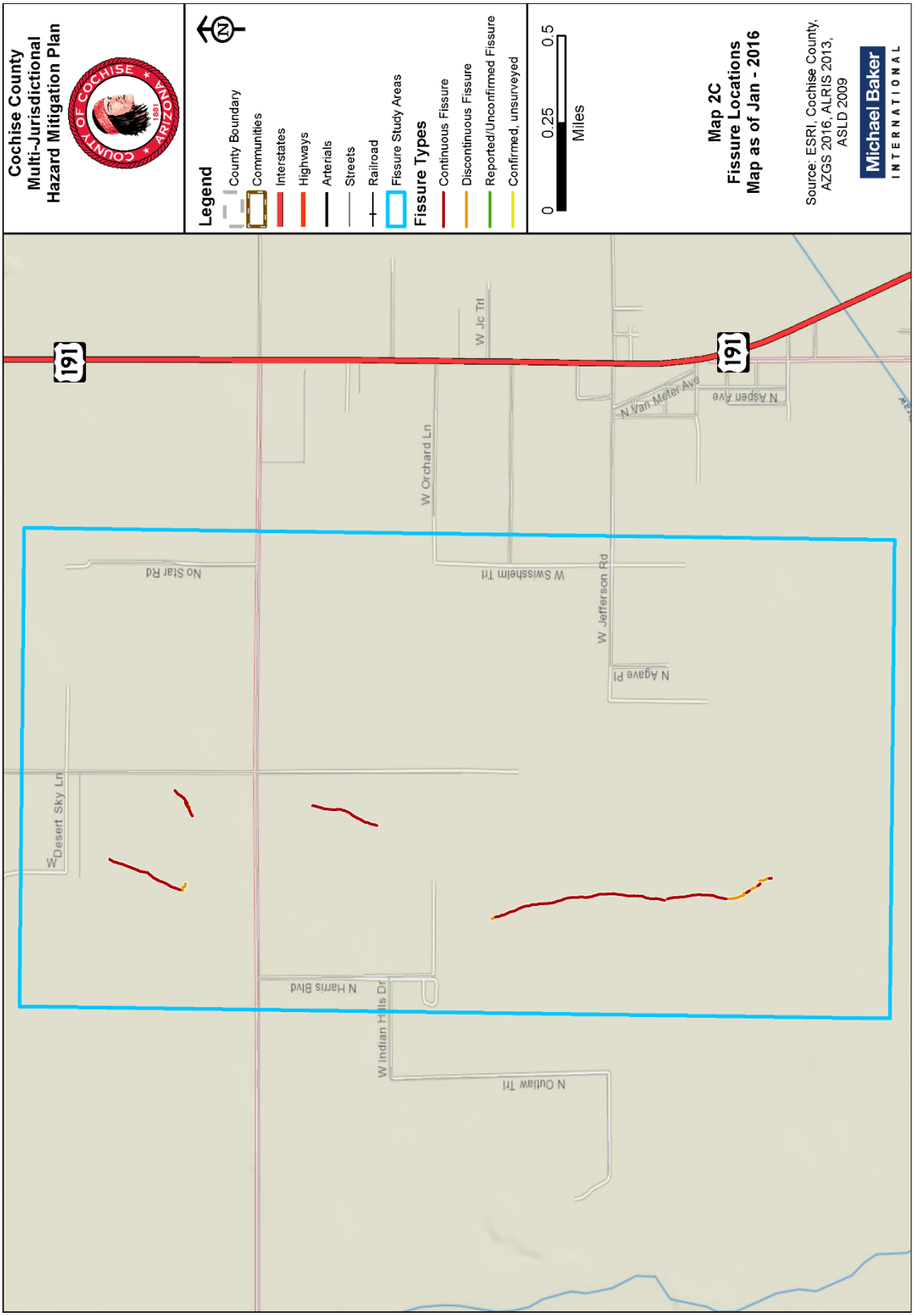
Map 5.6. Fissure Locations (2A)



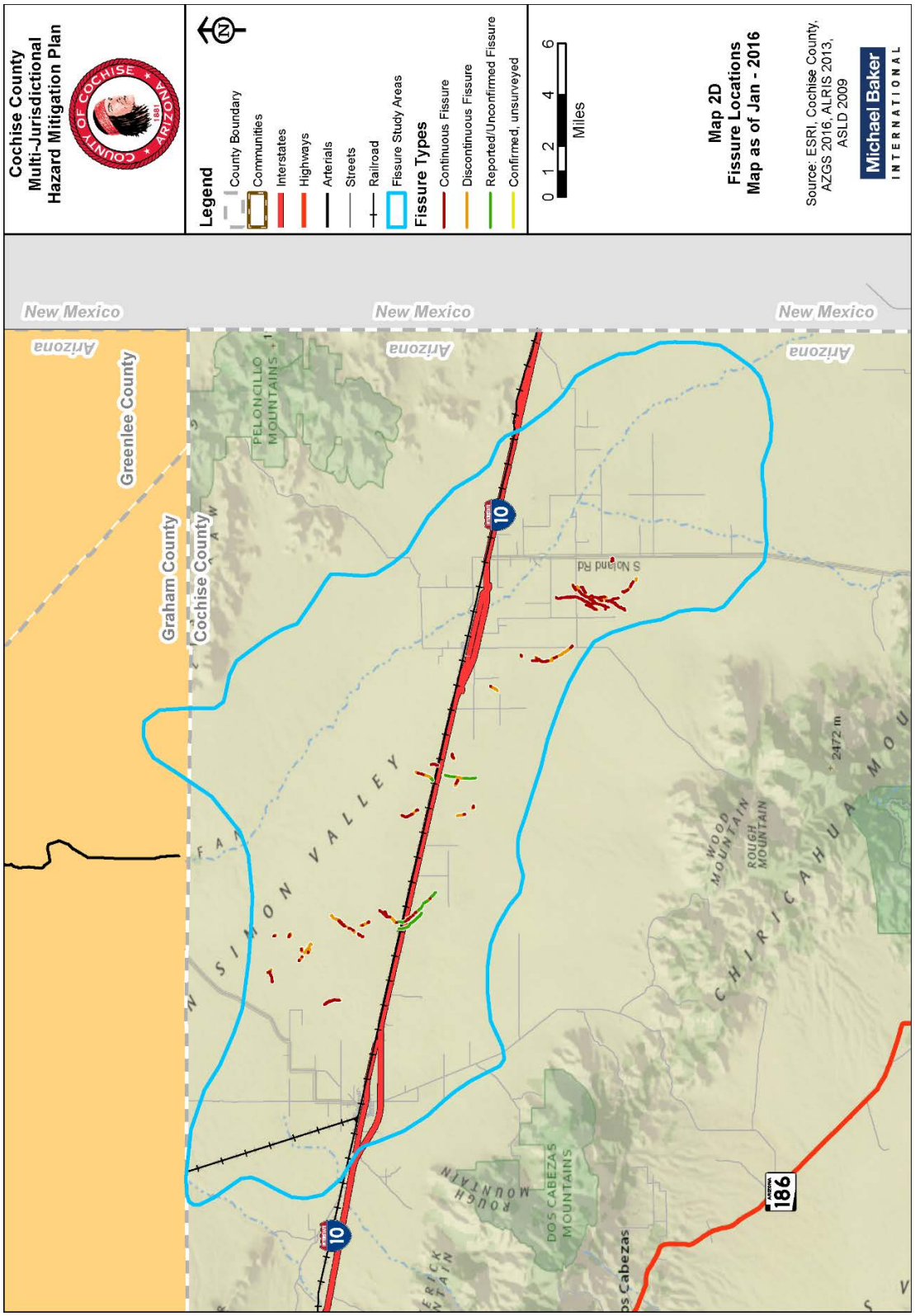
Map 5.7. Fissure Locations (2B)



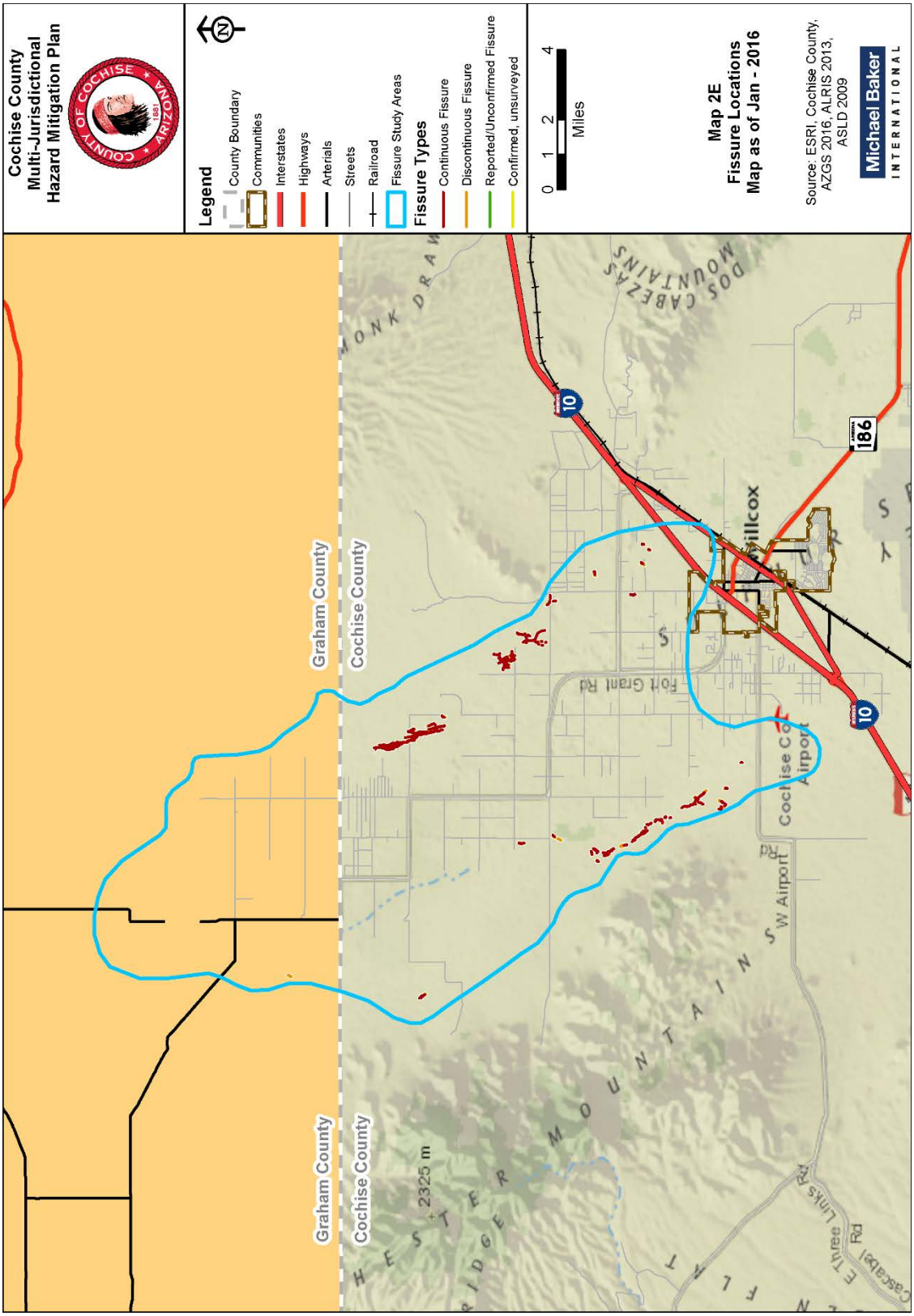
Map 5.8. Fissure Locations (2C)



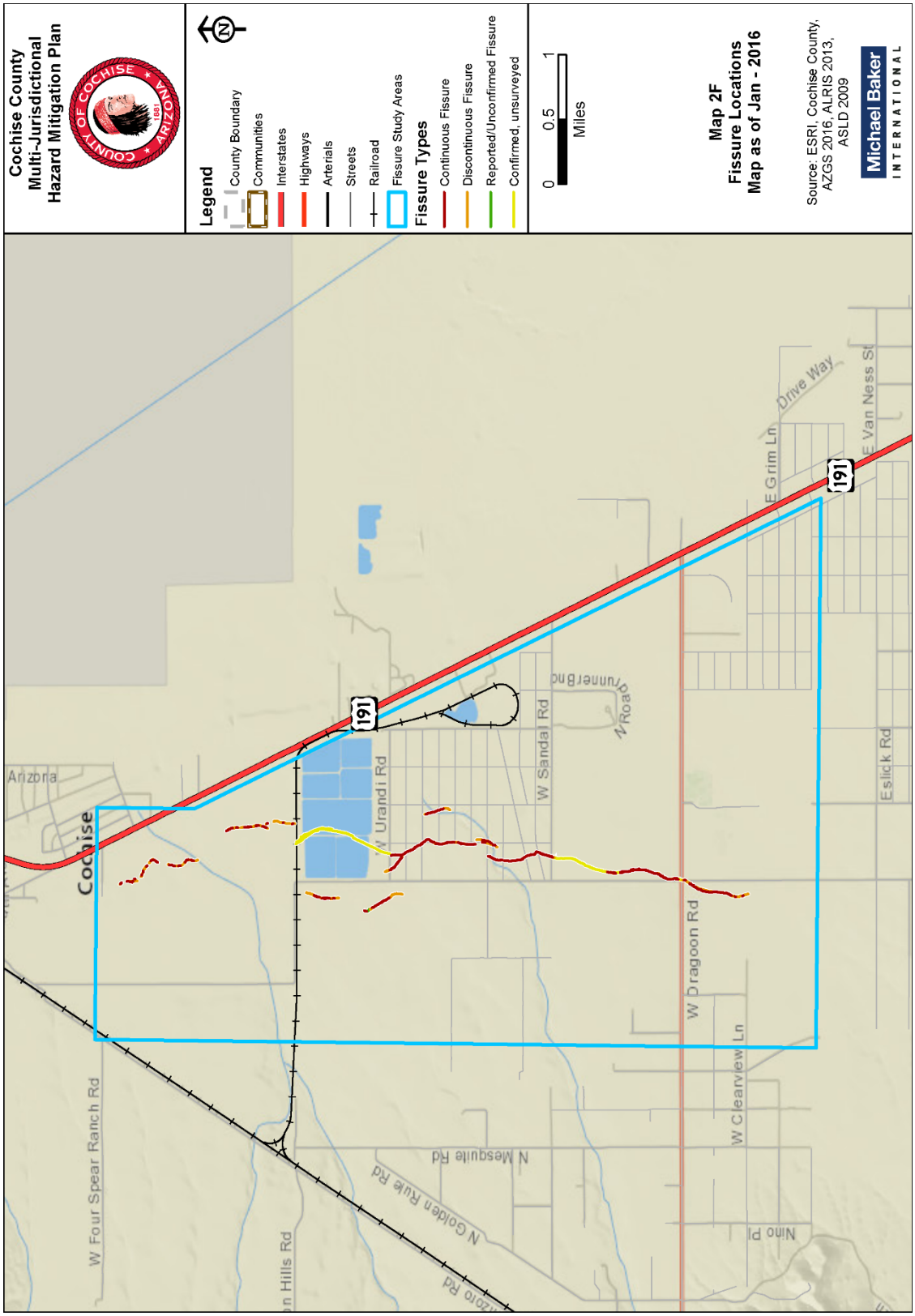
Map 5.9. Fissure Locations (2D)



Map 5.10. Fissure Locations (2E)



Map 5.11. Fissure Locations (2F)



5.3.5 Flood/Flash Flood

Description

For the purpose of this Plan, the hazard of flooding addressed in this section will pertain to floods that result from precipitation/runoff related events. Other flooding due to dam or levee failures are addressed separately. The three seasonal atmospheric events that tend to trigger floods in Cochise County are:

- *Tropical Storm Remnants*: Some of the worst flooding tends to occur when the remnants of a hurricane that has been downgraded to a tropical storm or tropical depression enter the State. These events occur infrequently and mostly in the early autumn, and usually bring heavy and intense precipitation over large regions causing severe flooding.
- *Winter Rains*: Winter brings the threat of low intensity; but long duration rains covering large areas that cause extensive flooding and erosion, particularly when combined with snowmelt.
- *Summer Monsoons*: In mid to late summer the monsoon winds bring humid subtropical air into the State. Solar heating triggers afternoon and evening thunderstorms that can produce extremely intense, short duration bursts of rainfall. The thunderstorm rains are mostly translated into runoff and in some instances, the accumulation of runoff occurs very quickly resulting in a rapidly moving flood wave referred to as a flash flood. Flash floods tend to be very localized and cause significant flooding of local watercourses.

Damaging floods in the county include riverine, sheet, alluvial fan, and local area flooding. Riverine flooding occurs along established watercourses when the bankfull capacity of a watercourse is exceeded by storm runoff or snowmelt and the overbank areas become inundated. Sheet flooding occurs in regionally low areas with little topographic relief that generate floodplains over a mile wide. Alluvial fan flooding is generally located on piedmont areas near the base of the local mountains and are characterized by multiple, highly unstable flowpaths that can rapidly change during flooding events. Local area flooding is often the result of poorly designed or planned development wherein natural flowpaths are altered, blocked or obliterated, and localized ponding and conveyance problems result. Erosion is also often associated with damages due to flooding.

Another major flood hazard comes as a secondary impact of wildfires in the form of dramatically increased runoff from ordinary rainfall events that occur on newly burned watersheds. Denuding of the vegetative canopy and forest floor vegetation, and development of hydrophobic soils are the primary factors that contribute to the increased runoff. Canopy and floor level brushes and grasses intercept and store a significant volume of rainfall during a storm event. They also add to the overall watershed roughness which generally attenuates the ultimate peak discharges. Soils in a wildfire burn area can be rendered hydrophobic, which according the NRCS is the development of a thin layer of nearly impervious soil at or below the mineral soil surface that is the result of a waxy substance derived from plant material burned during a hot fire. The waxy substance penetrates into the soil as a gas and solidifies after it cools, forming a waxy coating around soil particles. Hydrophobic soils, in combination with a denuded watershed, will significantly increase the runoff potential, turning a routine annual rainfall event into a raging flood with drastically increased potential for soil erosion and mud and debris flows.

History

Flooding is clearly a major hazard in Cochise County as shown in by the number of declared disaster events, as seen in Section 5.1. Cochise County has been part of nine (9) flood related disaster declarations. There have been numerous other non-declared events of reported flooding incidents. Over 151 flood and flash flooding events have occurred since 1996, according to the NCEI. Out of these 151 events, there were 11 direct deaths and four (4) injuries due to flooding and flash flooding. Over $3

million in estimated property damage also occurred due to these events. The following incidents represent examples of major flooding that have impacted the County:

- In October of 1977, Tropical Storm Heather caused four days of heavy rains and severe flooding in the Santa Cruz and San Pedro Rivers. Four-day rainfall amounts recorded for Bisbee and Douglas exceeded five inches. Overall, 700 people were evacuated from their homes, and severe damage occurred to crops, livestock, water supplies, and property (Tucson NWS, 2006).
- In August of 1982, a torrential rain storm of 2.5 inches in 2 hours flooded Bisbee streets and a four-foot wall of water came roaring down Brewery Gulch. A man trying to remove his car from a flooded street was carried downstream and into an underground culvert, where he drowned (Tucson NWS, 2006).
- In Late September – Early October 1983, extremely heavy rain deluged much of the state. During the previous week, a series of minor, widespread thunderstorms saturated the ground. On September 30th, another disturbance entered the state at the same time as a surge of moisture from Tropical Storm Octave off the coast of Baja California. The result was torrential rains and very destructive flooding over the southeast quarter of the State in broad zones along rivers, creeks, and washes. About 10,000 people were displaced from their residences. Water, mud and debris severely damaged or destroyed over 1300 homes; 1700 received lesser damage. Many persons who fled from their homes were cut off from help because roads, bridges, and phone and electric lines were washed away. Twenty main highways, including I-10, were closed, isolating dozens of towns. Nine (9) people drowned trying to cross flooded washes; four (4) others were killed when two aircraft got caught in downbursts and crashed. Numerous people were rescued from rooftops and stranded cars by helicopters. In many communities, water and sewer lines were severed. Damage to agriculture was enormous in all categories: crops, land, irrigation canals and ditches, wells, livestock and machinery. About one-seventh of the state's cotton crop was severely damaged or destroyed. Local produce growers in Willcox suffered massive damages as the flooding occurred just prior to the popular fall harvest and u-pick events. Willcox was also isolated for several days due to floods overtopping I-10 and other local roads.
- In August of 1989, sheet flooding from the mountains inundated the downtown and Playa area of Willcox (URS, 2004).
- In January and February of 1993, winter rain flooding damage occurred from winter storms associated with the El Nino phenomenon. These storms flooded watersheds throughout Arizona by dumping excessive rainfall amounts that saturated soils and increased runoff. Warm temperature snowmelt exacerbated the situation over large areas. Erosion caused tremendous damage and some communities along normally dry washes were devastated. Stream flow velocities and runoff volumes exceeded historic highs across the state. Many flood prevention channels and retention reservoirs were filled to capacity and floodwaters were diverted to the emergency spillways or the reservoirs were breached, causing extensive damage in some cases (e.g., Painted Rock Reservoir spillway). Ultimately, the President declared a major federal disaster that freed federal funds for both public and private property losses for all of Arizona's fifteen counties. The total of private and public damages for Cochise County is estimated to exceed $700,000. (Cochise County Multi-Hazard Mitigation Plan, 2007)
- In October of 2000, the east approach on Hereford Road and bridge was under 3 feet of water. 150 feet of Hereford Road was damaged and the north side of the road was eroded. The San Pedro River near Hereford had a height of 20 feet at the center point of the river. The San Pedro River near the Riparian National Conservation overflowed its banks damaging roads and trails along the river. The water spread out a half of a mile wide onto surrounding grasslands. Near Palominas, the San Pedro river exceeded flood stage of 15 feet. The water

was traveling at 17,500 cubic feet per second which was the highest flow recorded since 1940. The highest water levels of 18.9 feet occurred at 10:00 on the 23rd. The road between Tombstone and Gleeson flooded and eight cars were towed out of the Ghost Town Trail area. In Bisbee, a retaining wall collapsed at 124 OK Street onto a stairway leading into Brewery Gulch. Minor flooding of homes occurred down Brewer Gulch. Also, small rock slides were reported along Highway 80 on both sides of Mule Pass Tunnel near Bisbee. On Fire Road between Canelo and Coronado National Monument, a series of rock slides and mud slides occurred. There were several road closures near Elfrida, including Davis Road and Frontier Road between Bisbee and Douglas due to flooding. At Charleston, the San Pedro River reached highest water levels of 9.7 feet at 1900 on the 23rd which exceeded bankfull stage of 7 feet. The flood stage is 20 feet. A total of $120,000 in damages was reported. (Cochise County Multi-Hazard Mitigation Plan, 2007)

- In July of 2007, several homes were flooded in the Comstock neighborhood in Benson due to flash flooding. A swift water rescue also took place at Interstate 10 and the Pomerene Road exit in Benson which caused $75,000 in property damage. Excessive rainfall and low visibility contributed to a fatal accident on Highway 92 near Hereford. The Cochise County emergency dispatch facility flooded along with Highway 80 at Davis road. In this location two vehicles were stuck in high water which resulted in $5,000 in damages. (NCEI, 2010)
- In August of 2007, flash flooding from thunderstorms in the City of Douglas caused damage to several city buildings and facilities at a cost of $10,000. (NCEI, 2010)
- In September of 2009, scattered thunderstorms produced locally heavy rainfall near the intersection of State Highway 80 and Old Divide Road, approximately 2 miles northwest of Bisbee. Rainfall was not excessively heavy, with radar estimates of near 1.25 inch. However, an earlier fire burned hillsides in the area in May 2009, leaving the landscape prone to flash flooding. Flooding and debris flows destroyed portions of the road and surrounding culverts, and forced the closure of Old Divide Road. The damages were reported at $50,000. (NCEI, 2010)
- In July of 2010, thunderstorms produced heavy rainfall that resulted in flash flooding across portions of Cochise County. An automated rain gauge 3 miles southeast of Dragoon reported 2.6 inches of rain in less than 50 minutes. A vehicle stranded in Terry's Wash was pulled out of the wash by a trained spotter. Two people stranded in Prude Wash from their vehicle were assisted by the Cochise County sheriff. Prude Wash, which is normally dry, was running about 3 feet deep. The damages were reported at $10,000. (NCEI, 2010)
- In August of 2010, the Benson News-Sun reported that a man was pulled from a running wash after he attempted to drive through 2 feet of running water on an adjacent street. The force of the water on the street carried his car into the wash and up against a concrete wall. The driver then attempted to get out of the vehicle, but fell 10-15 feet down into the wash underneath his car. Fire crews were able to quickly rescue the driver. He was escorted to the local hospital. City officials also reported numerous washes flooding neighborhood streets. The damages were reported at $30,000. (NCEI, 2010)
- In September 2014, over a period of 3 days, the remnants of Hurricane Odile moved into Southeastern Arizona depositing over 6” of rain over much of Cochise County. Heavy downpours caused excessive roadway infrastructure and waterway embankment damage. Cochise County received a State of Arizona emergency declaration due to the extensive damage. Cochise County, Willcox and Bisbee received over $1.5M in combined disaster recovery funding from Arizona.

Probability and Magnitude

For the purposes of this Plan, the probability and magnitude of flood hazards in Cochise County jurisdictions are primarily based on the 1% annual chance flood event (100-year) floodplains delineated on FEMA Flood Insurance Rate Maps (FIRMs). FEMA recently completed a FIRM update that went Effective on 10/20/2016. DFIRM floodplain GIS base files were obtained from FEMA and are the basis for the flood hazard depictions in this Plan.

Map 5.12 shows the flood hazard areas for the entire county. Maps 5.13 through 5.19 show the flood hazard areas for Willcox, Tombstone, Sierra Vista, Huachuca City, Douglas, Bisbee, and Benson, respectively.

Vulnerability – CPRI Results

Flooding CPRI results for each community are summarized in the following table:

Table 5.12. CPRI Results by Jurisdiction for Flooding

Participating Jurisdiction	Probability	Magnitude/ Severity	Warning Time	Duration	CPRI Score
Benson	3.16 (Likely/Highly Likely)	2.74 (Limited/Critical)	3.21 (6-12 hours/< 6 hours)	2 (< 24 hours)	2.93
Bisbee	3.17 (Likely/Highly Likely)	2.76 (Limited/Critical)	2.68 (12-24 hours/6-12 hours)	2.34 (< 24 hours/< 1 week)	2.89
Douglas	3.2 (Likely/Highly Likely)	2.2 (Limited/Critical)	3 (6-12 hours)	2.1 (< 24 hours/ < 1 week)	2.76
Huachuca City	2.81 (Possible/Likely)	2.48 (Limited/Critical)	3.19 (6-12 hours/< 6 hours)	1.94 (< 6 hours/< 24 hours)	2.68
Sierra Vista	3.52 (Likely/Highly Likely)	2.48 (Limited/Critical)	2.48 (12-24 hours/6-12 hours)	2.04 (< 24 hours/< 1 week)	2.9
Tombstone	3.17 (Likely/Highly Likely)	2 (Limited)	3.5 (6-12 hours/< 6 hours)	1.67 (< 6 hours/< 24 hours)	2.72
Willcox	3.19 (Likely/Highly Likely)	2.75 (Limited)	2.81 (12-24 hours/6 - 12 hours)	2.5 (< 24 hours/< 1 week)	1.5
Unincorporated Cochise County	3.59 (Likely/Highly Likely)	2.62 (Limited/Critical)	3 (6-12 hours)	2.24 (< 24 hours/< 1 week)	3.08
				County-wide average CPRI =	2.68

Based on the CPRI Evaluation, Benson, Bisbee, Sierra Vista, and those living or working in Unincorporated Cochise County feel they are at most risk from a Flood / Flash Flood event. As demonstrated in the table above, the probability of this event occurring in these two jurisdictions is deemed more likely and the magnitude of flooding impacts are thought to be more severe. It should be noted that almost all jurisdictions feel that a flood event is highly likely to occur.

Vulnerability – Loss Estimations

The estimation of potential exposure to flooding risk was accomplished by intersecting the county parcel data with the with the SFHA data. The following table displays the total number of impacted parcels located in the Special Flood Hazard Areas (SFHA, i.e. – 100-year floodplain), for each participating jurisdiction.

Table 5.13. Impacted Parcels (Flood)

Jurisdiction	Parcels (SFHA)
Benson	101
Tombstone	66
Willcox	4,065
Bisbee	986
Douglas	969
Sierra Vista	963
Huachuca City	264
County	21,620

Utilizing Hazus 3.1, FEMA's loss estimation and hazard modeling software, a standard Hazus flood analysis was conducted for Cochise County, Arizona based on the default general Building Stock comprised of 2010 Census block data. Additionally, a user-defined 100 year flood Depth Grid was created using 10m National Elevation Dataset (NED) terrain data and FEMA's National Flood Hazard Layer (NFHL) floodplain data. The loss estimates where then calculated in the Hazus flood scenario at the census block level.

The Hazus model estimates that approximately 900 buildings will be at least moderately damaged by a 100-year flood event affecting all mapped floodplains throughout the entire county. An estimated 100 buildings will be substantially destroyed and most of the damage occurred will be to residential buildings. The model also estimates that 3,740 households will be displaced due to flooding and of these, 7,003 people will seek temporary shelter in public shelters. Total building-related losses are expected to be over $200 million.

The following table summarizes the critical facility (CF) exposure estimates for flood risk in the SFHA, which included a 100' buffer. Estimates are broken out by CF type, impacted structure count, and estimated CF replacement value (when available). In summary, approximately $259 million in critical facility related losses are estimated for flood hazards in the SFHA, for all the participating jurisdictions in Cochise County.

Overall results from the analysis show that the unincorporated areas of the county have the most structures at risk from a flooding event. From a jurisdictional viewpoint, Wilcox is most at risk to a flood event. All jurisdictions, however; do have localized areas of their communities at risk from a flood event. The results of this vulnerability assessment greatly contrast with the community's perception of flood hazard. This disconnect present an opportunity for focused public outreach and educational efforts.

Table 5.14. Critical Facilities Flood Impact

	Benson	Bisbee	Cochise County	Douglas	Huachuca City	Sierra Vista	Tombstone	Willcox
CF Type	Impacted Structures/Replacement Value							
Banking and Finance Institution	-	2 / NA	3 / $7,400,000	1 / $2,000,000	-	-	-	3 / $7,400,000
Cultural	-	-	1 / $750,000	-	1 / NA	-	-	1 / $750,000
Educational	-	-	6 / $15,500,000	-	-	-	-	4 / $15,500,000
Electrical Power System	-	-	4 / $17,000,000	-	-	-	-	3 / $14,000,000
Emergency Services	-	1 / NA	5 / $20,000,000	-	-	-	-	4 / $20,000,000
Gas and Oil Facilities	2 / $550,000	3 / NA	5 / $11,545,000	1 / $1,000,000	-	-	-	4 / $11,500,000
Government Services	-	2 / NA	8 / $28,450,000	1 / $560,000	-	-	-	6 / $28,250,000
Telecommunications Infrastructure	-	1 / $6,992,800	14 / $12,420,000	1 / $20,000	1 / NA	1 / $20,000	-	5 / $12,060,000
Transportation Networks	-	-	4 / $2,000,300	-	-	-	-	-

	Benson	Bisbee	Cochise County	Douglas	Huachuca City	Sierra Vista	Tombstone	Willcox
CF Type	Impacted Structures/Replacement Value							
Water Supply Systems	-	1 / NA	6 / $11,500,000	-	-	1 / $500,000	-	5 / $11,500,000

It should be noted that all infrastructure in floodplains and potential flooding areas are also vulnerable. Based on past flooding experiences, oftentimes bridge structures are oftentimes the most at risk to the effects of a flood event. This is especially important to take into account when assessing the risk presented by flood events, as the loss of bridges can have a cascading effect on a jurisdiction if transportation and evacuation routes are rendered inaccessible.

Vulnerability – Repetitive Loss Properties

Repetitive Loss (RL) properties are those NFIP-insured properties that since 1978, have experienced multiple flood losses. FEMA tracks RL property statistics, and in particular to identify Severe RL (SRL) properties. RL properties demonstrate a track record of repeated flooding for a certain location and are one element of the vulnerability analysis. RL properties are also important to the NFIP, since structures that flood frequently put a strain on the National Flood Insurance Fund. FEMA records dated September 2016 (provided by DEMA) indicate that there is no identified RL or SRL property in Cochise County.

Vulnerability – Development Trends

Over the last five years, Cochise County and the incorporated jurisdictions of Douglas and Sierra Vista have experienced moderate growth. All future growth areas will likely be impacted by the flood hazards. Growth areas located just outside of Willcox and Douglas are expected to be at an even higher risk due to the density of floodplain and floodway in those areas. Aside from future growth areas, all areas of the county and remaining jurisdictions will see impacts from flood events. Most of the floodprone properties in Cochise County pre-date the planning jurisdictions' entry into the NFIP and were constructed prior to current floodplain management practices. The development of new properties or substantial re-development of existing structures is now subject to regulatory review procedures implemented by each jurisdiction throughout the entire county. Challenges to the management of new growth include the need for converting approximate floodplain delineations into detailed delineations to better mitigate against flood risks, or to establish additional floodplain delineations to identify and map the flood hazards within the growth areas where no mapping currently exists.

Sources

Arizona Division of Emergency Management, 2013, State of Arizona Multi-Hazard Mitigation Plan.

FEMA, 2001, Understanding Your Risks; Identifying Hazards and Estimating Losses, FEMA Document No. 386-2.

JE Fuller/ Hydrology & Geomorphology, 2012, Cochise County Multi-Hazard Mitigation Plan

NOAA, National Weather Service Forecast Office – Tucson, 2011, website data accessed via the following URL: http://www.wrh.noaa.gov/twc/hydro/floodhis.php

National Centers for Environmental Information (NCEI), June 2016, Storm Events Database, website data accessed via the following URL: http://www.ncdc.noaa.gov/stormevents/

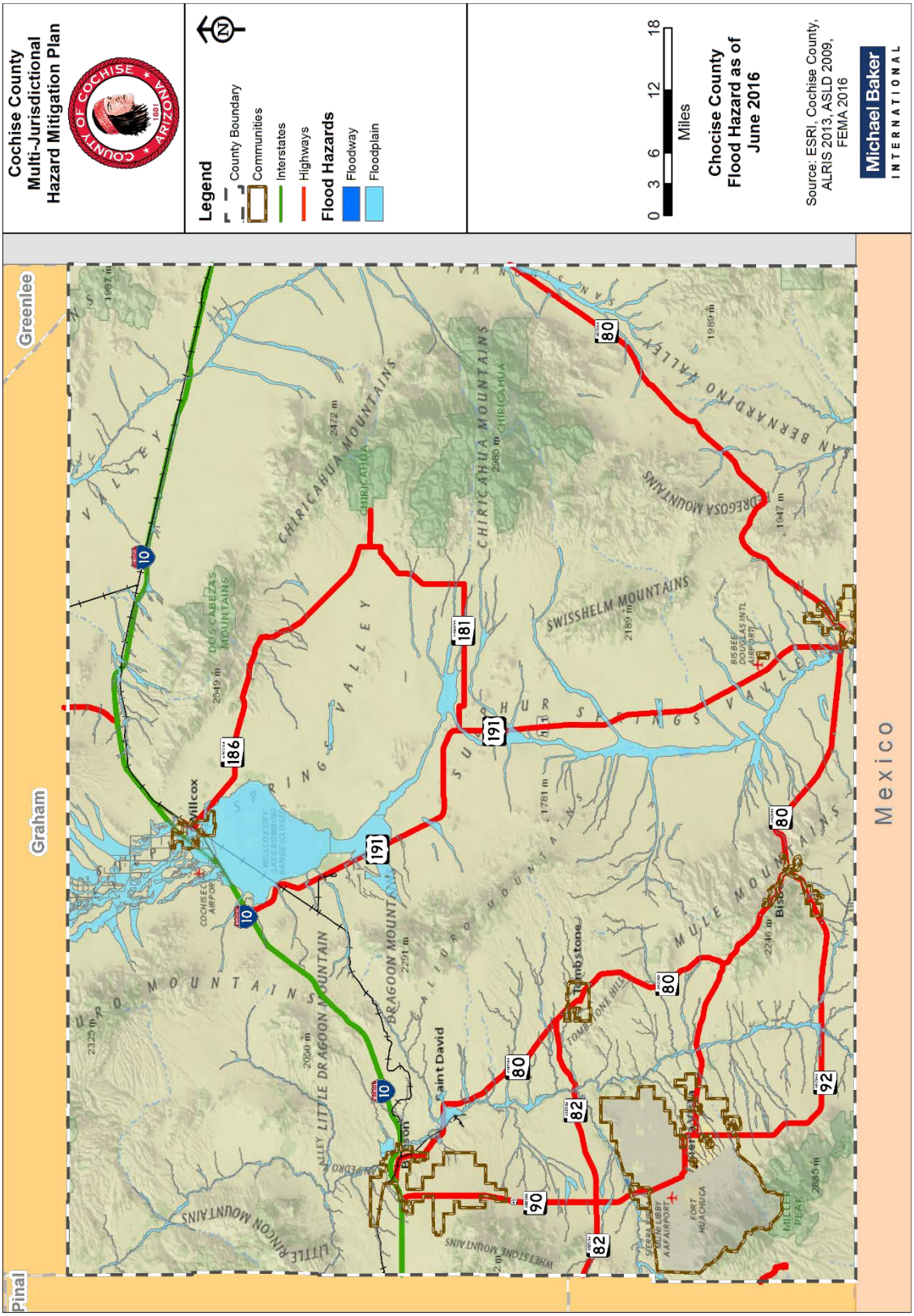
U.S. Army Corps of Engineers, Los Angeles District, 1994, Flood Damage Report, State of Arizona, Floods of 1993.

Profile Maps

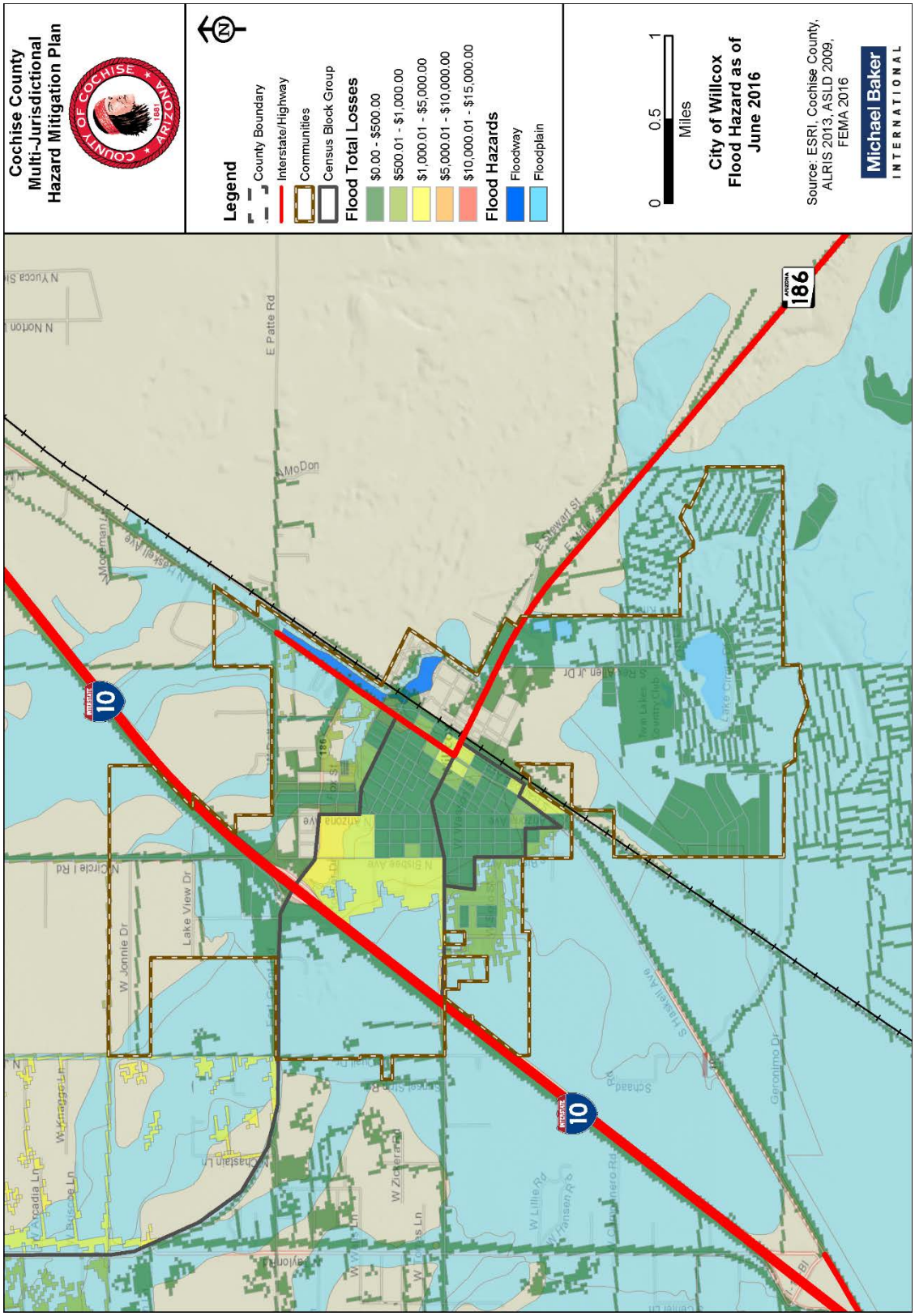
Map 5.12 – County-Wide Flood Hazard Map

Maps 5.13 through 5.19 – Benson, Bisbee, Douglas, Huachuca City, Sierra Vista, Tombstone, and Willcox Flood Hazard Maps

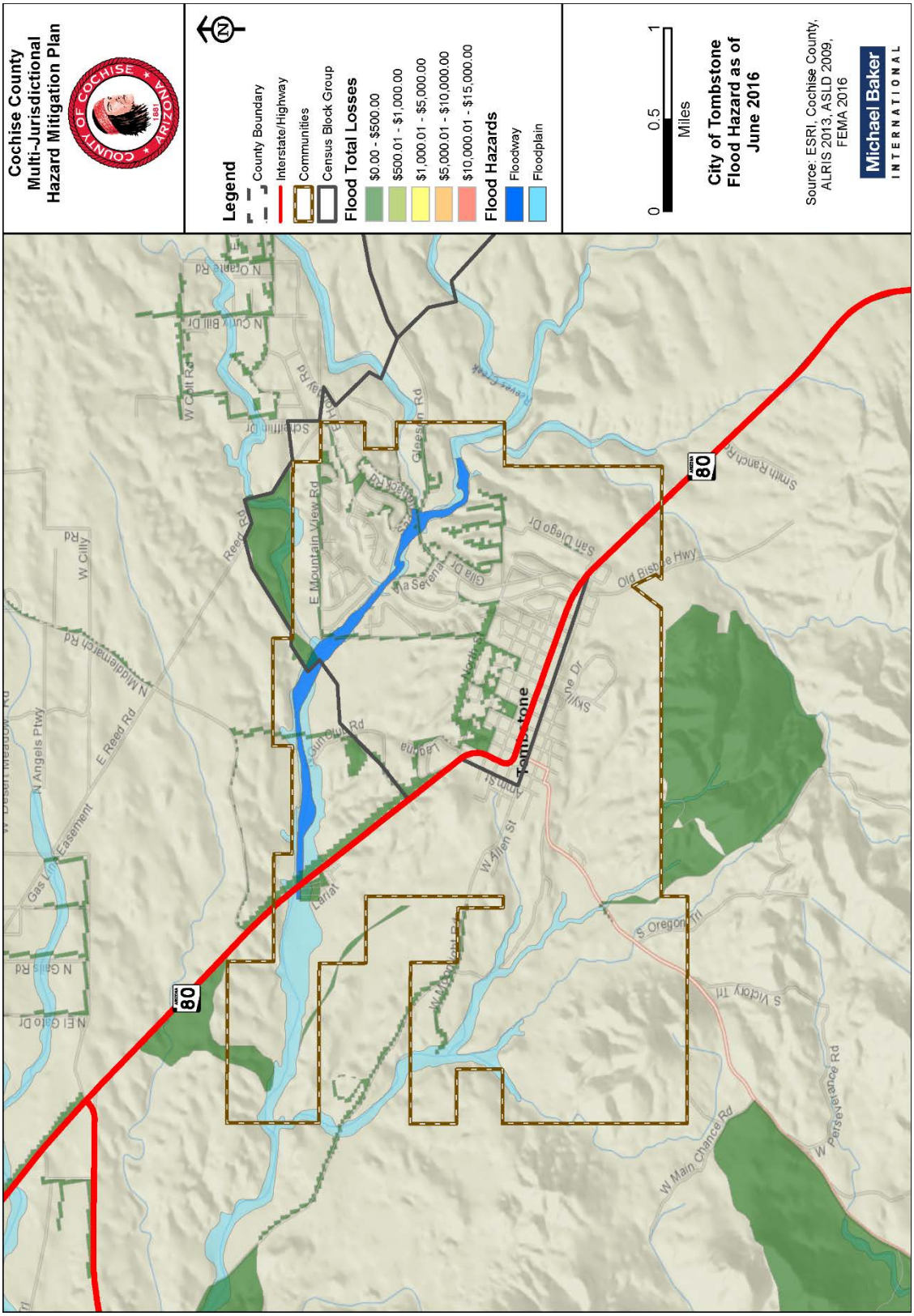
Map 5.12. Cochise County Flood Hazard



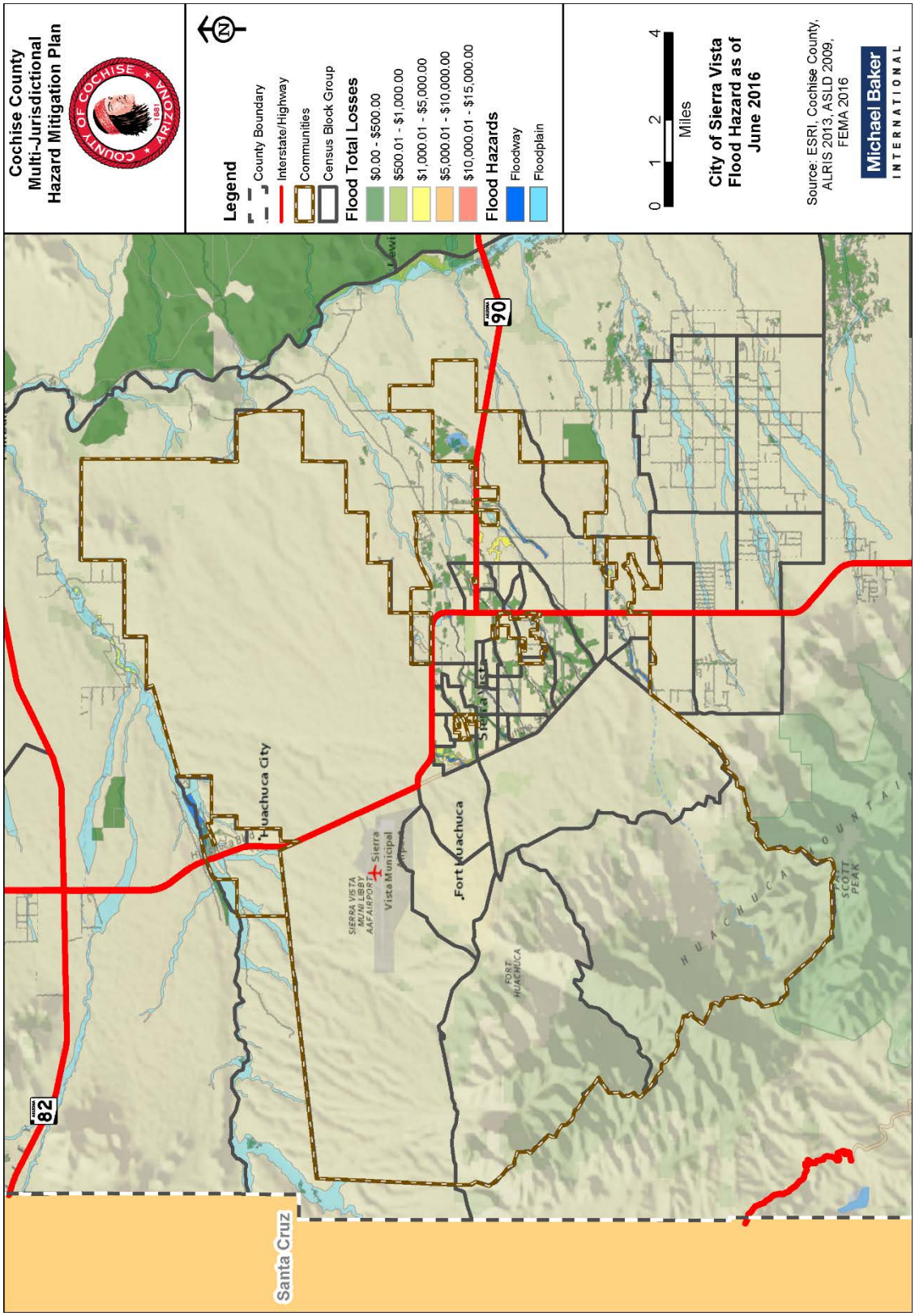
Map 5.13. City of Willcox Flood Hazard



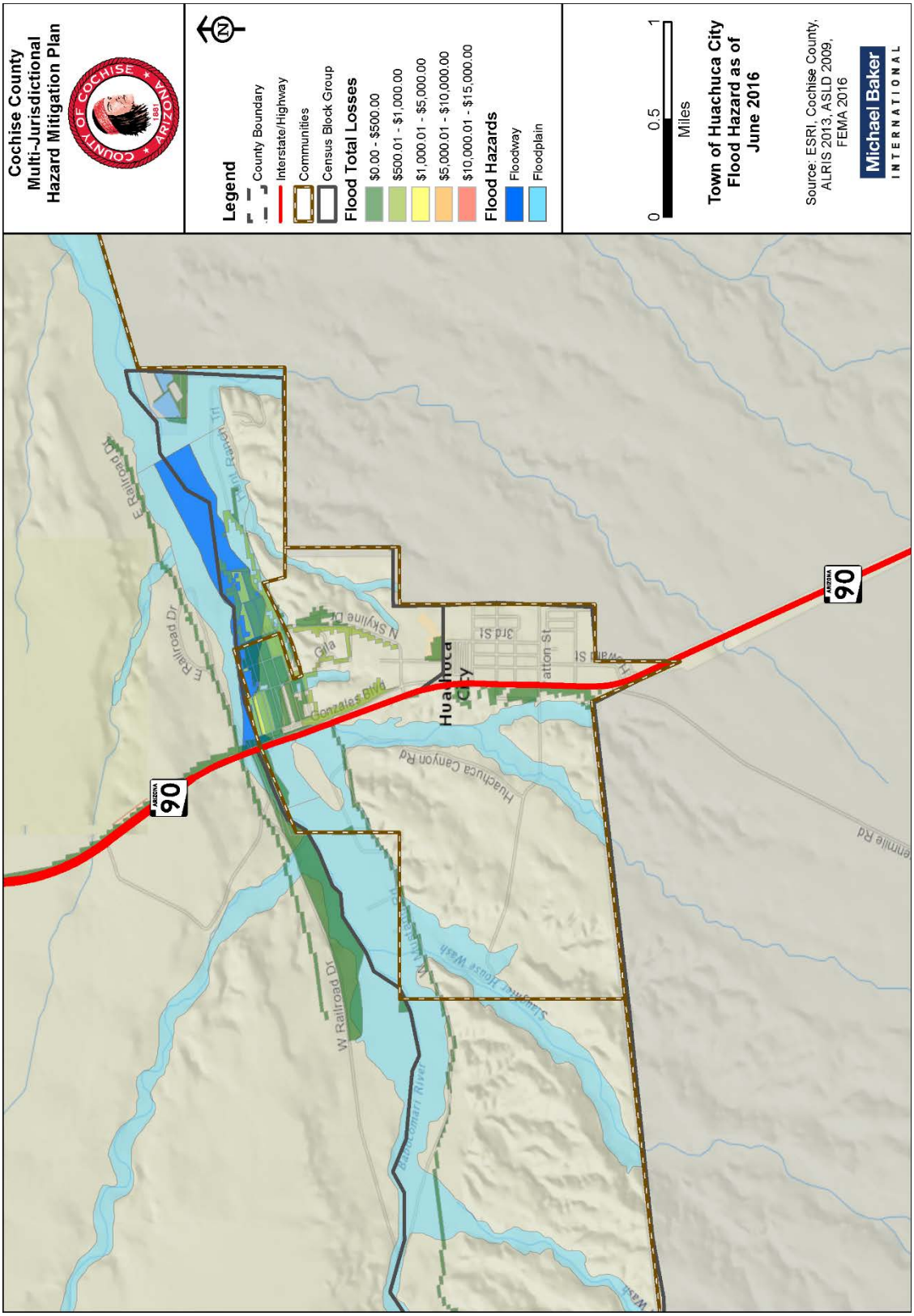
Map 5.14. City of Tombstone Flood Hazard



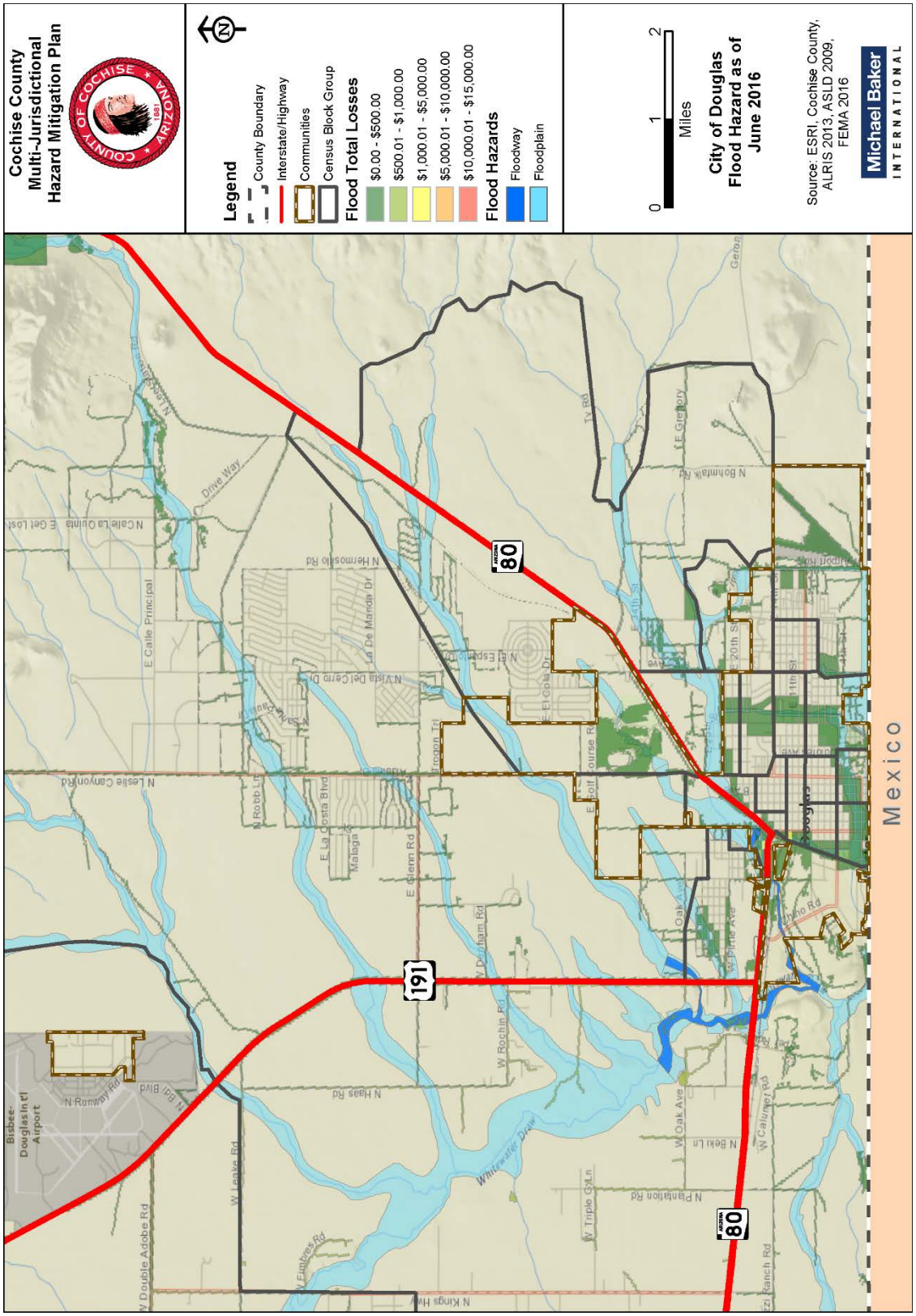
Map 5.15. City of Sierra Vista Flood Hazard



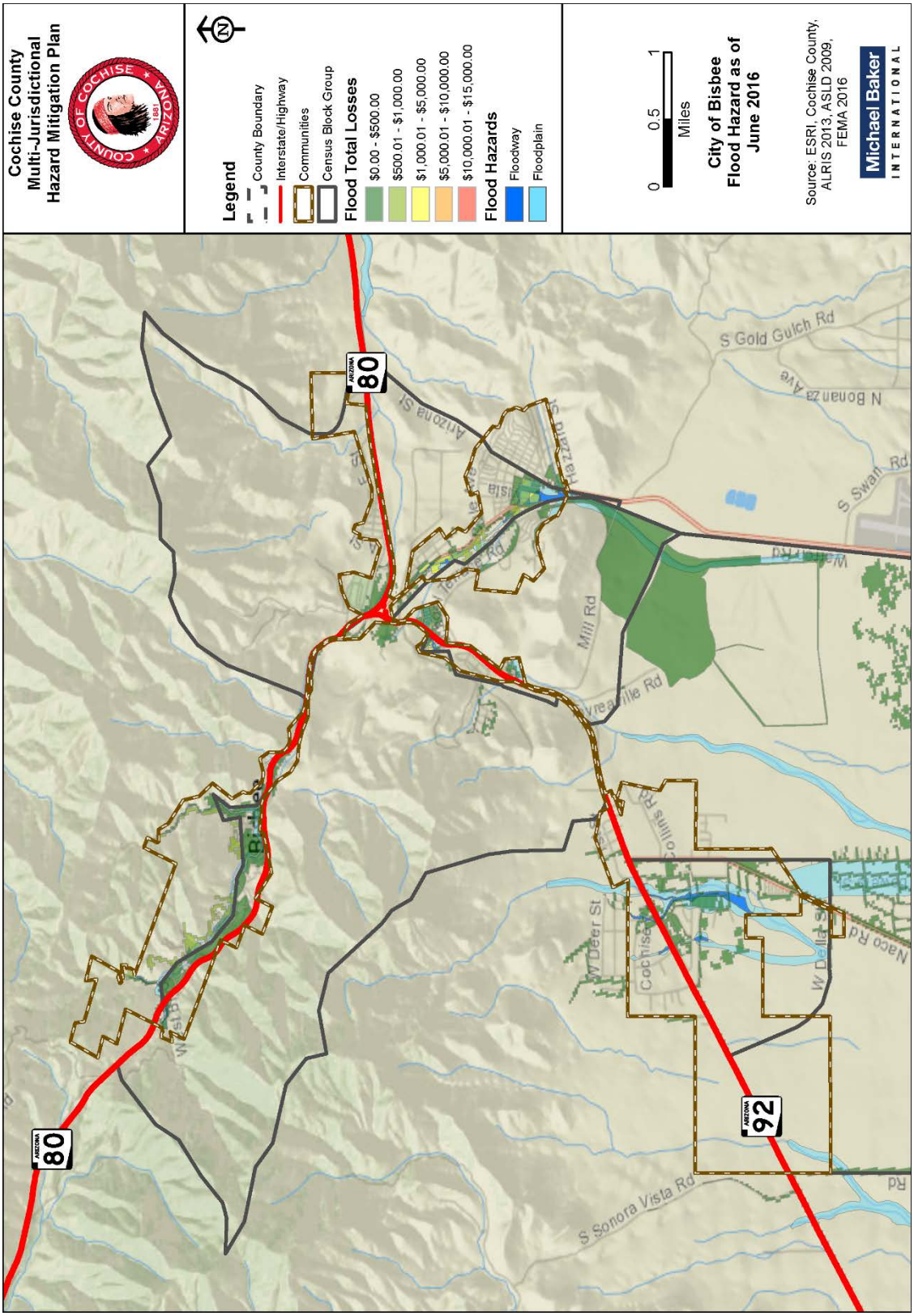
Map 5.16. Town of Huachuca City Flood Hazard



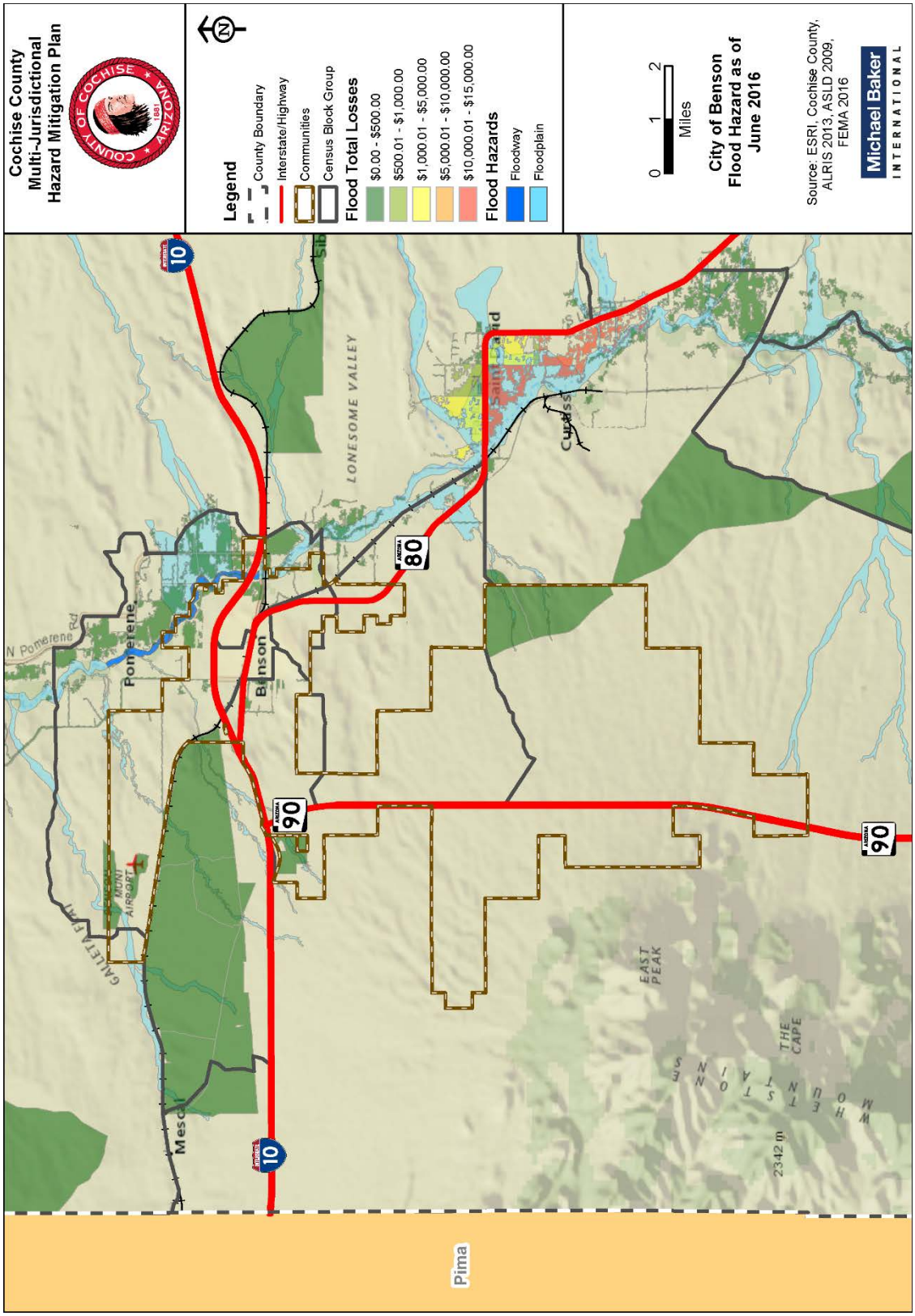
Map 5.17. City of Douglas Flood Hazard



Map 5.18. City of Bisbee Flood Hazard



Map 5.19. City of Benson Flood Hazard



5.3.6 Severe Wind

Description

The hazard of severe wind encompasses all climatic events that produce damaging winds. For Cochise County, severe winds usually result from either extreme pressure gradients that usually occur in the spring and early summer months, or from thunderstorms. Thunderstorms can occur year-round and are usually associated with cold fronts in the winter, monsoon activity in the summer, and tropical storms in the late summer or early fall.

Three types of damaging wind related features typically accompany a thunderstorm; 1) downbursts, 2) straight line winds, and infrequently, 3) tornadoes.

Downbursts are columns of air moving rapidly downward through a thunderstorm. When the air reaches the ground, it spreads out in all directions, creating horizontal wind gusts of 80 mph or higher. Downburst winds have been measured as high as 140 mph. Some of the air curls back upward with the potential to generate a new thunderstorm cell. Downbursts are called macrobursts when the diameter is greater than 2.5 miles, and microbursts when the diameter is 2.5 miles or less. They can be either dry or wet downbursts, where the wet downburst contains precipitation that continues all the way down to the ground, while the precipitation in a dry downburst evaporates on the way to the ground, decreasing the air temperature and increasing the air speed. In a microburst the wind speeds are highest near the location where the downdraft reached the surface, and are reduced as they move outward due to the friction of objects at the surface. Typical damage from downbursts 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.

Straight line winds are developed similar to downbursts, but are usually sustained for greater periods as a thunderstorm reaches the mature stage, traveling parallel to the ground surface at speeds of 75 mph or higher. These winds are frequently responsible for generating dust storms and sand storms, reducing visibility and creating hazardous driving conditions.

A tornado is a rapidly rotating funnel (or vortex) of air that extends toward the ground from a cumulonimbus cloud. Most funnel clouds do not touch the ground, but when the lower tip of the funnel cloud touches the earth, it becomes a tornado and can cause extensive damage. For Cochise County, tornadoes are the least common severe wind to accompany a thunderstorm.

History

According to Table 2, one declared severe wind event has been recorded for Cochise County. In reality, strong winds are a way of life for most areas of the county and severe wind events occur on frequent basis, and especially during the spring and early summer months. These events do not always have reported damages however. For example, a total of 154 severe wind events were noted in the NCEI database for period of July 1956 through October 2016. Forty-one (41) of those events caused three (3) deaths and 32 injuries, and had over $7.6 million in reported damages associated with them.

In September of 1999, Cochise County was included in a Federal Declaration (FEMA-1304-DR) with Maricopa County for summer monsoon events that caused $30.3 million in damages from thunderstorms, high winds and flooding. The following are examples of significant non-declared events that have occurred recently:

- In December 2007, strong winds off the Huachuca Mountains caused widespread damage to areas around Sierra Vista and Fort Huachuca. Damage in Sierra Vista included a roof blown off a home, a carport ripped off its foundation, numerous trees knocked down including one onto a vehicle. At Fort Huachuca downed trees snapped power lines and a portion of the Mountain View Golf Course

clubhouse's roof was damaged. Also, an 80 foot tall communications tower near Hereford Road and Highway 92 was bent almost halfway. Damages were estimated to exceed $150,000. (NCEI, 2010)

- In June 2008, strong outflow winds from a thunderstorm complex caused severe winds across the Douglas area. Strong winds blew down a storage shed in Douglas, knocked down several trees and caused a partial roof collapse. Damages were estimated to exceed $50,000. (NCEI, 2010)
- In May 2009, a thunderstorm outflow wind gust estimated at 60 mph destroyed a horse barn on the Diamond P Ranch on Brookerson Road, 17 miles north of Willcox. The 10-stall horse barn was completely destroyed by the wind gust. Two racehorses that were not in the barn were killed, when debris from the barn landed on them. Damages were estimated to exceed $20,000. (NCEI, 2010)
- In August 2009, severe thunderstorm microburst winds caused significant damage to mobile homes at Mescal. At least two mobile homes suffered roof damage or roof collapse. Several awnings on the mobile homes were destroyed. Thunderstorm winds were estimated to be near 70 mph. Damages were estimated to exceed $30,000. (NCEI, 2010)
- In October 2009, strong winds associated with a passing cold front created blowing dust across Cochise county into the overnight hours. Blowing dust created limited visibility on Interstate 10, which led to a three vehicle collision about 20 miles east of Willcox. A commercial truck entered the dust storm and slowed down due to the low visibility. A freight truck collided with the commercial truck from behind, before the freight truck was struck by a bus from behind as well. Three people from the three vehicles suffered injuries. Damages were estimated to exceed $50,000. (NCEI, 2010)
- In December 2009, widespread damaging winds occurred across Cochise County during the overnight hours. Law enforcement reported winds blew out windows of some businesses in Sierra Vista. Wind gusts near 70 mph blew portions of a roof off a warehouse in Sierra Vista, with the debris striking nearby power lines and causing power disruptions. Roof damage was also reported at a motel in Sierra Vista, with about half of the roof removed. Debris from the roof landed in a nearby parking lot, damaging several cars. High winds damaged a large sign at a restaurant, with numerous traffic signs receiving damage throughout the Sierra Vista area. Several reports of fallen trees and broken limbs were received, and at least four people in Sierra Vista reported falling trees causing damage to their vehicles. Strong winds caused damage to numerous power poles and power lines in Sierra Vista and surrounding Cochise County, resulting in power outages for thousands of homes and businesses. Many other power poles were damaged by the strong winds near Bowie, San Simon, and Willcox. The ASOS at Fort Huachuca measured a wind gust of 71 mph at 12:38 AM MST. Damages were estimated to exceed $1,000,000. (NCEI, 2010)
- In January 2010, several reports of high winds and wind damage were received from Cochise County during the afternoon and evening hours. The ASOS at Fort Huachuca measured a wind gust of 63 mph at 1:55 PM MST. At approximately 6 PM, a 70-foot transmission power pole was downed by the high winds along Buffalo Soldier Trail near Sierra Vista, resulting in a loss of power to approximately half of Sierra Vista. Seven additional power poles were downed near the intersection of Ramsey Road and Highway 92, resulting in power losses to another 500 residences. A trained spotter measured a wind gust of 67 mph at Bisbee at 10:39 PM MST, while another trained spotter measured a wind gust of 78 mph, 6 miles northwest of Pearce-Sunsites, at 11:30 PM MST. Damaging winds downed several trees across Monument Roadway near Chiricahua National Monument. Damages were estimated to exceed $80,000. (NCEI, 2010)
- In July 2010, the ASOS at the Bisbee-Douglas Airport measured a wind gust of 68 mph at 556 pm MST. Law enforcement reported that thunderstorm winds blew a roof off a residence on Double Adobe Road, approximately 7 miles west of the Bisbee-Douglas Airport. The Bisbee sheriff reported thunderstorm winds blew a roof completely off a large barn along Burnt Adobe Road, and snapped four power poles. A tree was uprooted and fell on a building at the Douglas Municipal Airport. Damages were estimated to exceed $50,000. (NCEI, 2010)

- In August 2010, the Benson News-Sun and a local city official reported extensive damage to much of the city of Benson from thunderstorm activity. The city official reported numerous mature and young trees uprooted, street signs bent or pulled completely out of the ground, damage to dwellings from uprooted trees, small sheds and car ports were lifted and thrown 50-75 feet, and shingle damage to numerous homes. Also, property fences were knocked over, camper trailers were turned over, and numerous power outages. The newspaper added that one particular insurance provider received 40 claims from residents, mostly related to roof damage. Additional information from the newspaper stated that at least 80 street signs had to be replaced. Extensive damage was also done to the Turquoise Hills Golf Course where numerous large trees were downed and buildings damaged. Damages were estimated to exceed $1,000,000. (NCEI, 2010) Map 17 presents a depiction of historic severe wind incident locations as reported by the NCEI for the period of 1955 to 2015. It is noted that this map is only intended to provide a visual view of areas impacted most and is not intended to represent a predictive tool.
- Beginning in 2016, Interstate 10 in the San Simon (NE Cochise County) area has closed down numerous times during high wind events due to agricultural tilling of property adjacent to the interstate. In 2016 & 2017 several serious accidents occurred on the interstate during zero-visibility dust events. These accidents caused both property damage, as well as driver injuries including one fatality. Additionally, forced I-10 road closures due to dust storms in the San Simon area resulted in 110 mile detours for both east and west-bound private and commercial traffic. Agricultural exemptions for dust control regulations in Arizona have made mitigating the dust problem extremely difficult.

Probability and Magnitude

Many severe wind events are associated with summer monsoon thunderstorms. The probability of a severe thunderstorm occurring with high velocity winds increases as the average duration and number of thunderstorm events increases. The average annual duration of thunderstorms in Cochise County ranges from 60 to 90 minutes and is among the longest in the nation (DEMA, 2004). Despite the long duration time, the actual number of thunderstorms on average varies from 50 to 70 per year across the county. Lightning strikes are another indicator of a thunderstorm hazard. According to recent data published by Vaisala©, strike densities across Cochise County for the period of 2005 to 2014, vary from 1 to 8 lightning strikes per square kilometer per year.

The NWS issues a severe thunderstorm watch when conditions are favorable for the development of severe thunderstorms. The local NWS office considers a thunderstorm severe if it produces hail at least 3/4-inch in diameter, wind of 58 mph or higher, or tornadoes. When a watch is issued for a region, residents are encouraged to continue normal activities but should remain alert for signs of approaching storms, and continue to listen for weather forecasts and statements from the local NWS office. When a severe thunderstorm has been detected by weather radar or one has been reported by trained storm spotters, the local NWS office will issue a severe thunderstorm warning. A severe thunderstorm warning is an urgent message to the affected counties that a severe thunderstorm is imminent. The warning time provided by a severe thunderstorm watch may be a couple hours, while a severe thunderstorm warning typically provides an hour or less warning time.

The American Society of Civil Engineers (ASCE) has identified a 3-second wind gust speed as the most accurate measure for identifying the potential for damage to structures, and is recommended as a design standard for wind loading. Most of Arizona and all of Cochise County is designated with a design 3-second gust wind speed of 90 mph, indicating relatively low levels of risk from severe winds (ASCE, 1999).

Likewise, FEMA identifies most of the county to be in design wind speed Zone I, as illustrated in the following figure. In this zone, a design wind speed of 130 mph is recommended for the design and construction of community shelters.

Based on the historic record, the probability of tornados occurring in Cochise County is probable. Tornado damage severity is measured by the Enhanced Fujita Scale. The EF-Scale measures tornado strength and associated damages and classifies tornadoes into six intensity categories, as shown in the following Table. The EF scale was revised in 2007 to reflect better examinations of tornado damage surveys, so as to align wind speeds more closely with associated storm damage. This new scale takes into account how most structures are designed, and is thought to be a much more accurate representation of the surface wind speeds in the most violent tornadoes. Most tornadoes last less than 30 minutes, but some last for over an hour. The path of a tornado can range from a few hundred feet to miles. The width of a tornado may range from tens of yards to more than a quarter of a mile.

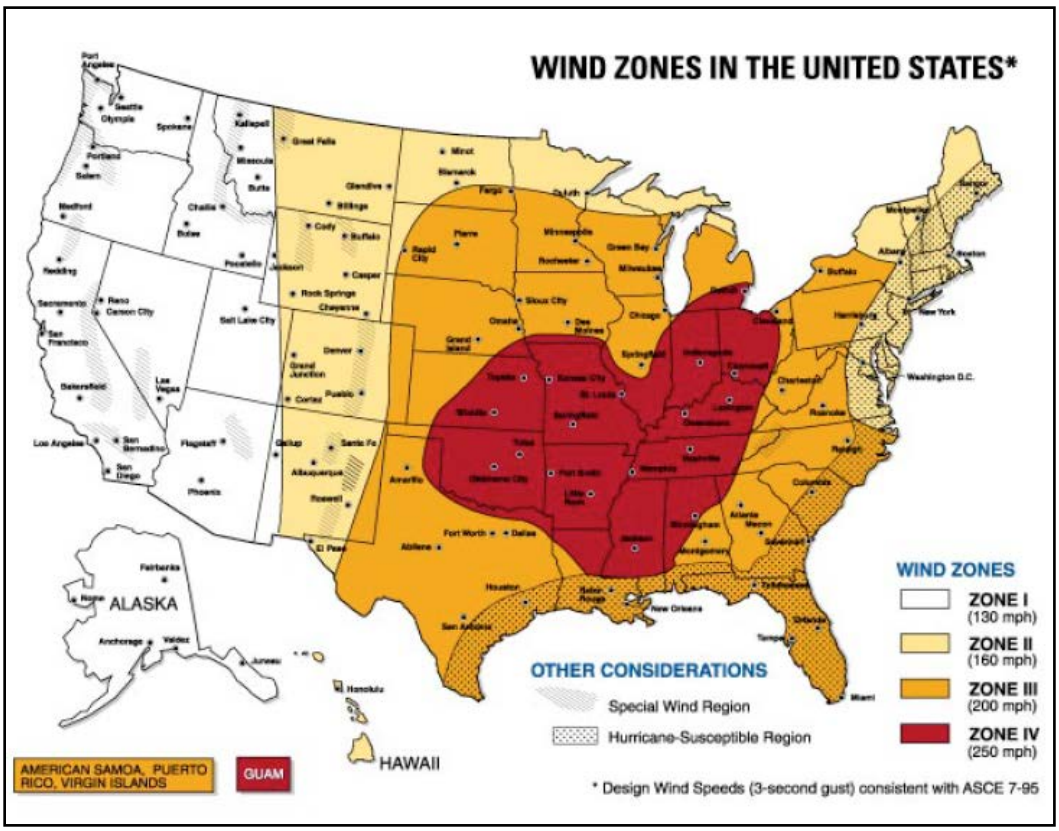


Figure 5.11. Illustration of FEMA Wind Zones

(Source: FEMA Website at the following URL: https://www.fema.gov/pdf/library/ism2_s1.pdf)

Table 5.15. Enhance Fujita Scale

Enhanced Fujita (EF) Scale		
Enhanced Fujita Category	Wind Speed (mph)	Potential Damage
EF0	65-85	Light damage: Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over.
EF1	86-110	Moderate damage: Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
EF2	111-135	Considerable damage: Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
EF3	136-165	Severe damage: Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance.
EF4	166-200	Devastating damage: Well-constructed houses and whole frame houses completely leveled; cars thrown and small missiles generated.
EF5	>200	Incredible damage: Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 m (109 yds.); high-rise buildings have significant structural deformation; incredible phenomena will occur.

Vulnerability – CPRI Results

Severe Wind CPRI results for each community are summarized in the following table:

Table 5.16. CPRI Results by Jurisdiction for Severe Wind

Participating Jurisdiction	Probability	Magnitude/ Severity	Warning Time	Duration	CPRI Score
Benson	3.16 (Likely/Highly Likely)	2.47 (Limited/Critical)	2.84 (12-24 hours/6-12 hours)	2.11 (< 24 hours/< 1 week)	2.8
Bisbee	3.2 (Likely/Highly Likely)	2.46 (Limited/Critical)	2.22 (12-24 hours/6-12 hours)	2.29 (< 24 hours/< 1 week)	2.74

Participating Jurisdiction	Probability	Magnitude/ Severity	Warning Time	Duration	CPRI Score
Douglas	3 (Likely)	2.5 (Limited/Critical)	2.9 (12-24 hours/6-12 hours)	1.9 (< 6 hours/< 24 hours)	2.73
Huachuca City	3.39 (Likely/Highly Likely)	2.52 (Limited/Critical)	2.94 (12-24 hours/6-12 hours)	1.77 (< 6 hours/< 24 hours)	2.9
Sierra Vista	3.74 (Likely/Highly Likely)	2.35 (Limited/Critical)	2.3 (12-24 hours/6-12 hours)	1.91 (< 6 hours/< 24 hours)	2.92
Tombstone	3.17 (Likely/Highly Likely)	2 (Limited)	3.5 (6-12 hours/< 6 hours)	1.83 (< 6 hours/< 24 hours)	2.73
Willcox	3.69 (Likely/Highly Likely)	2.69 (Limited/Critical)	2.81 (12-24 hours/6-12 hours)	2.44 (< 24 hours/< 1 week)	1.47
Unincorporated Cochise County	3.59 (Likely/Highly Likely)	2.17 (Limited/Critical)	2.72 (12 - 24 hours/6-12 hours)	2.17 (< 24 hours/< 1 week)	2.89
				County-wide average CPRI =	2.61

Based on the CPRI Evaluation, the Huachuca City, Sierra Vista, and unincorporated parts of the county are perceived to be most at risk from a Severe Wind event. As demonstrated in the table above, the probability of this event occurring in these two jurisdictions is thought to be more likely and the magnitude of impacts more severe.

Vulnerability – Loss Estimations

The entire county is assumed to be equally exposed to the damage risks associated with severe winds. Incidents are typically localized and damages associated with individual events are usually minor, unless the event occurs within a densely populated area. According to NCEI, Cochise County jurisdictions have experienced over $3.3 million in property damage and $5,000 in crop damage between 1959 and 2016. No deaths or injuries have been recorded, but it is not unreasonable to predict that severe wind incidents could cause harm to community members. No estimates of losses for individual jurisdictions are made due to the lack of discrete data.

Vulnerability – Development Trend Analysis

Since the 2010 Census, Cochise County has seen and projects continued population decreases. This means minimal new development is expected, which will keep the structure inventory at risk similar to what is was when the 2012 plan was updated. Future development can expand the exposure of life and property to the damaging effects of severe wind events. Enforcement and/or implementation of modern building codes to regulate new developments in conjunction with public education on how to respond to severe wind conditions are arguably the best way to mitigate against losses.

Sources

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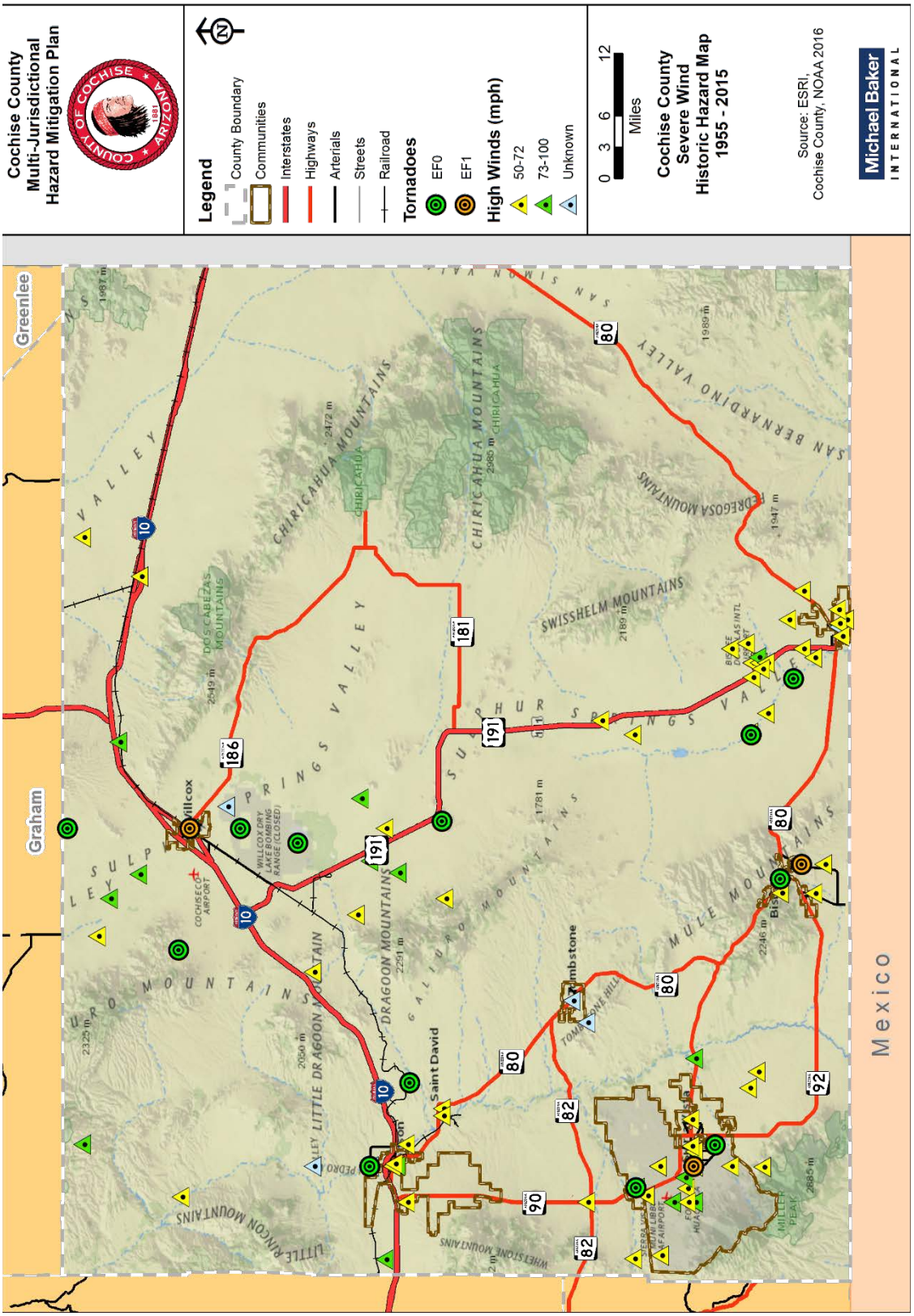
Profile Maps

Map 5.20 – County-Wide Severe Wind Historic Hazard Map

Map 5.20. Severe Wind



5.3.7 Wildfire

Description

A wildfire is an uncontrolled fire spreading through vegetative fuels, exposing and possibly consuming structures. They often begin unnoticed, spread quickly, and are usually signaled by dense smoke. Wildfires can be human-caused through acts such as arson, unattended campfires, or the improper burning of debris, or even an errant cigarette butt. Naturally sparked wildfires are usually caused by lightning. Wildfires can be categorized into four types:

- *Wildland fires* occur mainly in areas under federal control, such as national forests and parks, and are fueled primarily by natural vegetation. Generally, development in these areas is nonexistent, except for roads, railroads, power lines, and similar features.
- *Interface or intermix fires* occur in areas where both vegetation and structures provide fuel. These are also referred to as urban-wildland interface fires.
- *Firestorms* occur during extreme weather (e.g., high temperatures, low humidity, and high winds) with such intensity that fire suppression is virtually impossible. These events typically burn until the conditions change or the fuel is exhausted.
- *Prescribed fires and prescribed natural fires* are intentionally set or natural fires that are allowed to burn for beneficial purposes.

The following three factors contribute significantly to wildfire behavior and, as detailed more fully later, can be used to identify wildfire hazard areas:

- *Topography*: As slope increases, the rate of wildfire spread increases. South facing slopes are also subject to greater solar radiation, making them drier and thereby intensifying wildfire behavior. However, ridgetops may mark the end of wildfire spread, since fire spreads more slowly or may even be unable to spread downhill.
- *Fuel:* Wildfires spread based on the type and quantity of available flammable material, referred to as the fuel load. The basic characteristics of fuel include size and shape, arrangement and moisture content. Each fuel is assigned a burn index (the estimated amount of potential energy released during a fire), an estimate of the effort required to contain a wildfire, and an expected flame length.
- *Weather:* The most variable factor affecting wildfire behavior is weather. Important weather variables are temperature, humidity, wind, and lightning. Weather events ranging in scale from localized thunderstorms to large fronts can have major effects on wildfire occurrence and behavior. Extreme weather, such as high temperatures and low humidity, can lead to extreme wildfire activity. By contrast, cooling and higher humidity often signals reduced wildfire occurrence and easier containment. Wind has probably the largest impact on a wildfire's behavior, and is also the most unpredictable. Winds supply the fire with additional oxygen, further dry potential fuel, and push fire across the land at a quicker pace.

The frequency and severity of wildfires is also impacted by other hazards, such as lightning, drought, and infestations (e.g., Pine Bark Beetle, Salt Cedar and Buffelgrass). In Arizona, these hazards combine with the three other wildfire contributors noted above (topography, fuel, weather) to present an on-going and significant hazard across much of Arizona.

If not promptly controlled, wildfires may grow into an emergency or disaster. Even small fires can threaten lives, resources, and destroy improved properties. It is also important to note that in addition to affecting people, wildfires may severely affect livestock and pets. Such events may require the emergency watering/feeding, shelter, evacuation, and increased event-caused deaths and burying of animals.

The indirect effects of wildfires can also be catastrophic. In addition to stripping the land of vegetation and destroying forest resources, large, intense fires can harm the soil, waterways and the land itself. Soil exposed to intense heat may lose its capability to absorb moisture and support life. Exposed soils erode quickly and enhance siltation of rivers and streams thereby enhancing flood potential, harming aquatic life and degrading water quality. Lands stripped of vegetation are also subject to increased landslide hazards.

History

According to the 2014 Cochise County Wildfire Protection Plan (CCWPP), there have been a total of 54 large wildfires in the Cochise County Wildland-Urban Interface (WUI) since 2000. These fires have burned over 315,000 acres of land in total. Fires greater than 1,000 acres that have occurred in the last five years are described below in chronological order:

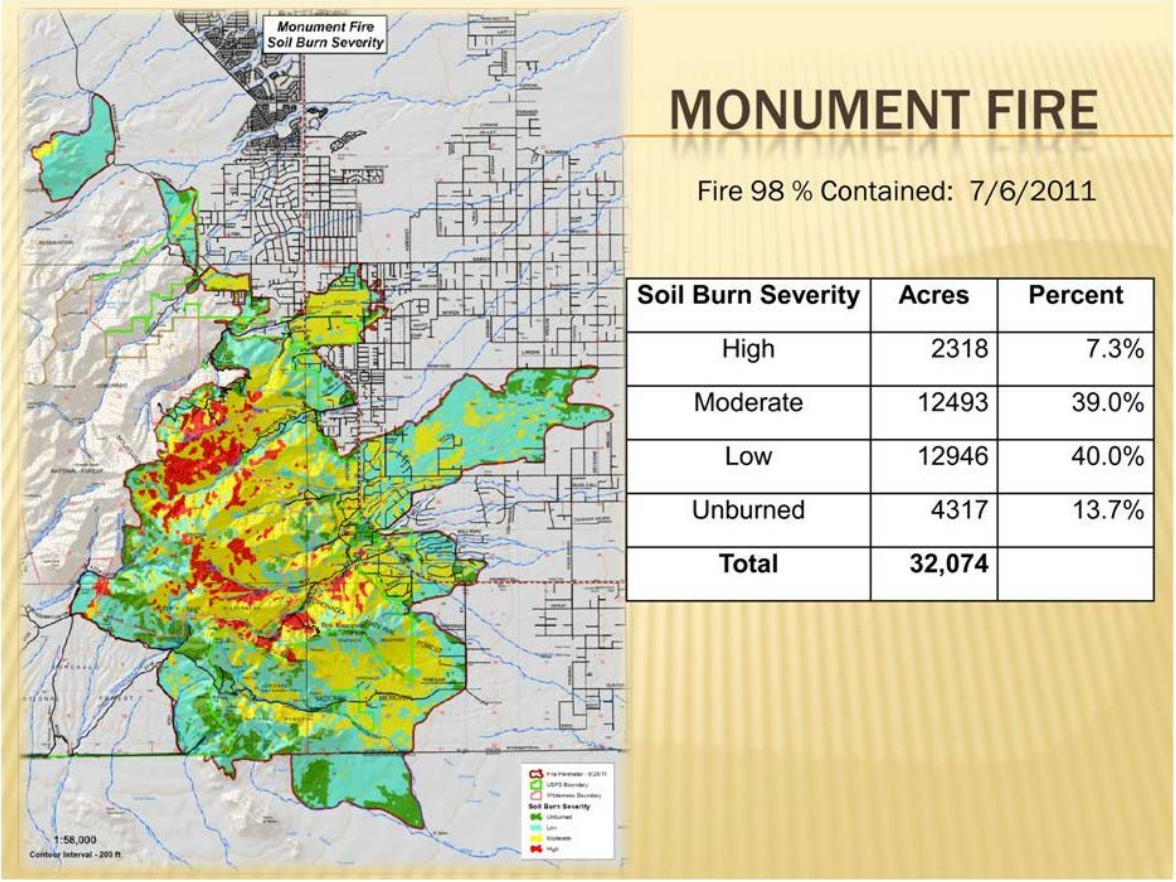
- *Horseshoe 2 Fire* – On May 8, 2011, the Horseshoe 2 Fire was ignited by human causes and burned a total of 222,954 acres within the Chiricahua Mountains of Southeastern Arizona. A total of 23 structures were destroyed, and at least $51.1 million in fire suppression costs were estimated. The fire was contained June 25, 2011 at approximately 6:00pm (CNF, 2011a). Figure 13 shows a map of the Horseshoe 2 Fire burn area and burn intensities.
- *Monument Fire* – On June 12, 2011, the Monument Fire burned a total of 32,074 acres in an area located four miles east of Hereford, Arizona. The cause of the fire is unknown. Early news reports estimated that about 40 homes and the Our Lady of the Sierras shrine, along with 10 other structures, were reportedly burned, and about 650 homes were evacuated (Tucson Sentinel, 2011). A subsequent report estimated over 50 homes destroyed and the evacuation of the entire community of Hereford, Arizona (AZCentral.com, 2011). A later report estimated four businesses and 14 residential structures were damaged or lost when the Monument Fire came down from Miller Canyon. Forty-four homes and 17 other buildings were damaged or destroyed in the Ash Canyon area. In the Stump Canyon area, seven houses and four other structures were destroyed. A vehicle and a historic building were also damaged. Authorities estimated that approximately 3,000 homes and 12,000 people were evacuated, and there was one injury as a result of smoke inhalation (AZFamily.com, 2011). Post-fire flooding from the burned watersheds also destroyed the City of Tombstone's water catchment structures on 24 springs in Carr and Miller Canyons, with damages estimated at over $30,000 and the possibility of a severe shortage in water supply until the springs are restored. Figure 14 shows a map of the Monument Fire burn area and burn intensities. The fire was declared 98% contained on July 6, 2011 and the fire suppression costs were estimated to exceed $20.35 million (CNF, 2011b).
- On June 21, 2008, the Adams Fire was started by lightning and burned 1,040 acres of Adams Peak, east of Benson, Arizona. The fire was contained on June 25, 2008 and there were no reported structure or human losses, and the fire suppression costs were estimated to exceed $4,000 (NWGC, 2010).
- On June 23, 2008, the Jack Wood WFU Fire was started by lightning and burned 8,241 acres located 12 miles southwest of Rodeo, New Mexico. The fire was contained on July 11, 2008, there were no reported structure or human losses, and the fire suppression costs were estimated to exceed $150,000 (NWGC, 2010).
- On July 3, 2008, the Buck Fire was started by human causes and burned 2,250 acres located 30 miles northeast of Douglas, Arizona. The fire was contained on July 8, 2008, there were no reported structure or human losses, and the fire suppression costs were estimated to exceed $100,000 (NWGC, 2010).
- On March 1, 2009, the Hog Fire was started by human causes and burned 16,802 acres located 25 miles northeast of Douglas, Arizona. The fire was contained on March 10, 2009, there were no

reported structure or human losses, and the fire suppression costs were estimated to exceed $265,000 (NWGC, 2010).

- On March 25, 2009, the Geronimo Fire was started by human causes and burned 2,460 acres near Sunizona, Arizona. The fire required the evacuation of about 50 residents and threatened 10 residential homes, 20 outbuildings or other assets, and ultimately destroyed 8 outbuildings and 2 vehicles. There were no human losses reported and the fire was contained on March 29, 2009, Fire suppression costs were not estimated (NWGC, 2010).
- On May 26, 2010, the Horseshoe Fire was started by human causes and burned 3,401 acres located 5 miles south of Portal, AZ. The fire was contained July 9, 2010. There were no reported structure losses, six reported injuries, and the fire suppression costs were estimated to exceed $10 million (NWGC, 2010).
- On June 24, 2010, the Brushy Fire was started by lightning and burned 5,935 acres located 15 miles east of Elfrida, AZ. The fire was contained July 10, 2010. There were no reported structure or human losses and the fire suppression costs were estimated to exceed $600,000 (NWGC, 2010).

Maps 6A through 6D provide a graphical depiction of the 100 acre plus wildfires for the 2002-2010 period (NWGC, 2010).

Two recent fires in 2011, have proven to be the worst fires to burn Cochise County, and are summarized below.



Soil Burn Severity	Acres	Percent
High	2318	7.3%
Moderate	12493	39.0%
Low	12946	40.0%
Unburned	4317	13.7%
Total	**32,074**	

Figure 5.12. Monument Fire Soil Burn Severity

(Source: InciWeb, 2011, http://www.inciweb.org/incident/map/2324/1/)

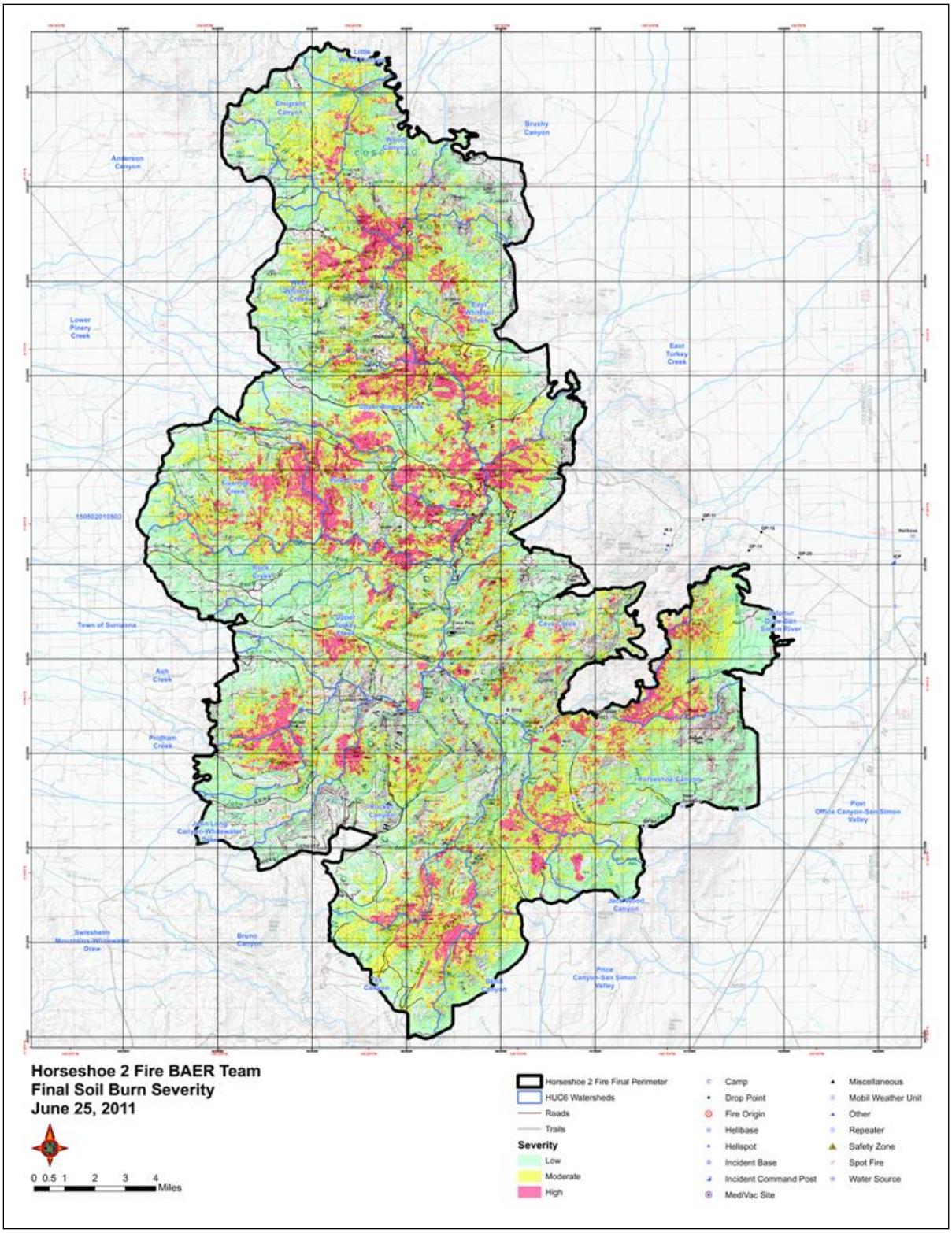


Figure 5.13. Horseshoe 2 Fire Soil Burn Severity

(Source: InciWeb, 2011, http://www.inciweb.org/incident/map/2225/0/)

On June 17, 2011, Governor Jan Brewer signed a Declaration of Emergency in response to the Horseshoe 2 and Monument Fires in Cochise County. This declaration released $100,000 from the Governor's Emergency Funds (via the State General Fund) to pay for emergency responses and recovery expenses for damage resulting from the fires. The funding will support costs not covered by the Federal Fire Management Assistance Grant (FMAG), as well as recovery efforts following suppression of the fire.

The Planning Team recognized that the disaster and historic hazard data collected and summarized in Section 5.1 does not adequately reflect the true cost of a wildfire. Particularly, the cost of wildfire suppression efforts to prevent structure and human loss. For example, the Brushy Fire did not result in any structure losses, however, the suppression costs exceeded $600,000. Furthermore, the County, State, Forest Service, and other agencies spend millions of dollars every year in wildfire mitigation in fuel treatment projects.

Probability and Magnitude

The probability and magnitude of wildfire incidents for Cochise County are influenced by numerous factors including vegetation densities, previous burn history, hydrologic conditions, climatic conditions such as temperature, humidity, and wind, ignition source (human or natural), topographic aspect and slope, and remoteness of area.

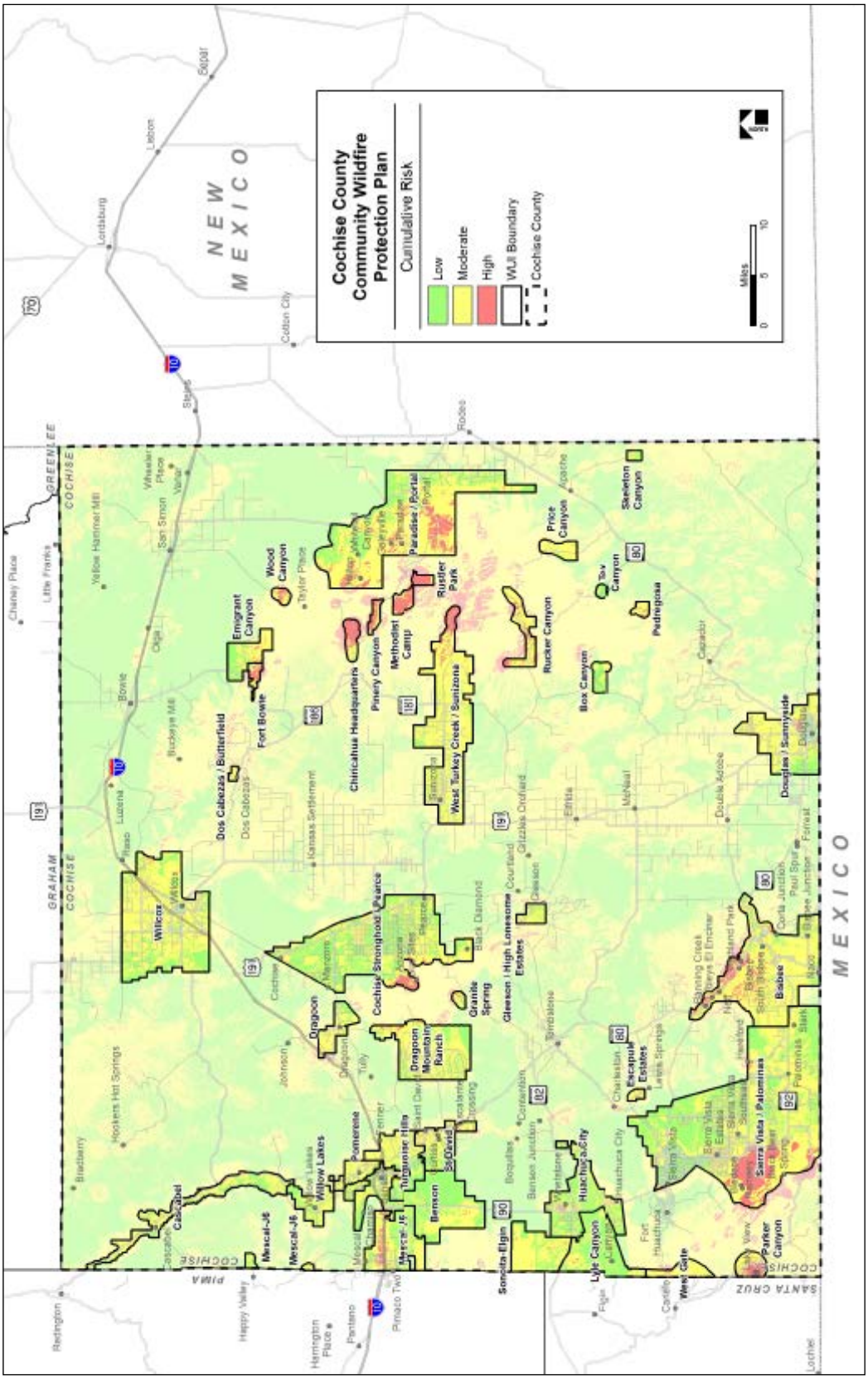
In 2014, Cochise County collaborated with various cooperating stakeholders to prepare the Cochise County Wildfire Protection Plan (CWPP), which discusses Wildland Urban Interface (WUI) areas and wildfire risk elements. The City of Bisbee had previously developed their own CWPP. The CWPP wildfire analysis records participating communities' WUI risk ratings, as seen in the following recommended at-risk communities table.

Table 5.17. CWPP Wildfire Risk Analysis

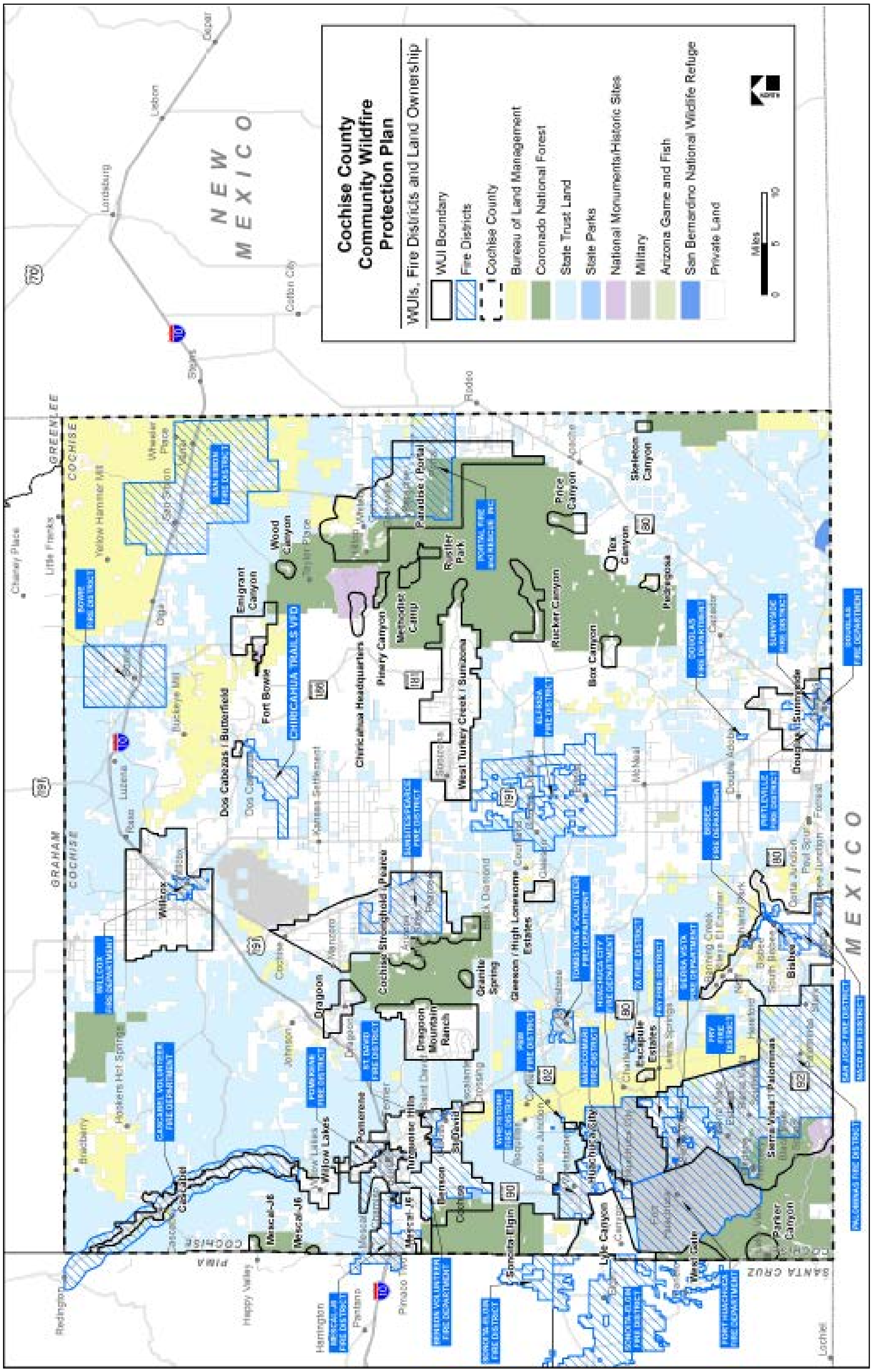
Community WUI	WUI Risk	Communities within WUI	Fire Dept/Dist
Benson	Low	Benson	Benson Fire Department
Bisbee	From Bisbee CWPP: 37% High 34% Moderate 29% Low	Bisbee Banning Creek, Highland Creek, Naco, South Bisbee, Warren	Bisbee Fire Dept., Naco Fire Dist., San Jose Fire Dist.
Douglas/Sunnyside	Moderate	Calumet, Douglas, Pirtleville, Sunnyside	Douglas Fire Dept., Sunnyside Fire Dist., Pirtleville Fire Dist.
Town of Huachuca City	Low	Campstone, Huachuca City, Whetstone	Huachuca City Fire Dept., Whetstone Fire Dept., PBW Fire Dist.
Sierra Vista/Palominas	Moderate	Bledsoe, Hereford, Miracle Valley, Nicksville, Palominas, Ramsey, Sierra Vista, Sierra Vista Southeast, Stark	Sierra Vista Fire Dept., Fry Fire Dist., Palominas Fire Dist.
Willcox	Moderate	Willcox	Willcox Fire Dept.

The following Map 5.21 displays the results of the cumulative risk analyses, which was conducted for Cochise CWPP. The risk analysis identifies areas and relative percentages of WUI areas of high, moderate, and low risk and synthesizes the risks that are associated with fuel hazards, wildfire ignitions, wildfire occurrence, and community values. Map 5.22 displays the established WUI boundaries, Fire Districts, and Land Ownership areas for the entirety of Cochise County.

Map 5.21. CWPP Cumulative Risk Analysis



Map 5.22. CWPP WUI Area



Vulnerability – CPRI Results

Wildfire CPRI results for each community is summarized in the following table:

Table 5.18. CPRI Results by Jurisdiction for Wildfire

Participating Jurisdiction	Probability	Magnitude/ Severity	Warning Time	Duration	CPRI Score
Benson	2.79 (Possible/Likely)	2.58 (Limited/Critical)	2.95 (12-24 hours/6-12 hours)	2.95 (< 24 hours/< 1 week)	2.76
Bisbee	3.05 (Likely/Highly Likely)	3.05 (Limited/Critical)	3.05 (6-12 hours/< 6 hours)	3.17 (< 1 week/> 1 week)	3.06
Douglas	3.2 (Likely/Highly Likely)	2.6 (Limited/Critical)	3.3 (6-12 hours/< 6 hours)	3.2 (< 1 week/> 1 week)	3.04
Huachuca City	3. (Likely/Highly Likely)	2.9 (Limited/Critical)	3.45 (6-12 hours/< 6 hours)	2.39 (< 24 hours/< 1 week)	3.04
Sierra Vista	3.61 (Likely/Highly Likely)	3.26 (Critical/Catastrophic)	2.78 (12-24 hours/6-12 hours)	3 (< 1 week)	3.32
Tombstone	3.17 (Likely/Highly Likely)	2.33 (Limited/Critical)	3.33 (6-12 hours/< 6 hours)	2.83 (< 24 hours/< 1 week)	2.91
Willcox	3.25 (Likely/Highly Likely)	2.88 (Limited/Critical)	3.19 (6-12 hours/< 6 hours)	2.5 (< 24 hours/< 1 week)	1.59
Unincorporated Cochise County	3.34 (Likely/Highly Likely)	2.97 (Limited/Critical)	3.24 (6-12 hours/< 6 hours)	3.59 (< 1 week/> 1 week)	3.24
				County-wide average CPRI =	2.87

Based on the CPRI Evaluation, the Bisbee, Douglas, Huachuca City, Sierra Vista, and those who live or work in Unincorporated Cochise County believe that they are most at risk from Wildfire event. It should be noted that almost every jurisdiction feels that a wildfire is highly likely to occur in their community.

Vulnerability – Loss Estimations

The estimation of potential exposure to High Risk Fire was accomplished by intersecting the county parcel data with the wildfire cumulative risk layer, which is depicted in Maps 5.24 – 5.30 at the end of this section. The following table displays the total number of impacted parcels located in the high risk fire area, for each participating jurisdiction.

Table 5.19. Impacted Parcels (Wildfire)

Jurisdiction	Parcels (High Risk Fire)
Benson	57
Tombstone	82
Willcox	5
Bisbee	366
Douglas	64
Sierra Vista	5
Huachuca City	36
County	4,926

The following table summarizes the critical facility (CF) exposure estimates for the high wildfire hazard areas, which includes a 100' buffer. Estimates are broken out by CF type, impacted structure count, and estimated CF replacement value (when available).

Table 5.20. Critical Facilities Wildfire Impact

	Bisbee	Cochise County
CF Type	Impacted Structures/Replacement Value	
Banking and Finance Institution	-	-
Cultural	-	-
Educational	-	1/NA
Electrical Power System	-	-
Emergency Services	-	1/NA
Gas and Oil Facilities	-	-
Government Services	-	-
Telecommunications Infrastructure	1/$20,000	13/$260,000
Transportation Networks	-	1/$1,610,000
Water Supply Systems	-	-

In summary, approximately $1.9 million in critical facility related losses are possible in areas of high wildfire hazard, for all the participating jurisdictions in Cochise County. It should be noted that these

exposure dollar amounts do not include the cost of wildfire suppression, which can be substantial. For example, deployment of a Type 1 wildland firefight crew costs about $1 million per day.

It is duly noted that the loss and exposure numbers presented above represent a comprehensive evaluation of the County as a whole. It is unlikely that a wildfire would occur that would impact all of the high wildfire hazard areas at the same time. Accordingly, actual event based losses and exposure are likely to be only a fraction of those summarized above.

Vulnerability – Development Trend Analysis

By its very definition, the WUI represents the fringe of urban development as it intersects with the natural environment. As previously discussed, wildfire risks are significant for a sizeable portion of the county. Any future development will only increase the WUI areas and expand the potential exposure of structures to wildfire hazards. The Cochise County CWPP addresses mitigation opportunities for WUI areas and provides recommended guidelines for safe building and land-use practices in wildfire hazard areas. It also presents recommendations for enhanced wildland fire protection capabilities and public education, information, and outreach.

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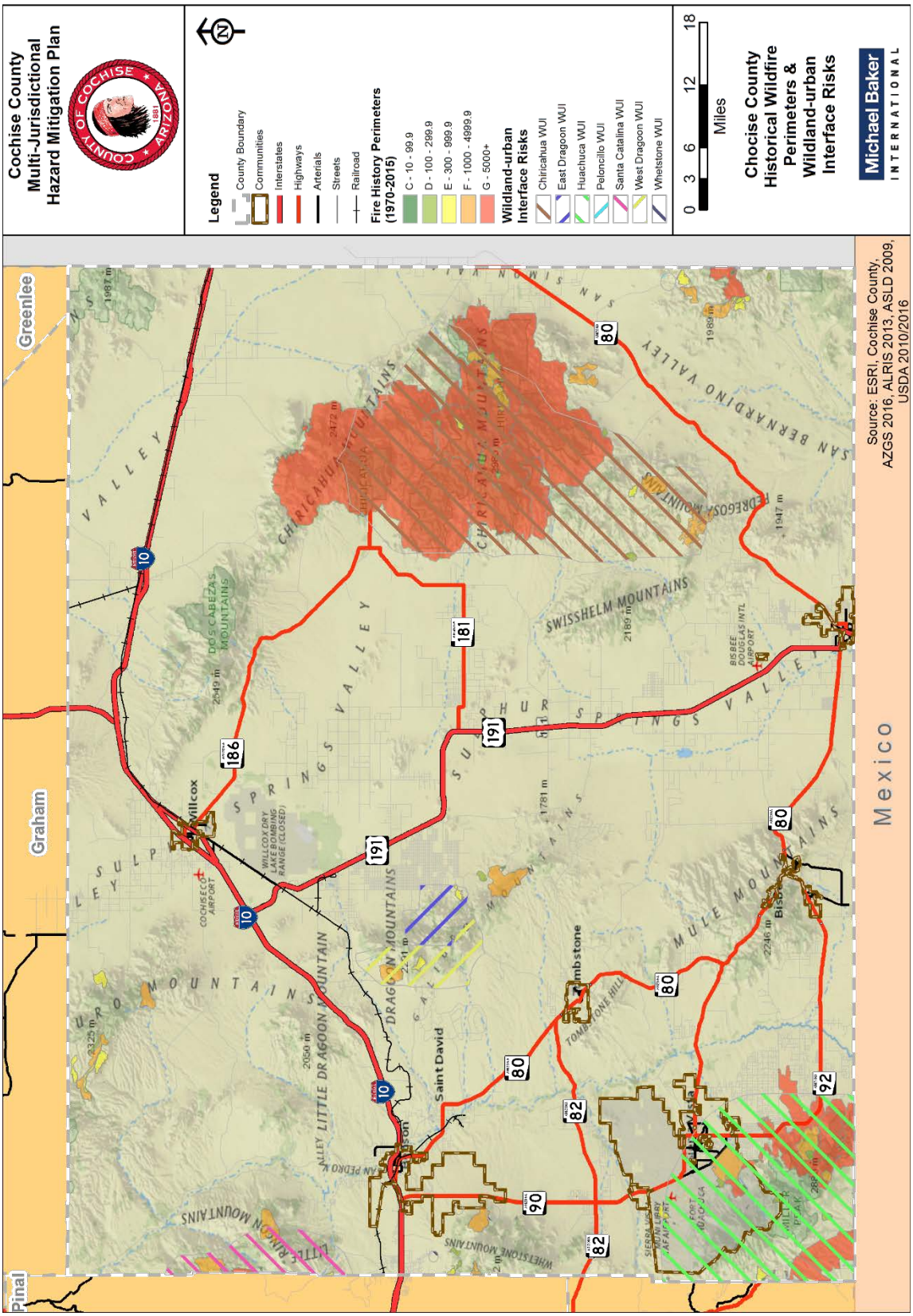
Profile Maps

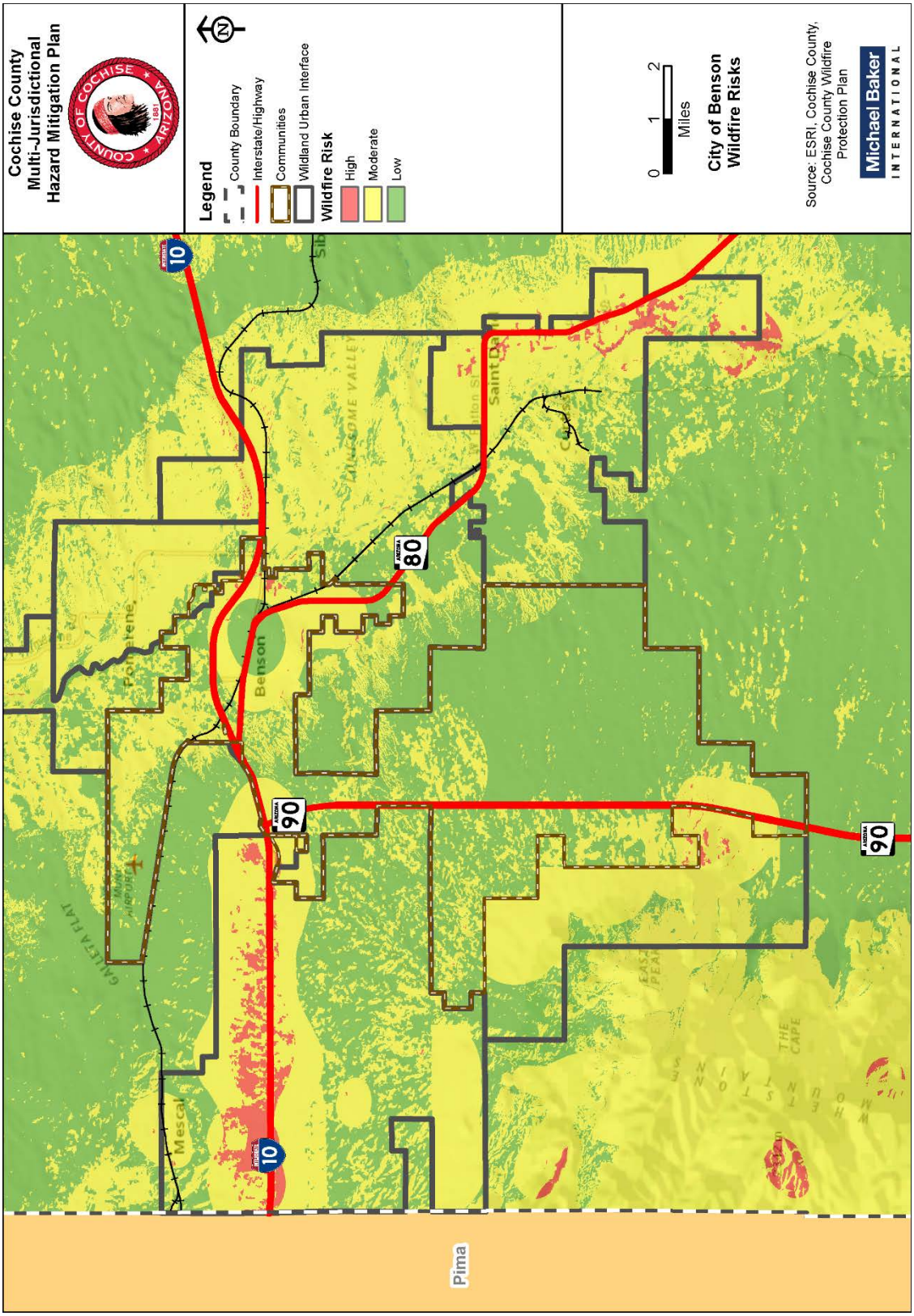
Maps 5.23 – County-Wide Historical Wildfire Perimeters & WUI Risks Map

Maps 5.24 through 5.30 – Benson, Bisbee, Douglas, Huachuca City, Sierra Vista, Tombstone, and Willcox Wildfire Hazard Maps

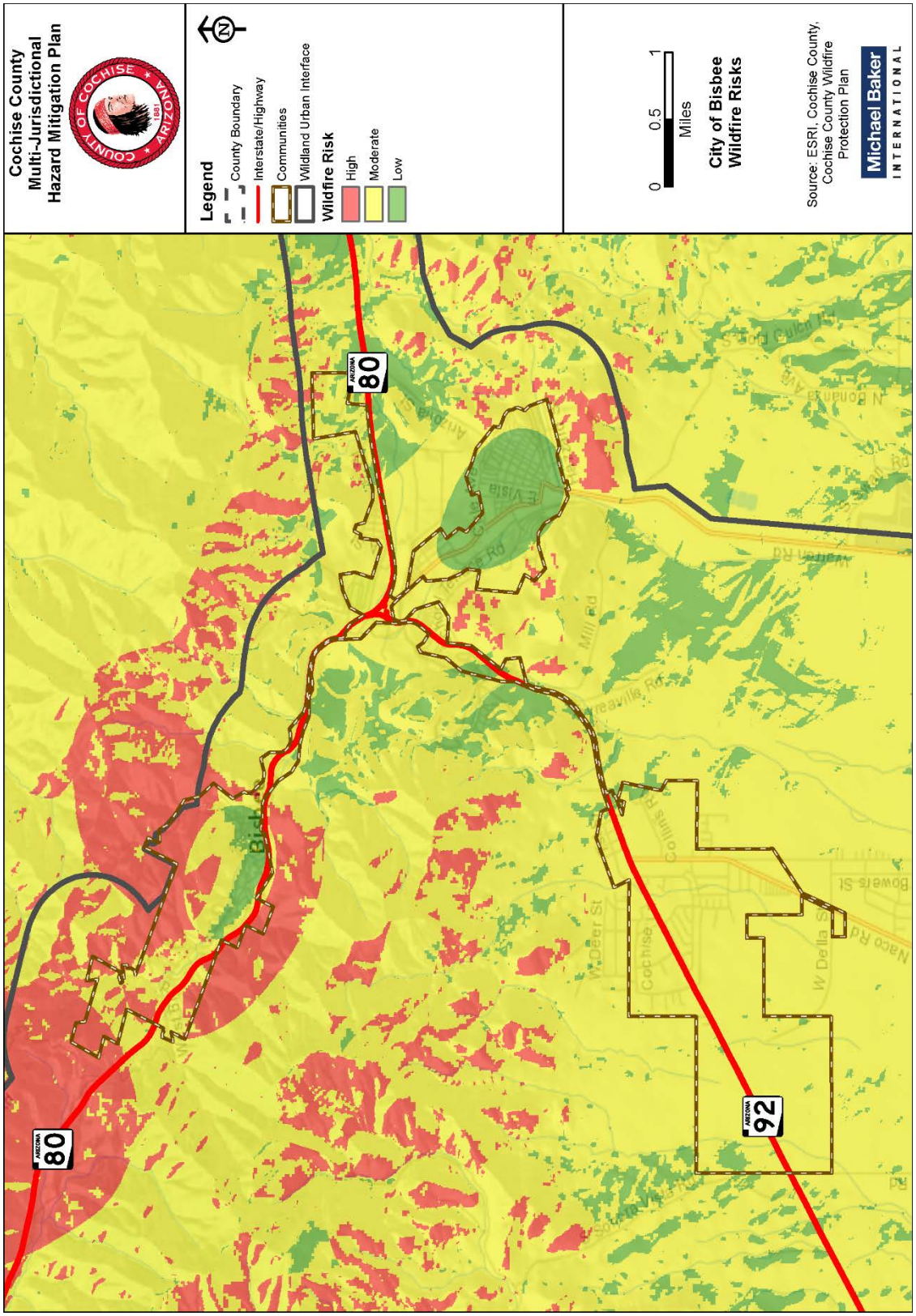
Map 5.23. Historical Wildfire Perimeters & Wildland-Urban Interface Risks



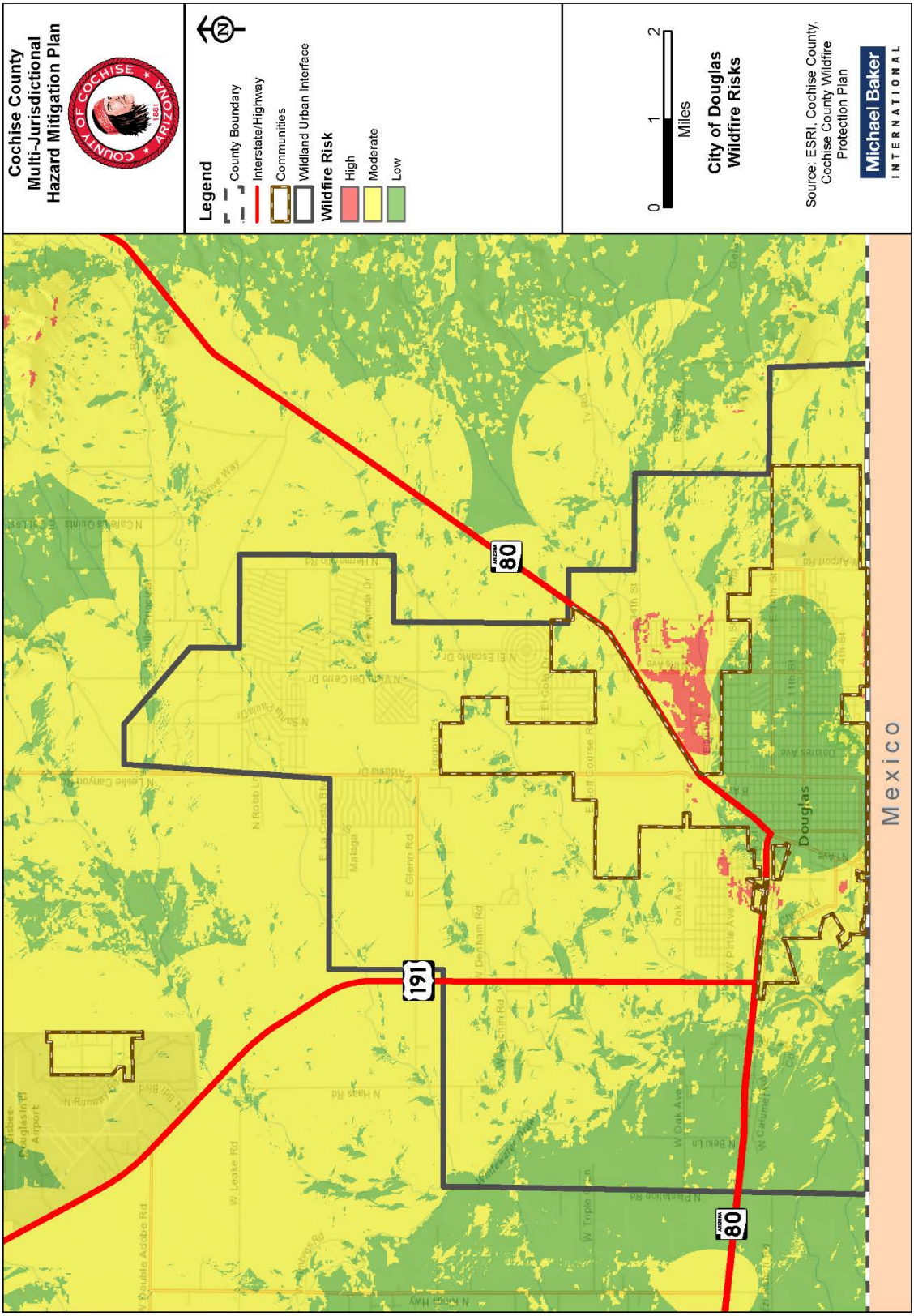
Map 5.24. City of Benson Wildfire Risks



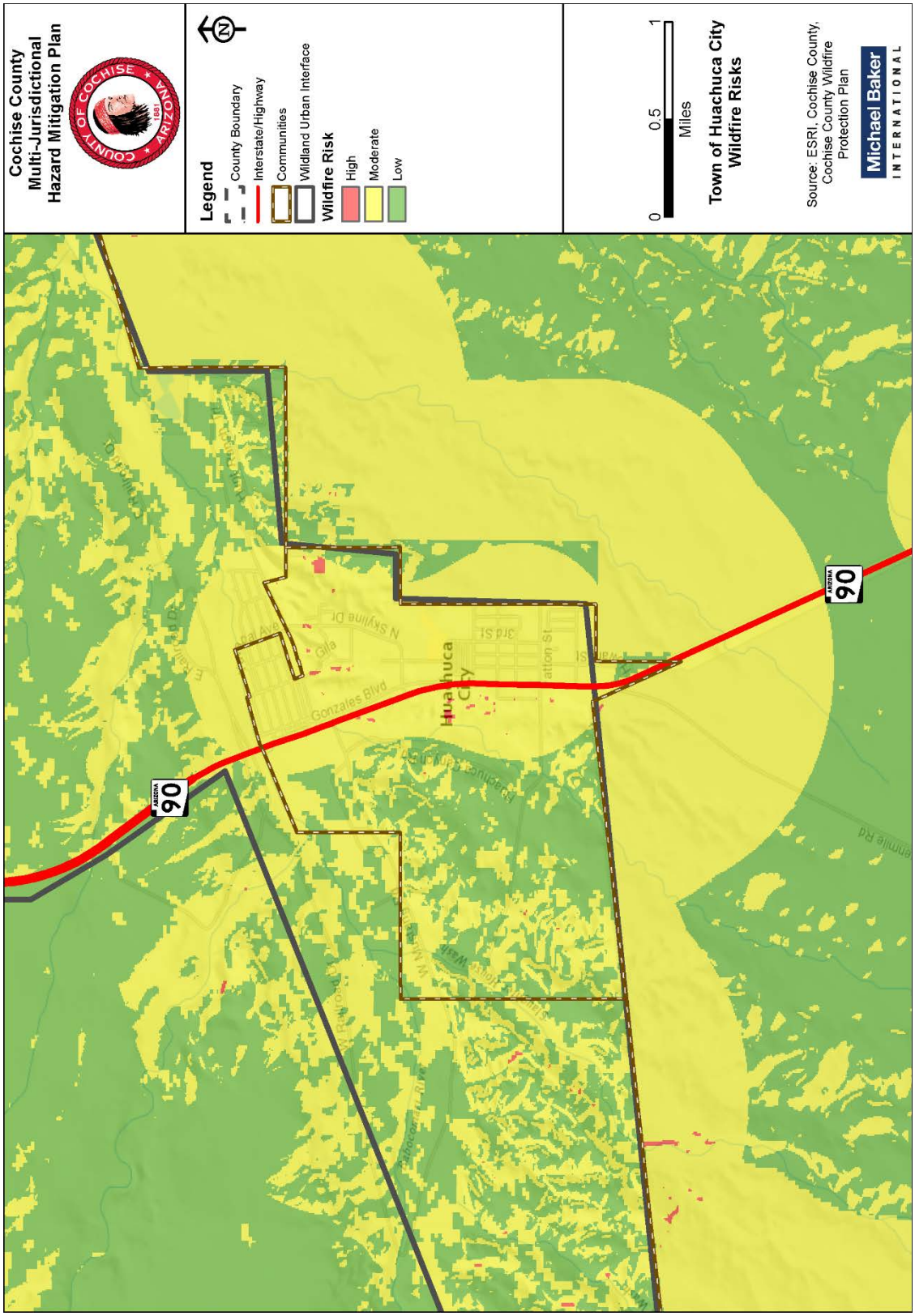
Map 5.25. City of Bisbee Wildfire Risks



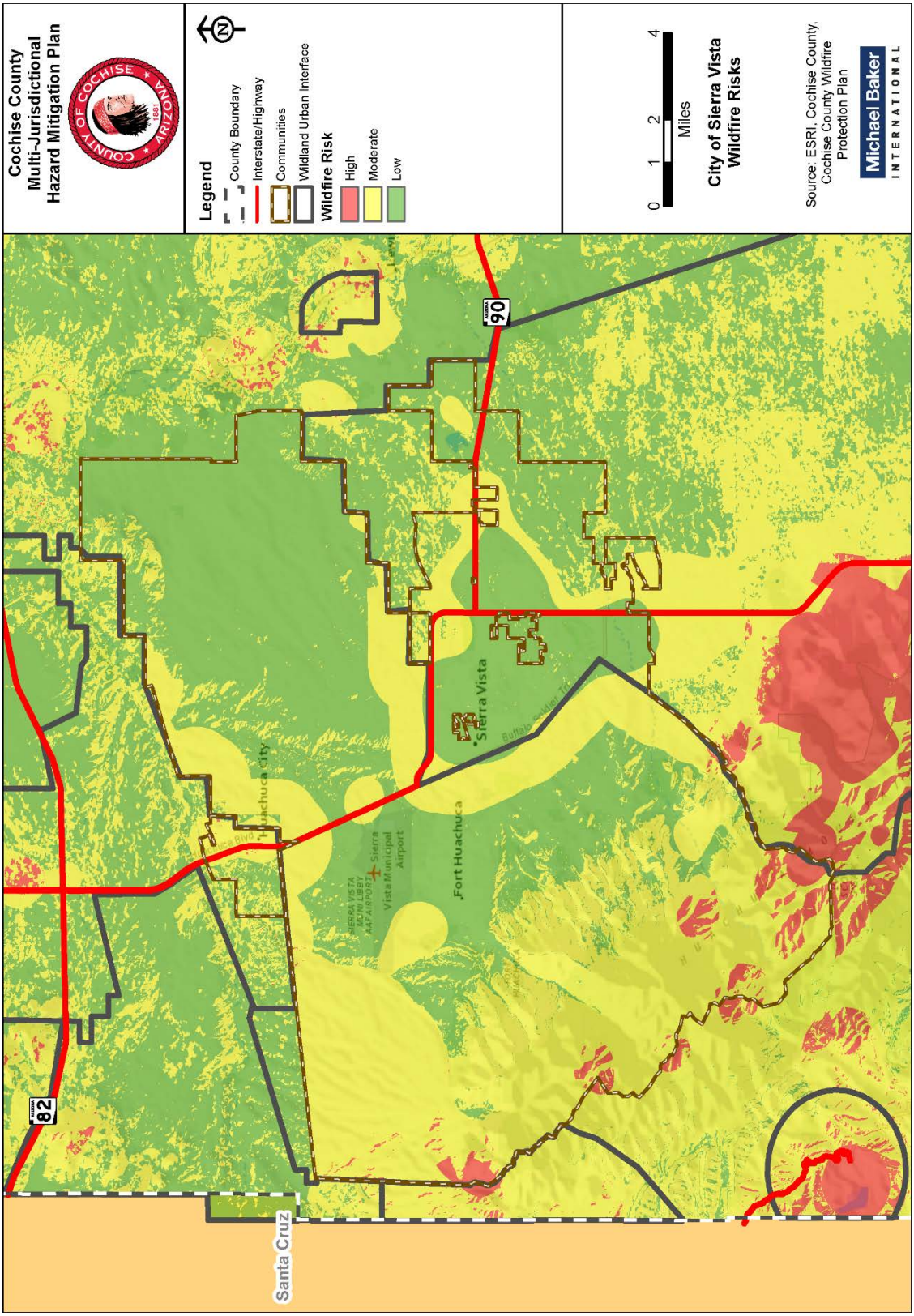
Map 5.26. City of Douglas Wildfire Risks



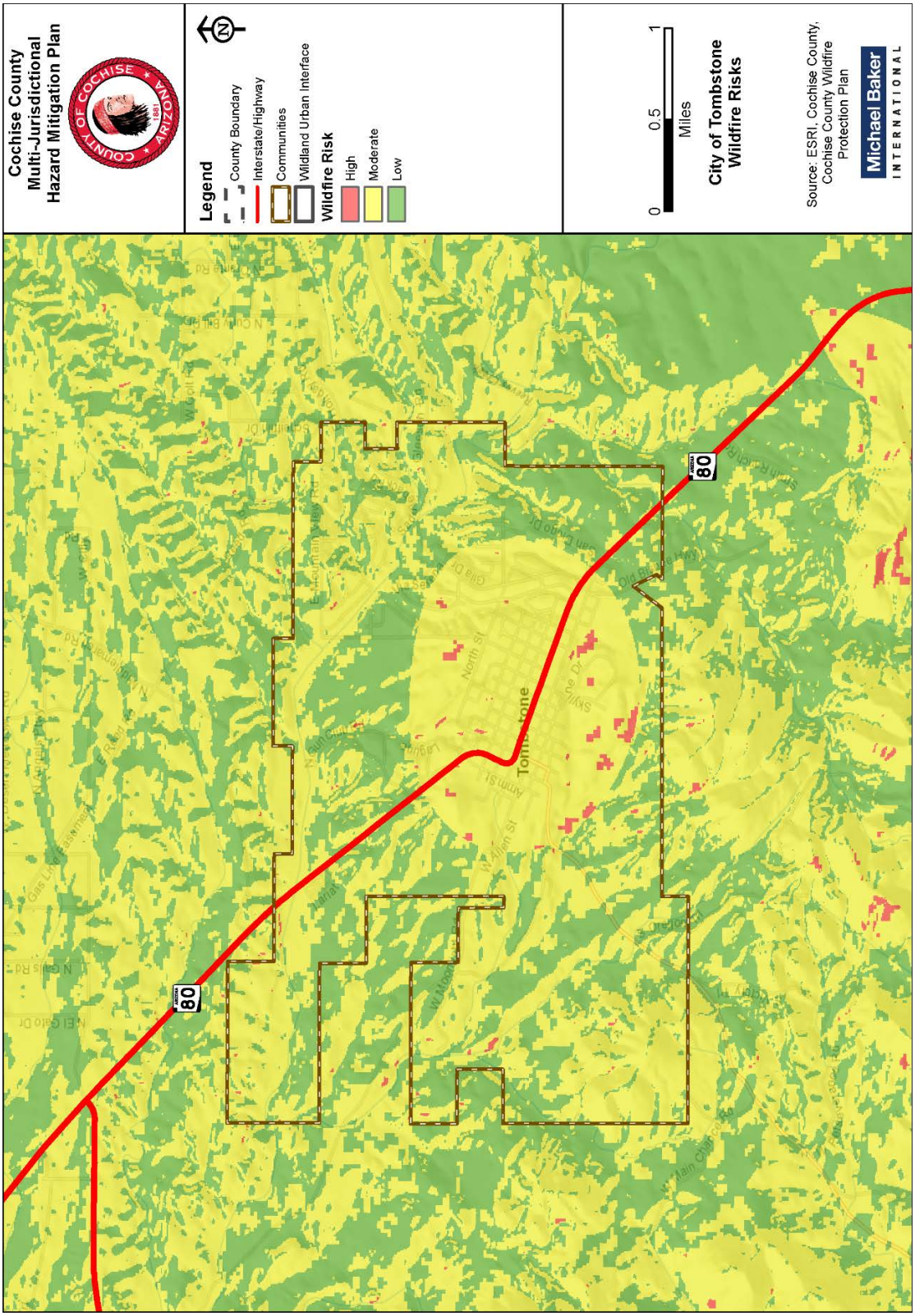
Map 5.27. Town of Huachuca City Wildfire Risks



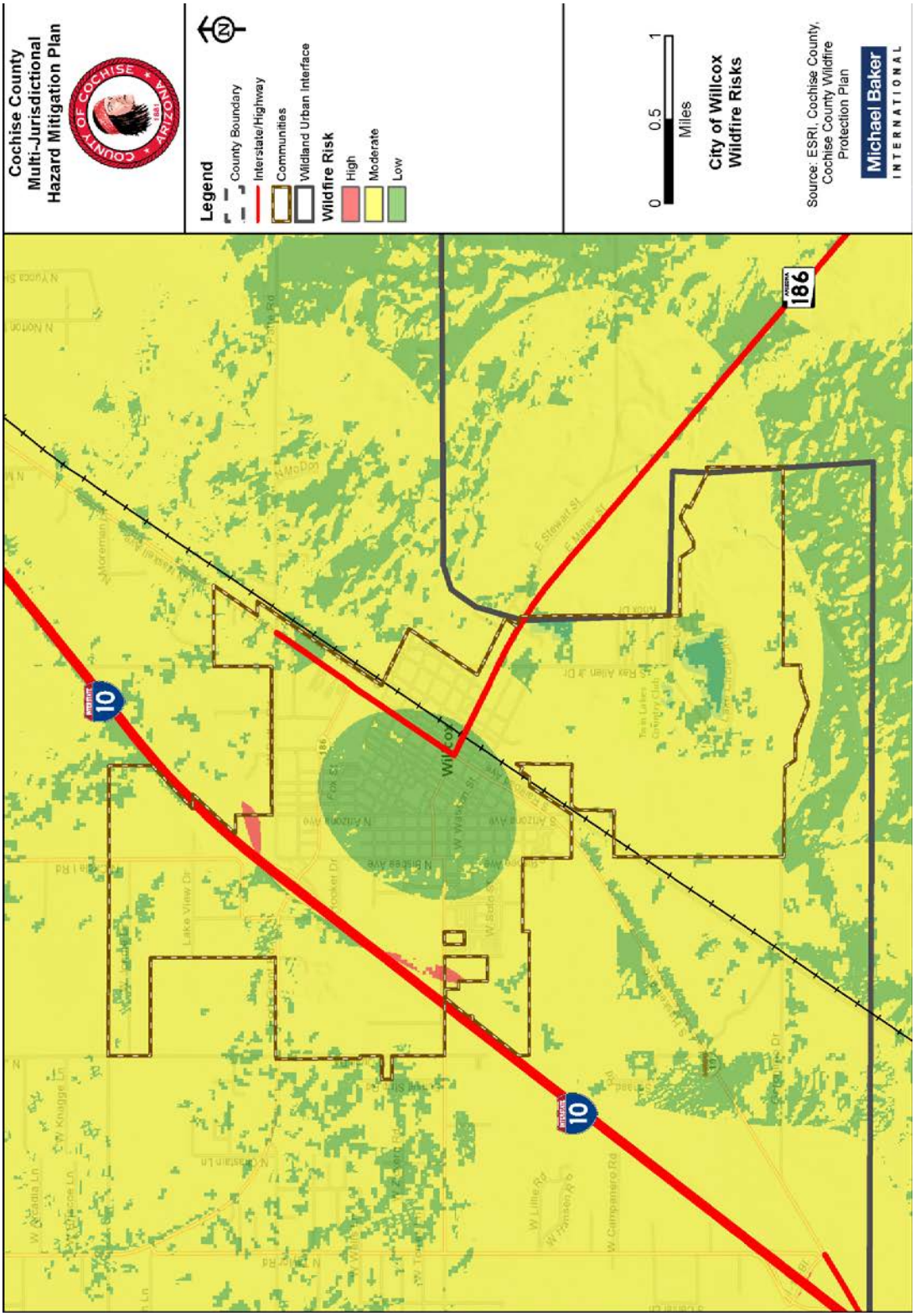
Map 5.28. City of Sierra Vista Wildfire Risks



Map 5.29. City of Tombstone Wildfire Risks



Map 5.30. City of Willcox Wildfire Risks



5.4 Risk Assessment Summary

The jurisdictional variability of risk associated with each hazard assessed in Section 5.3 is demonstrated by the various historical events, CPRI ratings, risk and vulnerability analysis, and loss estimation results. Accordingly, each jurisdiction has varying levels of vulnerabilities and risk to the hazards profiled as part of this plan. The following table presents each jurisdiction's self-identified overall risk ranking. These rankings were performed at the end of the planning process by each jurisdiction's Planning Team participants, after a thorough review of all components of the Plan's risk assessment and public outreach efforts.

It is important that these end results weigh in on the updated mitigation strategy and resulting mitigation projects identified by each jurisdiction. The Planning Team agreed that at a minimum, each jurisdiction would identify one mitigation action/project per each of their own 'high' risk hazards.

Table 5.21. Summary of Hazard Risk Rankings

Jurisdiction	Building Collapse / Mine Subsidence	Drought	Earthquake	Fissure	Flooding/Flash Flood	Severe Wind	Wildfire
Unincorporated Cochise County	L	H	L	M	H	M	H
Benson	L	H	L	M	H	M	H
Bisbee	H	M	H	H	H	M	M
Douglas	L	H	L	M	M	H	M
Huachuca City	L	M	L	L	M	H	H
Sierra Vista	L	M	L	L	H	M	H
Tombstone	H	L	M	L	H	M	L
Willcox	L	H	L	M	H	H	M
High Risk (H), Medium Risk (M), Low Risk (L)							

SECTION 6: MITIGATION STRATEGY

§201.6(c)(3): *[The plan shall include…] (3) A* ***mitigation strategy*** *that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools. This section shall include:*
(i) A description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.
(ii) A section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.
(iii) An action plan describing how the actions identified in paragraph (c)(3)(ii) of this section will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.
(iv) For multi-jurisdictional plans, there must be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.

The mitigation strategy provides a collection of mitigation actions and projects that will reduce or possibly remove the community's exposure to hazard risks. According to DMA 2000, the primary components of the mitigation strategy are generally categorized into the following:

Goals and Objectives

Capability Assessment

Mitigation Actions/Projects and Implementation Strategy

The entire 2012 Plan mitigation strategy was reviewed and updated by the Planning Team. Specifics of the changes and updates are discussed in the subsections below.

6.1 Hazard Mitigation Strategy

An assessment of the 2012 Plan goals and objectives by the Planning Team was made with consideration of the following[26]:

- Do the goals and objectives identified in the 2012 Plan reflect the updated risk assessment?
- Did the goals and objectives identified in the 2012 Plan lead to mitigation projects and/or changes to policy that helped the jurisdiction(s) to reduce vulnerability?
- Do the goals and objectives identified in the 2012 Plan support any changes in mitigation priorities?
- Are the goals and objectives identified in the 2012 Plan reflective of current State goals?
- Do the goals and objectives still align with the updated 2013 State Plan?

As a conclusion to the discussions, the Planning Team chose to continue utilizing the 2012 Mitigation Strategy to help focus the identification and development of new Mitigation Actions / Projects for 2017. Objective 1 was also updated to better reflect its intention.

Elements of this Mitigation Strategy are:

Goal: Reduce or eliminate the risk to people and property for all hazards.

- Objective 1: Reduce or eliminate the long term risks from natural disasters to life and property in the incorporated and unincorporated jurisdictions within Cochise County.
- Objective 2: Reduce risk to critical facilities and infrastructure from all hazards.

[26] FEMA, 2008, *Local Multi-Hazard Mitigation Planning Guidance*

- Objective 3: Promote hazard mitigation throughout the incorporated and unincorporated jurisdictions within Cochise County.

- Objective 4: Increase public awareness of hazards and risks that threaten the incorporated and unincorporated jurisdictions within Cochise County.

It is noted that no jurisdictions chose to include any additional goals or objectives.

6.2 Capability Assessment

An important component of the Mitigation Strategy is a review of each participating jurisdiction's resources in order to identify, evaluate, and enhance the capacity of local resources to mitigate the effects of hazards. The capability assessment is comprised of several components:

- ✓ Legal and Regulatory Review – a review of the legal and regulatory capabilities, including ordinances, codes, plans, manuals, guidelines, and technical reports that address hazard mitigation activities.
- ✓ Technical Staff and Personnel – this assessment evaluated and describes the administrative and technical capacity of the jurisdiction's staff and personnel resources.
- ✓ Fiscal Capability – this element summarizes each jurisdiction's fiscal capability to provide the financial resources to implement the mitigation strategy.
- ✓ National Flood Insurance Program (NFIP) Participation – the NFIP contains specific regulatory measures that enable government officials to determine where and how growth occurs relative to flood hazards. Participation in the NFIP is voluntary for local governments, but the program is promoted by FEMA as a basic first step for implementing and sustaining an effective flood hazard mitigation program, and is a key indicator for measuring local capability as part of this assessment.
- ✓ Prior Mitigation Actions – the final part of the capability assessment is a summary review of prior mitigation actions and/or projects that have been completed over the last five or so years.

The Planning Team reviewed the information provided in the 2012 Plan and decided to simply review and update the content, with only minor edits to the table structures.

6.2.1 Jurisdictional Capabilities

The following Tables summarize the legal and regulatory mitigation capability for each participating jurisdiction. Three separate tables have been developed for each jurisdiction. The first Table includes a brief listing of current codes, mitigation relevant ordinances, plans, and studies/reports. The second respective Table for each jurisdiction summarize the staff and personnel resources employed by each jurisdiction that serve as a resource for hazard mitigation. Each jurisdiction's third and final Table summarize the fiscal capability and budgetary tools available to each participating jurisdiction. Each of these three tables are listed below by jurisdiction.

Since the last plan update in 2012, the county and its jurisdictions have seen a decrease in population. This lack of growth has meant that many of these local governments are functioning with the same if not less funding and staffing levels. The Planning Team did review all of the following information to ensure that it is accurate, but it should be noted that there were not many increases or improvements to mitigation capabilities since the last plan update.

In addition to local capabilities, there are other potential mitigation resources available to the county and it's jurisdictions. These could include, but are not limited to: Coronado National Forest, Arizona Parks, Customs and Boarder Protection, Fort Huachuca, Fry Fire, Palominas, and other unincorporated communities within Cochise.

Cochise County Unincorporated Areas

Table 6-1-1: Legal and regulatory capabilities for Cochise County		
Regulatory Tools for Hazard Mitigation	Description	Responsible Department/Agency
CODES	• 2012 International, Commercial Building, Mechanical, Plumbing, and Fire Codes • 20011 National Electrical Code • 2012 International Fuel Gas Code	Community Development Services, Planning & Zoning Division
ORDINANCES	• Cochise Co Zoning Ordinance adopted Jan 1975 per Resolution 74-28; revised June 2008, Resolution 08-31; revised July 2016, Resolution 16-02. • Cochise Co Subdivision Regulations, re-adopted June 04, Res# 04-41. Revised June 2008, per Resolution 08-45 • Floodplain Regulation for Cochise Co (Amended Feb 1, 2003) • Zoning Ordinance revised Nov 1984, Res 84-64; Nov 1999, Res 99-68; June 2008, Res 08-31; Nov 2011, Res 11-03, 11-04, 11-05.	Community Development Services, Planning & Zoning Division Community Development Services, Highway & Floodplain Division
PLANS, MANUALS, and/or GUIDELINES	• Site Plan Review Requirements - Administrative review required prior to issuance of building permits. • Cochise Co Comprehensive Plan adopted in 1984, revised in 1996 & amended in 2002; Revised in 2006. Amended and Readopted in 2015. Includes sections related to land use, water conservation and public facility goals & policies. • CIP - The Highway & Floodplain Division prepares its CIP for roadways and Flood Control Structures. This plan is updated every Fiscal Year. • Emergency Response & Recovery Plan • Road Design & Construction Standards & Specifications for Public Improvements, Adopted May 27, 2003, Revised Apr 4, 2005, Revised Oct 11, 2005 • Cochise Co Long-Range Strategic Plan (2001-2015), April 2011 • Residential Green Building Program, February 2009 • Subdivision Regulations, revised Jan 2007, Res 06-127; April 2008, Res 08-20; June 2008, Res 08-45. • Floodplain Regulations of Cochise Co, adopted 2002, amended December 5, 2015. • Cochise Co Hazardous Materials Response & Recovery Plan, 1991, Revised February 2015.	Community Development Services Department: Planning & Zoning Division; Highway and Floodplain Division Economic Development Division Emergency Services Division Cochise County Board of Supervisors
STUDIES	• Cochise County Water Assessment & Strategy for the Sierra Vista Sub-Watershed of the Upper San Pedro River: This assessment & strategy states the position of the Cochise County Board of Supervisors regarding the County's approach to water issues in the SV sub-watershed of the San Pedro River. (September, 2003) • 2016 and 2008 Digital Flood Insurance Rate Maps (D-FIRMS) by FEMA and utilized daily to analyze flood hazards	Cochise County Board of Supervisors; Upper San Pedro Partnership; Cochise County Flood Control District Community Development Services Department: Planning & Zoning Division and Highway & Floodplain Division

Table 6-2-1: Summary of technical staff and personnel capabilities for Cochise County	
Staff/Personnel Resources	Department/Agency - Position
Planner(s) or engineer(s) with knowledge of land development and land management practices	Planning & Zoning Dept – Planners
Engineer(s) or professional(s) trained in construction practices related to buildings and/or infrastructure	Highway & Floodplain Division – County Engineer & Staff Planning & Zoning Dept – Building Official & Inspectors
Planner(s) or engineer(s) with understanding of natural and/or human-caused hazards	Community Development Services Director & Staff Cochise County Board of Supervisors Office – Emergency Services Coordinator & Staff
Floodplain Manager	Highway & Floodplain Division – Floodplain Administrator
Surveyors	Highway & Floodplain Division – County Surveyor
Staff with education or expertise to assess the community's vulnerability to hazards	Community Development Services Director & Staff Cochise County Board of Supervisors Office – Emergency Services Coordinator & Staff
Personnel skilled in GIS and/or HAZUS	GIS Dept
Scientists familiar with the hazards of the community	Highway & Floodplain Division: County Engineer & Staff Availability of other agencies – NWS, NRCS, USGS, etc.
Emergency Manager	Cochise County Board of Supervisors Office – Emergency Services Coordinator
Grant writer(s)	Board of Supervisors Office - Community Relations/Grants Administrator

Table 6-3-1: Fiscal capabilities for Cochise County	
Financial Resources	Accessible or Eligible to Use (Yes, No, Don't Know)
Community Development Block Grants	Yes, but must apply for new grants
Capital Improvements Project funding	Yes
Authority to levee taxes for specific purposes	Yes
Fees for water, sewer, gas, or electric service	No, services are privately owned
Impact fees for homebuyers or new developments/homes	Yes, none are currently implemented
Incur debt through general obligation bonds	Yes, none in progress or in future plans
Incur debt through special tax bonds	Yes, none in progress or in future plans

Benson

Table 6-1-2: Legal and regulatory capabilities for Benson		
Regulatory Tools for Hazard Mitigation	Description	Responsible Department/Agency
CODES	• International Building Code, 2006 • Fire Codes 2006	Building /Fire Department
ORDINANCES	• Flood Damage Prevention (Chapter 17 of City Code established by Ordinance No. 305) • Drainage Planning (§14-6 of City Code as modified by Ordinance No. 355)	Building/Fire Department
PLANS, MANUALS, and/or GUIDELINES	• General Development Plan: State-mandated document covering growth and development in Benson. Adopted every 10 years, reviewed every year, updated 2011 – map change. • Capital Improvement Plan –updated yearly • Economic Development Plan – 2007 Economic Development subcommittee was formed to provide clear direction for Benson's economic development future. • Airport Master Plan – Adopted 2002-completed 2007 • Small Area Transportation Plan (underway) • NW Cochise County Transportation Plan, updated 2010 • Subdivision Street Standards – in process • Floodplain Regulations for Cochise County, Arizona - promotes public health, safety and general welfare by reducing threats caused by stormwaters, amended February 1, 2003.	GDP -Planning and Zoning CIP – Finance Economic Development – Economic Development Subcommittee AMP – Public Works NWCTP – Public Works SSS – Public Works FP – City of Benson Flood Plain Management responsibility accepted by Cochise County PW.
STUDIES	• Drainage Study – CDBG project 106-11	Public Works

Table 6-2-2: Technical staff and personnel capabilities for Benson	
Staff/Personnel Resources	Department/Agency - Position
Planner(s) or engineer(s) with knowledge of land development and land management practices	COB Public Works – City Engineer
Engineer(s) or professional(s) trained in construction practices related to buildings and/or infrastructure	COB Public Works – City Engineer
Planner(s) or engineer(s) with understanding of natural and/or human-caused hazards	COB Public Works – City Engineer
Floodplain Manager	Cochise County has a full-time one.
Surveyors	Contracted as needed
Staff with education or expertise to assess the community's vulnerability to hazards	Police & Fire Chiefs
Personnel skilled in GIS and/or HAZUS	GIS Manager on staff
Scientists familiar with the hazards of the community	
Emergency Manager	Fire Chief
Grant writer(s)	Public Works, City Manager

Table 6-3-2: Fiscal capabilities for Benson	
Financial Resources	Accessible or Eligible to Use (Yes, No, Don't Know)
Community Development Block Grants	Yes. We apply for them every 2 years.
Capital Improvements Project funding	Yes
Authority to levee taxes for specific purposes	Yes, haven't implemented
Fees for water, sewer, gas, or electric service	Yes, Natural Gas, Water, Sewer, and Garbage
Impact fees for homebuyers or new developments/homes	Yes, currently Chapter 16 of City code. Will be reviewed per State Statue
Incur debt through general obligation bonds	Yes, 2010
Incur debt through special tax bonds	Yes, haven't implemented

Bisbee

Table 6-1-3: Legal and regulatory capabilities for Bisbee		
Regulatory Tools for Hazard Mitigation	Description	Responsible Department/Agency
CODES	• Uniform Building Code - Bisbee, Res # R-94-50. Codes Adopted: o 2002 National Electric Code o 1997 Uniform Building Code o 1997 Uniform Fire Code o 1997 Uniform Plumbing Code • 1997 Mechanical Code	Community Development Fire Department
ORDINANCES	• Zoning Ord #0-72-2 and 0-84-138 and Res #R-84-235 • Subdivision Code adopted 12-17-85 Ord 0-85-177 • Floodplain Regulations for Cochise Co (Amended Feb 2003) • Post-Disaster Recovery Ordinance	Community Development
PLANS, MANUALS, and/or GUIDELINES	• Site Plan Review Requirements • Bisbee General Plan Oct 2003 • Bisbee Municipal Airport Master Plan: The plan specifies design standards and airport safety measures (1999). • USPP-2005 Water Management and Conservation Plan: Provides information on the Upper San Pedro Partnership's water management and conservation efforts since the release of last year's Plan (March 2005). • Cochise Co Road Construction Standards and Specifications: Standardizes engineering design guidelines for roadway design elements in Cochise Co.	Community Development Public Works
STUDIES	• N/A	N/A

Table 6-2-3: Technical staff and personnel capabilities for Bisbee	
Staff/Personnel Resources	Department/Agency - Position
Planner(s) or engineer(s) with knowledge of land development and land management practices	Public Works - Superintendent
Engineer(s) or professional(s) trained in construction practices related to buildings and/or infrastructure	Community Development, Building Inspector Public Works, Director and Superintendent
Planner(s) or engineer(s) with and understanding of natural and/or human-caused hazards	Public Works, Director and Superintendent
Floodplain Manager	Cochise Co Highway & Floodplain and Board of Supervisors
Staff with education or expertise to assess the community's vulnerability to hazards	Police Chief; Fire Chief; Public Works, Director and Superintendent
Personnel skilled in GIS and/or HAZUS	Public Works
Emergency Manager	City Manager
Grant writer(s)	Assistant City Manager
Planner(s) or engineer(s) with knowledge of land development and land management practices	Public Works - Superintendent
Engineer(s) or professional(s) trained in construction practices related to buildings and/or infrastructure	Community Development, Building Inspector Public Works, Director and Superintendent

Table 6-3-3: Fiscal capabilities for Bisbee	
Financial Resources	Accessible or Eligible to Use (Yes, No, Don't Know)
Community Development Block Grants	Yes
Capital Improvements Project funding	Don't Know
Authority to levy taxes for specific purposes	Yes
Fees for water, sewer, gas, or electric service	Yes, Sewer and Garbage
Impact fees for homebuyers or new developments/homes	No
Incur debt through general obligation bonds	Yes
Incur debt through special tax bonds	Yes

Douglas

Table 6-1-4: Legal and regulatory capabilities for Douglas		
Regulatory Tools for Hazard Mitigation	Description	Responsible Department/Agency
CODES	• Uniform Building Code, 1997 Edition	Dept of Public Works, Building Safety Division
ORDINANCES	• Special Purpose Ordinance: Flood Hazard Control - Chapter 15.20 of the City Code	Dept of Public Works, Engineering Division
PLANS, MANUALS, and/or GUIDELINES	• Douglas General Plan April, 2002 • Douglas Municipal Airport Master Plan Update: Plan specifying design standards and airport safety measures. (Nov 1994) • Water Master Plan: The Water Supply Master Plan outlines the City's options and strategies for meeting future water demands and provides stages and phasing for capital improvements related to the water supply system's infrastructure needs. (Aug 1996) • Drainage Master Plan: Drainage master plan and CIP. (Sept 2002) • Emergency Operations Plan • Douglas Strategic Plan 2004-2009: Outlines the City's mission and goals, examine the organization's strengths, weaknesses, opportunities and threats, outline a map for the organization to follow. (2004) • Cochise Co Road Construction Standards and Specifications: Standardizes engineering design guidelines for roadway design elements in Cochise Co. (Apr 2005)	Dept of Public Works, Planning & Zoning And Engineering Divisions.
STUDIES	• Drainage Report: Drainage improvements. (1976)	Department of Public Works, Engineering Division

Table 6-2-4: Technical staff and personnel capabilities for Douglas	
Staff/Personnel Resources	Department/Agency - Position
Planner(s) or engineer(s) with knowledge of land development and land management practices	Public Works – Director City Engineer
Engineer(s) or professional(s) trained in construction practices related to buildings and/or infrastructure	Public Works – Director City Engineer
Planner(s) or engineer(s) with understanding of natural and/or human-caused hazards	Public Works – Director City Engineer
Floodplain Manager	Public Works – Director City Engineer
Surveyors	Consultant Contract
Staff with education or expertise to assess the community's vulnerability to hazards	Public Works – Director City Engineer
Personnel skilled in GIS and/or HAZUS	Public Works – Director City Engineer
Scientists familiar with the hazards of the community	Consultant Contract
Emergency Manager	Fire Dept, Fire Chief; Police Dept – Police Chief
Grant writer(s)	Neighborhoods Housing/Grants-Director
Others	Public Works – Director City Engineer

Table 6-3-4: Fiscal capabilities for Douglas	
Financial Resources	Accessible or Eligible to Use (Yes, No, Don't Know)
Community Development Block Grants	Yes
Capital Improvements Project funding	Yes
Authority to levee taxes for specific purposes	Yes
Fees for water, sewer, gas, or electric service	Yes
Impact fees for homebuyers or new developments/homes	Yes
Incur debt through general obligation bonds	Yes
Incur debt through special tax bonds	Yes
Other	Yes, Various grants and incur debt through private activity bonds.

Huachuca City

Table 6-1-5: Legal and regulatory capabilities for Huachuca City		
Regulatory Tools for Hazard Mitigation	Description	Responsible Department/Agency
CODES	• 2012 International Bldg Code • 2012 International Fire • 2012 International Residential Code • 2014 National Electrical Code • 2012International Existing Bldg Code with amendments • 2012 International Property Maintenance • Res 2014 Residential Anti displacement & Relocation Assistance	Code Official Fire Department Town Manager/Town Clerk
ORDINANCES	• Zoning Ordinance (Title 17 of City Code) • Subdivision Ordinance (Title 16 of City Code – Large Scale Development) • 2012 Fire, Building and Construction	Code Official Town Clerk Fire Chief
PLANS, MANUALS, and/or GUIDELINES	• Huachuca General Plan (2016) • Emergency Response Plan (2007)	All Departments
STUDIES	• Resolution 2016-12 Flood Insurance Study	Code Official

Table 6-2-5: Technical staff and personnel capabilities for Huachuca City	
Staff/Personnel Resources	Department/Agency - Position
Planner(s) or engineer(s) with knowledge of land development and land management practices	Development services Planning and Zoning Commission
Engineer(s) or professional(s) trained in construction practices related to buildings and/or infrastructure	Code Official/Engineer Public Works Department
Planner(s) or engineer(s) with understanding of natural and/or human-caused hazards	Code Official/Engineer Police Department Public Works Department
Floodplain Manager	Development Services
Surveyors	Public Works Department
Staff with education or expertise to assess the community's vulnerability to hazards	Planning & Zoning Commission Public Works Department Police Department
Personnel skilled in GIS and/or HAZUS	Code Official/Engineer
Scientists familiar with the hazards of the community	
Emergency Manager	Police Department Public Works Department City Manager
Grant writer(s)	Director of Library Services

Table 6-3-5: Fiscal capabilities for Huachuca City	
Financial Resources	Accessible or Eligible to Use (Yes, No, Don't Know)
Community Development Block Grants	Yes, CDBG Block Grant 2016 Water infrastructure Improvements
Capital Improvements Project funding	Yes
Authority to levee taxes for specific purposes	No
Fees for water, sewer, gas, or electric service	Yes, Water, Sewer, Refuse, Refuse Collection
Impact fees for homebuyers or new developments/homes	No
Incur debt through general obligation bonds	Yes
Incur debt through special tax bonds	No

Sierra Vista

Table 6-1-6: Legal and regulatory capabilities for Sierra Vista		
Regulatory Tools for Hazard Mitigation	Description	Responsible Department/Agency
CODES	• 2011 International Building Code (with the following adds) ✓ Basic wind speed-90 mph (3-second gust) ✓ Seismic Design Category - B ✓ Exposure – C ✓ Live load – 20lb ✓ Rainfall – 3 inches per hour ✓ Ground snow load – 5 lbs ✓ Weathering – Negligible ✓ Frost line depth – 0 ✓ Termite – very heavy ✓ Decay – None to slight ✓ Winter design temperature – 18-20 degrees ✓ Flood hazards – (a) May 1984 & (b) June 2001 • 2006 International Existing Building Code • 2006 International Residential Code • 2006 International Plumbing Code • 2006 International Mechanical Code • 2006 International Fuel Gas Code • 2006 International Fire Code including Appendix B • 2006 International Energy Conservation Code • 2006 International Property Maintenance Code • 2011 National Electrical Code • 1997 Uniform Code for the Abatement of Dangerous Buildings	• Department of Community Development/Building Inspections Division • Fire Department
ORDINANCES	• City of Sierra Vista Code of Ordinances (updated annually)	• City Clerk's Office
PLANS, MANUALS, and/or GUIDELINES	• Vista 2020 General Plan: A general plan to establish goals and strategies for future growth and management in such areas as land use, environment, transportation, public services, etc., and to provide a basis for development regulations and project funding. • Development Code (continuous updates) • Emergency Response and Recovery Plan: Sierra Vista operation plan for all-hazard emergencies. (2008) • Sierra Vista Municipal Airport Master Plan: a plan specifying design standards and airport safety measures. (2002) • USPP-2005 Water Management and Conservation Plan: provides information on the Upper San Pedro Partnership's water management and conservation efforts since the release of last year's Plan. (March 9, 2005) • Surface Water Plan (1988 – New plan currently underway) • Wastewater Management and Sewerage Master Plan (1999). • 208 Water Quality Management Plan with Amendments (2010) • Sierra Vista Public Transit System Three-Year Transit Plan Update (2009)	• Department of Community Development/Building Inspections Division • Fire Department • Police Department • Public Works Department

Table 6-1-6: Legal and regulatory capabilities for Sierra Vista		
Regulatory Tools for Hazard Mitigation	Description	Responsible Department/Agency
STUDIES	• Flood Insurance Study for Sierra Vista, Cochise County, AZ: Flood study administered by FEMA to define special flood hazard zones per requirements of the National Flood Insurance Program. (April 2, 2008) • Flood Insurance Rate Maps (DFIRMs) for Sierra Vista, Cochise County, AZ: Maps depicting special flood hazard areas within the city boundaries. (April 2, 2008)	• Public Works Department

Table 6-2-6: Technical staff and personnel capabilities for Sierra Vista	
Staff/Personnel Resources	Department/Agency - Position
Planner(s) or engineer(s) with knowledge of land development and land management practices	Public Works – Director, City Engineer, Engineering Services Division Staff Community Development – Planning Division Staff
Engineer(s) or professional(s) trained in construction practices related to buildings and/or infrastructure	Public Works – Director, City Engineer, Engineering Services Division Staff Community Development – Building Inspections Division Staff
Planner(s) or engineer(s) with understanding of natural and/or human-caused hazards	Public Works – Director, City Engineer, Engineering Services Division Staff Community Development – Planning Division Staff
Floodplain Manager	Community Development - Director
Surveyors	Public Works –Engineering Services Division
Staff with education or expertise to assess the community's vulnerability to hazards	Public Works – Director, City Engineer, Engineering Services Division Staff Community Development – Planning Division Staff Fire Department -
Personnel skilled in GIS and/or HAZUS	Community Development – Planning Division Staff Public Works –Engineering Services Division
Scientists familiar with the hazards of the community	Public Works –Engineering Services Division Community Development – Planning Division Staff
Emergency Manager	
Grant writer(s)	Grant writing performed by department

Table 6-3-6: Fiscal capabilities for Sierra Vista	
Financial Resources	Accessible or Eligible to Use (Yes, No, Don't Know)
Community Development Block Grants	Yes. CDBG 2016 was primarily used to improve sidewalks and install street lights.
Capital Improvements Project funding	Yes
Authority to levee taxes for specific purposes	No, however, County has a flood control district tax
Fees for water, sewer, gas, or electric service	Yes, Sewer and Refuse Only
Impact fees for homebuyers or new developments/homes	Yes
Incur debt through general obligation bonds	Yes

Incur debt through special tax bonds	Yes

Tombstone

Table 6-1-7: Legal and regulatory capabilities for Tombstone		
Regulatory Tools for Hazard Mitigation	Description	Responsible Department/Agency
CODES	• City Code Title 3 • 2006 International Building Code • 2006 Uniform Fire Code (NFPA 1) • 2006 International Property Maintenance Code • 1988 National Electrical Code (NFPA 72) • 1988 Uniform Mechanical Code • 1988 Uniform Plumbing Code	Public Works Building Inspector Fire Department
ORDINANCES	• Zoning Ordinance adopted in 1994 • Flood Damage Prevention (Title 3, Chapter 3 of City Code)	Planning & Zoning Commission
PLANS, MANUALS, and/or GUIDELINES	• Tombstone Master Plan (Title 12 of City Code) • Emergency Response Plan (1997) • Capital Improvements Plan (2014)	Planning & Zoning Commission Fire Dept
STUDIES	• Groundwater and the Benson, Oct 2000	Public Works / Water Dept

Table 6-2-7: Technical staff and personnel capabilities for Tombstone	
Staff/Personnel Resources	Department/Agency - Position
Planner(s) or engineer(s) with knowledge of land development and land management practices	Public Works – Building Inspector
Engineer(s) or professional(s) trained in construction practices related to buildings and/or infrastructure	Public Works – Building Inspector
Planner(s) or engineer(s) with and understanding of natural and/or human-caused hazards	Public Works, Fire Dept., & Marshal's Office
Floodplain Manager	Cochise County has a full-time one.
Surveyors	Contracted as needed
Staff with education or expertise to assess the community's vulnerability to hazards	Public Works, Marshal's Office & Fire Dept.
Personnel skilled in GIS and/or HAZUS	Assistance provided by Cochise County
Scientists familiar with the hazards of the community	N/A
Emergency Manager	Fire Dept. – Fire Chief Marshal's Dept. - Marshal
Grant writer(s)	Grant writing performed by department

Table 6-3-7: Fiscal capabilities for Tombstone	
Financial Resources	Accessible or Eligible to Use (Yes, No, Don't Know)
Community Development Block Grants	Yes
Capital Improvements Project funding	Yes
Authority to levy taxes for specific purposes	Yes
Fees for water, sewer, gas, or electric service	Yes, Water and sewer
Impact fees for homebuyers or new developments/homes	Yes
Incur debt through general obligation bonds	Yes
Incur debt through special tax bonds	Yes

Willcox

Table 6-1-8: Legal and regulatory capabilities for Willcox		
Regulatory Tools for Hazard Mitigation	Description	Responsible Department/Agency
CODES	• City of Willcox City Code • 2003 international building code	Development Services
ORDINANCES	• Zoning Ordinance (Title 17 of City Code) • Subdivision Ordinance (Title 16 of City Code – Large Scale Development)	Development Services Planning & Zoning Commission
PLANS, MANUALS, and/or GUIDELINES	• Willcox General Plan (2016) • City of Willcox Multi-Hazard Mitigation Plan (2006 – Never adopted by council or approved by FEMA). • Emergency Response Plan (2015)	City Manager Police Department Public Works Department
STUDIES	• N/A	N/A

Table 6-2-8: Technical staff and personnel capabilities for Willcox	
Staff/Personnel Resources	Department/Agency - Position
Planner(s) or engineer(s) with knowledge of land development and land management practices	Development services
Engineer(s) or professional(s) trained in construction practices related to buildings and/or infrastructure	Public Works Director Public Works Department
Planner(s) or engineer(s) with understanding of natural and/or human-caused hazards	Development Services Police Department Public Works Department
Floodplain Manager	Development Services
Surveyors	Public Works Department
Staff with education or expertise to assess the community's vulnerability to hazards	Planning & Zoning Commission Public Works Department Police Department
Personnel skilled in GIS and/or HAZUS	
Scientists familiar with the hazards of the community	
Emergency Manager	Police Department Public Works Department City Manager
Grant writer(s)	N/A

Table 6-3-8: Fiscal capabilities for Willcox	
Financial Resources	Accessible or Eligible to Use (Yes, No, Don't Know)
Community Development Block Grants	Yes
Capital Improvements Project funding	Yes
Authority to levee taxes for specific purposes	Yes
Fees for water, sewer, gas, or electric service	Yes, water, sewer, gas, and refuse
Impact fees for homebuyers or new developments/homes	No
Incur debt through general obligation bonds	Yes
Incur debt through special tax bonds	Yes

6.2.2 Historical Mitigation Activities

The Table in Appendix D provides an updated summary, by jurisdiction, of historical mitigation activities completed over previous planning cycles. This section will continue to serve as a record of mitigation successes for the county and its jurisdictions. As part of each Plan update, completed mitigation activities from the previous Plan's (in this case the 2007 A/Ps), will be migrated into this Appendix.

The City of Bisbee is the only participating jurisdiction to receive funding for a project through federal hazard mitigation grant money such as FMA, HMGP, or PDM. In 2001, the city received HMGP funds from the 1993 flooding disaster (FEMA-977-DR) to provide flood proofing of a retaining wall along Brewery Gulch Road, storm drain rehabilitation and structural augmentation for the Mule Gulch drainage channel, stormwater management and slope stabilization for the High Road retaining wall, and stormwater management for the Brooks Apartment drainage system. The total project costs for all four areas amounted to $787,390. Cochise County jurisdictions have also benefitted from PDM funds procured by DEMA for the development of the 2007, 2012, and 2017 hazard mitigation plans.

6.2.3 *National Flood Insurance Program Participation*

Participation in the NFIP is a key element of any community's local floodplain management and flood mitigation strategy. Cochise County and the seven other incorporated jurisdictions participate in the NFIP. Joining the NFIP requires the adoption of a floodplain management ordinance that requires jurisdictions to follow established minimum standards set forth by FEMA and the State of Arizona, when developing in the floodplain. These standards require that all new buildings and substantial improvements to existing buildings will be protected from damage by the 100-year flood, and that new floodplain development will not aggravate existing flood problems or increase damage to other properties. As a participant in the NFIP, communities also benefit from having Flood Insurance Rate Maps (FIRM) that map identified flood hazard areas and can be used to assess flood hazard risk, regulate construction practices, and set flood insurance rates. FIRMs are also an important source of information to educate residents, government officials, and the private sector about the likelihood of flooding in their community. The following Table summarizes the NFIP status and statistics for each of the jurisdictions participating in this Plan.

Table 6-5: NFIP status and statistics for Cochise County and participating jurisdictions as of November 2016

Jurisdiction	Community ID	NFIP Entry Date	Current Effective Map Date	Number of Policies	Amount of Coverage (x $1,000)	Floodplain Management Role
Cochise County	040012	12/4/1984	10/20/16	656	$119,501	Provides floodplain management for the Unincorporated County and assistance to other jurisdictions as needed
Benson	040013	6/25/1976	2/3/2016	7	$1,695	Benson provides floodplain management for the incorporated areas of the city
Bisbee	040014	1/3/1979	8/16/2006	104	$14,760	Cochise County provides floodplain management for the city
Douglas	040015	9/29/1978	10/20/16	99	$15,995	Douglas provides floodplain management for the incorporated areas of the city
Huachuca City	040016	2/14/1976	8/28/2008	34	$3,504	Cochise County provides floodplain management for the city
Sierra Vista	040017	9/28/1984	2/3/2016	100	$23,614	Sierra Vista provides floodplain management for the incorporated areas of the city
Tombstone	040106	2/16/1983	8/28/2008	N/A	N/A	Cochise County provides floodplain management for the city
Willcox	040018	7/17/1978	8/28/2008	318	$51,087	Willcox provides floodplain management for the incorporated areas of the city

Source: FEMA Community Status Report (2016)

6.3 Mitigation Actions / Projects and Implementation Strategy

Mitigation actions / projects (A/P) are those activities identified by a jurisdiction, that when implemented, will have the effect of reducing the community's exposure and risk to the particular hazard or hazards being mitigated against. The implementation strategy addresses the "*how, when, and by whom?*" questions related to implementing an identified A/P.

The process for defining the list of mitigation A/Ps for the Plan was accomplished in three steps. First, an assessment of the actions and projects specified in Section 6 of the 2012 Plan was performed, wherein each jurisdiction reviewed and evaluated their jurisdiction specific list. Second, a new list of A/Ps for the updated Plan was developed by combining the carry forward results from the assessment with new identified A/Ps. Third, an implementation strategy for the combined list of A/Ps was formulated. Details of each step and the results of the process are summarized in the following sections.

6.3.1 Past Plan Mitigation Actions/Projects Assessment

Each jurisdiction reviewed and assessed the actions and projects identified in the 2012 Plan. The assessment included evaluating and classifying each of the previously identified A/Ps based on the following criteria:

- Complete
- Ongoing
- In Process
- Deferred
- Cancelled / No Longer Applicable

Any A/P with a status of Ongoing, In Process, or Deferred was carried forward to become part of the A/P list for the 2017 Plan. Any A/Ps that were either Completed or Cancelled have been moved to Appendix D (those moved from the A/P list from the 2012 Plan have the last cell highlighted in grey), for continued tracking of mitigation successes and projects that jurisdictions may want to revisit in the future.

6.3.2 New Mitigation Actions / Projects and Implementation Strategy

Upon completion of the assessment summarized in Section 6.3.1, each jurisdiction developed new A/Ps in conjunction with the updated mitigation strategy, results of the vulnerability analysis and capability assessment, public survey results, and the planning team's institutional knowledge of hazard mitigation needs in the community

For each A/P, the following elements were identified:

- ID – a unique alpha-numeric identification number for the A/P.
- Mitigation Action / Project Description – a brief description of the A/P including a supporting statement that tells the "what" and "why" reason for the A/P.
- Hazard(s) Mitigated – a list of the hazard or hazards mitigated by the A/P.
- Estimated Costs – concept level cost estimates that may be a dollar amount or estimated as staff time.
- Priority Ranking – unless otherwise noted below, each A/P was assigned a priority ranking of either "High", "Medium", or "Low".
- Primary Agency / Job Title Responsible for Implementation –the agency, department, office, or other entity and corresponding job title that will have responsibility for the A/P and its implementation.

- **Summary** – Any additional notes or information.

Once the full list of A/Ps was identified, jurisdictions were then asked to help to prioritize each A/P. During the final Mitigation Strategy Workshop, Planning Team members were presented with ideas and tools relating to A/P prioritization. FEMA's STAPLEE method was included in these discussions, as was the need to ensure A/P costs versus benefits were taken into account when prioritizing the new A/Ps.

After Planning Team discussions about the pros and cons on various methods, it was decided that a simple priority ranking of either "High", "Medium", or "Low" would be utilized. The assignments were subjectively made using a simple process that assessed how well the A/P satisfied the following considerations:

- A favorable benefit versus cost evaluation, wherein the perceived direct and indirect benefits outweighed the project cost.
- A direct beneficial impact on the ability to protect life and/or property from natural hazards.
- A mitigation solution with a long-term effectiveness

Tables 6-6 at the end of this section lists all A/Ps identified by the Planning Team to be included in this 2017 Plan update.

6.3.3 Potential Funding Sources

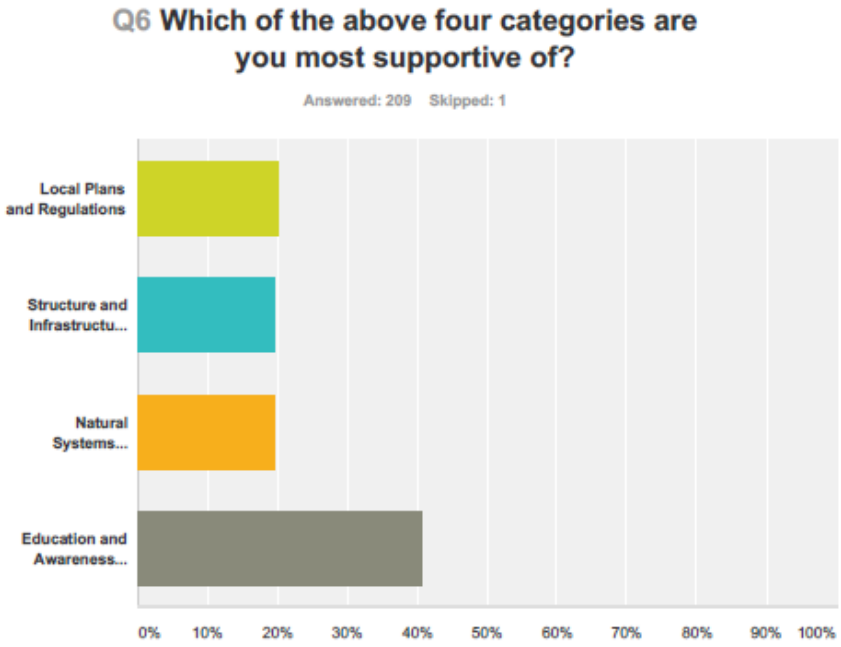
The following information relates to potential mitigation project funding sources to be evaluated by the plan's participating jurisdictions:

Hazard Mitigation Grant Program
POC: FEMA Region IX and State Hazard Mitigation Officer
Website: https://www.fema.gov/hazard-mitigation-grant-program
Pre-Disaster Mitigation Grant Program
POC: FEMA Region IX and State Hazard Mitigation Officer
Website: https://www.fema.gov/pre-disaster-mitigation-grant-program
Flood Mitigation Assistance Grant Program
POC: FEMA Region IX and State Hazard Mitigation Officer
Website: https://www.fema.gov/flood-mitigation-assistance-grant-program
Emergency Management Performance Grant Program
POC: FEMA Region IX
Website: https://www.fema.gov/emergency-management-performance-grant-program

6.3.4 Public Opinion on Mitigation Strategy

As mentioned in Section 4, the public was asked to weigh in on the subject of Mitigation Actions / Projects as part of this 2017 planning process. A total of 210 individual surveys were completed by residents of all participating jurisdictions. In addition to asked about preferred types of mitigation A/Ps, the survey also requested any specific A/P ideas. A total of 39 specific ideas were collected from the public. The full summary results of the survey can be found in Appendix C. These results were also provided to the Planning Team for consideration as they updated their jurisdictional A/P lists for 2017.

The main take-away from the public survey results was that a majority of survey participants preferred mitigation projects focused on Education and Awareness. That mitigation category was the preferred mitigation category to both: Local Plans and Regulations, Structure and Infrastructure Projects, and Natural Systems Protection by a two to one (2:1) margin.



Answer Choices	Responses	
Local Plans and Regulations	20.10%	42
Structure and Infrastructure Projects	19.62%	41
Natural Systems Protection	19.62%	41
Education and Awareness Programs	40.67%	85
Total		209

Figure 6.1. Public Survey Sample Result

Table 6-6: 2017 Mitigation Actions / Projects

ID	Mitigation Action/Project Description	Jurisdiction	Hazard(s) Mitigated	Estimated Cost	Priority Ranking	Anticipated Completion Date	Primary Agency / Job Title Responsible for Implementation	Status	Summary
2012-24	Drainage Study and Mapping of City Flood Plains. Floodplain mapping will be compliant with NFIP requirements.	Benson	Flooding	$150,000	High	2020	Public Works	In Process	NFIP Compliance, Funds not available
2012-25	Obtain and place signage and barricades at wash crossings within the city to reduce loss of life and property damage due to vehicular crossing of flooded washes.	Benson	Flooding	$100,000	High	2019	Public Works	In Process	Funds not available at this time
2012-26	Continue to enforce zoning and building codes through current site plan, subdivision, and building permit review processes to reduce the effects of drought, flood, severe wind, and other hazards on new buildings and infrastructure.	Benson	All	$10,000	Medium	2017	Development Services	Ongoing	Completed as plans are submitted
2012-27	Enforcement program to enforce recently added provisions to City building codes to address building settlement and collapse problems.	Benson	Building Collapse / Mine Subsidence	$10,000	Medium	2020	Development Services	Ongoing	

Table 6-6: 2017 Mitigation Actions / Projects

ID	Mitigation Action/Project Description	Jurisdiction	Hazard(s) Mitigated	Estimated Cost	Priority Ranking	Anticipated Completion Date	Primary Agency / Job Title Responsible for Implementation	Status	Summary
2012-28	Expand and maintain the City's Fire Wise programs for all communities, neighborhoods and home owners associations within the wildland fire/urban interface including instruction materials, facilitating partnerships with insurance agencies, clean-up crew programs.	Benson	Wildfire	$7,000	Low	2020	Fire/BLM	Ongoing	Funds not available
2012-30	Union Street Wash Crossing Improve existing culvert crossing to provide additional capacity to provide improved access to the only access to neighborhood area in times of flooding.	Benson	Flooding	$100,000	Low	2021	Public Works	Deferred	Lack of Funding
2017-1	Establish interconnection of Whetstone and Benson water system for reliability	Benson	Drought	$350,000	Medium	2019	Public Works	New	

Table 6-6: 2017 Mitigation Actions / Projects

ID	Mitigation Action/Project Description	Jurisdiction	Hazard(s) Mitigated	Estimated Cost	Priority Ranking	Anticipated Completion Date	Primary Agency / Job Title Responsible for Implementation	Status	Summary
2017-2	Improve drainage System on Northwest side of Benson at river to increase capacity	Benson	Flooding	$500,000	Medium	2021	Public Works	New	
2017-3	Obtain brush chipper to help reduce fuel in the city limits	Benson	Wildfire	150,000	low	2020	Public Works	New	
2012-31	Improvement and/or replacement of numerous bridge/culvert crossings of Mule Gulch Drainage Channel.	Bisbee	Flooding	$1 million	High	2022	Public Works / Director	In Process	
2012-32	Develop a drought mitigation plan for Bisbee as guided by the Governor's Drought Mitigation Task Force.	Bisbee	Drought	$15,000	High	2022	Public Works / DirectorFire Department / Fire Chief	In Process	
2012-33	Construction of bank stabilization and culvert improvements along 1/4 mile long reach of Santa Cruz Wash in southwest Bisbee.	Bisbee	Flooding	$1.3 million	High	2022	Public Works / Director	In Process	
2012-34	Rehabilitation, capacity expansion and cleaning of 1.5 mile long channel through Tombstone Canyon in Old Bisbee as a part of the Mule Gulch Drainage Project.	Bisbee	Flooding	$12 million	High	2022	Public Works / Director	In Process	

Table 6-6: 2017 Mitigation Actions / Projects									
ID	Mitigation Action/Project Description	Jurisdiction	Hazard(s) Mitigated	Estimated Cost	Priority Ranking	Anticipated Completion Date	Primary Agency / Job Title Responsible for Implementation	Status	Summary
2012-35	Perform an evaluation of City Hall, Library, Museum, Senior Center and Pump House buildings and infrastructure to determine infrastructure repair/replacement/maintenance needs.	Bisbee	Building Collapse, Flood	$75,000 per building	Medium	2022	Community Development / Director	In Process	
2012-36	Continue to enforce zoning and building codes through current site plan, subdivision, and building permit review processes to reduce the effects of drought, flood, severe wind, and other hazards on new buildings and infrastructure.	Bisbee	Drought, Flood, Severe Wind	Staff Time	Medium	2022	Community Development / Public Works Director	Ongoing	Annually
2012-37	Maintain current IGA with Cochise County Flood Control District to provide floodplain management services and review per the requirements of the NFIP and the City's floodplain ordinance.	Bisbee	Flooding	$30,000 for a 5 year period	Medium	2022	Public Works / Director	Ongoing	

Table 6-6: 2017 Mitigation Actions / Projects

ID	Mitigation Action/Project Description	Jurisdiction	Hazard(s) Mitigated	Estimated Cost	Priority Ranking	Anticipated Completion Date	Primary Agency / Job Title Responsible for Implementation	Status	Summary
2012-38	Purchase equipment to meet international border and associated terrorism related law enforcement needs including: vehicles, computers, in-car cameras, radios.	Bisbee	Border Security, Terrorism	$150,000 per year	Medium	2022	Police Department / Chief	Ongoing	
2012-39	Review existing City of Bisbee building codes for inclusion of provisions for addressing wildfire hazards to existing and future structures, and revise as needed.	Bisbee	Wildfire	Staff Time	Low	2021	Fire Department / Chief	Deferred	
2017-4	GIS Mapping for Fissures	Bisbee	Fissure	15000	High	2022	City Engineering	New	Phase 1 in progress
2017-5	Mule Gulch Rehabilitation This is a drainage channel that runs through the entire length of downtown Bisbee. Sections of the retaining walls require	Bisbee	Flooding	Staff Time	High	2022	City Streets Dept	New	50% complete

Table 6-6: 2017 Mitigation Actions / Projects									
ID	Mitigation Action/Project Description	Jurisdiction	Hazard(s) Mitigated	Estimated Cost	Priority Ranking	Anticipated Completion Date	Primary Agency / Job Title Responsible for Implementation	Status	Summary
	re-engineering and replacement								
2017-6	Earthquake: public awareness and planning project to identify high-risk populations and educate population on earthquake resistant modifications they can make to their homes or businesses.	Bisbee	Earthquake	Staff Time	High	2022	Public Works	New	Public awareness meeting begin July 10,2017
2017-7	Building collapse due to mine settling: identify locations and neighborhoods of existing mine tunnels and analyze potential damage and mitigation options.	Bisbee	Building Collapse / Mine Subsidence	1.5 M	High	2025	Public Works /Freeport McMoran	New	
2012-1	Support part-time road crew to perform roadside wildfire hazard fuel reduction along county roads.	Cochise County	Wildfire	$350,000	High	Annually 2022	Highway & Floodplain Division-Director	Ongoing	Ongoing annual effort. Weed and grass control is a regular part of the routine maintenance performed by the County.

Table 6-6: 2017 Mitigation Actions / Projects

ID	Mitigation Action/Project Description	Jurisdiction	Hazard(s) Mitigated	Estimated Cost	Priority Ranking	Anticipated Completion Date	Primary Agency / Job Title Responsible for Implementation	Status	Summary
2012-2	Identify and map new flood hazard areas and update existing mapping in accordance with FEMA & NFIP requirements.	Cochise County	Flooding	$1,000,000	High	2022	Highway & Floodplain Division-Director	Ongoing	Richland Ranchettes, St.David, N of Benson and 4 watersheds in Sierra Vista area mapped or remapped. Next Re-mapping Effective Map Date Feb. 3rd, 2016
2012-3	Construction of flood control improvements to address flooding that affects development in Hereford area.	Cochise County	Flooding	$5,000,000	High	2019	Highway & Floodplain Division-Director	In Process	Projects completed in Stump Canyon & Ash Canyon. Stone Ridge design & Arabian design complete. Design complete. Awaiting funding for Arabian.
2012-4	Install additional in stream, weather, and precipitation gauges in watersheds impacting Cochise County, particularly the eastern part of the county. Scope will include website development and	Cochise County	Flooding	$500,000	High	2020	Highway & Floodplain Division-Director	In Process	13 Installed. Propose 2 per FY.

Table 6-6: 2017 Mitigation Actions / Projects									
ID	Mitigation Action/Project Description	Jurisdiction	Hazard(s) Mitigated	Estimated Cost	Priority Ranking	Anticipated Completion Date	Primary Agency / Job Title Responsible for Implementation	Status	Summary
	remote dial up for public agencies.								
2012-5	Install road signage warning motorists of possible fissure activity in elevated fissure risk areas.	Cochise County	Fissure	$5,000	High	Annually 2022	Highway & Floodplain Division-Director	Ongoing	As needed.
2012-6	Continue to partner with AZGS to collect and monitor subsidence satellite data for Cochise County for the purpose of identifying potential hazard areas.	Cochise County	Subsidence, Fissure, Flood	$10,000 per year	High	Annually 2022	Highway & Floodplain Division-Director	Ongoing	FCD Board continues to fund annually $10K for support for satellite coverage.
2012-7	Provide hazardous materials awareness training to all County employees who work outside the conventional County facilities, to include Sheriff personnel, Highways personnel and others as identified	Cochise County	HAZMAT	$10,000 per year	High	Annually 2022	Office of Emergency Services/Risk Management-Directors	Ongoing	Completed FY 2015. Done annually.

Table 6-6: 2017 Mitigation Actions / Projects

ID	Mitigation Action/Project Description	Jurisdiction	Hazard(s) Mitigated	Estimated Cost	Priority Ranking	Anticipated Completion Date	Primary Agency / Job Title Responsible for Implementation	Status	Summary
2012-8	Davis Road -Three drainage crossing improvements	Cochise County	Flooding	$7,822,735	High	2022	Highway & Floodplain Division-Director	In Process	Attained environmental clearance. In process of acquiring ROW
2012-9	Davis Road - Design concept report. Design evaluation of Davis Road from Hwy 80 to Hwy 191.	Cochise County	Flooding	$431,303	High	2019	Highway & Floodplain Division-Director	In Process	Phase II: ROW declared/acquired Final Plans FY 16/17
2012-10	Leslie Canyon Ponds - Obtaining responsibility of breached pond. Constructing to meet jurisdictional dam requirements.	Cochise County	Flooding	$50,000	High	2020	Highway & Floodplain Division-Director	In Process	Surveying waterline delineation
2012-11	Fort Grant - 14 mile asphalt reconstruction. Removing, recycling and repaving Fort Grant Road from Cochise County Line to to Virginia Road to aleviate flooding on roadway and fissue damage.	Cochise County	Building Collapse / Mine Subsidence	$14M	High	2022	Highway & Floodplain Division-Director	In Process	14 miles need funding

Table 6-6: 2017 Mitigation Actions / Projects

ID	Mitigation Action/Project Description	Jurisdiction	Hazard(s) Mitigated	Estimated Cost	Priority Ranking	Anticipated Completion Date	Primary Agency / Job Title Responsible for Implementation	Status	Summary
2012-12	Davis Road - Project assessment of road and develop a plan for improving the roadway and mitigating roadway flooding	Cochise County	Flooding	$376,697	Medium	2019	Highway & Floodplain Division-Director	In Process	PA ID Next Steps Final PA Ongoing project
2012-13	Study, design, and construct a flood control facility to mitigate flooding on Rucker Creek for the Elfrida Community.	Cochise County	Flooding	$50,000	Medium	2022	Highway & Floodplain Division-Director	In Process	No progress made Need funding
2012-14	Evaluation of impact on flooding and county services resulting from unregulated lot splitting in unincorporated Cochise County.	Cochise County	Flooding	$100,000	Medium	2020	Planning & Zoning Division-Director	In Process	No progress made Lower priority due to economic downturn
2012-15	Continue drought mitigation measures for Cochise County as directed by the Governor's Drought Preparedness Plan	Cochise County	Drought	$250,000	Medium	Annually 2022	County administration	Ongoing	As needed
2012-16	Review feasibility of installing upgraded road stabilization at select high risk fissure areas to mitigate roadway damages caused by fissures.	Cochise County	Fissure	$50,000	Medium	2022	Highway & Floodplain Division-Director	Ongoing	Monitoring conditions, will address if needed.

Table 6-6: 2017 Mitigation Actions / Projects

ID	Mitigation Action/Project Description	Jurisdiction	Hazard(s) Mitigated	Estimated Cost	Priority Ranking	Anticipated Completion Date	Primary Agency / Job Title Responsible for Implementation	Status	Summary
2012-17	Perform construction to mitigate flood damage and maintain access along Moson Road. As a part of the process, project assessment and scoping will be performed to identify and prioritize improvement locations.	Cochise County	Flooding	$5,000,000	Low	2022	Highway & Floodplain Division-Director	In Process	Project assessment done. Funding needed for ROW & construction Funding needed for drainage easement
2012-22	Review existing Cochise County building codes for inclusion of provisions for addressing severe winds and revise as needed to protect existing and future structures.	Cochise County	Severe Wind	$250,000	Low	2022	Planning & Zoning Division-Director	Ongoing	
2012-23	Cochise County Drought Relief Plan Development of drought mitigation plan for Cochise County as directed by the Governor's Drought Mitigation Task Force.	Cochise County	Drought	$250,000	Medium	2019	Cochise County Emergency Services	In Process	Continue drought mitigation measures through the Water Conservation Office for Cochise County as directed by the Governor's Drought Preparedness Plan.

Table 6-6: 2017 Mitigation Actions / Projects

ID	Mitigation Action/Project Description	Jurisdiction	Hazard(s) Mitigated	Estimated Cost	Priority Ranking	Anticipated Completion Date	Primary Agency / Job Title Responsible for Implementation	Status	Summary
2017-8	Bella Vista Recharge- Design and building a groundwater recharge facility for the San Pedro River System	Cochise County	Drought	$8,300,000	High	2022	Highway & Floodplain Division-Director	New	Mitigating against drought by recharging waters near San Pedro. In the design stage. Funds for construction may need to be obtained from multiple channels.
2017-9	Continued implementation and tracking of projects identified in May 2014 Cochise County Community Wildfire Protection Plan (CWPP).	Cochise County	Wildfire	~$1,500,000	High	Annually 2022	Cochise County Emergency Services	New	
2017-10	Drainage repair: Washington & 34th; Bay Acres	Cochise County	Flooding	$500,000	High	2020	Highway & Floodplain Division-Director	New	Multiple drainage repair and projects needed to minimize and/or help alleviate flooding hazards

Table 6-6: 2017 Mitigation Actions / Projects									
ID	Mitigation Action/Project Description	Jurisdiction	Hazard(s) Mitigated	Estimated Cost	Priority Ranking	Anticipated Completion Date	Primary Agency / Job Title Responsible for Implementation	Status	Summary
2012-40	The City will continue to encourage the use of strapping and tie-downs for out-buildings and ancillary structures such as sheds and awnings.	Douglas	Severe Wind	$1,200	High	Annually 2022	Public Works / Building Safety	Ongoing	Annually
2012-41	Backup power supply (generator) for the new Emergency Operation Center. This system will supply the EOC with a backup power supply and help maintain emergency communication and operations during power failures.	Douglas	All	$150,000	High	2018	Public Works / City Engineer	In Process	
2012-42	To install CSV around all well-sites and security systems that will alert us of any illegal entries and tampering. This will provide us with secured facilities that will connected to the City's communication center.	Douglas	Border Security, Terrorism	$1,000,000	High	2018	Public Works / City Engineer	In Process	
2012-43	Grade and line Rose Avenue Channel from 15th Street to International Street to alleviate overflow of runoff to adjacent homes. The Rose Avenue Channel will intercept runoff	Douglas	Flooding	$80,000	Medium	2019	Public Works / City Engineer	In Process	

Table 6-6: 2017 Mitigation Actions / Projects									
ID	Mitigation Action/Project Description	Jurisdiction	Hazard(s) Mitigated	Estimated Cost	Priority Ranking	Anticipated Completion Date	Primary Agency / Job Title Responsible for Implementation	Status	Summary
	generated by the area between it and the Airport Channel.								
2012-44	Develop plans & specifications and construct retention/detention facilities in the Bay Acres area in order to mitigate flooding in Bay Acres and other areas to the west.	Douglas	Flooding	$1,000,000	Medium	2020	Public Works / City Engineer	In Process	
2012-45	Grade and line Airport Channel from International Street to 15th Street to alleviate overflow of runoff to adjacent homes. This channel is the first line of flood mitigation for runoff approaching the City from the east.	Douglas	Flooding	$2,000.00	Medium	2018	Public Works / City Engineer	In Process	
2012-46	Install backup generators at five of the City's water production wells.	Douglas	Severe Wind	$1,000,000	High	2020	Public Works / City Engineer	In Process	
2012-48	Construct flood control structures to address flooding that affects existing residential areas adjacent to the Palm Grove Wash drainage channel	Douglas	Flooding	$2,500,000	Medium	2020	Public Works / City Engineer	In Process	

Table 6-6: 2017 Mitigation Actions / Projects									
ID	Mitigation Action/Project Description	Jurisdiction	Hazard(s) Mitigated	Estimated Cost	Priority Ranking	Anticipated Completion Date	Primary Agency / Job Title Responsible for Implementation	Status	Summary
	located on private property, not within a dedicated drainage easement. Improvements will include an all-weather crossing at the intersection of 18th Street and I Avenue. This is the primary access to the Fairview and Pirtleville area.								
2012-49	Install CSV around the reservoir and security system that will alert the city of any illegal entries and tampering. This will provide a secured facility that is connected to the city's communication center.	Douglas	Border Security, Terrorism	$1,000,000	High	2021	Public Works / City Engineer	In Process	
2012-50	Prepare a city-wide master drainage plan for the identification and prioritization of all drainage and storm water improvements for the City of Douglas and contributing watershed. Study will include evaluation and update recommendations for current FEMA NFIP floodplains.	Douglas	Flooding	$1,500,000	High	2022	Public Works / City Engineer	In Process	
2012-51	Construction of flood control structures to address flooding and uncontrolled flow of stormwater along and through the Border Fence and	Douglas	Flooding	$5,000,000	Medium	2025	Public Works / City Engineer	In Process	

Table 6-6: 2017 Mitigation Actions / Projects									
ID	Mitigation Action/Project Description	Jurisdiction	Hazard(s) Mitigated	Estimated Cost	Priority Ranking	Anticipated Completion Date	Primary Agency / Job Title Responsible for Implementation	Status	Summary
	International Street. Mitigation of the flooding is a necessary part of homeland security.								
2012-53	Install CCTV around the WWTP and a security system that will alert the City of any illegal entries and tampering. This will provide the City with a secured facility that will be connected to the City's communication center. The Douglas WWTP is located right at the U.S. Mexico Border.	Douglas	Border Security, Terrorism	$1,000,000	High	2025	Public Works / City Engineer	In Process	
2017-11	Enforcement of tie down procedures for mobile homes and other building types will be strengthened	Douglas	Severe Wind	$70,000	High	2018	Public Works / Building Safety	New	
2017-12	Prepare comprehensive plan for water production in the case of long-term power outage, and demand from other systems.	Douglas	Drought	$500,000	High	2018	Public Works / City Engineer	New	

Table 6-6: 2017 Mitigation Actions / Projects

ID	Mitigation Action/Project Description	Jurisdiction	Hazard(s) Mitigated	Estimated Cost	Priority Ranking	Anticipated Completion Date	Primary Agency / Job Title Responsible for Implementation	Status	Summary
2017-13	Construct retention/detention basins on both sides of town to reduce flood flows going into Mexico, and to allow basic treatment of the stormwater (settling, skimming)	Douglas	Flood	$660,000	High	2018	Public Works / City Engineer	New	
2017-14	Inspect derelict commercial buildings in the downtown area for safety in wind, rain, and earthquake	Douglas	Severe Wind	$500,000	High	2018	Public Works / City Engineer	New	
2017-15	Provide free landfill services one day each month to help reduce wildfire risk.	Huachuca City	Wildfire	Staff Time	Medium	monthly starting in 2018	Public Works	New	Five free days provided in October
2017-16	We have developed a Wildfire Plan and are currently implementing this plan in our town. We are debrushing and creating fire breaks near housing.	Huachuca City	Wildfire	Staff Time	High	2019	Fier Chief and Public Works	New	The Town is working towards this goal for fire prevention.
2017-17	The Town has been working with the public on high winds with flying debris. We plan to develop a public education campaign aimed at securing or eliminating items around the home and business that may	Huachuca City	Severe Wind	Staff Time	High	2019	Fire and Police working Supervisors	New	Ongoing work towards educating the public on securing property.

Table 6-6: 2017 Mitigation Actions / Projects									
ID	Mitigation Action/Project Description	Jurisdiction	Hazard(s) Mitigated	Estimated Cost	Priority Ranking	Anticipated Completion Date	Primary Agency / Job Title Responsible for Implementation	Status	Summary
	cause damage during high wind events.								
2017-18	Implement public awareness program for possible flooding and flash floods. Educate property owners and tenants about mitigation techniques.	Huachuca City	Flooding	Staff Time / $500.00	Medium	2018	Public Information Officer/Code Official	New	Code official will teach this class.
2012-54	Administer city-wide water conservation programs and public awareness campaigns. Also, continue to take a pro-active lead in regional water conservation and management organizations.	Sierra Vista	Drought	$20,000	High	Starting 7/1/17, Ongoing	Public Works/Director	Ongoing	
2012-55	Identify and map new flood hazard areas and update existing mapping in accordance with FEMA and NFIP requirements	Sierra Vista	Flooding	$50,000	High	Starting 7/1/17, Ongoing	Public Works/ Director Community Development Director	Ongoing	
2012-56	Operate and maintain Reverse 911 for City of Sierra Vista to warn public of emergency situations. The system would be implemented out of the City of Sierra Vista Police Department.	Sierra Vista	All	$15,000	High	Completed	Police Department / Chief	Ongoing	

Table 6-6: 2017 Mitigation Actions / Projects									
ID	Mitigation Action/Project Description	Jurisdiction	Hazard(s) Mitigated	Estimated Cost	Priority Ranking	Anticipated Completion Date	Primary Agency / Job Title Responsible for Implementation	Status	Summary
2012-57	Purchase containment materials such as sand, absorbent litter and containment "pigs" for HAZMAT spills.	Sierra Vista	HAZMAT	$50,000	High	Starting 7/1/17, Ongoing	Fire Department / Chief Public Works / Director	Ongoing	
2012-58	Coyote Wash Flood Control Project Phase 1 (Coronado Site) - construct gabion walls, drop structures and concrete bank armor to mitigate flood damage to susceptible community developments.	Sierra Vista	Flooding	$300,000	Medium	6/30/2020	Public Works / Director	Deferred	
2012-59	Plan and construct a central facility for the collection and redistribution of household hazardous wastes from residents of the community.	Sierra Vista	HAZMAT	$250,000	Low	Starting 7/1/17, Ongoing	Public Works / Director	In Process	
2012-60	Coyote Wash Flood Control Project Phase 2 - construct gabion walls, drop structures and concrete bank armor to mitigate flood damage to susceptible community developments.	Sierra Vista	Flooding	$160,000	Low	6/30/2022	Public Works / Director	In Process	
2012-61	Retrofit all city buildings, as necessary, with equipment to reduce the impacts and damage of lightning strike on	Sierra Vista	Lightning	$50,000	Low	6/30/2020	Public Works / Director	In Process	

Table 6-6: 2017 Mitigation Actions / Projects									
ID	Mitigation Action/Project Description	Jurisdiction	Hazard(s) Mitigated	Estimated Cost	Priority Ranking	Anticipated Completion Date	Primary Agency / Job Title Responsible for Implementation	Status	Summary
	existing structures and equipment.								
2012-63	Third Street Wash. Construct gabion walls, drop structures, and concrete bank armor to mitigate flood damage to susceptible community developments.	Sierra Vista	Flooding	$170,000	Low	6/30/2018	Public Works / Director	In Process	
2017-19	Reuse treated effluent from the City's EOP for on-site equipment cleaning to reduce portable water use.	Sierra Vista	Drought	$400,000	High	6/30/2019	Public Works / Director	New	Save over 10 million gallons of potable water per year
2017-20	Keep City's Emergency Response Plan and Continuity of Operations Plan Up to Date	Sierra Vista	All	$5,000/year	High	Starting 7/1/18, Ongoing	Fire Department / Chief	New	
2017-21	Improve security at critical City buildings	Sierra Vista	Terrorism	$2,000,000	High	6/30/2019	Police Department / Public Works	New	
2017-22	Obtain brush clearing equipment for use in removing fire fuels along City roads, alleys, washes and at the airport and other areas where fire poses a significant hazard.	Sierra Vista	Wildfire	$300,000	High	6/30/2020	Public Works / Director	New	

Table 6-6: 2017 Mitigation Actions / Projects

ID	Mitigation Action/Project Description	Jurisdiction	Hazard(s) Mitigated	Estimated Cost	Priority Ranking	Anticipated Completion Date	Primary Agency / Job Title Responsible for Implementation	Status	Summary
2017-23	Upgrade existing and install new back-up generators for critical public infrastructures	Sierra Vista	Severe Wind	$500,000	High	6/30/2020	Public Works / Director	New	
2017-24	Consider programs to promote rainwater harvesting, water recharge, and other water conservation practices	Sierra Vista	Drought	$100,000	Medium	Starting 7/1/17, Ongoing	Public Works	New	
2017-25	Drainage Improvement. Implement the recommended drainage improvement projects for communities in the City	Sierra Vista	Flood	$1,500,000	Medium	6/30/2022	Public Works / Director	New	
2012-65	Providing emergency back up electrical power for emergency service radio repeaters due to extended power failure from sudden violent thunder storms, which stretch all available electrical service to its limit.	Tombstone	Severe Wind, lightning	$5,000	High	2020	Tombstone Marshal's Office/ Fire Department	Ongoing	In the process of obtaining generators for this purpose
2012-68	Continuation of educational awareness regarding fire prevention in the local school system for youths as well as adults through local civic organizations; and establishment of City fire breaks through weed abatement.	Tombstone	Wildfire	$1,000	Medium	2022	Fire Department	Ongoing	Annually

Table 6-6: 2017 Mitigation Actions / Projects

ID	Mitigation Action/Project Description	Jurisdiction	Hazard(s) Mitigated	Estimated Cost	Priority Ranking	Anticipated Completion Date	Primary Agency / Job Title Responsible for Implementation	Status	Summary
2012-69	Trouble shoot for cracks in concrete, pavement and structures as well as holes in anything caused by seismic energy to identify potential problem areas regarding collapse of mines within the City's Mining District as well as potential unidentified mine hazard areas.	Tombstone	Building Collapse / Mine Subsidence	Staff Time	Medium	2021	Fire Department/Public Works	Ongoing	Ongoing; matter being monitored as needed and required.
2017-26	Working with local mining companies, state and county authorities to accurately map all residual vertical and horizontal shafts, using GPS technology, located inside the city limits.	Tombstone	Mine Subsidence		High	2018	Public Works / Fire Department	New	
2017-27	Obtaining brush clearing equipment for use in removing fire fuels along City roads, washes, the airport, and other areas where fire poses a significant hazard.	Tombstone	Wildfire	$20,000	Medium	2017	Public Works / Tombstone Marshal's Office	New	Purchase of equipment and tools for road clearing crew.
2017-28	Establish city-wide water conservation programs and public awareness campaigns. Establish working relationships with regional water conservation and management	Tombstone	Drought		Low	2020	Public Works / Fire Department	New	Public education

Table 6-6: 2017 Mitigation Actions / Projects									
ID	Mitigation Action/Project Description	Jurisdiction	Hazard(s) Mitigated	Estimated Cost	Priority Ranking	Anticipated Completion Date	Primary Agency / Job Title Responsible for Implementation	Status	Summary
	organizations to offer public education classes.								
2017-29	Design and construct improvements to the City's water system to mitigate future issues with the 30 mile Aqueduct.	Tombstone	Wildfire		High	2021	Public Works Department	New	Improvements to be considered: a new well, storage tanks.
2017-30	Design and construct improvements to roads that repeatedly sustain damage in flood prone areas and that have a high probability of leaving motorists or first responders stranded.	Tombstone	Flooding / Flash Flood	$450,000	High	2020	Public Works Department	New	Improvements will first be looked at along Charleston Rd.
2012-71	Clean, maintain and improve water drainage though out town to prevent flooding.	Willcox	Flooding	$20,000	High	2021	Public Works Department / Supervisor	Ongoing	1st step to clean, then annually maintain Willcox's drainage system is in desperate need of improvement involving engineering planning.

Table 6-6: 2017 Mitigation Actions / Projects

ID	Mitigation Action/Project Description	Jurisdiction	Hazard(s) Mitigated	Estimated Cost	Priority Ranking	Anticipated Completion Date	Primary Agency / Job Title Responsible for Implementation	Status	Summary
2012-72	Conduct a public education campaign to increase awareness of fire hazards. Distribute mitigation flyers outlining defensible space mitigation strategies at public gathering opportunities as appropriate.	Willcox	Wildfire	$1,000	High	2021	Fire Department/ Fire Chief	Ongoing	Annually City of Willcox working towards goal.
2012-73	Develop evacuation plans for the areas along I-10 and Railroad areas due to heavy traffic with hazardous materials on board.	Willcox	HAZMAT	Staff Time	High	2022	Fire Department/ Fire Chief	Ongoing	Once developed, regularly revisit.
2012-74	Review and update "Title 18 flood damage prevention ordinance" and municipal codes to help prevent flooding and maintain compliance with the NFIP Program.	Willcox	Flooding	Staff Time	High	2021	Development Services / Supervisor	Ongoing	Annually.
2017-31	Quail Park: Grading of drainages for water flow, installation of energy dissipaters such as rip raps and toe downs along drainages, as necessary	Willcox	Flooding	$25,000	Medium	2021	Public Works Department / Supervisor	New	
2017-32	Implement annual program relating to wildfire mitigation in City right of ways- Clean up	Willcox	Wildfire	$3,000	Medium	2018	Fire Department/ Fire Chief	New	Reduce the risk of wildfires

Table 6-6: 2017 Mitigation Actions / Projects									
ID	Mitigation Action/Project Description	Jurisdiction	Hazard(s) Mitigated	Estimated Cost	Priority Ranking	Anticipated Completion Date	Primary Agency / Job Title Responsible for Implementation	Status	Summary
	parkways and property to reduce wildfire fuels								
2017-33	Implement annual program relating to wildfire mitigation in City ROWs- Clean up parkways and property to reduce debris and other items that could potentially cause damage during a high wind event	Willcox	Severe Wind	$3,000	High	2020	Public Works	New	Reduce high wind damage
2017-34	Willcox plans to work with the public on reducing flying debris during high wind events. We plan to develop a public education campaign aimed at securing or eliminating items around the home and business that may cause damage during high wind events.	Willcox	Severe Wind	3000	High	2019	Fire/Police	New	Ongoing work towards educating the public on securing property.

SECTION 7: PLAN MAINTENANCE PROCEDURES

§201.6(c)(4): *[The plan shall include…] (4) A* ***plan maintenance process*** *that includes:*
(i) A section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.
(ii) A process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.
(iii) Discussion on how the community will continue public participation in the plan maintenance process.

§201.6(d)(3): *Plans must be reviewed, revised if appropriate, and resubmitted for approval within five years in order to continue to be eligible for HMGP project grant funding.*

According to the DMA 2000 requirements, each plan must define and document processes or mechanisms for maintaining and updating the hazard mitigation plan within the established five-year planning cycle. Elements of this plan maintenance section include:

Monitoring and Evaluating the Plan

Updating the Plan

Implementing the Plan by Incorporation into Other Agency or Jurisdictional Planning Mechanisms

Cochise County and the participating jurisdictions recognize that this hazard mitigation plan is intended to be a "living" document with regularly scheduled monitoring, evaluation, and updating.

As part of the 2012 Plan update process, the Planning Team recognized the need for improvement to the Plan monitoring and evaluation process. The Planning Team discussed ways to make sure that the Plan review and maintenance process will occur over the next five years. The results of those discussions are outlined in the following sections and the plan maintenance strategy.

7.1 Monitoring and Evaluation

During the 2017 Plan update process, it was clear that the planned improvements to the monitoring and evaluation process were successfully implemented. The Planning Team had established the following monitoring and evaluation procedures:

- Schedule – The Plan shall be reviewed on at least an annual basis or following a major disaster. The County EM will contact each jurisdiction's point of contact or the City/Town Manager/Clerk to coordinate the Plan review.
- Review Content – The content and scope of the Plan review and evaluation will address the following questions:
    - *Hazard Identification: Have the risks and hazards changed?*
    - *Goals and objectives: Are the goals and objectives still able to address current and expected conditions?*
    - *Mitigation Projects and Actions: Has the project been completed? If not complete but started, what has been done and what percent of the project has been completed? What remains to be done? Are there changes to the scope of work?*

Each jurisdiction will review the Plan as it relates to their community and document responses to the above questions in the form of an informal memorandum. During the annual review process, each jurisdiction may present their review findings to the Planning Team to discuss concerns or successes. Documentation of the annual review will include a compilation of the memorandums generated by each jurisdiction plus any notes on discussions and conclusions. Copies of the annual review report are included in Appendix E. Additional information and

7.2 Plan Update

According to DMA 2000, the Plan requires updating and approval from FEMA every five years. The plan updates will adhere to that set schedule using the following procedure:

- ✓ Approximately one year prior to the plan expiration date, the Planning Team, or their designated planning consultant, will perform an update to the Plan and planning process and will revise the appropriate or affected portions of the plan and produce a revised plan document.
- ✓ The revised plan document will be presented before the respective councils and boards for an official concurrence/adoption of the changes.
- ✓ The revised plan will be submitted to DEMA and FEMA for review, comment and approval.

7.3 Incorporation into Existing Planning Mechanisms

Incorporation of this Hazard Mitigation Plan into other planning mechanisms, either by content or reference, enhances a community's ability to perform natural hazard mitigation by expanding the scope of the Plan's influence. A poll of the participating jurisdictions revealed that success of incorporating the 2012 Plan elements over the past planning cycle into other planning programs has varied. Successes are summarized below:

Cochise County:

- The County plan correlated 2012 Plan mitigation A/Ps with the County Highway and Floodplain Division's CIP project list.
- The 2012 Plan was referred to as a part of the regular grant planning process.

City of Benson:

- The City correlated 2012 Plan mitigation A/Ps with the City's CIP project list.

City of Douglas:

- The City incorporated 2012 A/Ps into the Road Capital Improvements Plan.

City of Sierra Vista:

- Correlation of 2012 Plan mitigation A/Ps with the City's CIP project list.
- Mitigation planning was considered during all General Plan and development code updates.

City of Tombstone:

- The City used the 2012 Plan to help prevent development in areas of 'flood prone' washes.

City of Willcox:

- During and following Hurricane Odile, the 2012 Plan was reviewed for potential mitigation project ideas to implement.

In all of the above instances, the 2012 Plan was found to be beneficial, and especially with regard to the critical facility inventories, vulnerability analysis results, and the mitigation strategy. Other specific insights and lessons learned shared by various participating jurisdictions include:

- Several of the communities just do not have much in the way of "plans" that correlate to the mitigation plan.
- Changes in staff/personnel or the lack of staff/personnel to accomplish the Plan goals and also a lack of priority.

Ways in which the 2017 Plan will be incorporated or referenced into other planning mechanisms for each jurisdiction are summarized below:

Cochise County:

- The County plans to continue correlation of 2017 Plan mitigation A/Ps with the County Highway and Floodplain Division's CIP project list.
- The 2017 Plan will continue to be referred to as a part of the regular grant planning.
- Risk assessment data from 2017 Plan will be used for future Emergency Operations Plan (EOP) updates.

City of Benson:

- Continued correlation of 2017 Plan mitigation A/Ps with the City's CIP project list.

City of Bisbee:

- The City will look for opportunities to incorporate mitigation actions / projects from the 2017 Plan as part of the annual monitoring and evaluation process.

City of Douglas:

- 2017 Plan will be reviewed during updates to all Capital Improvement Plans going forward.

Town of Huachuca City:

- The Town plans to incorporate portions of the HMP into a new Development Plan that is being formulated.
- The Town also plans to integrate the results of the HMP into a 10-Year / General Plan that is currently being updated, which included building code updates.

City of Sierra Vista:

- Continued correlation of 2017 Plan mitigation A/Ps with the city's CIP project list.
- Mitigation planning will continue to be considered during all General Plan and development code updates.

City of Tombstone:

- The City plans to reference the HMP as they update their Emergency Management Program.

City of Willcox:

- The 2017 Plan will be reviewed by the City during the annual monitoring and evaluation process to identify opportunities for incorporation into other City planning mechanisms.

Typical ways to use and incorporate the Plan over the next five-year planning cycle, discussed by the Planning Team, included:

- Use of, or reference to, Plan elements in updates to general and comprehensive planning documents, codes, and ordinances.
- Addition of defined mitigation A/Ps to capital improvement programming.
- Inclusion of Plan elements into development and retrofitting planning and practices.
- Resource for developing and/or updating emergency operations plans, community wildfire protection plans, emergency response plans, etc.
- Make use of the annual evaluations to keep the Plan awareness elevated and that stakeholders are still identified.

The Plan will continue to function as a standalone document subject to its own review and revision schedule presented in Sections 7.1 and 7.2. The Plan will also serve as a reference for other mitigation and land planning

needs of the participating jurisdictions. Whenever possible, each jurisdiction will endeavor to incorporate the risk assessment results and mitigation actions and projects identified in the Plan, into existing and future planning mechanisms. Specific incorporation of the Plan risk assessment elements into the natural resources and safety elements of each jurisdictions' general plans (county comprehensive plan) and development review processes, adding or revising building codes, adding or changing zoning and subdivision ordinances, and incorporating mitigation goals and strategies into general and/or comprehensive plans, will help to ensure hazard mitigated future development.

7.4 Continued Public Involvement

The Planning Team reviewed the subject of continued public involvement as was documented in the 2012 Plan and discussed the challenges and successes regarding the identified continued public involvement strategy. It was noted that public education and outreach relating to the hazards faced by communities was an on-going effort. Some of the participating jurisdictions specifically identified mitigation actions / projects relating to these public education and outreach efforts. Additional details relating to these can be found in Section 6.

This left the subject of how best to involve the public going forward with this updated Plan? As is detailed later on in Section 7 of this document, one of the greatest successes of the Planning Team was their willingness and ability to hold yearly plan review and monitoring meetings. Therefore, it was decided that this annual process would be expanded upon to include a larger component relating to continued public involvement of the Plan, and most importantly of the identified mitigation actions / projects.

Following the yearly plan review and monitoring meetings, meeting minutes and/or a summary report of progress on mitigation actions / projects will be produced and posted on the County website. Public questions relating to the yearly meeting and ideas for additional mitigation actions / projects will also be solicited.

In addition, some jurisdictions provided additional opportunities for continued public involvement relating to the HMP:

- Cochise County
    - Public hearing/meeting process for all mitigation actions/projects.
    - County will provide various mitigation brochures and information at the County Fair.
    - Provide mitigation and code literature at the SACA Home Show.
    - Free Dump Day for disposal of HAZMATs and other debris for each jurisdiction.
    - Educational material will be provided for our Small MS4 Permit Program
- City of Douglas
    - Public hearing/meeting process for all mitigation actions/projects.
    - City provides various mitigation brochures and information at the County Fair.
    - Public notices in utility bills for drought mitigation and conservation efforts.
    - Free Dump Day for disposal of HAZMATs and other debris.
    - Include a hazard mitigation agenda item to the regular LEPC meetings.
- Town of Huachuca City
    - Public Workshop for Planning and Public Meetings, Public Hearings or meetings for all mitigation actions and projects.
    - Incorporating the 2017 HMP into the City's Development Plan.
    - Add EOP and HMP Plans to the Occupancy Permits.
- City of Tombstone

- Public hearing/meeting process for all mitigation actions/projects.
- Public service announcements for mitigation activities.
- Public notices in utility bills for drought mitigation and conservation efforts.
- Free Dump Day for disposal of HAZMATs and other debris.
- Notices regarding meetings/hearings/updates on social media and websites.

SECTION 8: PLAN TOOLS

8.1 Acronyms

A/P ..... Mitigation Action/Project
ADEM ..... Arizona Division of Emergency Management
ADEQ ..... Arizona Department of Environmental Quality
ADWR ..... Arizona Department of Water Resources
AGFD ..... Arizona Game and Fish Department
ALOHA ..... Areal Location of Hazardous Atmospheres model
ARS ..... Arizona Revised Statutes
ASCE ..... American Society of Civil Engineers
AZSERC ..... Arizona State Emergency Response Commission
ASLD ..... Arizona State Land Department
AZGS ..... Arizona Geological Survey
BLM ..... Bureau of Land Management
CAMEO ..... Computer Aided Management of Emergency Operations model
CAP ..... Central Arizona Project
CAP ..... Community Assistance Program
CIKR ..... Critical Infrastructure and Key Resources
CLIMAS ..... Climate Assessment for the Southwest
CFR ..... Code of Federal Regulations
CRS ..... Community Rating System
CWPP ..... Community Wildfire Protection Plan
DEMA ..... Arizona Department of Emergency and Military Affairs
DFIRM ..... Digital Flood Insurance Rate
DMA 2000 ..... Disaster Mitigation Act of 2000
DOT ..... Department of Transportation
EHS ..... Extremely Hazardous Substance
EOP ..... Emergency Operations Plan
EPA ..... Environmental Protection Agency
EPCRA ..... Emergency Planning and Community Right to Know Act
FEMA ..... Federal Emergency Management Agency
FMA ..... Flood Mitigation Assistance Grant Program
GIS ..... Geographic Information System
HAZMAT ..... Hazardous Material
HAZUS-99 ..... Hazards United States1999
HAZUS-MH ..... Hazards United States Multi-Hazard
HMGP ..... Hazard Mitigation Grant Program
IFCI ..... International Fire Code Institute
LEPC ..... Local Emergency Planning Committee
MJHMP ..... Multi-Jurisdictional Hazard Mitigation Plan
MMI ..... Modified Mercalli Intensity
NCEI ..... National Center for Environmental Information
NDMC ..... National Drought Mitigation Center
NESDIS ..... National Environmental Satellite, Data and Information Service
NFIP ..... National Flood Insurance Program
NFPA ..... National Fire Protection Association
NHC ..... National Hurricane Center
NIBS ..... National Institute of Building Services
NID ..... National Inventory of Dams
NIST ..... National Institute of Standards and Technology

NSF .....National Science Foundation
NOAA .....National Oceanic and Atmospheric Administration
NRC .....National Response Center
NWCG .....National Wildfire Coordination Group
NWS .....National Weather Service
PDM .....Pre-Disaster Mitigation Grant
PSDI .....Palmer Drought Severity Index
RL .....Repetitive Loss
SARA .....Superfund Amendments and Reauthorization Act
SRLP .....Severe Repetitive Loss Properties
SRL .....Severe Repetitive Loss
SRP .....Salt River Project
TPC .....Threshold Planning Quantity
UBC .....Uniform Building Code
USACE .....United States Army Corps of Engineers
USDA .....United States Department of Agriculture
USFS .....United States Forest Service
USGS .....United States Geological Survey
VA.....Vulnerability Analysis
WUI .....Wildland Urban Interface

8.2 Definitions

The following terms and definitions are provided for reference and are taken from the 2007 State Plan with a few minor modifications.

ARIZONA HAZARDS

Dam Failure

A dam failure is a catastrophic type of failure characterized by the sudden, rapid and uncontrolled release of impounded water. Dam failures are typically due to either overtopping or piping and can result from a variety of causes including natural events such as floods, landslides or earthquakes, deterioration of foundation or compositional materials, penetration by vegetative roots or animal burrows, fissures or improper design and construction. Such a failure presents a significant potential for a disaster as significant loss of life and property would be expected in addition to the possible loss of power and water resources.

Drought

A drought is a deficiency of precipitation over on extended period of time, resulting in water shortage for some activity, group or environmental sector. "Severe" to "extreme" drought conditions endanger livestock and crops, significantly reduce surface and ground water supplies, increase the potential risk for wildland fires, increase the potential for dust storms, and cause significant economic loss. Humid areas are more vulnerable than arid areas. Drought may not be constant or predictable and does not begin or end on any schedule. Short term droughts are less impacting due to the reliance on irrigation and groundwater in arid environments.

Earthquake

An earthquake is a naturally-induced shaking of the ground, caused by the fracture and sliding of rock within the Earth's crust. The magnitude is determined by the dimensions of the rupturing fracture (fault) and the amount of displacement that takes place. The larger the fault surface and displacement, the greater the energy. In addition to deforming the rock near the fault, this energy produces the shaking and a variety of seismic waves that radiate throughout the Earth. Earthquake magnitude is measured using the Richter Scale and earthquake intensity is measured using the Modified Mercalli Intensity Scale.

Fissure

Earth fissures are tension cracks that open as the result of subsidence due to severe overdrafts (i.e., pumping) of groundwater, and occur about the margins of alluvial basins, near exposed or shallow buried bedrock, or over zones of differential land subsidence. As the ground slowly settles, cracks form at depth and propagate towards the surface, hundreds of feet above. Individual fissures range in length from hundreds of feet to several miles, and from less than an inch to several feet wide. Rainstorms can erode fissure walls rapidly causing them to widen and lengthen suddenly and dangerously, forming gullies five to 15- feet wide and tens of feet deep.

Flooding

Flooding is an overflowing of water onto normally dry land and is one of the most significant and costly of natural disasters. Flooding tends to occur in Arizona during anomalous years of prolonged, regional rainfall (typical of an El Nino year), and is typified by increased humidity and high summer temperatures.

Flash flooding is caused excessive rain falling in a small area in a short time and is a critical hazard in Arizona. Flash floods are usually associated with summer monsoon thunderstorms or the remnants of a tropical storm. Several factors contribute to flash flooding: rainfall intensity and duration, topography, soil conditions, and ground cover. Most flash flooding is caused by slow-moving thunderstorms or thunderstorms repeatedly moving over the same area and can occur within a few minutes or hours of excessive rainfall, or a quick release from a dam or levee failure. Thunderstorms produce flash flooding, often far from the actual storm and at night when natural warnings may not be noticed.

Landslide / Mudslide

Landslides like avalanches are massive downward and outward movements of slope-forming materials. The term landslide is restricted to movement of rock and soil and includes a broad range of velocities. Slow movements, although rarely a threat to life, can destroy buildings or break buried utility lines. A landslide occurs when a portion of a hill slope becomes too weak to support its own weight. The weakness is generally initiated when rainfall or some other source of water increases the water content of the slope, reducing the shear strength of the materials. A mud slide is a type of landslide referred to as a flow. Flows are landslides that behave like fluids: mud flows involve wet mud and debris.

Levee Failure / Breach

Levee failures are typically due to either overtopping or erosive piping and can result from a variety of causes including natural events such as floods, hurricane/tropical storms, or earthquakes, deterioration of foundation or compositional materials, penetration by vegetative roots or animal burrows, fissures, or improper design, construction and maintenance. A levee breach is the opening formed by the erosion of levee material and can form suddenly or gradually depending on the hydraulic conditions at the time of failure and the type of material comprising the levee.

Severe Wind

Thunderstorms are characterized as violent storms that typically are associated with high winds, dust storms, heavy rainfall, hail, lightning strikes, and/or tornadoes. The unpredictability of thunderstorms, particularly their formation and rapid movement to new locations heightens the possibility of floods. Thunderstorms, dust/sand storms and the like are most prevalent in Arizona during the monsoon season, which is a seasonal shift in the winds that causes an increase in humidity capable of fueling thunderstorms. The monsoon season in Arizona typically is from late-June or early-July through mid-September.

Tornadoes are violently rotating columns of air extending from a thunderstorm to the ground. The most violent tornadoes are capable of tremendous destruction with wind speeds in excess of 250 mph. Damage paths can exceed a mile wide and 50 miles long. The damage from tornadoes is due to high winds. The Fujita Scale of Tornado Intensity measures tornado / high wind intensity and damage.

Tropical Storms are storms in which the maximum sustained surface wind ranges from 39-73 mph. Tropical storms are associated with heavy rain and high winds. High intensity rainfall in short periods is typical. A tropical storm is classified as a hurricane when its sustained winds reach or exceed 74 mph. These storms are medium to large in size and are capable of producing dangerous winds, torrential rains, and flooding, all of which may

result in tremendous property damage and loss of life, primarily in coastal populated areas. The effects are typically most dangerous before a hurricane makes landfall, when most damage occurs. However, Arizona has experienced a number of tropical storms that caused extensive flooding and wind damage.

Subsidence

Land subsidence in Arizona is primarily attributed to substantial groundwater withdrawal from aquifers in sedimentary basins. As the water is removed, the sedimentary layers consolidate resulting in a general lowering of the corresponding ground surface. Subsidence frequently results in regional bowl-shaped depressions, with loss of elevation greatest in the center and decreasing towards the perimeter. Subsidence can measurably change or reverse basin gradients causing expensive localized flooding and adverse impacts or even rupture to long-baseline infrastructure such as canals, sewer systems, gas lines and roads. Earth fissures are the most spectacular and destructive manifestation of subsidence-related phenomena.

Wildfire

Wildfire is a rapid, persistent chemical reaction that releases heat and light, especially the exothermic combination of a combustible substance with oxygen. Wildfires present a significant potential for disaster in the southwest, a region of relatively high temperatures, low humidity, low precipitation, and during the spring moderately strong daytime winds. Combine these severe burning conditions with people or lightning and the stage is set for the occurrence of large, destructive wildfires.

Winter Storm

Winter storms bring heavy snowfall and frequently have freezing rain and sleet. Sleet is defined as pellets of ice composed of frozen or mostly frozen raindrops or refrozen partially melted snowflakes. These pellets of ice usually bounce after hitting the ground or other hard surfaces. Freezing rain begins as snow at higher altitudes and melts completely on its way down while passing through a layer of air above freezing temperature, then encounters a layer below freezing at lower level to become supercooled, freezing upon impact of any object it then encounters. Because freeing rain hits the ground as a rain droplet, it conforms to the shape of the ground, making one thick layer of ice. Snow is generally formed directly from the freezing of airborne water vapor into ice crystals that often agglomerates into snowflakes. Average annual snowfall in Arizona varies with geographic location and elevation, and can range from trace amounts to hundreds of inches. Severe snow storms can affect transportation, emergency services, utilities, agriculture and basic subsistence supply to isolated communities. In extreme cases, snowloads can cause significant structural damage to under-designed buildings.

GENERAL PLAN TERMS

Asset

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.

Building

A structure that is walled and roofed, principally above ground and permanently affixed to a site. The term includes a manufactured home on a permanent foundation on which the wheels and axles carry no weight.

Critical Facilities and Infrastructure

Systems or facilities whose incapacity or destruction would have a debilitating impact on the defense or economic security of the nation. The Critical Infrastructure Assurance Office (CIAO) defines eight categories of critical infrastructure, as follows:

Telecommunications infrastructure: Telephone, data services, and Internet communications, which have become essential to continuity of business, industry, government, and military operations.

Electrical power systems: Generation stations and transmission and distribution networks that create and supply electricity to end-users.

Gas and oil facilities: Production and holding facilities for natural gas, crude and refined petroleum, and petroleum-derived fuels, as well as the refining and processing facilities for these fuels.

Banking and finance institutions: Banks, financial service companies, payment systems, investment companies, and securities/commodities exchanges.

Transportation networks: Highways, railroads, ports and inland waterways, pipelines, and airports and airways that facilitate the efficient movement of goods and people.

Water supply systems: Sources of water; reservoirs and holding facilities; aqueducts and other transport systems; filtration, cleaning, and treatment systems; pipelines; cooling systems; and other delivery mechanisms that provide for domestic and industrial applications, including systems for dealing with water runoff, wastewater, and firefighting.

Government services: Capabilities at the federal, state, and local levels of government required to meet the needs for essential services to the public.

Emergency services: Medical, police, fire, and rescue systems.

Disaster Mitigation Act of 2000 (DMA2K)
A law signed by the President on October 30, 2000 that encourages and rewards local and state pre-disaster planning, promotes sustainability as a strategy for disaster resistance, and is intended to integrate state and local planning with the aim of strengthening statewide mitigation planning.

Emergency Preparedness and Response (EPR) Directorate
One of five major Department of Homeland Security Directorates which builds upon the formerly independent Federal Emergency Management Agency (FEMA). EPR is responsible for preparing for natural and human-caused disasters through a comprehensive, risk-based emergency management program of preparedness, prevention, response, and recovery. This work incorporates the concept of disaster-resistant communities, including providing federal support for local governments that promote structures and communities that reduce the chances of being hit by disasters.

Emergency Response Plan
A document that contains information on the actions that may be taken by a governmental jurisdiction to protect people and property before, during, and after a disaster.

Federal Emergency Management Agency (FEMA)
Formerly independent agency created in 1978 to provide a single point of accountability for all Federal activities related to disaster mitigation and emergency preparedness, response and recovery. As of March 2003, FEMA is a part of the Department of Homeland Security's Emergency Preparedness and Response (EPR) Directorate.

Flood Insurance Rate Map (FIRM)
Map of a community, prepared by FEMA that shows the special flood hazard areas and the risk premium zones applicable to the community.

Frequency
A measure of how often events of a particular magnitude are expected to occur. Frequency describes how often a hazard of a specific magnitude, duration, and/or extent typically occurs, on average. Statistically, a hazard with a 100-year recurrence interval is expected to occur once every 100 years on average, and would have a 1% chance – its probability – of happening in any given year. The reliability of this information varies depending on the kind of hazard being considered.

Geographic Information Systems (GIS)
A computer software application that relates physical features on the earth to a database to be used for mapping and analysis.

Hazard
A source of potential danger or adverse condition. Hazards include both natural and human-caused events. A natural event is a hazard when it has the potential to harm people or property and may include events such as

floods, earthquakes, tornadoes, tsunami, coastal storms, landslides, and wildfires that strike populated areas. Human-caused hazard events originate from human activity and may include technological hazards and terrorism. Technological hazards arise from human activities and are assumed to be accidental and/or have unintended consequences (e.g., manufacture, storage and use of hazardous materials). While no single definition of terrorism exists, the Code of Federal Regulations defines terrorism as "…unlawful use of force and violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives."

Hazard Event
A specific occurrence of a particular type of hazard.

Hazard Identification
The process of identifying hazards that threaten an area.

Hazard Mitigation
Cost effective measures taken to reduce or eliminate long-term risk associated with hazards and their effects.

Hazard Profile
A description of the physical characteristics of hazards and a determination of various descriptors including magnitude, duration, frequency, probability, and extent.

HAZUS
A GIS-based nationally standardized earthquake, flood and high wind event loss estimation tool developed by FEMA.

Mitigate
To cause to become less harsh or hostile; to make less severe or painful. Mitigation activities are actions taken to eliminate or reduce the probability of the event, or reduce its severity of consequences, either prior to or following a disaster/emergency.

Mitigation Plan
A systematic evaluation of the nature and extent of vulnerability to the effects of natural hazards typically present in a defined geographic area, including a description of actions to minimize future vulnerability to hazards.

100-Hundred Year Floodplain
Also referred to as the Base Flood Elevation (BFE) and Special Flood Hazard Area (SFHA). An area within a floodplain having a 1% or greater chance of flood occurrence in any given year.

Planning
The act or process of making or carrying out plans; the establishment of goals, policies, and procedures for a social or economic unit.

Probability
A statistical measure of the likelihood that a hazard event will occur.

Promulgation
To make public and put into action the Hazard Mitigation Plan via formal adoption and/or approval by the governing body of the respective community or jurisdiction (i.e. – Town or City Council, County Board of Directors, etc.).

Q3 Data
The Q3 Flood Data product is a digital representation of certain features of FEMA's Flood Insurance Rate Map (FIRM) product, intended for use with desktop mapping and Geographic Information Systems technology. The digital Q3 Flood Data are created by scanning the effective FIRM paper maps and digitizing selected features and lines. The digital Q3 Flood Data are designed to serve FEMA's needs for disaster response activities, National Flood Insurance Program activities, risk assessment, and floodplain management.

Repetitive Loss Property

A property that is currently insured for which two or more National Flood Insurance Program losses (occurring more than ten days apart) of at least $1,000 each have been paid within any 10 year period since 1978.

Risk
The estimated impact that a hazard would have on people, services, facilities, and structures in a community; the likelihood of a hazard event resulting in an adverse condition that causes injury or damage. Risk is often expressed in relative terms such as a high, moderate, or low likelihood of sustaining damage beyond a particular threshold due to a specific type of hazard event. It also can be expressed in terms of potential monetary losses associated with the intensity of the hazard.

Substantial Damage
Damage of any origin sustained by a structure in a Special Flood Hazard Area whereby the cost of restoring the structure to its before-damaged condition would equal or exceeds 50% of the market value of the structure before the damage.

Vulnerability
Describes how exposed or susceptible to damage an asset is. Vulnerability depends on an asset's construction, contents, and the economic value of its functions. Like indirect damages, the vulnerability of one element of the community is often related to the vulnerability of another. For example, many businesses depend on uninterrupted electrical power–if an electric substation is flooded, it will affect not only the substation itself, but a number of businesses as well. Often, indirect effects can be much more widespread and damaging than direct effects.

Vulnerability Analysis
The extent of injury and damage that may result from a hazard event of a given intensity in a given area. The vulnerability analysis should address impacts of hazard events on the existing and future built environment.

Vulnerable Populations
Any segment of the population that is more vulnerable to the effects of hazards because of things such as lack of mobility, sensitivity to environmental factors, or physical abilities. These populations can include, but are not limited to, senior citizens and school children.

Goals
General guidelines that explain what you want to achieve. Goals are usually broad statements with long-term perspective.

Objectives
Defined strategies or implementation steps intended to attain the identified goals. Objectives are specific, measurable, and have a defined time horizon.

Actions/Projects
Specific actions or projects that help achieve goals and objectives.

Implementation Strategy
A comprehensive strategy that describes how the mitigation actions will be implemented.

GENERAL HAZARD TERMS

Fujita Scale of Tornado Intensity
Rates tornadoes with numeric values from F0 to F5 based on tornado winds peed and damage sustained. An F0 indicates minimal damage such as broken tree limbs or signs, while an F5 indicates severe damage sustained.

Liquefaction
The phenomenon that occurs when ground shaking (earthquake) causes loose soils to lose strength and act like viscous fluid. Liquefaction causes two types of ground failure: lateral spread and loss of bearing strength.

Modified Mercalli Intensity Scale

The Modified Mercalli Intensity Scale is commonly used in the United States by seismologists seeking information on the severity of earthquake effects. Intensity ratings are expressed as Roman numerals between I at the low end and XII at the high end. The Intensity Scale differs from the Richter Magnitude Scale in that the effects of any one earthquake vary greatly from place to place, so there may be many Intensity values (e.g.: IV, VII) measured from one earthquake. Each earthquake, on the other hand, should have just one Magnitude, although the several methods of estimating it will yield slightly different values (e.g.: 6.1, 6.3).

Monsoon

A monsoon is any wind that reverses its direction seasonally. In the Southwestern U.S., for most of the year the winds blow from the west/northwest. Arizona is located on the fringe of the Mexican Monsoon which during the summer months turns the winds to a more south/southeast direction and brings moisture from the Pacific Ocean, Gulf of California, and Gulf of Mexico. This moisture often leads to thunderstorms in the higher mountains and Mogollon Rim, with air cooled from these storms often moving from the high country to the deserts, leading to further thunderstorm activity in the desert. A common misuse of the term monsoon is to refer to individual thunderstorms as monsoons.

Richter Magnitude Scale

A logarithmic scale devised by seismologist C.F. Richter in 1935 to express the total amount of energy released by an earthquake. While the scale has no upper limit, values are typically between 1 and 9, and each increase of 1 represents a 32-fold increase in released energy.

APPENDIXES

Appendix A: Official Resolution of Adoption

Appendix B: Planning Process Documentation

Cochise County Multi-Jurisdiction Hazard Mitigation Plan
Project Kick-Off Meeting

When and Where
June 1st, 2016, 10:00 – 12:00 AM
BOS Board room, 1415 Melody Lane, Bldg. G, Bisbee

Agenda

1. Welcome and Introductions
2. Project Overview/Purpose
    a. Hazard mitigation overview
    b. Benefits to Adoptees
3. Project Approach
4. Project Schedule
    a. Future Planning Team Meetings
5. Participation Requirements
6. Hazards to Profile / Perceived Risk Exercise
7. 5-Year Plan Review
8. Mitigation Strategy
9. Data request
10. Public Outreach / Project Website
11. Additional Questions?

2929 N. Central Avenue., Suite 800 |
Phoenix Plaza Tower II
Phoenix, AZ 85012 | Office: 602.279.1234

Michael Baker
INTERNATIONAL

We Make a Difference

Cochise County Multi-Jurisdiction Hazard Mitigation Plan
Project Kick-Off Meeting

When and Where
County Board of Supervisor's Boardroom, 1415 Melody Lane, Building G, Bisbee
June 1st, 2016, 10:00 AM – 12:00 PM

Attendees

Name	Representing	Email
Gale Robison	City of Willcox	
Tammy Mitchell	Town of Huachuca	
Jim Thies	HCPD	
Brad Simmons	Cochise County H & F	bsimmons@cochise.az.gov
Michael Izzo	Cochise County	mizzo@cochise.az.gov
Andy Haraltik	CO B	
Sharon Flissar	CCSV	sharon.flissar@sierravistaaz.gov
Jing Luo	COSU	jing.luo@sierravistaAZ.gov
PAT KELLY	CITY OF TOMBSTONE	publicworks.tombstone@gmail.com
Daisy Ilmsey	Forest Service	dlmsey@fs.fed.us
CARLOS DE LA TORRE	CITY OF DOUGLAS	carlos.delatorre@douglasaz.gov
Sandra Espinoza	AZ DEMA	sandra.espinoza@azdema.gov
KEITH SPANGLER	BENSON FIRE	KSPANGLER@BENSONAZ.GOV
Bradley J. Hamilton	City of Benson	bhamilton@bensonaz.gov

Cochise County Multi-Jurisdiction Hazard Mitigation Plan
Planning Team Conference Call

When and Where
Call-in information and webinar link to be distributed
Date - Time: 9/19/16 - 10:00 PM
Conference Call Info: 571-209-6390 / Access Code: 993 661 259

Agenda

1. Project status update
2. Risk Assessment Update
3. Critical Infrastructure and Key Resources discussion
4. Public Outreach / Project Website
5. Additional Questions?

Cochise County Multi-Jurisdiction Hazard Mitigation Plan
Planning Team Conference Call

When and Where
Call-in information and webinar link to be distributed
Date - Time: 11/4/16 - 2:00 PM
Conference Call Info: 571-209-6390 / Access Code: 993 661 259

Agenda

1. Project status update
2. Risk Assessment Complete – Draft available for HMP Planning Team review and comment
3. Adopting Jurisdiction To-Do's
    a. Update/edit capability tables
    b. Update/edit incorporation into existing planning mechanisms
    c. Update/edit continued public involvement
4. Scheduling upcoming Final HMP Planning Team Meeting – Mitigation Project Workshop
5. Public Outreach / Project Website
6. Additional Questions?

Cochise County Multi-Jurisdiction Hazard Mitigation Plan
Mitigation Strategy Meeting

When and Where
County Board of Supervisor's Boardroom, 1415 Melody Lane, Building G, Bisbee
December 12th, 2016, 1:00 – 3:00 AM

Agenda

1. Welcome and Introductions
2. Project Overview/Purpose
3. Project Schedule
4. Participation Requirements
5. Review of Past Jurisdictional Tasks
6. Mitigation Strategy
7. Future Monitoring
8. Additional Questions?

To-Do's

1. Review Past Mitigation Action/Project reporting
2. Identify New Mitigation Actions/Projects (at a minimum addressing 'high hazards')
3. Review Draft Updated Plan
4. Help to Disseminate Final Public Survey
5. Help to Disseminate Final Draft Plan for Public Review/Comment
6. Inform Your Communities About Mitigation Strategy

Michael Baker
INTERNATIONAL

We Make a Difference

Cochise County Multi-Jurisdiction Hazard Mitigation Plan
Mitigation Strategy Meeting

When and Where
County Board of Supervisor's Boardroom, 1415 Melody Lane, Building G, Bisbee
December 12th, 2016, 1:00 – 3:00 AM

Attendees

Name	Representing	Email
Lynn Kartchner	City of Douglas	
Jing Luo	Sierra Vista	
Tammy Mitchell	Town of Huachuca	
Kelly Norris	Town of Huachuca City	knorris@huachucacityaz.gov
Gale Robison	City of Willcox	
Andy Haratyk	City of Bisbee	
Bradley Simmons	Cochise County H & F	bsimmons@cochise.az.gov
Paul Esparza	Cochise County P&Z	pesparza@cochise.az.gov
Bradley J. Hamilton	City of Benson	bhamilton@bensonaz.gov
David Bruster	City of Tombstone	tombstonefire94@gmail.com
Norm Sturm	Cochise County OES	

Cochise County Hazard Mitigation Plan Update

As a participating member of the Cochise County Hazard Mitigation Planning Team, you serve as a vital link between the county and its jurisdictions, businesses, and residents. Individual jurisdictional and organizational representatives can help ensure a successful planning process by helping to inform your communities about this process and the ultimate goal of a more resilient Cochise County. Please leverage any opportunities that you may have to inform your jurisdictional staff and public about this important project (https://www.cochise.az.gov/emergency-services/2016-cochise-county-multi-jurisdictional-hazard-mitigation-plan-update).

When opportunities do arise to discuss this planning process internally or to outreach to groups of citizens, it is important to document these interactions so that they can be mentioned in the plan document. During the course of the planning process, please help to document these interactions using the brief form below.

Jurisdiction/Organization:	Cochise County – Public Relations Dept
Meeting / Event :	Lisa Marra, Community Relations Administrator
Date:	
Location:	
Brief Description of outreach performed:	**Various:** Friday Focus Morning Radio Show – Norm Sturm 7/22/16 Daily Brief – Norm's email blast - ongoing CC Website Home page – 7/26/16 – scrolling photo County Facebook Pages – 7/26/16 Bookmobile – same Elfrida Library – same Bowie Library – same Sunsites Library – same Sunizona Library – same Portal Library - same *This will repeat on social media for the duration of the survey life and plan participation and be shared by over 2500 users.

Please return these forms to Mike Garner (mgarner@mbakerintl.com). Thanks for your participation.

Cochise County Hazard Mitigation Plan Update

As a participating member of the Cochise County Hazard Mitigation Planning Team, you serve as a vital link between the county and its jurisdictions, businesses, and residents. Individual jurisdictional and organizational representatives can help ensure a successful planning process by helping to inform your communities about this process and the ultimate goal of a more resilient Cochise County. Please leverage any opportunities that you may have to inform your jurisdictional staff and public about this important project (https://www.cochise.az.gov/emergency-services/2016-cochise-county-multi-jurisdictional-hazard-mitigation-plan-update).

When opportunities do arise to discuss this planning process internally or to outreach to groups of citizens, it is important to document these interactions so that they can be mentioned in the plan document. During the course of the planning process, please help to document these interactions using the brief form below.

Jurisdiction/Organization:	Cochise County
Meeting / Event :	Update on Hazard Mitigation planning progress at County safety Officer's meeting
Date:	8/17/2016
Location:	County Highway Department meeting room
Brief Description of outreach performed:	Norm Sturm Gave a 10 minute update on the HMP planning purpose and progress.

Please return these forms to Mike Garner (mgarner@mbakerintl.com). Thanks for your participation.

Cochise County Hazard Mitigation Plan Update

As a participating member of the Cochise County Hazard Mitigation Planning Team, you serve as a vital link between the county and its jurisdictions, businesses, and residents. Individual jurisdictional and organizational representatives can help ensure a successful planning process by helping to inform your communities about this process and the ultimate goal of a more resilient Cochise County. Please leverage any opportunities that you may have to inform your jurisdictional staff and public about this important project (https://www.cochise.az.gov/emergency-services/2016-cochise-county-multi-jurisdictional-hazard-mitigation-plan-update).

When opportunities do arise to discuss this planning process internally or to outreach to groups of citizens, it is important to document these interactions so that they can be mentioned in the plan document. During the course of the planning process, please help to document these interactions using the brief form below.

Jurisdiction/Organization:	Cochise County
Meeting / Event :	Update on Hazard Mitigation planning progress at the Cochise County Department Directors Meeting
Date:	9/7/2016
Location:	County BOS meeting room, Melody Lane Campus, Bisbee
Brief Description of outreach performed:	Norm Sturm Gave a 10 minute update on the HMP planning purpose and progress to Cochise County Department Directors and senior staff..

Please return these forms to Mike Garner (mgarner@mbakerintl.com). Thanks for your participation.

Cochise County Hazard Mitigation Plan Update

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Jurisdiction/Organization:	Cochise County
Meeting / Event :	Update on Hazard Mitigation planning progress at the Cochise County Fire Association meeting
Date:	9/28/2016
Location:	Sunsites-Pearce Fire District
Brief Description of outreach performed:	Norm Sturm Gave a 10 minute update on the HMP planning purpose and progress to County Fire Chiefs and senior staff.

Please return these forms to Mike Garner (mgarner@mbakerintl.com). Thanks for your participation.

Cochise County Hazard Mitigation Plan Update

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When opportunities do arise to discuss this planning process internally or to outreach to groups of citizens, it is important to document these interactions so that they can be mentioned in the plan document. During the course of the planning process, please help to document these interactions using the brief form below.

Jurisdiction/Organization:	City of Douglas
Meeting / Event :	Distribution of Jurisdictional Risk Perception Survey
Date:	09/26/2016
Location:	City Hall, 425 10th Street, Douglas, AZ 85607
Brief Description of outreach performed:	Forwarded survey document to various department heads, with request that they forward to as many people as possible.

Please return these forms to Mike Garner (mgarner@mbakerintl.com). Thanks for your participation.

Cochise County Hazard Mitigation Plan Update

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Jurisdiction/Organization:	Town of Huachuca City
Meeting / Event :	Development Plan
Date:	September 12, 2016, October 12, 2016
Location:	Community Center
Brief Description of outreach performed:	This is for residents and business owners to present their input of Huachuca City Planning. This will help with Hazard mitigation with what the Town can do with shelters etc. Planning to incorporate the 2012 HMP to the City.

Please return these forms to Mike Garner (mgarner@mbakerintl.com). Thanks for your participation.

Cochise County Hazard Mitigation Plan Update

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Jurisdiction/Organization:	Town of Huachuca City
Meeting / Event :	Planning and Zoning Meeting
Date:	January 4 and February 1, 2017
Location:	Council Chambers 500 N Gonzales Blvd
Brief Description of outreach performed:	Discussion on incorporating the Hazard Mitigation Plan into or Development Plan. The Mitigation Plan will stand alone and also be within our City Plan for easy access. This is so the public can give their input on what they would like to see done for the Town. We are also putting this on water bills for those who could not attend to still get this information and know where to look for our plan.

Please return these forms to Mike Garner (mgarner@mbakerintl.com). Thanks for your participation.

Cochise County Hazard Mitigation Plan Update

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Jurisdiction/Organization:	City of Sierra Vista
Meeting / Event :	Phone call from Zimmerman
Date: after 6/8/16	
Location:	
Brief Description of outreach performed:	Surface Water Plan Update, floodplain at Player Avenue- Residents along player Avenue have been paying high prices for flood insurance. Their calls prompted staff to examine the Zone A floodplain in light of the new hydrology developed as part of the Surface Water Plan Update. The new hydraulic model shows that the breakout from the Country Club Estates Drainageway does not occur given the new flows. Therefore, staff has begun to prepare a Letter of Map Revision (LOMR) submittal to have the floodplain boundaries re-drawn. This has been in progress for approximately 2 years due to lack of resources to apply to the LOMR preparation. As an interim solution, approximate BFEs were established in the Zone A floodplain along Player Ave. It is hoped that residents can obtain an elevation certificate to lower their insurance premiums. Called asking about BFE's + had questions about ECs.

Please return these forms to Mike Garner (mgarner@mbakerintl.com). Thanks for your participation.

Cochise County Hazard Mitigation Plan Update

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Jurisdiction/Organization:	City of Sierra Vista
Meeting / Event :	Phone call from Zimmerman
Date: 4/14/16	2405 Player
Location:	
Brief Description of outreach performed:	Surface Water Plan Update, floodplain at Player Avenue- Residents along player Avenue have been paying high prices for flood insurance. Their calls prompted staff to examine the Zone A floodplain in light of the new hydrology developed as part of the Surface Water Plan Update. The new hydraulic model shows that the breakout from the Country Club Estates Drainageway does not occur given the new flows. Therefore, staff has begun to prepare a Letter of Map Revision (LOMR) submittal to have the floodplain boundaries re-drawn. This has been in progress for approximately 2 years due to lack of resources to apply to the LOMR preparation. As an interim solution, approximate BFEs were established in the Zone A floodplain along Player Ave. It is hoped that residents can obtain an elevation certificate to lower their insurance premiums. Called asking for information. His insurance rates increased.

Please return these forms to Mike Garner (mgarner@mbakerintl.com). Thanks for your participation.

Cochise County Hazard Mitigation Plan Update

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Jurisdiction/Organization:	City of Sierra Vista
Meeting / Event :	Dissecussion of BFE, 2457 Player
Date: 6/17/16	
Location:	w/ owner Deb Gunsh
Brief Description of outreach performed:	Surface Water Plan Update, floodplain at Player Avenue- Residents along player Avenue have been paying high prices for flood insurance. Their calls prompted staff to examine the Zone A floodplain in light of the new hydrology developed as part of the Surface Water Plan Update. The new hydraulic model shows that the breakout from the Country Club Estates Drainageway does not occur given the new flows. Therefore, staff has begun to prepare a Letter of Map Revision (LOMR) submittal to have the floodplain boundaries re-drawn. This has been in progress for approximately 2 years due to lack of resources to apply to the LOMR preparation. As an interim solution, approximate BFEs were established in the Zone A floodplain along Player Ave. It is hoped that residents can obtain an elevation certificate to lower their insurance premiums. phone conversation + email exchange

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Cochise County Hazard Mitigation Plan Update

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Jurisdiction/Organization:	City of Sierra Vista
Meeting / Event :	Letters to homeowners
Date: 6/8/16	
Location:	
Brief Description of outreach performed:	Surface Water Plan Update, floodplain at Player Avenue- Residents along player Avenue have been paying high prices for flood insurance. Their calls prompted staff to examine the Zone A floodplain in light of the new hydrology developed as part of the Surface Water Plan Update. The new hydraulic model shows that the breakout from the Country Club Estates Drainageway does not occur given the new flows. Therefore, staff has begun to prepare a Letter of Map Revision (LOMR) submittal to have the floodplain boundaries re-drawn. This has been in progress for approximately 2 years due to lack of resources to apply to the LOMR preparation. As an interim solution, approximate BFEs were established in the Zone A floodplain along Player Ave. It is hoped that residents can obtain an elevation certificate to lower their insurance premiums. Mailed 16 letters to homeowners w/ site specific BFEs for their homes

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Cochise County Hazard Mitigation Plan Update

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Jurisdiction/Organization:	City of Sierra Vista
Meeting / Event :	Phone conversations with
Date: 2014-2016	Cassius Mathews, 2431 Player
Location:	
Brief Description of outreach performed:	Surface Water Plan Update, floodplain at Player Avenue- Residents along player Avenue have been paying high prices for flood insurance. Their calls prompted staff to examine the Zone A floodplain in light of the new hydrology developed as part of the Surface Water Plan Update. The new hydraulic model shows that the breakout from the Country Club Estates Drainageway does not occur given the new flows. Therefore, staff has begun to prepare a Letter of Map Revision (LOMR) submittal to have the floodplain boundaries re-drawn. This has been in progress for approximately 2 years due to lack of resources to apply to the LOMR preparation. As an interim solution, approximate BFEs were established in the Zone A floodplain along Player Ave. It is hoped that residents can obtain an elevation certificate to lower their insurance premiums. I've had close to 20 phone conversations w/ Mr Mathews regarding insurance; the modeling process; the responsibility of the City to Remodel the Player Floodplain

Please return these forms to Mike Garner (mgarner@mbakerintl.com). Thanks for your participation.

Cochise County Hazard Mitigation Plan Update

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Jurisdiction/Organization:	Tombstone
Meeting / Event :	Public Survey #2
Date:	January 19th, 2017
Location:	Tombstone Fire Dept. Facebook page
Brief Description of outreach performed:	General information along with a link to the survey was posted for public view.

Please return these forms to Mike Garner (mgarner@mbakerintl.com). Thanks for your participation.

Appendix C: Public Involvement Records

COCHISE COUNTY Arizona

HOME DEPARTMENTS NEWS CALENDAR JOBS ABOUT US

2016 Cochise County Multi-jurisdictional Hazard Mitigation Plan Update

Emergency Services / County Emergency Plans / 2016 Cochise County Multi-jurisdictional Hazard Mitigation Plan Update

Welcome to the project webpage for the **2016 Cochise County Multi-jurisdictional Hazard Mitigation Plan Update.** Please check back often for project updates and postings. This webpage will be discontinued after the project is completed.

What is Hazard Mitigation?

The term "Hazard Mitigation" describes actions that can help reduce or eliminate long-term risks caused by hazards, or disaster, such as floods, hurricanes, wildfires, landslides, tornadoes, earthquakes, dam failures, or terrorism. As the costs of disasters continue to rise, governments and ordinary citizens must find ways to reduce hazard risks to our communities and ourselves. Efforts made to reduce hazard risks are easily made compatible with other community goals; safer communities are more attractive to employers as well as residents. As communities plan for new development and improvements to existing infrastructure, mitigation can and should be an important component of the planning effort.

While mitigation activities can and should be taken before a disaster event has the chance to occur, after disasters hazard mitigation is essential. Oftentimes after disasters, repairs and reconstruction are often completed in such a way as to simply restore damaged property to pre-disaster conditions. These efforts may "get things back to normal", but the replication of pre-disaster conditions often results in a repetitive cycle of damage, reconstruction, and repeated damage. Hazard mitigation breaks this repetitive cycle by producing less vulnerable conditions through post-disaster repairs and reconstruction. The implementation of such hazard mitigation actions now by state and local governments means building stronger, safer and smarter communities that will be able to reduce future injuries and future damage.

About the Project

Cochise County created its previous Mitigation Plan in accordance with the requirements of the Federal Stafford Act, the National Flood Insurance Act, and 44 Code of Federal Regulations (CFR). The last plan was approved by FEMA in 2012, and was adopted by the County Board of Supervisors and municipalities within Cochise County. These plans must be updated and approved by FEMA every five years.

Cochise County and its participating jurisdictions, agencies, and organizations are now in the process of

CONTACT US

Emergency Services Coordinator
Norman A. Sturm Jr., M.S., CEM

Locations
Main Office
1415 Melody Lane
Bldg A
Bisbee, AZ 85603
Ph: 520-432-9220
more...

LATEST NEWS

NEW! Ready for Anything

Communication, awareness keys to safety during disaster BY AMANDA BAILLIE For the Herald/Review

In case of emergency, follow Norm Sturm's advice.

As the go-to guy when a crisis...
Read more

City of Sierra Vista

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City of Sierra Vista
20 mins

This brief survey will help Cochise County update a plan that ensures our area is prepared for natural disasters and other hazards. Residents throughout the county are encouraged to offer their input.

Cochise County Hazard Mitigation Plan - Hazard Mitigation Strategy Survey

Welcome to Cochise County, Arizona

Public Programs...Personal Service

Last Day to Register to Vote in the Primary Election

Last day to register to vote in the Primary Election or to make any changes to your voter registration file such as change of address, party or your name is August 1, 2016. The Primary Election is Tuesday, August 30... Read more

AUGUST

Sun	Mon	Tue	Wed	Thu	Fri	Sat
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

UPCOMING EVENTS

08/01 Last Day to Register to...
08/03 Early Voting begins for...
08/04 ALICE Training - Naco...
08/11 ALICE Student Training...

NEWS

08/01 **2016 Over-the-Counter Sales** Selected properties within Cochise County held by...
08/01 **Cochise County Auctions Off Surplus**

MEETING INFO

Legal Notices
Other Public Meetings

CUSTOMER SURVEY

Take our survey.

EMERGENCY INFO

Cochise County

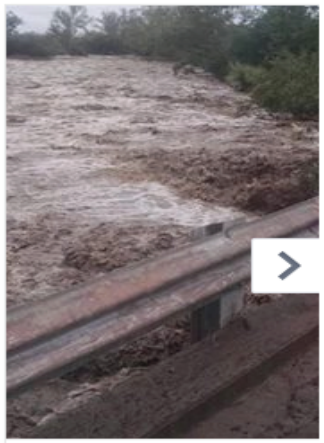
August 22 at 2:43pm

Multi-jurisdictional Hazard Mitigation Plan

Cochise County, along with all incorporated communities within the county, has begun the process of updating the county's Multi-jurisdictional Hazard Mitigation Plan (HMP). The current HMP was updated in 2012, and the Federal Emergency Management Agency (FEMA) requires the plan to be updated at least every five years. The County has set up a webpage dedicated to the HMP update - click on picture below for link.

The public as wel... See More

2016 Cochise County Multi-jurisdictional Hazard Mitigation Plan Update | Cochise County



2016 Cochise County Multi-ju Hazard Mitigation Plan Updat

BENSON, ARIZONA

Home of Kartchner Caverns State Park

Search

Home
Calendar - City Meetings
Summer Programs
City Pool
What to do Today
ADOT Traffic Alerts

City of Benson Begins Work on Hazard Mitigation Plan

A planning team comprised of representatives from the City of Benson, Arizona Department of Emergency Management and other Cochise County communities and organizationswill be meeting regularly to participate in a hazard mitigation planning process. The team will develop a Multi-Jurisdictional Hazard Mitigation Plan for Cochise County, according to The Disaster Mitigation Act of 2000 (DMA2K).

The DMA2K requires all local, county, tribal and state governments to have a FEMA approved hazard mitigation plan in order to be eligible for federal hazard mitigation funds. The plan will focus on the area's most threatening hazards to citizens and property and will provide a strategy to reduce or eliminate the risk from those hazards.

Quick Links

- *Apply for a City Job
- *Volunteer Opportunities
- Building Permits
- City Code of Ordinances
- Community Links
- Maps
- Online Business License Payment
- Online Utility Payment
- Police Department Employment
- Press Room
- Register to Vote
- Voting and Election Information
- Zoning Map Information

Sierra Vista

Development in City Hall. The Draft Annual Action Plan is also available here or by contacting Jenifer Thornton at (520) 439-2200 and requesting a copy.

Land Use Assumptions and Infrastructure Improvement Plan
On May 12, 2016, the Sierra Vista City Council adopted the Land Use Assumptions and Infrastructure Improvement Plan found by clicking on this link. This document will guide the Council's consideration of the City's updated development impact fees. A public hearing on the proposed fees has been scheduled for Thursday, June 23 at 5:00 p.m. during the City Council's regular meeting. The City Council will consider formal action at their regular meeting of July 28 at 5:00 p.m. Both meetings will be held in the City Council Chambers at City Hall.

Cochise County and its jurisdictions are in the

Visitor's Center

- Monday - Tuesday Hikers Group 7/19/2016 7:30 AM
- High Desert Farmers Market 7/20/2016 9:00 AM
- Tourism Commission 07/21/16 7/21/2016 8:00 AM

More |

Welcome to Douglas Arizona

City of Douglas

Home | Services | Government | Businesses | Gallery | Visitors | Employment | Contact

Home

City of Douglas Begins Work on Hazard Mitigation Plan

A planning team comprised of representatives from the City of Douglas, Arizona Department of Emergency Management and other Cochise County communities and organizations will be meeting regularly to participate in a hazard mitigation planning process. The team will develop a Multi-Jurisdictional Hazard Mitigation Plan for Cochise County, according to The Disaster Mitigation Act of 2000 (DMA2K).

City News

Community News & Events

- City of Douglas Begins Work on Hazard Mitigation Plan
- Official Election Results
- Unofficial Election Results
- CDBG Annual Action Plan (Draft)

Tombstone Fire Department

Norm Home

9-11-01 Remember Arlington, VA

Tombstone Fire Department

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August 22

Multi-jurisdictional Hazard Mitigation Plan

Cochise County, along with all incorporated communities within the county, has begun the process of updating the county's Multi-jurisdictional Hazard Mitigation Plan (HMP). The current HMP was updated in 2012, and the Federal Emergency Management Agency (FEMA) requires the plan to be updated at least every five years. The County has set up a webpage dedicated to the HMP update (https://www.cochise.az.gov/.../2016-cochise-county-multi-juri...) that contains the latest information regarding the current planning process. The public as well as area stakeholder groups are encouraged to provide input into the HMP update. A short public perception survey can be accessed at https://www.surveymonkey.com/r/CochiseHazardRisk.

PEOPLE ALSO LIKE

Positively Tombstone, AZ — Community
Tombstone at Twilight — Arts & Entertainment
The Old Tombstone Ga... — Media/News/Publishing
Fire Stations in Tombstone, Arizona

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Tombstone Sarsaparilla

The City of Willcox has been serving the community since 1915. We specialize in Customer satisfaction, and our City offers quality and reliable services you can count on. In addition, our friendly and professional staff is here to answer any questions you may have about our City or our services.

Whether you are visiting the area or relocating to Willcox, we have what you need at prices you can afford. At the City of Willcox, our goal is to provide you with courteous, expedient, professional service of the highest caliber.

Browse our Web site for more information about the City of Willcox. If you have any questions or would like to speak with a City of Willcox representative regarding our services, please e-mail us at city@willcoxcity.org or call us at 520-384-4271.

At the City of Willcox, the customer always comes first.

Opportunities to give

Donate

Public library

Welcome . . .

Originally known as "Maley", Willcox was founded in 1880 as a whistlestop on the Southern Pacific Railroad. It was later renamed in honor of General Orlando B. Willcox who arrived on the first train in 1880. The town was incorporated in 1915. Willcox has maintained its rural lifestyle through a strong agricultural and ranching economy.

Historic Railroad Avenue, Willcox.

Today is Mon, 1st August 2016

City of Willcox Notices

6th July 2016 Quail Park Rodeo Grounds Quail Park Rodeo grounds is temporarily shut down due to storm damage. The City will not be accepting any reservations for Quail Park rodeo grounds until further notice.

22nd July 2016 County Hazard Mitigation survey and information Residents are being asked to participate in an eleven question survey regarding hazards and risks (at https://www.surveymonkey.com/r/CochiseHazardRisk) in the community. A link to the Countys Hazard

Companion Websites

Willcox Tourism and Chamber
Cochise County Tourism Council
Willcox Unified School District
Northern Cochise Community Hospital
Willcox Historic Theater

Bill Pay

Xpress Bill Pay instructions
Xpress Bill Pay iOS App

Pay Bills on-line HERE

Community News

Whats Happening in Willcox
Quarterly City Newsletter

Facilities Reservations

Willcox, AZ

City of Willcox
101 S. Railroad Ave Suite. B
Willcox, AZ 85643
520-384-4271
city@willcoxcity.org

Hours of operation:

HOME ABOUT MAYOR AND COUNCIL COMMISSIONS POLICE & FIRE TOWN CODE IMPORTANT DOCUMENTS

Administrative
Elections
Library
Animal Shelter
Public Works
Landfill
Planning & Zoning
Magistrate
Transit
Procurement of Goods and Services/Job Openings
Community Events
Senior Center
Schools

Welcome to the Sunset City

Huachuca City is located on State Route 90 inSoutheastern Arizona. We are just minutes from the City of Sierra Vista and our neighbor the U.S. Army Base, Fort Huachuca. We are a small, vibrant rural town with the benefits of shopping and employment all around us!

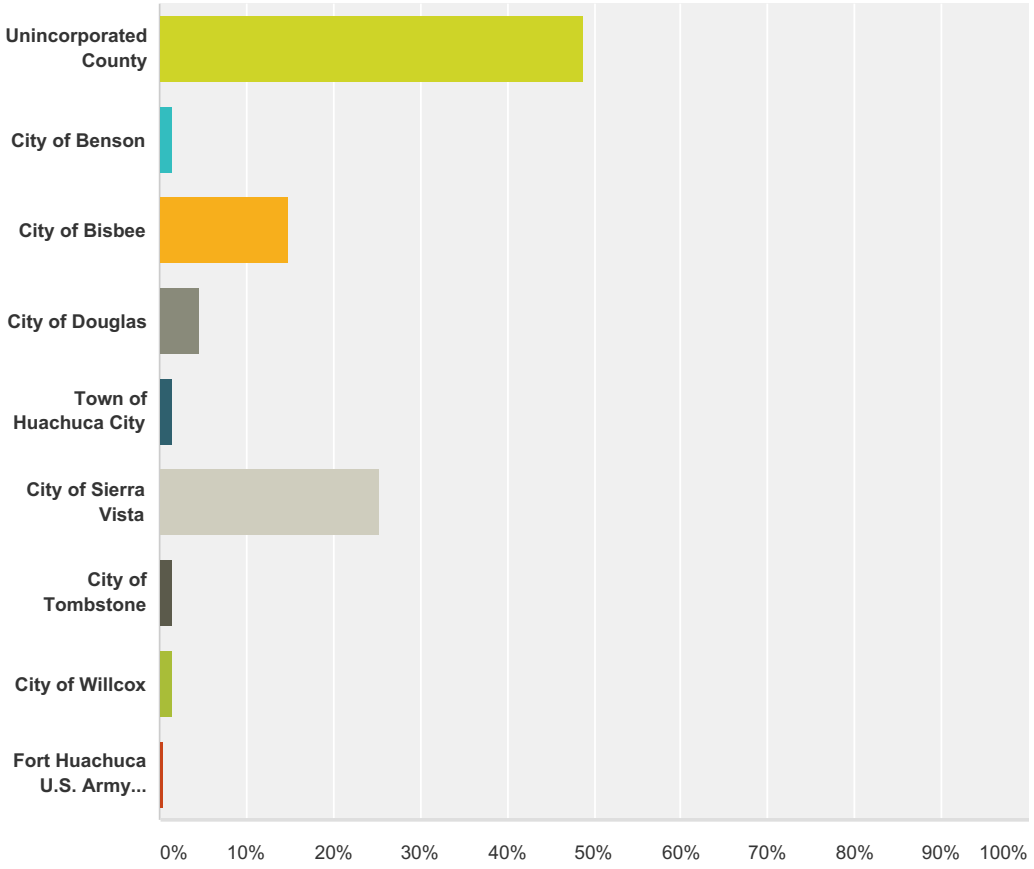
****** The Town of Huachuca City does not endorse or host any other websites, facebook pages, complaint forms, etc outside of this website. Any complaint forms from other sites do not go to Huachuca City Officials. These sites are held by individuals not associated with the Huachuca City Municipal Government. Any complaints for the Town of Huachuca City or the Huachuca City Police and Fire should be directed to Town Hall or the Police Department. ******

Cochise County Multi-Jurisdictional Hazard Mitigation Plan - Update Website

Cochise County Multi-Jurisdictional Hazard Mitigation Plan - Public Risk Perception Survey

Q1 Do you live in the Unincorporated County, or in one of its Cities?

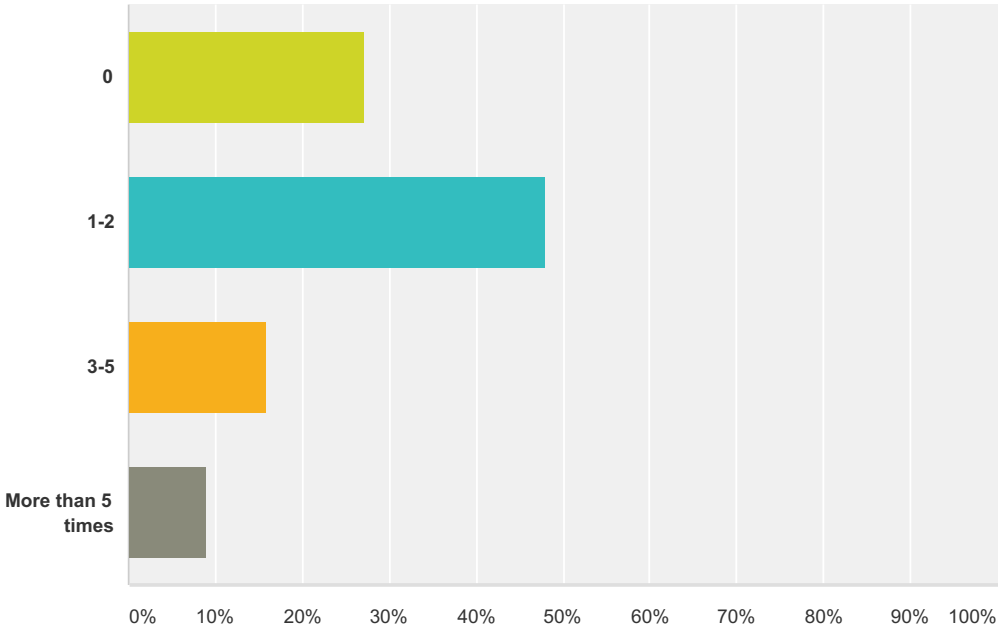
Answered: 258 Skipped: 0



Answer Choices	Responses	
Unincorporated County	**48.84%**	126
City of Benson	**1.55%**	4
City of Bisbee	**14.73%**	38
City of Douglas	**4.65%**	12
Town of Huachuca City	**1.55%**	4
City of Sierra Vista	**25.19%**	65
City of Tombstone	**1.55%**	4
City of Willcox	**1.55%**	4
Fort Huachuca U.S. Army Garrison	**0.39%**	1
Total		**258**

Q2 How many times has a natural hazard disrupted your daily life in the last five years?

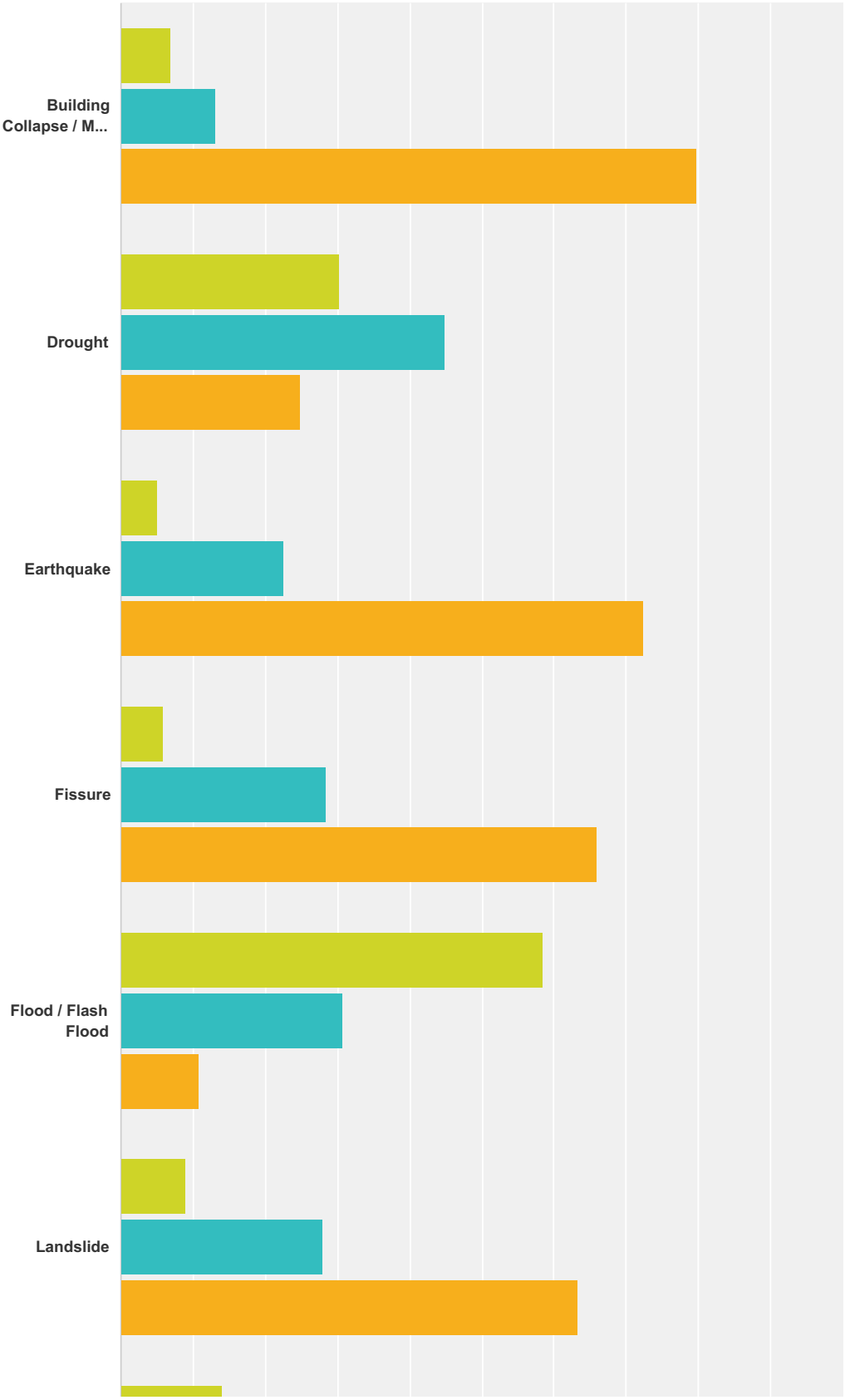
Answered: 258 Skipped: 0



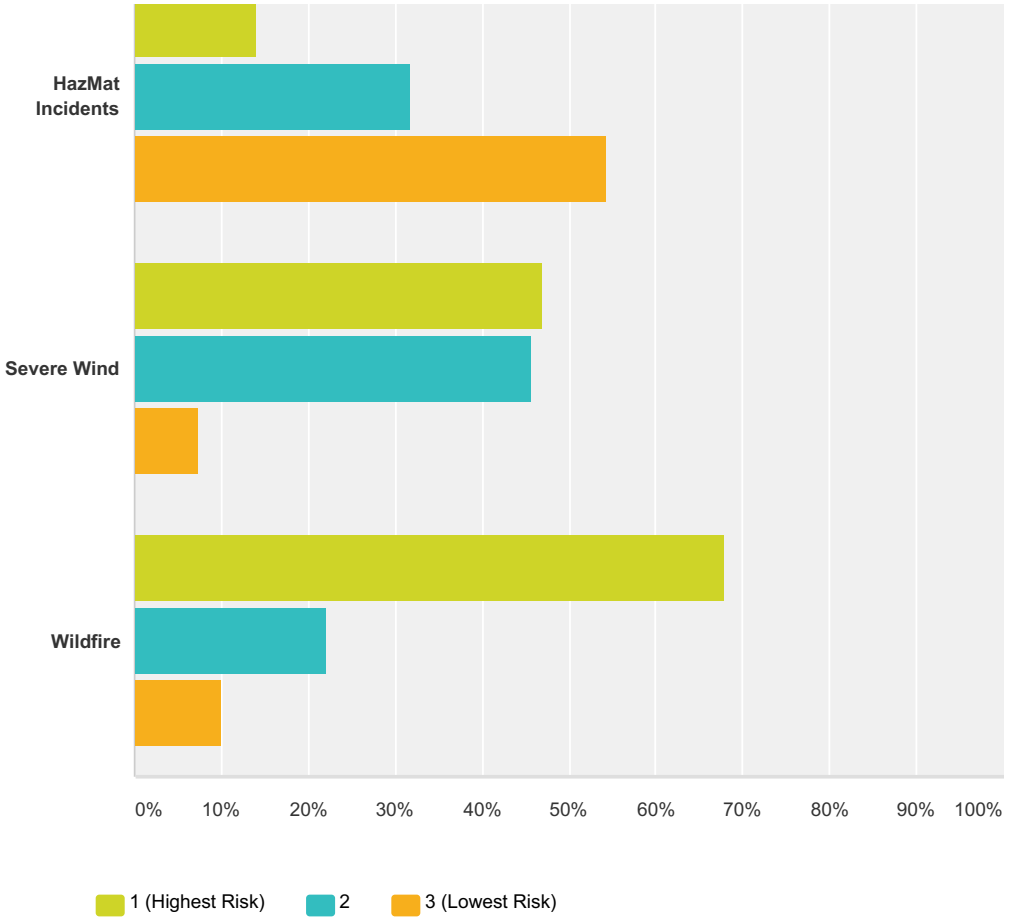
Answer Choices	Responses	
0	**27.13%**	70
1-2	**48.06%**	124
3-5	**15.89%**	41
More than 5 times	**8.91%**	23
Total		**258**

Q3 Please rank the following hazards based on the overall risk that they present.

Answered: 258 Skipped: 0



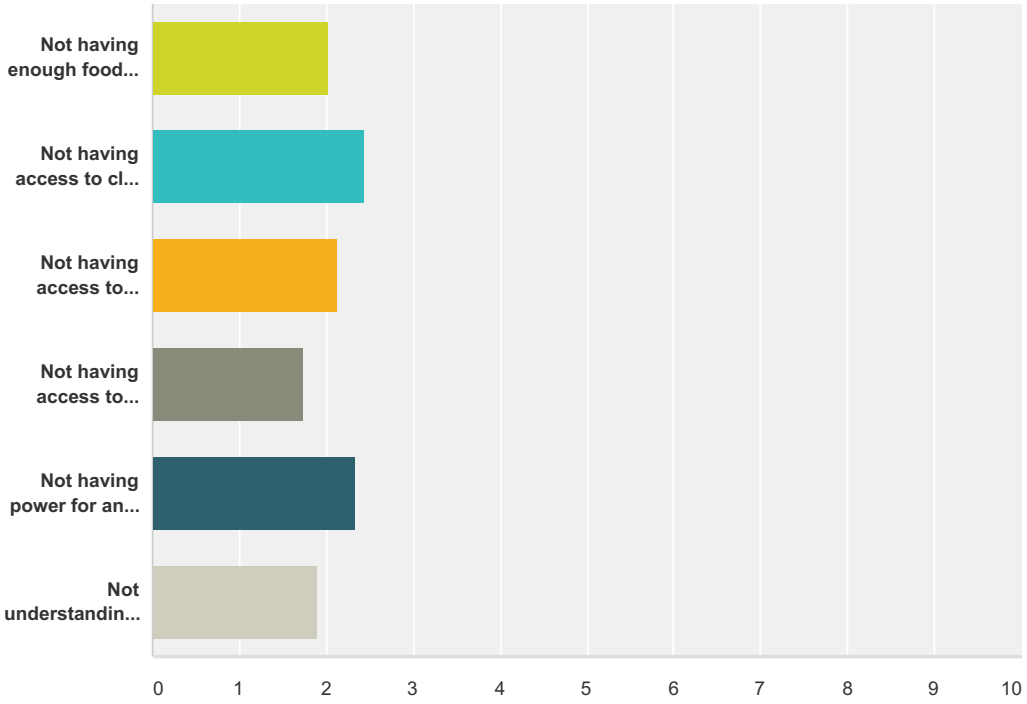
Cochise County Public Risk Perceptions



	1 (Highest Risk)	2	3 (Lowest Risk)	Total
Building Collapse / Mine Subsidence	**6.98%** 18	**13.18%** 34	**79.84%** 206	258
Drought	**30.23%** 78	**44.96%** 116	**24.81%** 64	258
Earthquake	**5.04%** 13	**22.48%** 58	**72.48%** 187	258
Fissure	**5.81%** 15	**28.29%** 73	**65.89%** 170	258
Flood / Flash Flood	**58.53%** 151	**30.62%** 79	**10.85%** 28	258
Landslide	**8.91%** 23	**27.91%** 72	**63.18%** 163	258
HazMat Incidents	**13.95%** 36	**31.78%** 82	**54.26%** 140	258
Severe Wind	**46.90%** 121	**45.74%** 118	**7.36%** 19	258
Wildfire	**67.83%** 175	**22.09%** 57	**10.08%** 26	258

Q4 How concerned are you about the following scenarios?

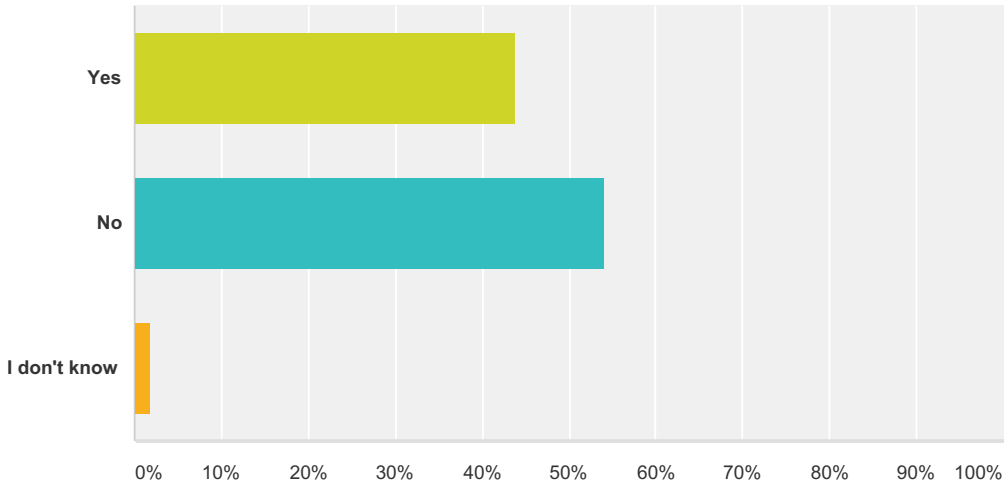
Answered: 258 Skipped: 0



	Not Concerned	Somewhat Concerned	Extremely Concerned	I don't know/no opinion	Total	Weighted Average
Not having enough food during a disaster	**20.39%** 52	**56.86%** 145	**22.35%** 57	**0.39%** 1	255	2.03
Not having access to clean water during a disaster	**7.00%** 18	**41.63%** 107	**51.36%** 132	**0.00%** 0	257	2.44
Not having access to medications during a disaster	**22.35%** 57	**44.31%** 113	**32.16%** 82	**1.18%** 3	255	2.12
Not having access to transportation in the event of an evacuation	**45.49%** 116	**36.47%** 93	**16.86%** 43	**1.18%** 3	255	1.74
Not having power for an extended period of time	**10.89%** 28	**43.97%** 113	**45.14%** 116	**0.00%** 0	257	2.34
Not understanding/hearing warning sirens or other warning messages	**35.32%** 89	**41.67%** 105	**21.83%** 55	**1.19%** 3	252	1.89

Q5 Do you have a preparedness kit?

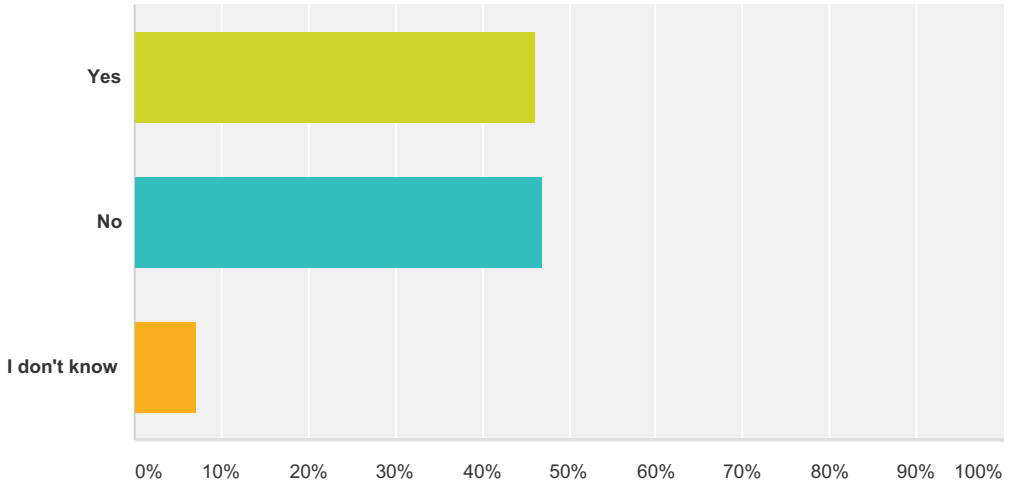
Answered: 255 Skipped: 3



Answer Choices	Responses	
Yes	**43.92%**	112
No	**54.12%**	138
I don't know	**1.96%**	5
Total		**255**

Q6 Have you taken any actions to make your home or neighborhood more resistant to hazards?

Answered: 256 Skipped: 2



Answer Choices	Responses	
Yes	**46.09%**	118
No	**46.88%**	120
I don't know	**7.03%**	18
Total		**256**

#	If yes, please explain	Date
1	Maintain grass	9/9/2016 10:18 PM
2	I have a countertop water filter and igloo jug, I always have 4-5 gallons of potable water available. Always have extra food, matches, radio, working vehicle with sufficient gas. Getting to know my neighbors and exchange contact info. Am designing water catchment zones to lessen runoff and grow food.	9/9/2016 1:34 PM
3	keep extra pet food on hand, keep car gas tank at least half full, have important documents in one place	8/24/2016 8:37 PM
4	clear home of excessive grass and weeds	8/24/2016 9:45 AM
5	Defensible area for wildfires	8/23/2016 4:20 PM
6	Strap water heater; berm to divert sheet flow to unused public land/wash to the south	8/22/2016 8:50 PM
7	I keep a fire break cut around my home and keep drainage areas clear for water	8/22/2016 2:38 PM
8	Called County when road needs maintenance. Sandbags.	8/22/2016 1:49 PM
9	30ft plus fire break around the house assist in road main. so we have an exit	8/22/2016 1:02 PM
10	30 ft perimeter , metal roofs	8/22/2016 12:26 PM
11	Mowing grass short around the house	8/22/2016 12:00 PM
12	Worked on road to improve drainage so that the road is passable during monsoon.	8/22/2016 11:17 AM
13	firewise mitigation around my house and outbuildings	8/22/2016 11:11 AM
14	Removing combustibles from around the buildings to create a firebreak	8/22/2016 9:41 AM

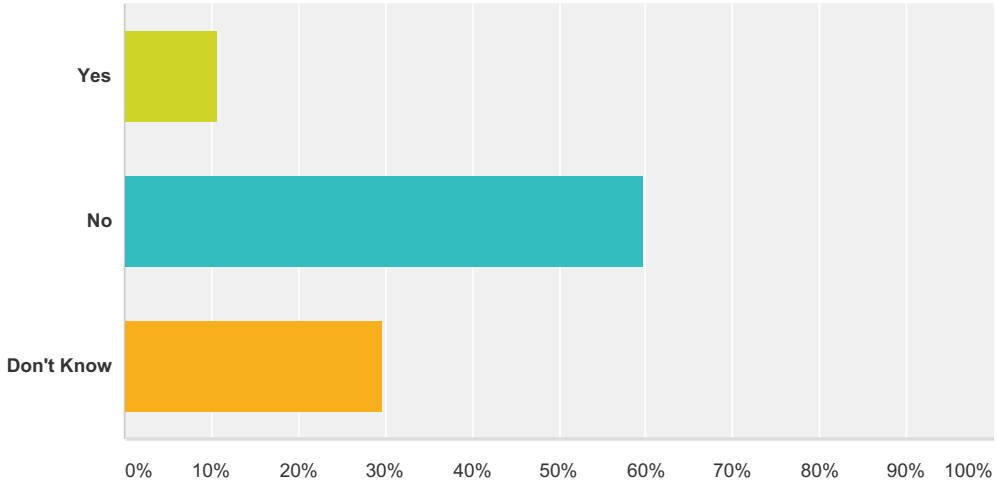
15	Try to keep dry brush cleared away from buildings; drainage ditch to carry off running water	8/20/2016 3:37 PM
16	Groun cleared	8/19/2016 4:53 PM
17	Clearing out all dry/dead vegatation away from structures	8/19/2016 2:17 PM
18	We have a plan and we have a binder of important documents that we can easily grab.	8/19/2016 2:00 PM
19	Land surrounding home kept cut/grazed so no fuel for gire	8/19/2016 12:49 PM
20	Keeping area clear around house - water storage	8/19/2016 12:10 PM
21	continually work on public roads that are not county maintained so there are more than one way in and out of our area	8/19/2016 11:25 AM
22	We have dry ditches to run water away from the house	8/19/2016 11:18 AM
23	keep living area clear of brush and fuel for fires	8/19/2016 11:18 AM
24	Brush clearing in areas near structures.	8/19/2016 10:25 AM
25	Defensible space (standoff) for fire, water storage.	8/19/2016 10:25 AM
26	Self reliance preparations.	8/17/2016 4:02 PM
27	cleaned a barrier of no plants, grass or weeds around my home.	8/17/2016 2:45 PM
28	Try to keep a fire area between the buildings.	8/17/2016 2:21 PM
29	I keep my grass mowed to the best of my ability and include mowing and mesquite trimming along our yard and the adjacent driveways of my neighbors.	8/17/2016 1:32 PM
30	Stockpile supplies	8/17/2016 12:49 PM
31	Gated entrance, stocked food, water	8/17/2016 10:04 AM
32	cutting back brush and grasses	8/17/2016 8:52 AM
33	cut weeds 50' from residence	8/17/2016 7:23 AM
34	Rainwater Collection, remove or cut grass/weeds back from house.	8/16/2016 8:48 PM
35	Have built up the foundation in case of flooding. Have food and water storage. Have plans with neighbors to assist each other in time of emergency.	8/16/2016 4:54 PM
36	Mowing weeds and keeping a 4 wheel drive auto at home	8/16/2016 4:12 PM
37	Kept bushes, grasses and trees trimmed around our home.	8/16/2016 4:08 PM
38	Cutting back vegetation,cutting in ditches,putting on a metal roof,collecting water,going solar.	8/16/2016 3:47 PM
39	keep weeds down close to the house	8/16/2016 2:57 PM
40	created wider clear spaces around structures, widened roadways for better ingress/egress	8/16/2016 2:03 PM
41	solar battery backup	8/16/2016 2:03 PM
42	Keep brush & grasses cut by home to prevent wildfire spread	8/16/2016 1:36 PM
43	Report anything that needs fixed.	8/16/2016 12:34 PM
44	clear vegetation around the house	8/16/2016 12:29 PM
45	We have sandbagged in our neighborhood.	8/16/2016 12:21 PM
46	Keep the grass and weeds around property cut/trimmed back	8/16/2016 12:07 PM
47	Live on a dirt road; made caverns on sides to re-direct water.	8/16/2016 12:03 PM
48	Extra batteries, flashlights and oil lamps on hand. One week supply of extra medication, water and food at home. Have made arrangements for a place to stay and keep a bag packed with extra medicine, clothing, toiletries in car in case cannot make it home.	8/16/2016 11:44 AM
49	keep area clear of brush/debris	8/16/2016 11:40 AM
50	House is built above ground level	8/16/2016 11:39 AM
51	I keep my brush cleared from around my home for a defensible area of at least 30 feet. I have a metal roof on my home. I have some channelling to divert water around my home.	8/16/2016 11:26 AM

52	We keep the fule for fires cut as short as possible	8/16/2016 11:24 AM
53	Keep brush clean around home, metal roof(more durable)	8/16/2016 11:21 AM
54	Keeping the yard clean and keeping water and ammo stored.	8/16/2016 11:20 AM
55	Cutting back growth around house and trees/	8/16/2016 11:03 AM
56	extra water, fire extinguisher, cutting weeds, flashlights, candles, bleach	8/16/2016 10:55 AM
57	trimmed all trees that are close to our home	8/16/2016 10:42 AM
58	cut down trees close to house in case of fire, dug areas for floodwater to flow away from house.	8/16/2016 10:40 AM
59	water diversion channels in our front and back yard in case of heavy rain or flooding	8/16/2016 10:37 AM
60	dry/canned food, water, first aid	8/16/2016 10:31 AM
61	prepared for flooding - sandbags, barriers	8/16/2016 10:29 AM
62	Remove flammable material away from home and yard; store chemicals in safe place; maintain household appliances; adhere to flashflood warnings; aware of fire-level warning at all times	8/16/2016 10:29 AM
63	property maintenance	8/16/2016 10:27 AM
64	Brush cleaned around home	8/16/2016 10:26 AM
65	brush/grass cut low, generator to provide power	8/16/2016 10:18 AM
66	trim down property keep well maintained	8/16/2016 10:18 AM
67	fire prevention measures	8/16/2016 10:14 AM
68	Food stockpile	8/16/2016 10:12 AM
69	50' perimeter around home cleared of fire fuel	8/16/2016 10:12 AM
70	keeping several 5 gallon bottles of water on hand, 3 BBQ propane tanks full at all time	8/16/2016 10:10 AM
71	Brush clearance	8/16/2016 10:09 AM
72	Clear fire hazards, secure items during high winds	8/16/2016 10:09 AM
73	removed brush near house, reworked yard/driveway to help prevent in case of extreme flood waters	8/16/2016 10:09 AM
74	Keep vegitation cleared around my home for fire prevention	8/16/2016 10:07 AM
75	Cut 'safe space' around property.	8/16/2016 10:04 AM
76	Keep weeds & grass away from structures on property	8/16/2016 10:04 AM
77	Generic stockpiling of necesseties.	8/16/2016 10:03 AM
78	Firewise trimming around my house	8/16/2016 9:43 AM
79	Have a water truck, grader, mower, and a generator. We mow a fire break, fill truck before power is out, keep water running to low ground.	8/14/2016 3:44 PM
80	Weed abatement	8/5/2016 10:29 AM
81	generator, fuel, xtra food	8/4/2016 10:00 PM
82	Cleared property 30 ft around to prevent wildfure from speading	8/4/2016 4:29 PM
83	Reduced vegetation, added rock groundcover	8/4/2016 4:02 PM
84	Purchased sandbags to prevent flood.	8/1/2016 9:11 PM
85	Secure moveable items outside, to withstand wind. Avoid plantings around house, using non flammable materials instead.	8/1/2016 10:19 AM
86	Secure moveable items outside, to withstand wind. Avoid plantings around house, using non flammable materials instead.	8/1/2016 10:15 AM
87	stored food, water, amateur radio & RACES affiliation, CERT	8/1/2016 10:11 AM
88	Keeping grass and weeds under control; water harvesting.	7/27/2016 10:47 AM
89	Cleared brush away from structures	7/26/2016 8:28 PM

90	Clearing vegetation which is a potential fire hazard.	7/22/2016 5:22 PM
91	30' defensible zone around home	7/22/2016 4:04 PM
92	Keep vegitation cut around property	7/21/2016 9:32 PM
93	My own prep, water food meds, etc generator	7/20/2016 5:06 PM
94	Keeping out side free of excess trees/brush. Ensuring proper drainage of water outside. Inside of house fire safe. Calling utilities prior to digging.	7/20/2016 3:07 PM
95	Fire-scaping, keeping brush from building up. Upgrading drainage around the house.	7/20/2016 11:02 AM
96	Water containers, food preparation	7/20/2016 9:43 AM
97	Clear space around home/buildings. Water and food storage	7/20/2016 8:06 AM
98	Fortified garage for secure storage.	7/14/2016 5:37 PM

Q7 Is your home or business currently in a FEMA designated floodplain?

Answered: 256 Skipped: 2



Answer Choices	Responses	
Yes	**10.55%**	27
No	**59.77%**	153
Don't Know	**29.69%**	76
Total		**256**

Q8 What currently mapped floodplains would you like to see revised or corrected?

Answered: 69 Skipped: 189

#	Responses	Date
1	All Flood Zone A to reflect the true Base Flood Elevation or Flood risk	10/5/2016 6:54 PM
2	n/a	9/28/2016 3:48 PM
3	na	8/30/2016 3:32 PM
4	St David	8/23/2016 8:58 AM
5	N/A	8/22/2016 2:38 PM
6	I have flood insurance thought I'm not required (not in a designated floodplain). I don't know what the benefit/risk is to revising/correcting the plains.	8/22/2016 11:11 AM
7	Didn't know there was any.	8/20/2016 10:01 PM
8	Don't know	8/19/2016 8:52 PM
9	not sure	8/19/2016 7:36 PM
10	All of them. The inaccuracy of the floodplain in SV Estates 2 is inexcusable.	8/19/2016 2:00 PM
11	Runoff area in Palominas from Huachucas.	8/19/2016 12:10 PM
12	NA	8/19/2016 11:25 AM
13	don't know	8/19/2016 10:33 AM
14	Don't know.	8/19/2016 10:25 AM
15	Warren/Galena floodplains	8/19/2016 10:13 AM
16	n/a	8/18/2016 11:00 AM
17	the area of galileo in sierra vista	8/17/2016 11:44 PM
18	The county should prioritize that, I don't know.	8/17/2016 6:30 PM
19	Flood zone	8/17/2016 4:39 PM
20	None	8/17/2016 2:45 PM
21	drainage from Carr Canyon, Ramsey Canyon, etc.	8/17/2016 1:32 PM
22	Hereford/Palominas	8/17/2016 11:28 AM
23	Don't know	8/17/2016 10:04 AM
24	Unknown	8/17/2016 8:49 AM
25	AE	8/16/2016 4:54 PM
26	FEMA has recently revised our home in a flood plain. Neighbors who have lived there for 4 generations have never experienced flooding. Feel that the government wants us to purchase insurance so it takes the burden off of us.	8/16/2016 4:54 PM
27	Coronado estates	8/16/2016 4:12 PM
28	Area of Hereford, especially Miller Canyon Area and across Hwy 92 area	8/16/2016 4:11 PM
29	All of them (?)	8/16/2016 4:08 PM
30	Don't know	8/16/2016 3:47 PM
31	where APN 102.31.144 is located	8/16/2016 1:36 PM
32	Unknown	8/16/2016 12:29 PM
33	None	8/16/2016 12:21 PM

34	I don't know what section it is under but since paving the roads in sunset acres area, the water run off is so fast there is no accumlation. I think the flood plain has probably changed now and should be reviewed. My location is likely not as high a risk anymore.	8/16/2016 12:07 PM
35	Lower Huachuca City should be re-designated	8/16/2016 11:36 AM
36	Several should be mapped that have not been	8/16/2016 11:25 AM
37	Have no Idea were to find them in the first place	8/16/2016 11:24 AM
38	NA	8/16/2016 11:21 AM
39	Entire county is overdue, i believe	8/16/2016 11:07 AM
40	entire county	8/16/2016 10:55 AM
41	dont know	8/16/2016 10:55 AM
42	Pirtleville, Az	8/16/2016 10:42 AM
43	Willcox Area	8/16/2016 10:38 AM
44	Dont know	8/16/2016 10:37 AM
45	n/a	8/16/2016 10:31 AM
46	Not sure - Newly moved to Area	8/16/2016 10:29 AM
47	Don't let builders develop the flood plains!	8/16/2016 10:18 AM
48	Moson Rd / Whetstone	8/16/2016 10:18 AM
49	NA???	8/16/2016 10:10 AM
50	Not sure. Map on Floodplain page is terrible.	8/16/2016 10:10 AM
51	unknown	8/16/2016 10:09 AM
52	100 yr flood	8/16/2016 10:04 AM
53	The above question #7 is misleading...we are ALL in a floodplain, it just depends at what level of risk. You should consider revising this question.	8/16/2016 10:04 AM
54	All should be updated more frequently than they are.	8/16/2016 10:03 AM
55	don't know	8/16/2016 10:01 AM
56	N/A	8/16/2016 9:43 AM
57	All	8/4/2016 4:29 PM
58	Palominas	8/4/2016 4:02 PM
59	High knolls area	8/2/2016 4:04 PM
60	I'd like to be able to find the maps	8/1/2016 10:11 AM
61	n/a	7/28/2016 8:59 AM
62	Lower Huachuca City	7/26/2016 9:46 AM
63	all of Cochise County, and esp the roads	7/22/2016 5:54 PM
64	Unknown	7/22/2016 5:22 PM
65	willcox	7/22/2016 4:04 PM
66	n/a	7/20/2016 5:06 PM
67	All within Sierra Vista	7/20/2016 11:02 AM
68	Palominas/Hereford area	7/20/2016 8:06 AM
69	All in City of Douglas. All are inaccurate.	7/14/2016 5:37 PM

Q9 If you responded to the previous Question 8: What Information do you have (technical knowledge, living in the areas for many years without flood issues, photos, etc) that leads you to believe the floodplain mapping is presently incorrect?

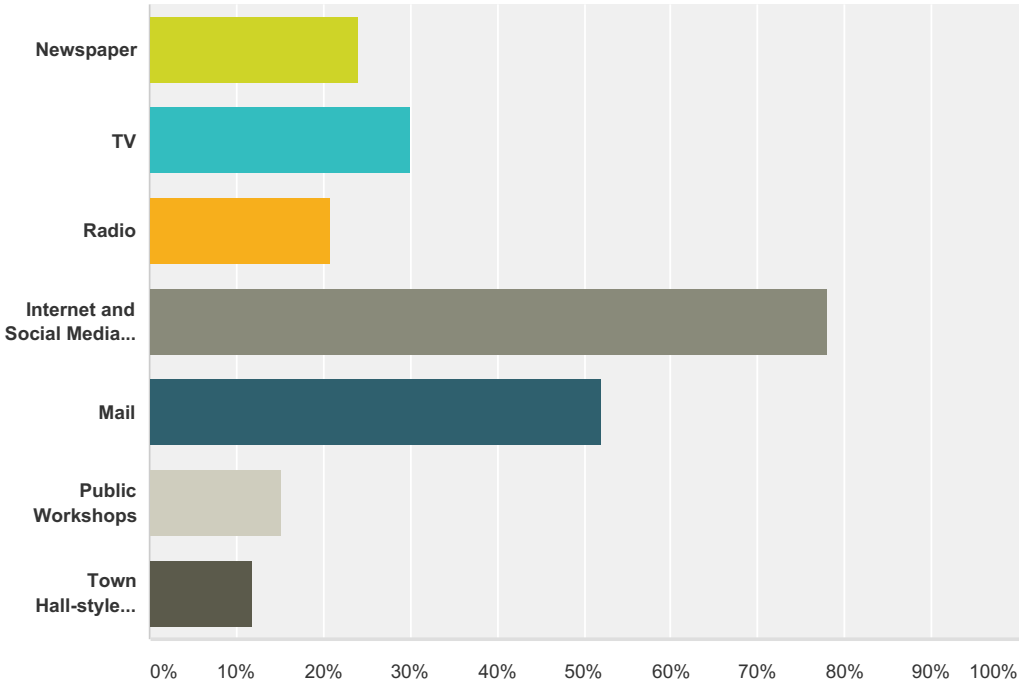
Answered: 55 Skipped: 203

#	Responses	Date
1	I work in the Floodplain dept.	10/5/2016 6:54 PM
2	Chippewa street in hereford is a disaster put county doesn't maintain ourselves and neighbors are sometimes stuck and I have no idea how emergency respondes could get to some not only on chippewa.	9/9/2016 10:18 PM
3	na	8/30/2016 3:32 PM
4	seen old floodplain maps that showed most of St David flooding	8/23/2016 8:58 AM
5	N/A	8/22/2016 2:38 PM
6	I think my area is just (possibly) underrepresented due to very limited population and narrow risk.	8/22/2016 11:11 AM
7	Didn't know there was any flood mapping, maybe that's what needs to be corrected. Informing the general public.	8/20/2016 10:01 PM
8	Husband has lived here since 74 and I since 81 and quite frankly, the wash near us has run banked to bank without any impact on our property but our property was tagged. We spent a lot of money to have our home surveyed to make sure it did not rest in the flood zone. Here's reality... you cannot insure land... only the buildings. The mortgaged building does not lie in the flood zone. But a small corner of the land does, even though in the many years we have lived here, we have never seen the running wash further than the wash itself.	8/19/2016 2:00 PM
9	I've lived here for 15 years - just want to know if there is more we should be prepared for with flooding.	8/19/2016 12:10 PM
10	NA	8/19/2016 11:25 AM
11	Problem is the Mine tailing that are draining into Galena	8/19/2016 10:13 AM
12	i don't have any	8/17/2016 11:44 PM
13	I don't have that information, the county should have it.	8/17/2016 6:30 PM
14	My last elevation that was taken to get flood insurance, that was requested by my mortgage company. I have lived in the same house for more than 20 years and just recently I needed to get flood insurance.	8/17/2016 4:39 PM
15	most of the runoff during high rain volume overfills the intended stream beds and ends up eroding the road on Moson, Ramsey	8/17/2016 1:32 PM
16	The past 5 years the flooding varies from the map	8/17/2016 11:28 AM
17	Don't know	8/17/2016 10:04 AM
18	We do have the federal flood insurance just in case.	8/17/2016 8:55 AM
19	Unknown	8/17/2016 8:49 AM
20	Being a Building Inspector, there are several areas in the county that have hazards of sheet flooding, 2" to 6" but they are required to elevate 2' to 3'.	8/17/2016 7:23 AM
21	We have a drainage ditch beside our home. We are zoned AE since the drainage is so close. We need flood insurance for that reason.	8/16/2016 4:54 PM
22	No flooding in the last 4 generations.	8/16/2016 4:54 PM
23	My home is listed as C but more that once have I had flood waters on my land	8/16/2016 4:12 PM
24	with the fires of the hereford area a few years ago, flood issues have developed along hwy 92 area's, these areas have gone unimproved upon since then.	8/16/2016 4:11 PM

25	I don't. I don't know how long it has been since mapping was completed. I do know that things can change.	8/16/2016 4:08 PM
26	N/A	8/16/2016 3:47 PM
27	Living in the area for many years without flood issues.	8/16/2016 1:36 PM
28	N/A	8/16/2016 12:29 PM
29	I've lived on Kentucky st. in Sunset acres for almost 10 years now and have never had even close to flooding in the area. Since the paving of the roads 4-5? years ago, the run off is so fast there is no water accumulation anymore. I think the flood zone has definitely changed and is no longer the risk it was 10 or more years ago.	8/16/2016 12:07 PM
30	There seems NO evidence to support the current designation given improvements over the last two decades.	8/16/2016 11:36 AM
31	Civil Engineer with experience in performing flood plain studies. Many in the County are by visual estimating rather than actual ground contours.	8/16/2016 11:25 AM
32	NA	8/16/2016 11:21 AM
33	Private developers seeking approvals have identified numerous areas where maps are out of date in recent years. I believe P&Z is aware of these areas.	8/16/2016 11:07 AM
34	I believe some areas are incorrectly included in the floodplain.	8/16/2016 10:55 AM
35	have lived there 55 yrs never seen it or heard of it flooding - yet paid for flood insurance for 20 yrs because I live in a flood zone	8/16/2016 10:42 AM
36	Needs updated	8/16/2016 10:38 AM
37	New to the Area - Not yet known	8/16/2016 10:29 AM
38	I am really old and I was born here!	8/16/2016 10:18 AM
39	not sure they are incorrect, but a new up to date mapping cant hurt.	8/16/2016 10:18 AM
40	N/A	8/16/2016 10:09 AM
41	The drainage in the Sulphur Springs Valley would not allow flooding near my property.	8/16/2016 10:04 AM
42	Same as above	8/16/2016 10:04 AM
43	My family has been here for over 20 years and there has been one adjustment of the floodplain to my knowledge. There are definitely areas that need to be reevaluated and it should be easier to access and understand.	8/16/2016 10:03 AM
44	I know that before Hereford Rd was widened, a ditch ran on the low side (north) of the road and the roads running north didn't wash out like they do now. We own Dos Amigos and it is a mess unless we fix it frequently. I saw pictures of the roads on this north side this year that looked like rivers.	8/14/2016 3:44 PM
45	Its obvious to anyone that has lived here..	8/4/2016 4:29 PM
46	Damage to schools	8/4/2016 4:02 PM
47	Live in the area for 10 years. 2 of the 3 deaths from swift water have been in the high knoll area. I'm a swiftwater tech.	8/2/2016 4:04 PM
48	I'd like to be able to find the maps!	8/1/2016 10:11 AM
49	The Babacarmi has been changed.	7/26/2016 9:46 AM
50	several of the roads are flooded during heavy rains despite not being in floodplains	7/22/2016 5:54 PM
51	Unknown	7/22/2016 5:22 PM
52	no flood damage reported in over 50 years	7/22/2016 4:04 PM
53	Erosion happened. We haven't been hit by a hurricane for years and no one realizes how much water will flow when one hits (Like Tucson's flood of '93)	7/20/2016 11:02 AM
54	Update FEMA maps! Many areas are no longer subject to flooding due to recharge projects the County has put in place (Palominas) Flood insurance is hugely expensive and a deterrent to many people selling homes/property. We have had a surveyors report done which shows we are not prone to flooding and yet no one wants to pay the expense to have the maps updated.	7/20/2016 8:06 AM
55	Maps show water backed up on downslope side of berms, no basis for edges of floodplains.	7/14/2016 5:37 PM

Q10 What is the most effective way for you to receive information about how to make your home and neighborhood more resistant to hazards (you may select more than one)?

Answered: 250 Skipped: 8



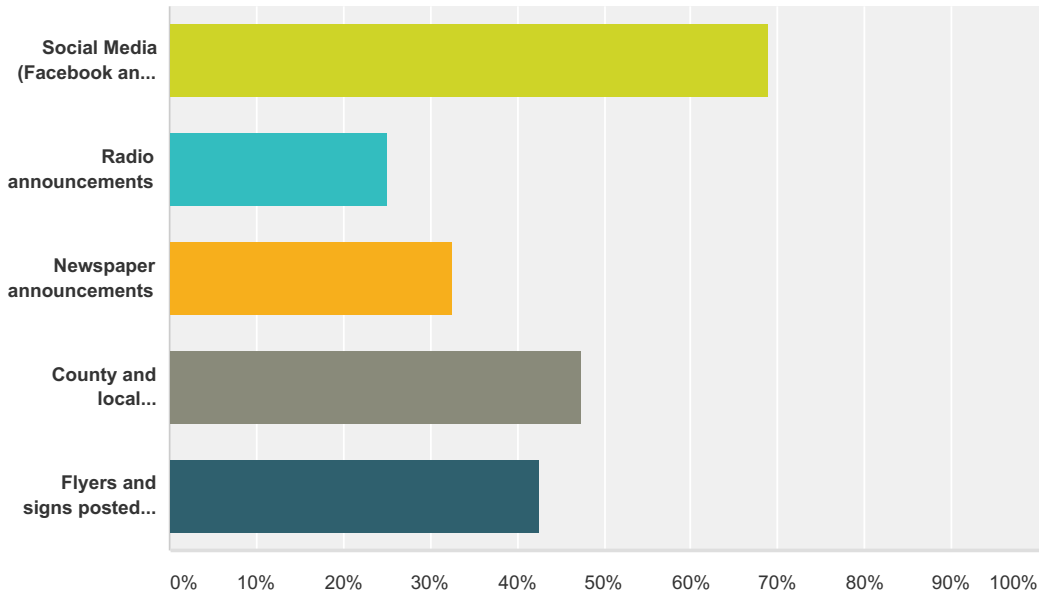
Answer Choices	Responses	
Newspaper	**24.00%**	60
TV	**30.00%**	75
Radio	**20.80%**	52
Internet and Social Media (Twitter, Facebook)	**78.00%**	195
Mail	**52.00%**	130
Public Workshops	**15.20%**	38
Town Hall-style Meetings	**12.00%**	30
Total Respondents: 250		

#	Other (please specify)	Date
1	email	10/5/2016 6:54 PM
2	Home & Garden Show; partnerships with Cochise College & The Water Project & U OF A SOUTH	8/22/2016 8:50 PM
3	Text messaging	8/22/2016 2:38 PM
4	Email	8/22/2016 1:49 PM
5	Internet. We don't have TV and no radio reception.	8/22/2016 11:17 AM

6	online and text alerts	8/22/2016 9:41 AM
7	Texting alerts to updates or events	8/19/2016 11:38 PM
8	Pointless on tv for rural people, still only get Tucson news as we only have satellite tv. Can't even access Sierra vista tv. Why wasn't this resolved after 911?	8/19/2016 12:49 PM
9	Text	8/19/2016 11:53 AM
10	The town hall meetings were terrific during the monument fire	8/19/2016 11:18 AM
11	On site inspection (Whetstone Fire)	8/19/2016 10:25 AM
12	Visit schools and let the kids know too.	8/17/2016 2:45 PM
13	Cell alerts	8/17/2016 12:49 PM
14	Cell phone warning from county	8/17/2016 10:04 AM
15	email and text message alerts	8/16/2016 5:35 PM
16	cell phone alerts	8/16/2016 4:14 PM
17	text	8/16/2016 3:23 PM
18	cell phone	8/16/2016 1:02 PM
19	Text message via cell phone	8/16/2016 11:39 AM
20	all	8/16/2016 10:55 AM
21	neighbors & dog walkers	8/16/2016 10:18 AM
22	County Email to All Staff	8/16/2016 10:10 AM
23	E-Mail	8/16/2016 10:04 AM
24	Cellphone Text	8/5/2016 3:07 PM
25	SMS texts would make the most sense in reaching the greatest amount of people quickly with emergency alerts	8/4/2016 8:51 PM
26	county website. FORGET social media, I never use it	8/1/2016 10:11 AM
27	Text message alerts	7/20/2016 11:02 AM

Q11 What is the best way for your local emergency manager to contact you about future planning activities, surveys, meetings, and announcements? Please select any options that would work well for you.

Answered: 251 Skipped: 7



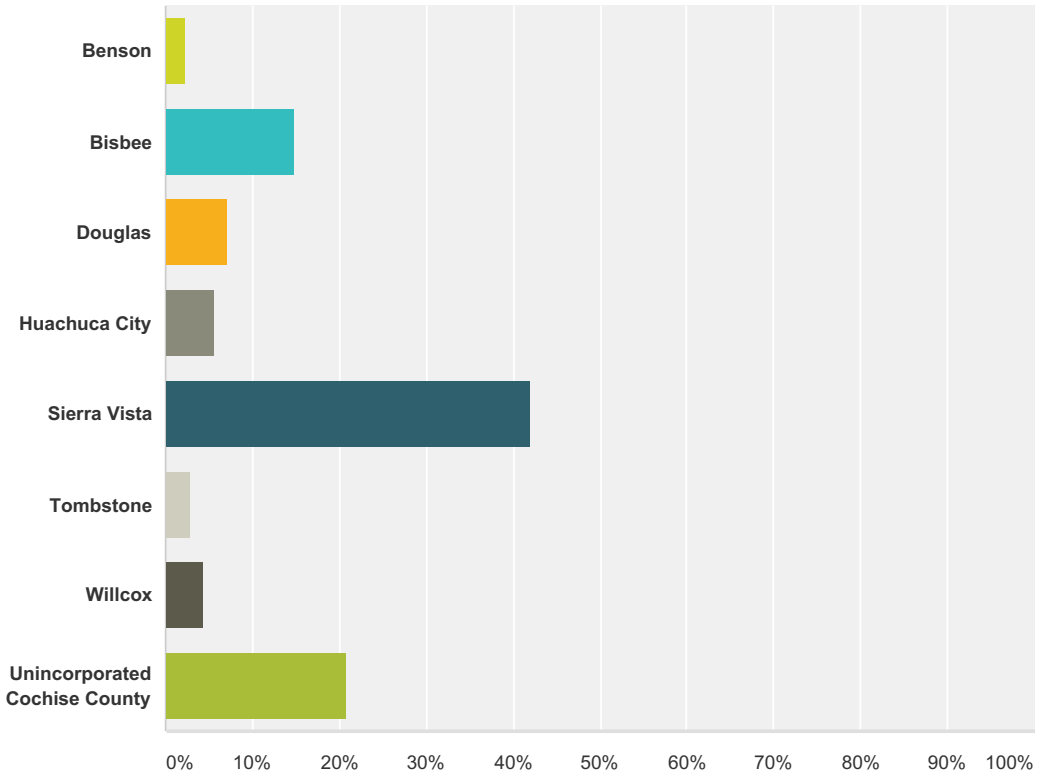
Answer Choices	Responses	
Social Media (Facebook and Twitter)	**68.92%**	173
Radio announcements	**25.10%**	63
Newspaper announcements	**32.67%**	82
County and local jurisdiction Websites	**47.41%**	119
Flyers and signs posted in public places	**42.63%**	107
Total Respondents: 251		

#	Other (please specify)	Date
1	email	10/5/2016 6:54 PM
2	Email	9/9/2016 1:34 PM
3	Email	8/22/2016 10:27 PM
4	Text messaging	8/22/2016 2:38 PM
5	Email	8/22/2016 11:17 AM
6	County emails?	8/22/2016 11:11 AM
7	mail	8/22/2016 10:05 AM
8	Online notices - I received the Daily Brief	8/22/2016 9:41 AM

9	Texting and Facebook are the best	8/19/2016 11:38 PM
10	Cell phone- like the CC emergency test service	8/19/2016 4:15 PM
11	Text	8/19/2016 11:53 AM
12	HOA	8/19/2016 10:25 AM
13	Text	8/19/2016 10:13 AM
14	Email	8/18/2016 11:00 AM
15	Mail	8/17/2016 6:30 PM
16	Tucson TV stations ABC, NBC and CBS	8/17/2016 2:45 PM
17	Cell alerts	8/17/2016 12:49 PM
18	e-mail	8/17/2016 7:23 AM
19	email	8/16/2016 8:48 PM
20	email and text message alerts	8/16/2016 5:35 PM
21	cell phone alerts	8/16/2016 4:14 PM
22	Mailings to the residential addresses. alot of people living in modest means, don't have social media or leave their homes. elderly people living in rural areas need to be contacted as well.	8/16/2016 4:11 PM
23	mail	8/16/2016 2:57 PM
24	cell phone and email	8/16/2016 1:02 PM
25	Text messages	8/16/2016 12:49 PM
26	Mail	8/16/2016 11:44 AM
27	County Staff Email	8/16/2016 10:10 AM
28	Cell Phone notifications similar to emergency notifications.	8/16/2016 10:04 AM
29	Email alerts	8/4/2016 4:02 PM
30	Would like to use this forum to point out a problem. I receive text notifications that give severe warning alerts. But, *county-wide* alerts are not useful. Our county is huge! For me, in Palominas, an alert about something happening in Portal is not helpful. These text alerts are so over broad as to be useless for me. A flash flood watch "for Cochise County" does not tell me whether I need to do anything special in my *PART* of Cochise County.	8/1/2016 10:19 AM
31	Would like to use this forum to point out a problem. I receive text notifications that give severe warning alerts. But, *county-wide* alerts are not useful. Our county is huge! For me, in Palominas, an alert about something happening in Portal. These text alerts are so over broad as to be useless for me.	8/1/2016 10:15 AM
32	option on CC Alerts to receive such info	8/1/2016 10:11 AM

Q1 What jurisdiction do you live in?

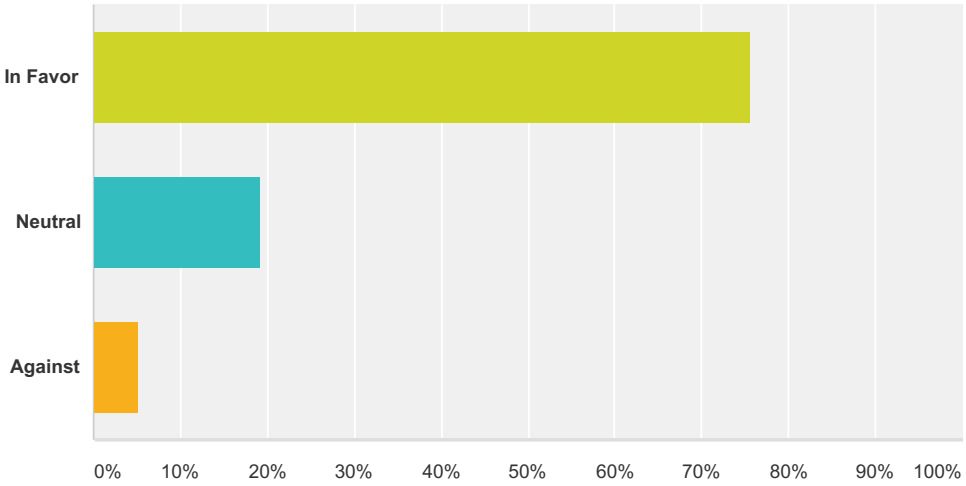
Answered: 210 Skipped: 0



Answer Choices	Responses	
Benson	**2.38%**	5
Bisbee	**14.76%**	31
Douglas	**7.14%**	15
Huachuca City	**5.71%**	12
Sierra Vista	**41.90%**	88
Tombstone	**2.86%**	6
Willcox	**4.29%**	9
Unincorporated Cochise County	**20.95%**	44
Total		**210**

Q2 Local Planning and Regulations-Building Codes-Local Zoning and Land Use Codes-Identification/Mapping of Hazard Areas-Stormwater Management Planning

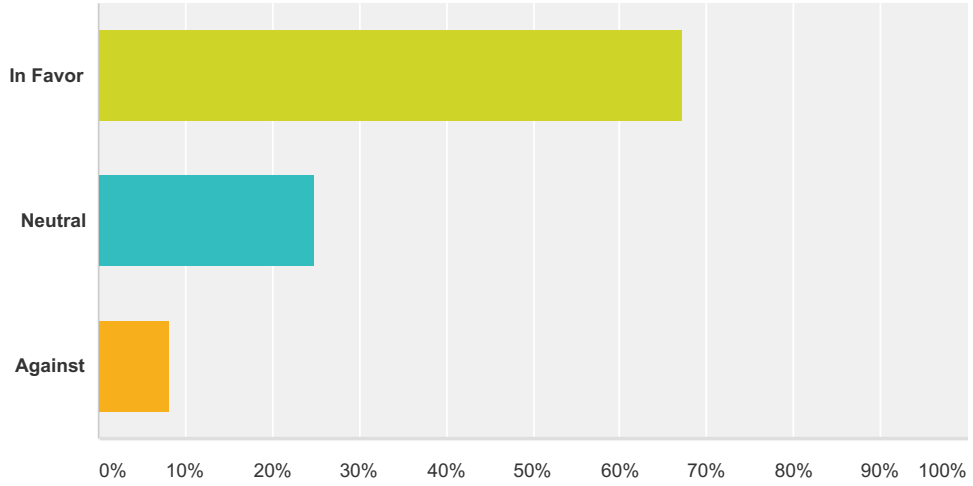
Answered: 209 Skipped: 1



Answer Choices	Responses	
In Favor	**75.60%**	158
Neutral	**19.14%**	40
Against	**5.26%**	11
Total		**209**

Q3 Structure and Infrastructure Projects-Construct Tornado Safe Rooms-Improve Drainage to Reduce Flood Threats-Retrofit Buildings to Higher Code Standards-Acquire and Demolish Structures in Hazard-prone Areas

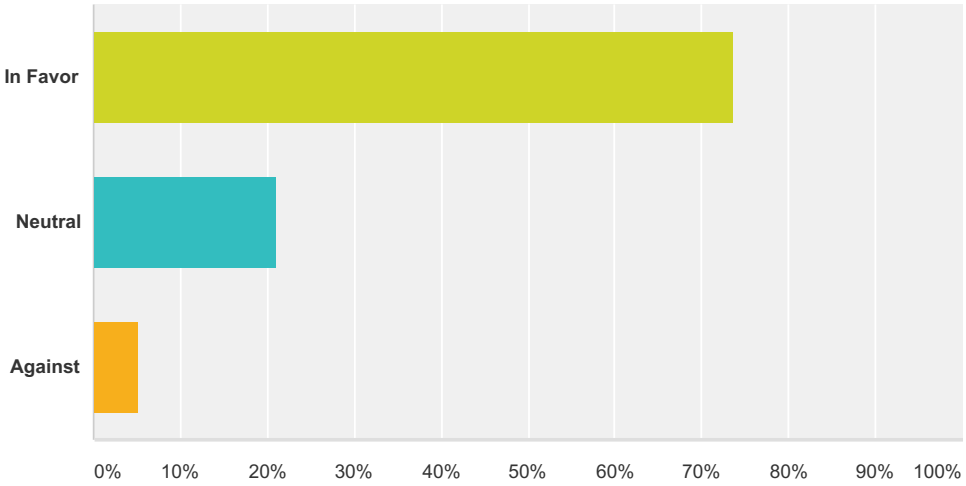
Answered: 210 Skipped: 0



Answer Choices	Responses	
In Favor	**67.14%**	141
Neutral	**24.76%**	52
Against	**8.10%**	17
Total		**210**

Q4 Natural Systems Protection-Implement Erosion Control Measures-Create Defensible Space Regulations-Protect and Preserve Natural Areasx

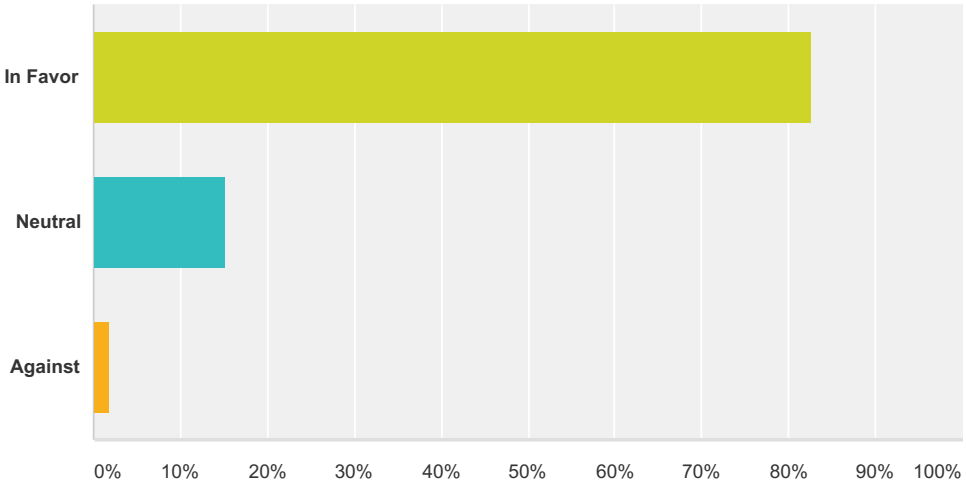
Answered: 209 Skipped: 1



Answer Choices	Responses	
In Favor	**73.68%**	154
Neutral	**21.05%**	44
Against	**5.26%**	11
Total		**209**

Q5 Education and Awareness Programs- Incentivize Drought Tolerant Landscaping- Host Informational Workshops and Events- Educate the Public about Risks

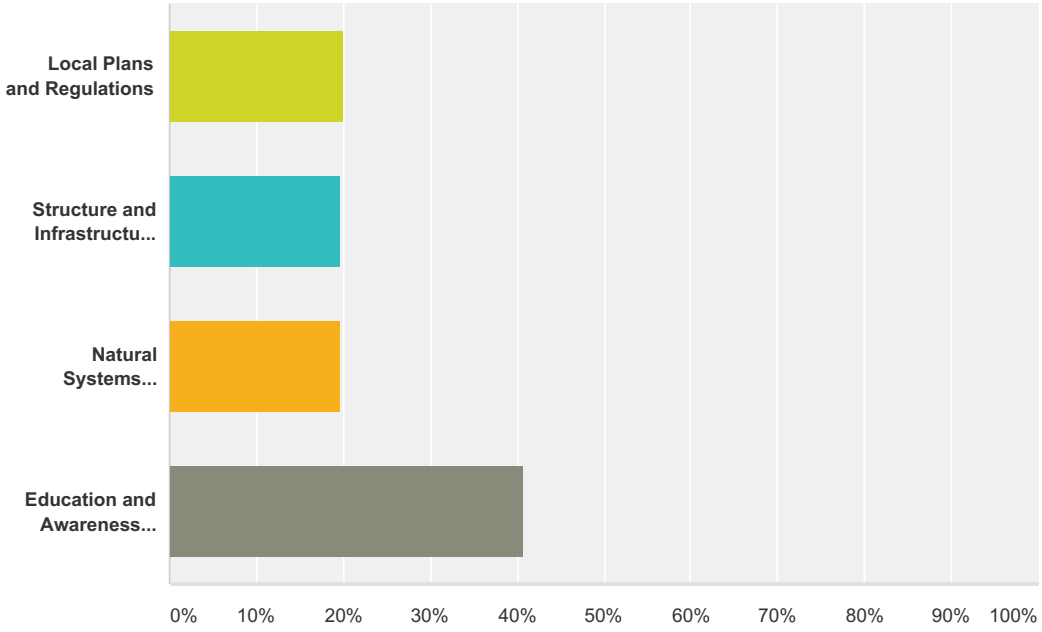
Answered: 209 Skipped: 1



Answer Choices	Responses	
In Favor	**82.78%**	173
Neutral	**15.31%**	32
Against	**1.91%**	4
Total		**209**

Q6 Which of the above four categories are you most supportive of?

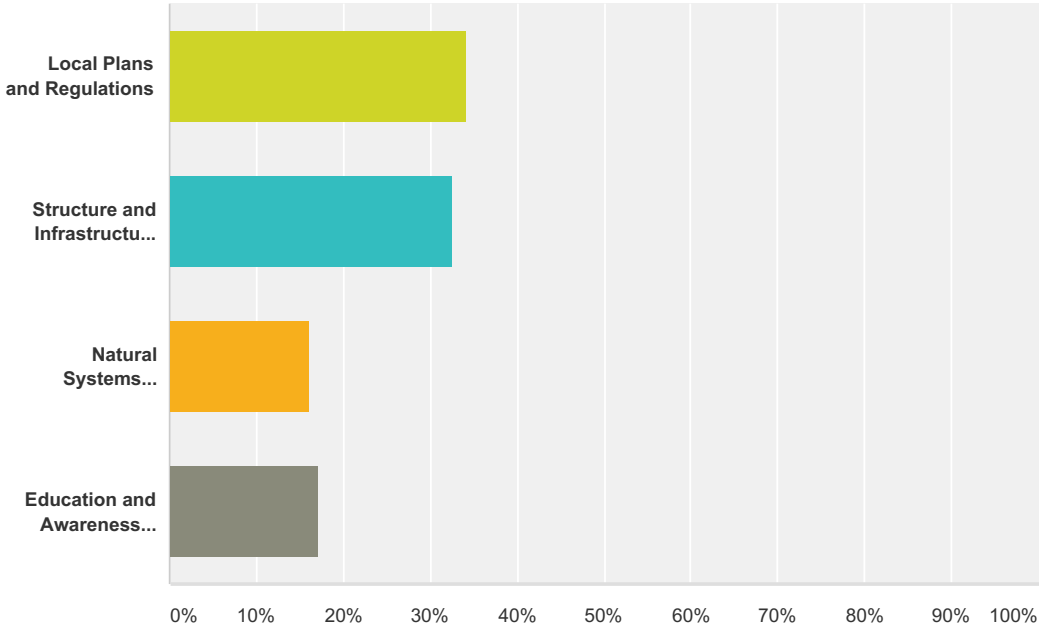
Answered: 209 Skipped: 1



Answer Choices	Responses	
Local Plans and Regulations	**20.10%**	42
Structure and Infrastructure Projects	**19.62%**	41
Natural Systems Protection	**19.62%**	41
Education and Awareness Programs	**40.67%**	85
Total		**209**

Q7 Which of the above four categories are you least supportive of?

Answered: 199 Skipped: 11



Answer Choices	Responses	
Local Plans and Regulations	**34.17%**	68
Structure and Infrastructure Projects	**32.66%**	65
Natural Systems Protection	**16.08%**	32
Education and Awareness Programs	**17.09%**	34
Total		**199**

Q8 Please share your top idea for a specific mitigation project or action that you would like to see implemented by your government, should funding be available.

Answered: 77 Skipped: 133

#	Responses	Date
1	I prefer smaller government and less regulation with greater individual property rights. Educate and inform. If a citizen or business causes a problem (i.e., fire), penalize that person or business. More regulations and codes are not the answer. We are already over-regulated.	2/3/2017 8:10 AM
2	restoration of healthy watershed function, reducing erosion	2/2/2017 8:23 AM
3	Storm water run off and collections show be are top priority in this area to help in water issues	2/2/2017 5:43 AM
4	Eliminate junkyards that provide homes for rodents/snakes and mosquitos	2/1/2017 4:12 PM
5	Service the water tank.	2/1/2017 3:40 PM
6	More Police Officers on the streets.	2/1/2017 1:20 PM
7	Hurricane force wind preparation and awareness (Particularly in the Hereford area) Earthquake threat assessment to infrastructure.	1/31/2017 11:01 PM
8	I think fire breaks for land owners would be essential as well as eliminating attractive nuisances such as inoperable vehicles, debris and trash. Erosion control and water saving landscaping education are crucial in these times. I wish county could, more importantly, would assist Huachuca City to clean up its mess that its allowing.	1/31/2017 6:59 PM
9	Public information on possible hazards	1/31/2017 1:43 PM
10	I would like to see our flood zone updated, they have not been updated in years and now my mortgage company has insisted that we get flood insurance which is very expansive and I have already done a new elevation certificate but does not march the existing maps,	1/31/2017 10:06 AM
11	Incentivize Drought Tolerant Landscaping	1/31/2017 10:01 AM
12	While I don't think the taxpayer should pay for incentivization, I think educational programs that talk about drought tolerant landscaping and other mitigation measures (fire avoidance) are a good idea.	1/31/2017 9:33 AM
13	Weed Control and better drainage for rain waters	1/31/2017 8:40 AM
14	How to fire-proof your property	1/30/2017 6:21 PM
15	Construct retention basins and channels to protect US properties as well as those of Mexico.	1/30/2017 2:01 PM
16	Help elderly, rural residents clear brush close to their home. Some local fire departments are doing this, but it's a never ending issue	1/30/2017 1:48 PM
17	Local zoning and land use codes.	1/30/2017 10:02 AM
18	Improvements in areas already implemented in the city that need updating.flood planes, erosion control. Warning system	1/28/2017 6:16 PM
19	Work with the core of engineers and FEMA, to determine how we can alleviate if not remove the flood zone in lower Huachuca City.	1/26/2017 10:35 PM
20	Fire-wise activities.	1/26/2017 8:53 PM
21	Just be fair when implementing codes that everyone has follow the standards	1/26/2017 12:07 PM
22	Public Education campaigns for water conservation (incentives not regulations are good) and especially FireWise incentives. Also...there needs to be good consideration to responsible zoning for Floodplains and WUI areas. People should not be building where there is known natural hazards. If they do...they need to take total responsibility for their decision and not have any expectations for government assistance regarding losses resulting from their location.	1/26/2017 10:32 AM

23	We need more sheriff's for our safety.... this sheriff's working in the northern part of the county are to far stretched out... there are other parts of this county besides just Sierra Vista.. contractors don't want to come to cochise county bcuz they say planning and zoning is difficult to work with and not builder friendly.	1/25/2017 9:13 AM
24	Obtain needed resources, establish memorandums of understanding between adjoining counties for assistance if needed, additional training for first responders and support staff.	1/25/2017 7:52 AM
25	Defensible space requirements Flood mitigation	1/25/2017 7:26 AM
26	Complete the bike path so it goes completely around Sierra Vista including along the by-pass.	1/24/2017 5:15 PM
27	Reducing excess fire fuels in open areas (city, county, state trust and national forest lands). Improving water shedding and sustainability of recreation trails in same areas. Improve signage and mapping for public use of same trails. Continue to build shared use paths in Sierra Vista (but add center stripes for safer user experiences). These efforts could help tourism, one of the supplemental incomes to our area.	1/24/2017 3:10 PM
28	What needs to be repaired needs to begin first.	1/24/2017 2:38 PM
29	I would like to see a location restriction of small church's based on zoning or change the restrictions on businesses who serve alcohol being close to one of these micro church's. It limits the property available to those in the beverage industry production, bars, wineries or otherwise.	1/24/2017 8:31 AM
30	I have no specific suggestions	1/24/2017 6:59 AM
31	Good luck with the water issue in Federal court in November.	1/23/2017 12:11 PM
32	Land use inforcement	1/23/2017 11:48 AM
33	Clear brush in fire prone areas	1/23/2017 11:26 AM
34	defensible space	1/23/2017 10:56 AM
35	Development projects should be cognizant of the effects of changing the local environment on properties east and south of their developments, specifically water. Runoff has increased considerably in the last 8 years as more houses are built on the east side of Sierra Vista and natural vegetation is paved over. Residents receiving the excess runoff have to mitigate runoff at huge personal costs.	1/23/2017 10:49 AM
36	Implement erosion control measures in the county.	1/23/2017 10:17 AM
37	A real exit plan in case of a serious disaster	1/23/2017 9:43 AM
38	Combination of all the above	1/23/2017 9:33 AM
39	I would like to see the broken down building demolished, they are a danger to the town.	1/23/2017 9:16 AM
40	education is the best way to handle it. We have enough laws so we do not need any more regulation. The county and state roadways should be mowed past the normal 6 feet. Grass and weeds should be cut back to the fence lines. This made a difference during the monument fire.	1/23/2017 9:06 AM
41	Create defensible space regulations	1/23/2017 8:30 AM
42	I think it would be cheaper for the county to study how the water flows BEFORE they engage in a paving project. More expensive to go back to repair a section of road after it has washed away. Installing a culvert or concrete slab first would save time and money.	1/23/2017 8:22 AM
43	I am not well versed on these matters, I feel it wouldn't be prudent to make a suggestion. I'm hopeful the government agencies will make wise and educated decisions.	1/23/2017 7:49 AM
44	wild fire and flood control in grass areas	1/23/2017 7:46 AM
45	Infrastructure	1/23/2017 7:24 AM
46	-	1/21/2017 7:42 PM
47	Demolition of aging, eyesore, and non-compliant structures. Produce community planning, and create a SAFE infrastructure with forward thinking aimed at a progressive city future.	1/21/2017 5:13 PM
48	Projects that put more water into the riparian area.	1/20/2017 8:09 PM
49	The same regulations for defensive areas applied to riparian areas locally. And allowance of taking dead and downed in local areas. USGS is not doing it .	1/20/2017 7:50 PM
50	Flood control	1/20/2017 7:06 PM
51	Flood control on Dragoon Road. It's like no one ever heard of culverts.	1/20/2017 5:11 PM

52	Road aND sidewalk improved	1/20/2017 3:12 PM
53	addresses assigned and affixed to county residence to locate residence quickly during an emergency	1/20/2017 10:53 AM
54	N/A	1/20/2017 10:07 AM
55	Road improvement in rural areas.	1/20/2017 9:59 AM
56	Additional clearing of dead trees and underbrush which remain from previous fires and invasion of non-native species.	1/20/2017 9:15 AM
57	Grants to home owners to make their own homes and properties more durable.	1/20/2017 8:27 AM
58	More water runoffmitigation, how tos for homeowners....	1/20/2017 7:50 AM
59	Awareness and education	1/20/2017 7:33 AM
60	Soft target protection from terrorist threats, particularly schools, such as improvements in building security and physical access restrictions, surveillance, and discussions about the pros and cons of armed guards.	1/20/2017 12:07 AM
61	Better bridges	1/19/2017 11:27 PM
62	Education	1/19/2017 8:21 PM
63	Better signage and drivers education regarding typical flooded roads in Cochise County	1/19/2017 8:21 PM
64	Protect and preserve water quality.	1/19/2017 6:57 PM
65	Acquire and Demolish Structures in Hazard-prone Areas	1/19/2017 5:27 PM
66	Pave roadway shoulders, accurate floodplain mapping in growth/or at least existing residential areas	1/19/2017 4:44 PM
67	Do not have an opinion.	1/19/2017 4:20 PM
68	Complete flood control program East of Bay Acres to divert sheet flows into Palm Grove Wash. Cochise County Flood Control District	1/19/2017 3:23 PM
69	Drought Prep/Workshops	1/19/2017 3:22 PM
70	mitigation of known flood hazards	1/19/2017 2:30 PM
71	Transportation of food, water, medications and other supplies	1/19/2017 2:28 PM
72	Watershed improvement through removal of brush reseeding of grasses. Use inmate labor to maunually chop out woody brush. require acre for acre watershed restoration on public lands for new subdivisions. Water is most important issue facing this region. Encourage cluster development of high quality homes with co-op owned open space instead of sprawling rectangular development pattern filled with mobile homes and junk. Reduce the number of pollution generating dirt roads	1/19/2017 2:02 PM
73	large parks and trails that protect natural areas as well as bring in revenue from tourism	1/19/2017 1:46 PM
74	Repair streets in poor condition. Majority of the neighborhood streets in Bisbee, especially in Warren area are dangerous to drive on and in the event of an emergency could impede traffic flow	1/19/2017 1:42 PM
75	Active shooter training for schools, treat assessment team training	1/19/2017 1:42 PM
76	2 & 3	1/19/2017 1:39 PM
77	Education and Awareness Programs	1/19/2017 1:37 PM

Q9 Please share any additional comments or information, relating to mitigation strategies for natural hazards, that you would like your jurisdiction to receive. If you would like to be contacted regarding your comments, please include contact information as appropriate.

Answered: 44 Skipped: 166

#	Responses	Date
1	Over regulation is a form of fascism.	2/3/2017 8:10 AM
2	minimize disruption or destruction of the land, thereby not creating an erosion problem to begin with	2/2/2017 8:23 AM
3	Eliminate weeds and dry grass to downgrade fire hazards.	2/1/2017 4:12 PM
4	None.	2/1/2017 3:40 PM
5	Be Smart about what ever is approved.	2/1/2017 1:20 PM
6	I would happily support county in all jurisdictions for all of these proposed ideas. County needs to step up and become more responsible. It also needs to seriously help small towns like Huachuca City who can't help themselves. 90% of the town would crumble in a natural disaster because of the dilapidated buildings, junk yards and lack of enforcement.	1/31/2017 6:59 PM
7	Protect and Preserve Natural Areas	1/31/2017 10:01 AM
8	There's only one highway in or out of Huachuca City. In the event of any disaster that closes the highway in either direction, people are not able to travel that direction, causing detours of 50+ miles. Partnering with Ft. Huachuca and Sierra Vista, could alternative routes be established through the surrounding military land in the event of a long-term highway closure? Thank you. Joy Banks joybanks.az@gmail.com	1/30/2017 6:21 PM
9	Floodways and retention/detention basins should be the top priority for now	1/30/2017 2:01 PM
10	There is a lot of contention with the fact much of lower Huachuca City, falls into some type of flood zone, resulting in massive insurance costs to individuals on fixed incomes. Looking at the flood map alone, there are homes over 1,000 feet away, that fall into the floodplain when their neighbors, may not.	1/26/2017 10:35 PM
11	Do educational activities - not just presentation but hands-on - with students to educate our future residents on best practices that can be done cheaply at home.	1/26/2017 8:53 PM
12	We do not have tornados in Cochise county. Why would we want to build tornado proof rooms?	1/26/2017 11:14 AM
13	The flood zones in this county are rediculous, monies should be better spent instead of county employees using the county vehicles for personal use,	1/25/2017 9:13 AM
14	N/A	1/25/2017 7:52 AM
15	Why would you include tornado shelters? Each area had some priorities and some lesser ideas. Makes decisions harder, or not valid.	1/25/2017 7:26 AM
16	Where would these tornado proof rooms be constructed? Specific buildings such as schools? Do we get a lot of tornadoes to justify the expense?	1/24/2017 5:15 PM
17	I serve as an IMBA trail steward and have volunteers that we work with if trail improvements and maintenance are desired. I can also contract specific trail work to be done (by hand) on more remote areas (like Forest Service in the Huachucas). I can advise on trail signage that would affordably improve our systems and have a good longevity. Shane Stilwell, 520-266-1951 twikaneshane@cox.net	1/24/2017 3:10 PM
18	Providing education doesn't have an effect but actions do.	1/24/2017 2:38 PM
19	Simply put I would like to see less regulation and more preservation. Thank you for the survey!	1/24/2017 6:59 AM
20	Let the Forest service people give input on this. They know more than I do!	1/23/2017 10:19 PM

21	helping senior citizens maintain their properties either by helping keep grass and weeds mowed, and trees trimmed to create defensible spaces and help with junk removal	1/23/2017 10:56 AM
22	Do not "Create Defensible Space "Regulations" (#4). Instead...do "Educate and Awareness" on this.	1/23/2017 10:35 AM
23	We really need to make sure the people who cannot get around on their own have a way to be rescued in the event of a disaster. The transit system should have a plan and registry for people who are not able to get out on their own.	1/23/2017 9:43 AM
24	I would like to see more booklets made for the citizens. And more surveying done on mitigation problem areas.	1/23/2017 9:16 AM
25	Tornado rooms?? When was the last time we had a tornado here? I believe if you would have just left that one stupid thing off of the list, you'd probably get full support for the rest in that category. Honestly...	1/23/2017 8:30 AM
26	Please continue cleanup and removal of derelict properties as quickly as possible.	1/23/2017 7:03 AM
27	-	1/21/2017 7:42 PM
28	None	1/21/2017 5:13 PM
29	There has to be a better way, more 21st century, to warn people about issues. During the 2011 Monument fire, I had facebook and I listened to the FM radio station to TRY and get updates about the evacuation and fire control efforts. It was very very limited in telling me what was going on. I read on-line the Slerra Vista Herald, to even know what was being done. If the power goes out, I done. So, information based on the way people can routinely get it, plan for it ahead of time. Some recent improvements are the emails from County Super, and the warning alerts on my phone, email etc.	1/20/2017 8:09 PM
30	Education on roads and repair of local infrastructure.	1/20/2017 7:50 PM
31	N/A	1/20/2017 10:07 AM
32	Not so much a mitigation, but a preparedness, I'd like to see the CERT program built up.	1/20/2017 8:27 AM
33	None	1/20/2017 7:50 AM
34	Perhaps explore what the impacts would be in the event of a major earth quake and damage to critical infrastructure such as severe electric disruption and access to potable water	1/20/2017 12:07 AM
35	Police and emt and firefighters	1/19/2017 8:21 PM
36	Flood preparedness.	1/19/2017 6:57 PM
37	No thank you.	1/19/2017 4:20 PM
38	The need for flood control in Douglas to prevent serious flooding in Agua Prieta, Sonora needs to be made clear to American residents.	1/19/2017 3:23 PM
39	Convert 'dips' on hard surfaced roads to bridges.	1/19/2017 3:22 PM
40	Enforce existing law; avoid new regulations. We need to open paths for new industry and business, not find new roadblocks.	1/19/2017 2:37 PM
41	floods, fire control, wild cat building are also very important issues.	1/19/2017 1:46 PM
42	I would be happy to discuss my recommendations to someone who would listen Renee Cooper 520-432-9463.	1/19/2017 1:42 PM
43	has anyone looked at the fishers over the north end of the lavender pit over the mine. they are continuing to get larger.	1/19/2017 1:42 PM
44	No building of structural residence or business in a known flood zone.	1/19/2017 1:39 PM

Appendix D: Historical Hazard Mitigation Projects

Jurisdiction	Project Name	Project Description	Project Cost	Completion Date
Cochise County	Ramsey Road Drainage Improvement Project-Hereford Area	Culvert construction to mitigate flood damage & maintain access along Ramsey Road from SR92 east to Moson Road. Budget will only allow for routine maintenance, so project was canceled by BOS, FY 10/11.	$118,141 (maint) $ 85,901 (design) $204,042 (sum)	Project Cancelled
Cochise County	Dust Storm Warning System-countywide	Purchase & use 2pair of free-standing mobile sign boards for deployment along county highways during dust and sand storms and other miscellaneous emergencies	$ 80,000	FY 09/10
Cochise County	Ft Grant Road Drainage Improvement Project-Willcox Area	Budget would only allow for misc culvert and road improvements to mitigate flood damage to maintain access on Ft Grant Road between Willcox City Limits and Graham County Line.	$805,400	FY 10/11
Cochise County City of Sierra Vista	Design, develop and equip a County Emergency Operations Center	Cochise County and the City of Sierra Vista worked to design develop and equip emergency operations centers, with one located in Sierra Vista and one located in the County Sheriff's Office Bisbee-Judd Conference room.	$8,000,000 (approx)	FY 2011
Douglas	W&WW Improvement	Replaced aging water & wastewater infrastructure.	$6,000,000	June 2010
Douglas	Washington Drainage	Improved Washington drainage area.	$50,000	June 2009
Douglas	A Avenue Repaving	Repaved A Avenue from 10th Street thru 23rd Street.	$500,000	December 2009
Douglas	21st Street Chip Seal	Chip Seal 21st Street from A Avenue to Washington Avenue.	$300,000	June 2010
Douglas	10th Street Chip Seal	Chip Seal 10th Street from A Avenue to Washington Avenue.	$300,000	June 2010
Douglas	CDBG Curbing	Curbing improvements in Ward 6.	$300,000	September 2011
Cochise County & City of Sierra Vista	County Emergency Operations Center	Design, develop and equip a County EOC.	$8,000,000	2011
Cochise County	Dust Storm Warning System	Purchase and use free-standing mobile sign boards for deployment along county highways during dust and sand storms.	$80,000	FY09/10
Cochise County	Fort Grant Road Drainage Improvement Project	Culvert and road construction to mitigate flood damage and to maintain access along Fort Grant Road, between Willcox city limits and Graham County line.	$805,400	2010
City of Benson	Fire Wise Community Programs	Expand and maintain the City's Fire Wise programs for all communities, neighborhoods and home owners associations within the wildland fire/urban interface including instruction materials, facilitating partnerships with insurance agencies, clean-up crew programs.	$30,000	2007
City of Douglas	Weed Abatement	Continue to enforce city code requiring maintenance of trash and weeds on properties within city limits, to mitigate the potential for wildfire ignition within city limits.	$15,000	Prior to 2012

Jurisdiction	Project Name	Project Description	Project Cost	Completion Date
City of Douglas	Water Conservation Measures	Establish a water conservation program that educates residents on appropriate water conservation strategies, including the use of xeriscape and other low water plants in appropriate areas of the City.	$15,000	2008
City of Douglas	Douglas Municipal Airport	Improve the existing fuel island and protect it from illegal tampering and overall airport security.	$10,000	March 2011
City of Douglas	P.W. Radio Communications	Acquire radio communication equipment for all public works vehicles to enable an adequate response and coordination to emergency situations and with other emergency service providers.	$50,000	July 2011
City of Douglas	High Zone-Water Production Well	Develop and construct a new well in the high zone to augment the City's water production capabilities. The well will provide fire suppression capacity during peak demand hours that currently do not exist. The current system does not comply with the 24-hour storage capacity requirement.	$600,000	September 2011
City of Sierra Vista	Sierra Vista Police Department	Purchase and implement Reverse 911 for City of Sierra Vista to warn public of emergency situations. The system would be implemented out of the City of Sierra Vista Police Department.	$50,000	Prior to 2012
City of Sierra Vista	Public Works Advance Warning Devices	Obtain traffic control devices, signs, barricades and lighted transportation trailer to alert the public of natural and manmade hazards.	$100,000	Prior to 2012
City of Sierra Vista	Public Works Hazardous Materials Containment	Purchase containment materials such as sand, absorbent litter and containment "pigs" for hazardous spills.	$50,000	Prior to 2012
City of Willcox	Revision to Existing City of Willcox Floodplain Regulation	Update and revise the City's existing floodplain regulation to improve protection of life and future critical facilities and infrastructure.	$800	2007
Cochise County	ADEMA – Repairs from flooding damage	Multiple roadway & drainage repair	$1,300,000	Prior to 2017
Cochise County	Flood control district	Cave Creek cleanout. Crushing.	$760,000	Prior to 2017
Cochise County	Emergency Watershed Protection (EWP)	Joint effort with the Natural Resources Conservation Service (NRCS) to mitigate post-fire flood damage. Various Sites. K-Rails, & Other Repairs	$48,000	Prior to 2017
Cochise County	Palominas Area Regional Detention & Stormwater Recharge	Analysis, Design & Construction of flood control improvements to address flooding that affects development in the Palominas area combined with a stormwater recharge pilot project.	$3,257,408	July 2015

Jurisdiction	Project Name	Project Description	Project Cost	Completion Date
City of Benson	Removal of fire fuels along roads	Obtain brush hog and other brush clearing equipment for use in removing fire fuels along City roads, alleys, washes and at the airport and other areas where fire poses a significant hazard.	$16,500	2007
City of Sierra Vista	Summit Wash Flood Control Project	Construct gabion walls, drop structures and concrete bank armor to mitigate flood damage to susceptible community developments.	$230,000	Project Cancelled / No Longer Applicable
City of Tombstone	Installation of alternate/back up electrical service to wastewater lift stations	To provide continued sanitary pumping flow service in time of loss of primary electrical power due to violent thunder storms, which stretch all available electrical resources to its limit; thus maintaining a high level of public health in this area, as well as maintain compliance with the Arizona Department of Environmental Quality (ADEQ).	$10,000	2014
City of Tombstone	Implement flood control by diverting water from residential and commercial arteries	Direct waters into designated and eventual flood plain areas to help enhance flow and progression of both vehicular and pedestrian traffic on arteries and thoroughfares throughout the City as well as helping to enhance public safety and establishing cost cutting measures for repair of City thoroughfares.	$10,000	Project Cancelled / No Longer Applicable
Cochise County	Post-wildfire mitigation for Miller Canyon, Rucker Canyon, and other properties impacted by the 2011 Monument and Horseshoe II fires	Installation of K rails and other structural projects.		2014
City of Douglas	Install a backup generator at the Public Works facility			Prior to 2017
City of Douglas	Install a backup generator at City Hall			Prior to 2017
City of Tombstone	Design and construct improvements to current roads, trails and paths to all 24 total springs and catch basins in and attributed to both Carr Canyon and Miller Canyon	Owned and maintained by the City of Tombstone, including water rights as well as water collection and transmission; design and construct permanent structures to existing springs and catch basins to help enhance maximum water flow for collection and transmission into and through the 30 Mile Aqueduct to the City's One Million Gallon Reservoir.	$250,000	2016

Appendix E: Plan Maintenance Review Memorandums