YUMA COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN

March 2019

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SECTION 1: JURISDICTIONAL ADOPTION AND FEMA APPROVAL

1.1 DMA 2000 Requirements

1.1.1 General Requirements

The Yuma 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 CFR Title 44, Section 201.6 and 201.7 for tribal plans. 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 hazards through mitigation planning.[1] A mitigation plan is the representation of the jurisdiction's commitment to reduce risks from hazards, serving as a guide for decision makers as they commit resources to reducing the effects of hazards.

Under 44 CFR §201.6, local governments must have a cy 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)

Additionally, tribal governments must have a FEMA-approved plan to ensure eligibility for post disaster recovery funding in the event of a presidentially declared disaster.

1.1.2 Tribal Government Assurances

The Cocopah Indian Tribe assures that it will continue to comply with all applicable Federal statutes and regulations in effect with respect to the periods for which it receives grant funding, in compliance with 44 CFR 13.11(c). The Tribe will amend its plan whenever necessary to reflect changes in Tribal or Federal laws and statutes as required in 44 CFR 13.11(d).

1.2 Official Record of Adoption

Adoption of the Plan is accomplished by the governing body for each jurisdiction and Tribe. Participants in the Plan include:

Counties	Tribes	Cities	Towns
Yuma	Cocopah	San Luis Somerton Yuma	Wellton

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

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

[FEMA Approval Letter]

SECTION 2: INTRODUCTION

2.1 Plan History

In 2010, Yuma County, all incorporated cities and towns in Yuma County, along with Cocopah Tribe, participated in a multi-jurisdictional mitigation planning process that resulted in one unified plan. Three planning team meetings, one tribal planning meeting, and several other individual community outreach meetings were conducted over the period of March 2009 to June 2010. Collectively and individually, this plan will be referred to herein as the 2010 Plan.

2.2 Plan Purpose and Authority

The purpose of the Plan is to identify hazards that impact the various jurisdictions and Tribe located within Yuma 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 2010 Plan.

Yuma 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 of the Arizona Revised Statutes (ARS). The Cocopah Indian Tribe is a federally recognized sovereign nation that was created by Executive Order in 1917 and is governed by a Tribal Council that is elected by tribal members pursuant to the Tribe's Constitution. 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 Yuma County from FEMA. Michael Baker International was retained by Yuma County to provide consulting services in guiding the update 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 – an overall description of the jurisdictions/tribe and the County as a whole.

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

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

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

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

SECTION 3: COMMUNITY DESCRIPTIONS

3.1 County Overview

3.1.1 History & Geography

The history of Yuma County is quite colorful and continues to live on today in a fast-growing and vibrant community. In 1540, 18 years after the conquest of Mexico by Cortez, and 67 years before the settlement of Jamestown, Hernando de Alarcon visited the site of what is now the current City of Yuma. He was the first European to visit the area and to recognize the best natural crossing of the Colorado River. Much of Yuma County's later development occurred because of this strategic location. From the 1850's through the 1870's, steamboats on the Colorado River transported passengers and goods to various mines, military outposts in the area, and served the ports of Yuma, Laguna, Castle Dome, Norton's Landing, Ehrenberg, Aubry, Fort Mohave and Hardyville. During this time, stagecoaches also carried the mail and passengers on bone-jarring rides through the area.

The Cocopah (Kwapa), also known as the River People, have long lived along the lower Colorado River and delta. When Don Juan de Onate and Father Escobar sailed up the Colorado River, there were estimated to be about 6,000-7,000 Cocopah people living along the delta and the lower Colorado River. Throughout the mid 1800s and early 1900s, the Cocopah Indian Tribe effectively resisted assimilation to an established reservation and maintained its social, religious and cultural identities. In the last half of the nineteenth century, the steamboat business became important to the Cocopah people. Cocopah men, known for their skillful river navigating, were valued pilots.

Yuma County is located in the extreme southwestern corner of Arizona, as depicted in Figure 1. The County is larger than the state of Connecticut, and much of Yuma County's 5,519 square miles is desert land accented by rugged mountains. According to the Arizona Department of Commerce,[2] Yuma County is one of four original counties designated by the first Territorial Legislature. In 1864, Yuma was selected as the county seat and has remained so to this day. The County maintained its original boundaries until 1983, when voters decided to split Yuma County, forming La Paz County in the north and the new, present day Yuma County in the south.

[2] Arizona Department of Commerce, 2008, *Community Profile for Yuma County*

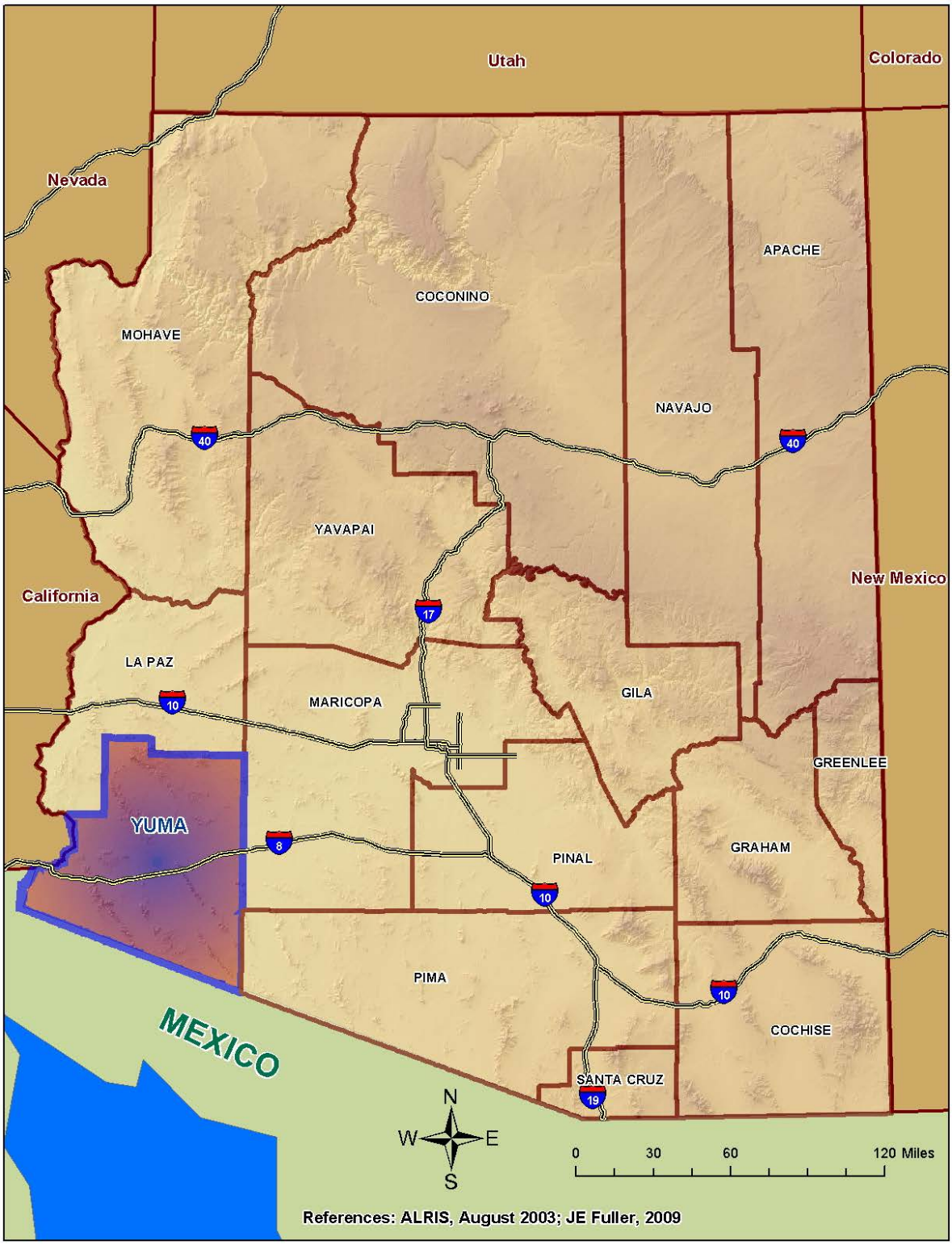


Figure 1. Yuma County Vicinity Map

Yuma County is characterized by two prominent river valley regions formed by the Gila and Colorado Rivers. Within these regions exist an abundance of arable land which is irrigated with water from the Colorado River and groundwater supplies. There are also over 200 miles of irrigation canals that extend at regular intervals through the County's agricultural belt. The Colorado and Gila River Valley areas have some of the most fertile soils in the world, having received silt and mineral deposits from flooding of the watercourses until the rivers were “tamed” by an intricate series of dams and canals.

For many years, Yuma served as the gateway to the new western territory of California, which brought thousands of people from around the world in search of gold, or provide services to those who had it. In 1870, the Southern Pacific Railroad bridged the Colorado River and Yuma became a hub for the railroad. The Ocean-to-Ocean Bridge (or Old Highway 80 Bridge) was the first vehicle bridge across the Colorado River. Prior to the construction of the bridge, cars were ferried across. Present day major highways through the County include Interstate 8 and U.S. Highways 95 and 80, and State Highway 195, the high speed truck route from Mexico to Yuma. Yuma County is bordered by California on the West and Mexico on the South. The Marine Corps Air Station (MCAS) shares one of the longest runways in the country with the Yuma International Airport. Additionally, the U.S. Air Force operates Laguna Air Force Base in the central-western portion of the County. Figure 2 depicts the geographic location and major transportation routes, including roadways, railways, and airports, of Yuma County.

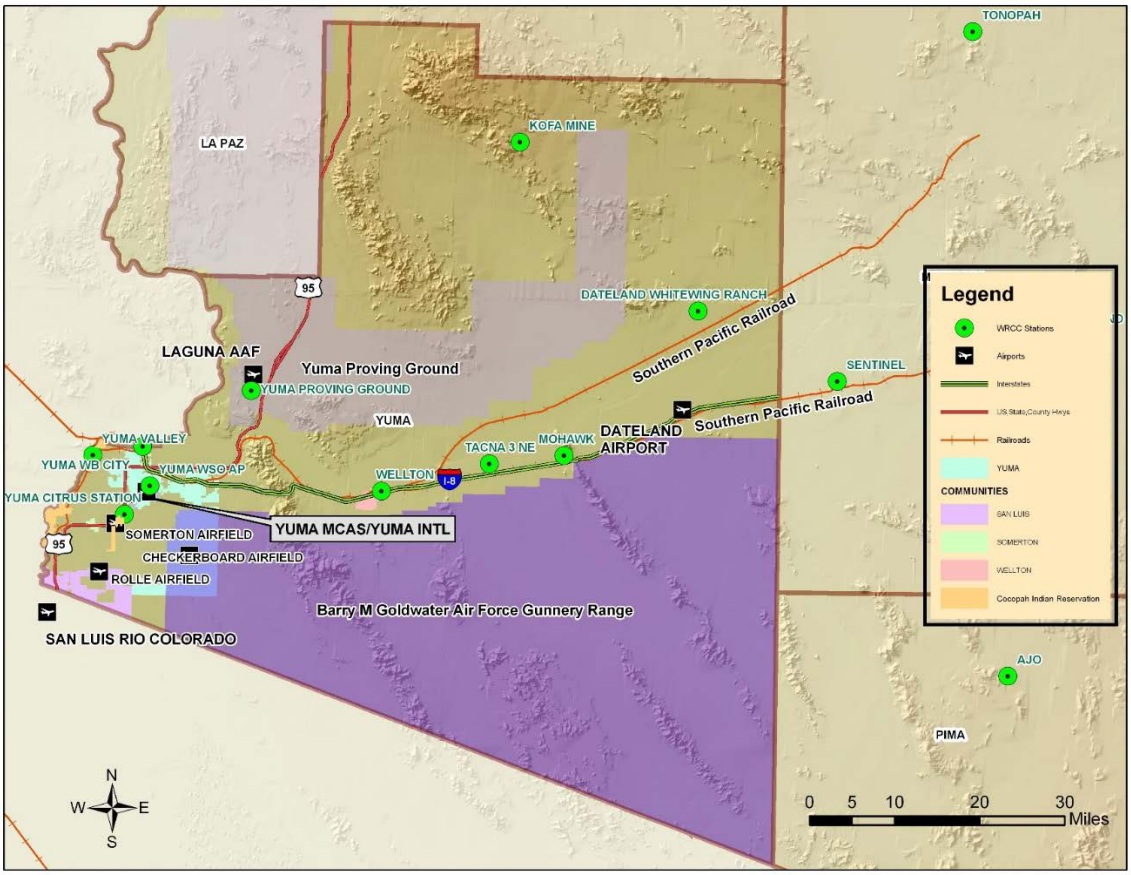


Figure 2. General Location and Transportation Map

The U.S. Forest Service and Bureau of Land Management own 42% of Yuma County land; Indian Reservations, 0.5%; and the State of Arizona 5%; individual and corporations 13%; and other public lands 40%. Figure 3 illustrates the land ownership in Yuma County.

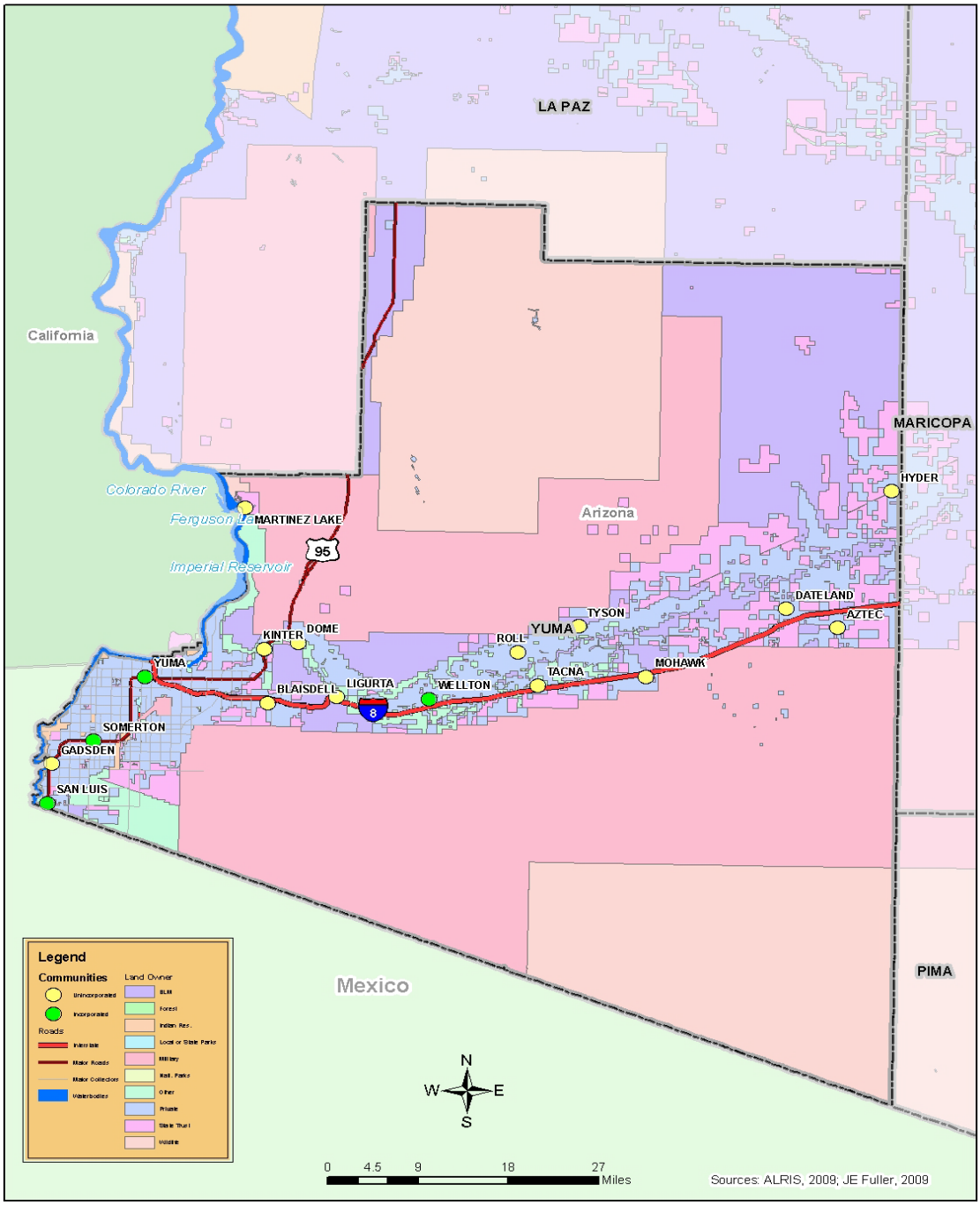


Figure 3. Community Location and Land Ownership Map

3.1.2 Climate

The climate in Yuma County is typically hot and dry during the summer and mild during the winter. Climatic statistics for weather stations within Yuma County are produced by the Western Region Climate Center[3] and span records dating back to the early 1900's. Statistics for the Dateland Whitewing Ranch and Yuma Proving Grounds Stations are provided in the following discussions.

Average temperatures within Yuma County are fairly uniform and range from near freezing during the winter months to over 110° Fahrenheit during the hot summer months. Average extreme temperatures have exceeded either end of the spectrum by 10 to 15°. Figure 4 shows climate averages for the Yuma Proving Ground Station.

YUMA PROVING GROUND, ARIZONA (029654)

Period of Record Monthly Climate Summary

Period of Record : 01/01/1955 to 06/08/2016

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	68.6	72.9	78.6	85.6	94.1	103.2	106.7	105.5	100.6	89.8	76.9	67.8	87.5
Average Min. Temperature (F)	43.3	46.8	51.4	57.2	64.8	72.9	80.8	80.8	74.2	62.1	50.0	42.7	60.6
Average Total Precipitation (in.)	0.51	0.42	0.33	0.14	0.03	0.04	0.23	0.53	0.42	0.31	0.25	0.45	3.64
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.: 98.4% Min. Temp.: 98.4% Precipitation: 98.2% Snowfall: 98.4% Snow Depth: 98.4%
Check Station Metadata or Metadata graphics for more detail about data completeness.

Western Regional Climate Center, wrcc@dri.edu

Figure 4. Monthly Climate for Yuma Proving Ground

Annual precipitation across Yuma County varies significantly with elevation. For example, the urbanized Yuma Valley area receives less than three inches of rainfall annually while the eastern portion of the County receives nearly five inches annually and the northern areas approach seven inches annually.[4] From a rainfall perspective, the Yuma Valley area is one of the driest areas of the State, however, as residents will testify, "you have to be here on the day it all comes!"

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, the strongest thunderstorms usually do not form in Yuma County area, but are found in the mountainous regions of the central southeastern portions of Arizona. Thunderstorms that do materialize are often accompanied by strong winds, blowing dust, and infrequent hail storms.[5] During the period of October through February, temperature inversions occur

[3] 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

[4] Per WRCC statistics for the Kofa Mine Station, which is at an elevation of 1,780 feet (see Figure 1-2).

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

nightly and last about one hour after sunrise. Air pollution levels can rise significantly during this period, as does the potential for fog. Prevailing winds are basically northwesterly, except during the months of June, July, August and September when they become south to southwesterly. Average wind speed through the year is about 7.8 miles per hour.

All of Yuma County is situated within the Sonoran Desert and is characterized by an arid environment typical to much of southwestern Arizona. The elevations vary across the County with mountain peaks that are less than 3,000 feet in elevation to a low elevation of 175 feet. Vegetation in this zone is comprised mainly of a mixture of palo verde, cacti, creosotebush, and bursage communities.[6] The river bottoms are primarily comprised of saltbrush and arroweed scrub, with a few sparse stands of mesquite and riparian deciduous woodland. Figure 6 depicts the various Sonoran Desert biotic regions for the County.

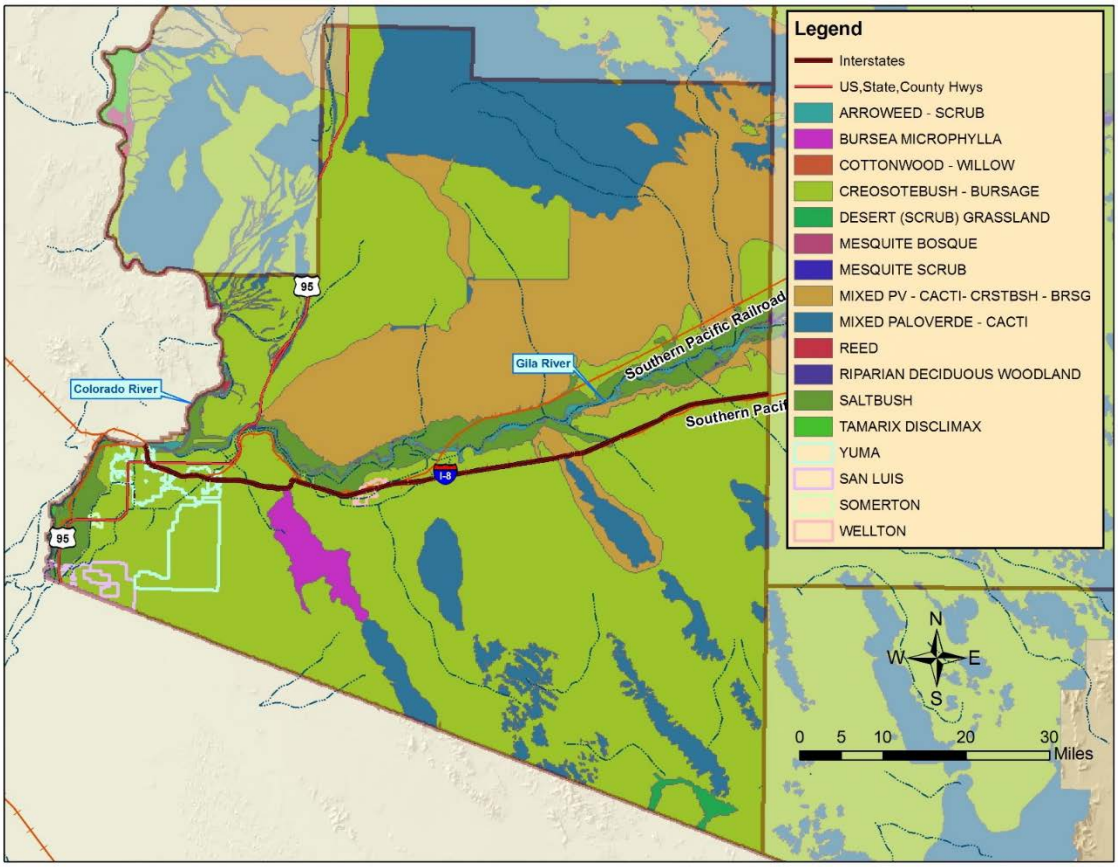


Figure 5. Vegetative Communities in Yuma County

[6] Brown, D.E., University of Utah, 1999, *Biotic Communities; Southwestern United States and Northwest Mexico.*

3.1.3 Population

Yuma County is home to 203,779 residents, with the majority of the citizens living in the incorporated communities or Indian Reservation portions of Yuma County. The largest community is the City of Yuma. All three incorporated cities and one town are geographically located in the southwest portion of the County. The other 13 towns and communities located throughout the county, with most situated along major highways are mostly comprised of only a few structures or landmark. Table 1 summarizes jurisdictional population statistics for Yuma County communities and the County as a whole.

Table 1. Population Estimates

Jurisdiction	1990	2000	2010	2025	2040
Yuma County (total)	106,895	160,026	195,751	251,130	307,708
Cities, Towns and Tribes					
Cocopah Indian Tribe	N/A	1,025	817	883	876
City of San Luis	4,212	15,322	27,909	49,888	72,566
City of Somerton	5,282	7,266	14,287	19,929	26,834
Town of Wellton	1,066	1,829	2,882	3,852	4,955
City of Yuma	56,966	77,515	90,660	109,943	132,518
Unincorporated	39,369	57,033	60,013	67,518	70,835

Note: Figures for 1990, 2000 and 2010 from US Census Bureau:http://www.azcommerce.com/econinfo/demographics/Census+2000.html
Figures for 2025 to 2040: Arizona Office of Economic Opportunity, https://population.az.gov/population-projections, accessed March 2018

3.1.4 Economy

The Yuma valley regions contain an abundant of arable land, which utilizes the close proximity of the Colorado River water through a network of canals. Agriculture, tourism, military and government and retail trade are the county's main industries.

The Yuma County labor force in 2017 numbered 99,001 with an unemployment rate of 15.7%[7]. Farming, cattle raising, tourism, retail trade, and the US Marine Corp Air Station Yuma and US Army Yuma Proving Ground military bases are Yuma County's principal industries. Some of the major tourist attractions in Yuma County include the historical Territorial Prison, Yuma Crossing Historic Park, Kofa Mountain Range and Wildlife Refuge, Martinez and Mittry Lakes, and hunting for a variety of game.

Arizona Western College (AWC) is located in Yuma County, and offers a two-year community college education to full-time and part-time on-campus and off-campus students. AWC shares its campus with a satellite campus of Northern Arizona University, which offers a variety of two year, four year and postgraduate programs.

Yuma County is currently experiencing rapid growth, with the most significant growth having occurred in the last ten years. Growth factors of economic opportunity, beneficial climate, and an active lifestyle are beginning to transform the region's prime agricultural lands into residential, commercial, and industrial development. This rapid growth presents a significant challenge to the County in the effort of maintaining a sustained economic prosperity, enhancing the quality of life, and maintaining the safety of County residents.

[7] Arizona Office of Economic Opportunity, https://laborstats.az.gov/sites/default/files/documents/files/pr-laus-04cnt-2010to2020-nsa.pdf

In order to plan more efficiently, the County has been divided into nine Designated Study Areas (DSA). A map showing the boundaries of each DSA is provided in Figure 7. The development histories for each DSA are provided in the following text and are excerpts from the Yuma County 2020 Comprehensive Plan. Figure 3 represents the community locations and land ownership throughout Yuma County.

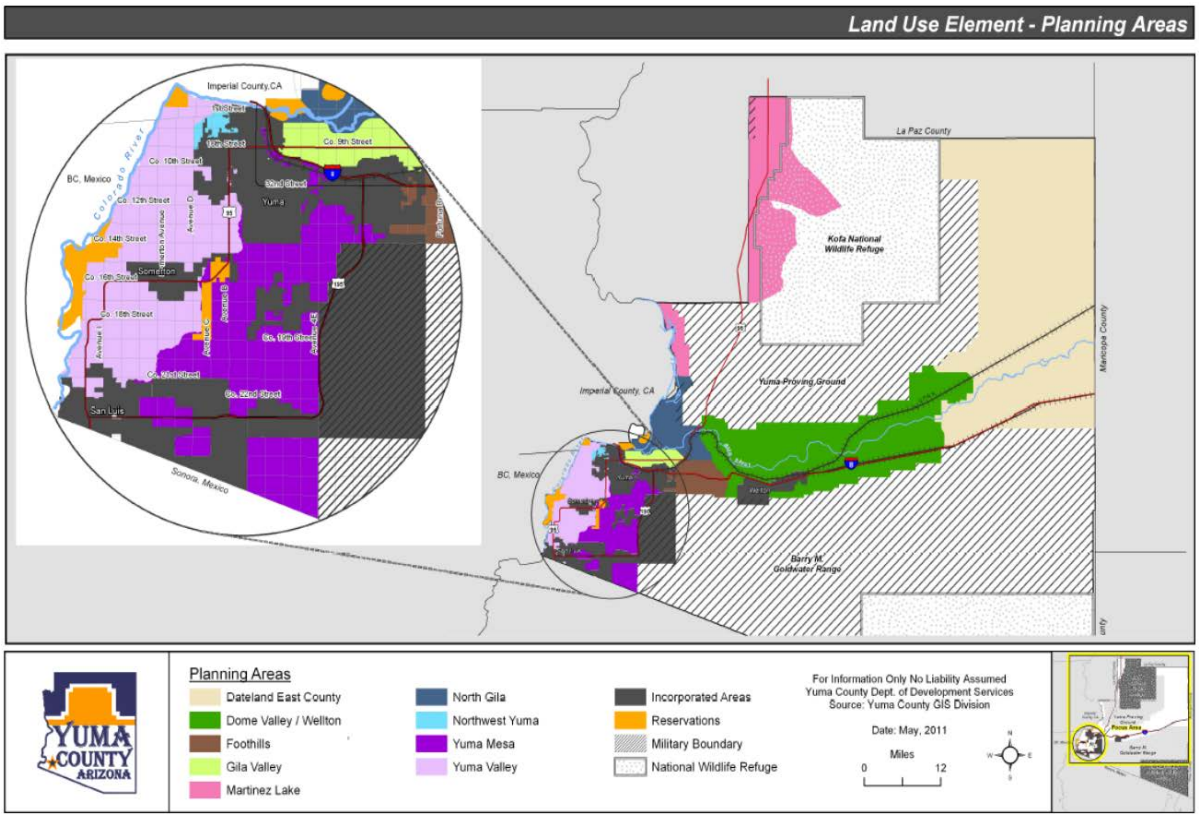


Figure 6. Development Study Areas in Yuma County

North Gila - The North Gila Planning Area is comprised of the area roughly bounded by California to the west, Yuma Proving Ground and the Gila Mountains to the east, Levee Road to the south and Imperial Dam to the north. The planning area is almost exclusively located in the Colorado and Gila River valley. The confluence of the Colorado and Gila Rivers is located along the southern boundary of the planning area.

- The North Gila Planning Area is a rural area that is predominately used for agricultural purposes with nonagricultural land being mountainous or riparian areas owned by various government entities.
- Farmland within the North Gila Planning Area tends to be of the highest quality found in Yuma County.
- The total population of the North Gila Planning Area is 1,038.
- Low overall population density with 15 persons per square mile over the 60.5 square miles.

Yuma Mesa - The Yuma Mesa Planning Area is comprised of the unincorporated portion of Yuma County that is roughly bounded by the East Main Canal and a small portion of the City of Somerton to the west, the Barry M. Goldwater Range and City of Yuma to the east, the City of San Luis and Mexico to the south and Interstate 8 and MCAS-Yuma to the north. A portion of the Cocopah Reservation is located within the planning area; however, it is part of a sovereign nation and not under the land use planning jurisdiction of Yuma County.

- Total population of the Yuma Mesa Planning Area is 7,411.
- The planning area has a low population density of approximately 79 persons per square mile.
- MCAS Yuma is directly adjacent to the planning area.
- All farmland within the planning area is classified by the United States Department of Agriculture as "farmland of unique importance."
- Residential development in the planning area has occurred almost exclusively at rural style densities.

Northwest Yuma - The Northwest Yuma Planning Area is comprised of the unincorporated portion of Yuma County that is roughly bounded by Avenue D to the west, the City of Yuma to the south and east and the West Main Canal and 1st Street to the north.

- Almost entirely composed of older residential neighborhoods.
- Because the area has been nearly built out for quite some time, development in the planning area tends to occur as redevelopment or infill development.
- The planning area is located in the Yuma Valley close to the Colorado River. As such, extensive drainage systems and pumping are necessitated due to the high ground water that is found in much of the planning area.
- here are two areas within the Northwest Yuma Planning Area federally recognized by the U.S. Department of Housing and Urban Development (HUD) as a colonia.
- The total population of the planning area is 9,649. The planning area has a relatively high population density of approximately 5,517.12 persons per square mile.

Gila Valley - The Gila Valley Planning Area is comprised of the area roughly bounded by Pacific Avenue to the west, Fortuna Wash to the east, Levee Road to the north and the City of Yuma to the south. The planning area is almost exclusively located in the Colorado and Gila River valleys. The confluence of the Colorado and Gila Rivers is located along the northern boundary of the planning area.

- 2010 population of 2,833.
- The overwhelming majority of acreage within the planning area is used for agricultural production.
- Extensive drainage systems and pumping are utilized due to the high groundwater found in much of the planning area.
- MCAS Yuma is located just south of the planning area.

Foothills - The Foothills Planning Area is comprised of the unincorporated portion of Yuma County that is roughly bounded by the City of Yuma to the west, the crest of the Gila Mountains to the east, the Barry M. Goldwater Range to the south and the Gila Gravity Main Canal and County 9th Street to the north. Fortuna Wash, which runs in a northeasterly direction, more or less bisects the planning area.

- The Foothills Planning Area is an unincorporated community of 28,867 people located directly east of the City of Yuma. The planning area is the most urbanized area in unincorporated Yuma County.
- The planning area has a mix of young families and retirees. The planning area represents the center of residential growth in Yuma County.

Yuma Valley - The Yuma Valley Planning Area is comprised of the unincorporated portion of Yuma County that is roughly bounded by Mexico to the west, the City of Yuma, Avenue D, the City of Somerton and the East Main Canal to the east, the City of San Luis to the south and California to the north. The planning area is located in the Yuma Valley close to the Colorado River.

- Extensive drainage systems and pumping are required due to the high ground water that is found in much of the planning area.
- There are four areas within the Yuma Valley Planning Area federally recognized by the U.S. Department of Housing and Urban Development (HUD) as a colonia.
- The overwhelming majority of the Yuma Valley Planning Area is comprised of large acreage parcels that are actively being used for agricultural purposes.
- Farmland within the planning area tends to be of the highest quality found in Yuma County, all of it located off the mesa in the fertile river bottoms.

Martinez Lake - The Martinez Lake Planning Area is comprised of two geographically separate areas that can be roughly defined as the portion of Yuma County that is located north of Imperial Dam and west of Yuma Proving Ground and the Kofa National Wildlife Refuge. The topography of the southern portion of the planning area is dominated by the Colorado River and Martinez Lake which forms the western boundary of the planning area and the County. Development in this area centers around the Martinez Lake shoreline. The northern portion of the Martinez Lake Planning Area is a sliver of land located between the La Paz County line and the Kofa Mountains and the Kofa National Wildlife Refuge.

- Martinez Lake is one of a series of man-made lakes along the Colorado River, and was formed with the construction of Imperial Dam in 1935.
- In 1955, the Martinez Lake Resort began as a fishing camp and eventually expanded into a year-round community that caters to winter visitors, sightseers, fishermen, rock hounds, boaters, hunters, and water skiers.
- Currently, retirees, winter visitors, military personnel, and recreation are fueling the growth and adding another facet to the ever-evolving character of this area.
- The Martinez Lake Planning Area is surrounded on multiple sides by Yuma Proving Ground (YPG). Because of this, activities on YPG have the potential to have a major impact on the planning area.

Dome Valley/Wellton - The Dome Valley/Wellton Planning Area is comprised of the unincorporated portion of Yuma County that is roughly bounded by the crest of the Gila Mountains to the west, the Barry M. Goldwater Range to the south, the crest of the Mohawk Mountains to the east and Yuma Proving Ground to the north. The Gila River runs from east to west, bisecting the planning area.

- The valley through which the Gila River flows contains irrigated, prime farmland and is extensively used for agriculture. The mesa rises abruptly above the Gila River Valley and is a flat area drained by washes. The majority of residential development has occurred on the “mesa.”
- Located in the northwest corner of the planning area, the Muggins Mountains Wilderness Area covers 12 square miles.
- The Dome Valley/Wellton Planning Area contains 31 platted subdivisions. Combined there are 2,222 lots contained within these subdivisions. The 2010 Census reported a combined population of 2,915.
- Many but not all of the subdivisions have little to no physical infrastructure for improved roads.

Dateland/East County - The Dateland/East County Planning Area is comprised of the unincorporated portion of Yuma County that is roughly bounded by the crest of the Mohawk Mountains and Yuma Proving Ground to the west, the Barry M. Goldwater Range to the south, Maricopa County to the east and La Paz County to the north. The Gila River runs from east to west bisecting the planning area. The Eagle Tail Mountains Wilderness Area covers 12 square miles. This area is managed by the Bureau of Land Management in a manner that minimizes as much as possible human impact on the land.

- The economic base is primarily farming, agricultural production and associated railroad activities.
- Planning area covers 554,156 acres or about 861 square miles.
- The 2010 Census reported a combined population of 815, of which 35.7% of the total population of the planning area lives in a platted subdivision. Further, the Census reported 118 housing units within in these subdivisions which means that of 5,157 lots contained within platted subdivision, 96.9% are vacant lots.
- Many but not all of the subdivisions have little to no physical infrastructure.
- Low population density (approximately one person per square mile).
- The Dateland Elementary School serves as the focal point for the community.

3.2 Jurisdictional Overviews

3.2.1 Cocopah Indian Tribe

Cocopah Indian Reservation is located in the western portion of Yuma County, Arizona, as depicted in Figure 2. The Reservation is comprised of three non-contiguous bodies of land known as the North, West and East Reservations. Cocopah Indian Reservation is located adjacent to the Colorado River; 13 miles south of Yuma; 15 miles north of San Luis, a national border city with Mexico; 197 miles west of Phoenix; and Tucson is approximately 250 miles to the southeast. U.S. Highway 95 and I-8 are nearby roadways for travel to the Reservation. The major transportation routes and land features around the Reservation are shown on Figure 2. Established by Executive Order in 1917, the Reservation currently encompasses approximately 6,500 acres. Cocopah Indian Reservation location is primarily surrounded by Bureau of Land Management and State Trust lands as represented in Figure 3.

The total 2010 Census population for Cocopah Indian Tribe and Yuma County is 817 and 195,751. Table 1 summarizes population estimates for Cocopah Indian Tribe and Yuma County from 1990-2040, however population data is not available for Cocopah Indian Tribe prior to 2000.[8]

Agriculture has always been an important part of the economy. Continually adjusting to the river's seasonal changes, they relied on the lush riparian habitats to obtain food. Tribal members grew grains, corn, beans and melons in the floodplains of the Colorado River. In traveling the waterways on log rafts, they collected wild wheat and shellfish. They netted fish and collected shellfish in the delta and hunted deer and small game in the mesquite forests. As time progressed and farms and towns populated the West, the flow of water eventually stopped due to the construction of dams along the Colorado River. This altered the Cocopah's way of life along the river.[9]

The Cocopah Indian Tribe is one of seven descendant Tribes stemming from the Yuman language-speaking people who occupied the lands along the Colorado River. The Cocopah people had no written language, but the records were passed on orally or interpreted in documents and written by outsiders.

During the westward expansion in the 1840s and discovery of gold in California in 1849, this brought many migrants through the area. The U.S. government recognized the importance of the river crossing and therefore established Camp Independence in 1850 to protect the entry route through the Tribe's territories. Soon after the camp was moved to an old Spanish Mission later call Fort Yuma, which still exists today. The Cocopahs effectively resisted assimilation to an established reservation and continued its social, religious, and cultural identities. During the last half of the nineteenth century, the Cocopah men, known for their skillful river navigability abilities, were valuable as pilots for the steamboat business.

As recent as the 1960s, a number of Tribal families continued to live in traditional arrow weed-thatched homes. In the late 1970s and 80s, the Tribe began acquiring lands for building homes, installing utilities, developing an infrastructure system and initiating economic development.

The agricultural industry provides annual income through leasing land to non-Indians. In 1985, the Tribe started new business ventures including a Bingo hall and Casino, in order for the Tribe to become more self-sufficient. The civilian labor force estimate in 2016 was 292 with an unemployment rate of 22.4%.

[8] U.S. Census Bureau and Arizona Office of Economic Opportunity, https://population.az.gov/population-projections

[9] http://www.cocopah.com/about.html

3.2.2 San Luis

The City of San Luis lies in Yuma County at the southwest corner of the State of Arizona. San Luis is a growing U.S. Port of Entry city and shares a border with Mexico on the south and the Colorado River and State of Baja California del Norte, Mexico on the west, as depicted in Figure 2. Many visitors come to San Luis as a stopover for shopping in Mexico or for a fishing trip in the Gulf of Mexico.

The total 2010 population for San Luis is 27,909. Table 1 summarizes population estimates from 1990 to 2040.[10]

San Luis was established in 1930 as a U.S. Port of Entry into Mexico. In 1979, the city was incorporated. Since then, it has experience a rapid growth, both in population and commercial sectors, and is one of the fasted growing communities in Yuma County. San Luis Rio Colorado, Sonora, Mexico is the sister city across the border with an estimated population of 178,380 in 2010.

San Luis is located 206 miles west of Phoenix and 259 miles west of Tucson. The Gulf of Mexico is located 75 miles to the south.

The population center of the City is located on both sides of U.S. Highway 95. Major airports in the vicinity include the Marine Corps Air Station Yuma/Yuma International Airport in Yuma, and the new MCAS auxiliary field located east of the city. San Luis is also served by Rolle Airfield which currently operates as a day-use airfield located in the north central portion of the city. Figure 2 depicts the general geographic features and transportation routes within the region surrounding the City of San Luis.

All of the City of San Luis is geographically situated within the Sonoran Desert ecoregion and is characterized by an arid environment typical too much of southwestern Arizona. Across Yuma County, the elevations vary with mountain peaks that are less than 3,000 feet in elevation to a low elevation of 140 feet near San Luis. Typical Sonoran Desert vegetation is comprised mainly of a mixture of palo verde, cacti, creosotebush, and bursage communities;[11] however, most of the City is surrounded by agriculture with little of the original desert flora remaining. Figure 6 depicts the various Sonoran Desert biotic regions for the City and County.

Development within San Luis has been primarily tied to agriculture and border activities and economies. Established in 1930 with the U.S. Port of Entry, the city grew slowly over the first 50 years. Since its incorporation in 1978, the city population has grown over 700% and is expected to outpace the rest of Yuma County. Past challenges to growth have included water supply, wastewater treatment, and other infrastructure needs.

The city has identified a future growth area for planning purposes. Figure 8 is an excerpt from the City of San Luis General Plan depicting this future growth area and the planned land uses. Much of the future growth is centered on the construction of a new commercial Port of Entry (POE) east of the current location and the corresponding Robert A. Vaughan Expressway (formerly Area Service Highway) and upon completion known as State Highway 195.

The civilian labor force estimate in 2016 was 12,904 with an unemployment rate of 17.2%. The San Luis economy is driven by retail trade, agriculture and manufacturing. Several light industries are located on both sides of the international border.

[10] U.S. Census Bureau and Arizona Office of Economic Opportunity, https://population.az.gov/population-projections

[11] Brown, D.E., University of Utah, 1999, *Biotic Communities; Southwestern United States and Northwest Mexico.*

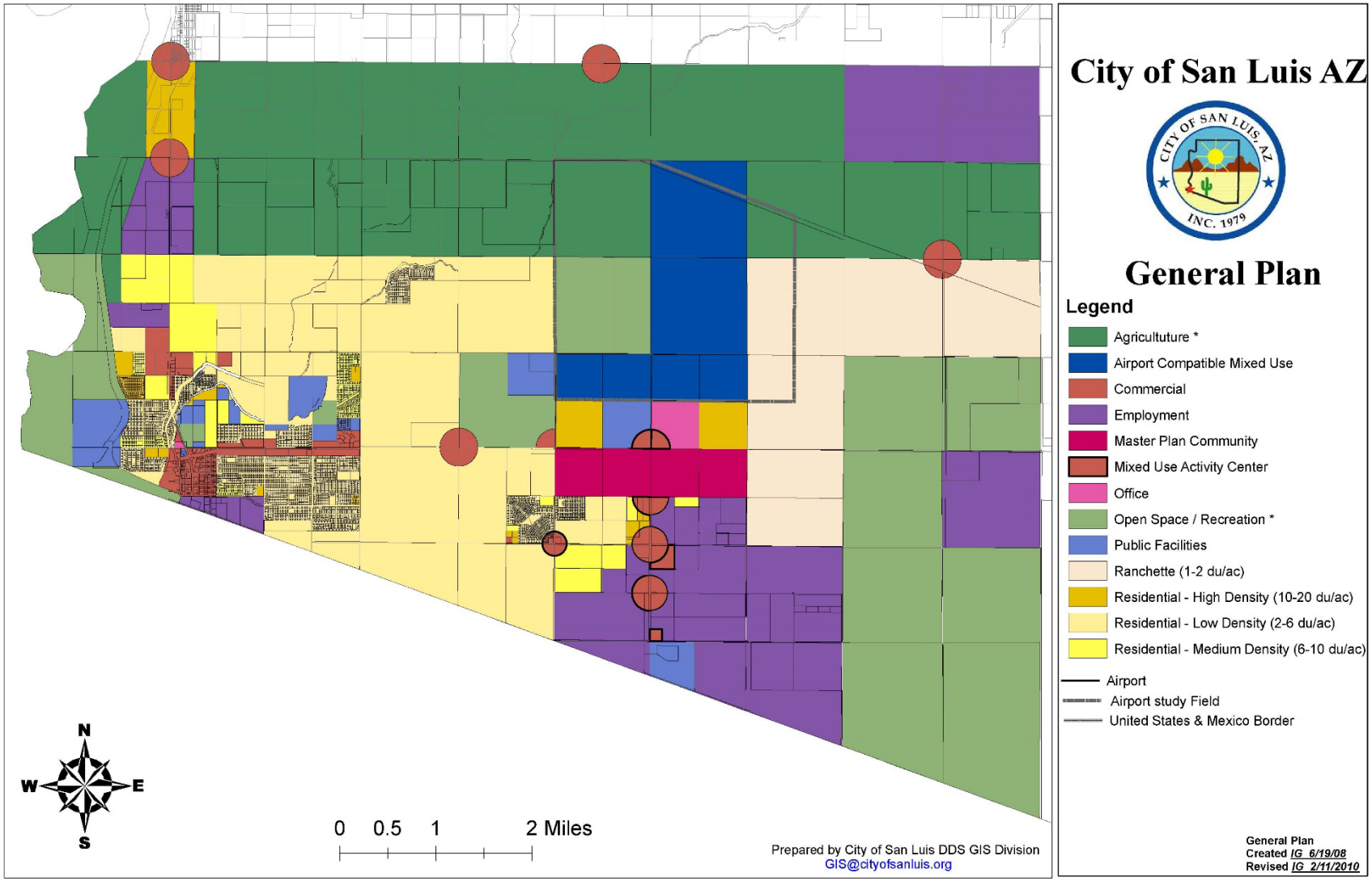


Figure 7. Land Use, City of San Luis

3.2.3 Somerton

According to the Somerton General Plan, the City lies in South Yuma County approximately 10 miles southwest of the City of Yuma and 12 miles from the U.S./Mexican border, as depicted in Figure 2. [12] The area is bounded by the Cocopah Indian Reservation at locations that limit the City's ability to expand east onto the mesa or west to the Colorado River.

The total 2010 population for Somerton is 14,287. Table 1 summarizes population estimates from 1990 to 2040.[13]

Also, the mild winter weather brings about 90,000 additional, part-time residents to the Yuma Valley that are not reflected by these numbers.

Somerton was established in 1898 and incorporated in 1918. The city is located on land once claimed for the fraudulent Rancho El Paso de los Algodones (land) Grant. Land along the Colorado River was attractive to speculators. One of them, a citizen of the Mexican city of Hermosillo, petitioned authorities in Sonora, Mexico, for 21,692 acres between the Gila River on the north and Algodones Pass on the south and was granted the land in 1838. Arizona historian Jay J. Wagoner said rights to the alleged grant passed to the Colorado Commercial and Land Company in 1873, and the U.S. government withdrew the land from public entry in 1875. An investigation revealed that the grant's original title papers had been forged. Despite this, the U.S. Court of Private Land Claims confirmed the Algodones grant in 1893. Immediately, Wagoner said, "the alleged owners...began selling deeds...for tracts of 40 acres or less." The government appealed, and the U.S. Supreme Court reversed the land court in 1898. After the reversal, the U.S. Congress passed a law allowing settlers who were on the land before May 25, 1898, to buy up to 40 acres for $1.25 per acre.[14]

Somerton is located 192 miles west of Phoenix and 248 miles west of Tucson.

The City is located on both sides of U.S. Highway 95 (Main Street) and Somerton Avenue runs north and south. Major airports in the vicinity include the Marine Corps Air Station Yuma/Yuma International Airport in Yuma, and the new MCAS auxiliary field located southeast of the city. Somerton is also served by a small day-use airfield located northwest of the city on the mesa. Figure 2 depicts the general geographic features and transportation routes within the region surrounding the City of Somerton.

According to the Somerton General Plan, the city has a long history of overcoming physical and economic adversity. Early settlers had to prevail over annual flooding of the Colorado River in order to benefit from the tremendous potential offered in the rich floodplain soils. In 1902, the Somerton school district was formed and in 1917, Main Street was paved. The downtown business district survived a huge fire in 1926 and was able to continue to be a major economic influence in Yuma County until the early 1960's. The reduced need for manual labor caused by technological improvements in agriculture mirrored the decline of the local economy even as the surrounding communities of Yuma and San Luis began to grow. Census counts for Somerton never tallied the hundreds of temporary farm workers who lived outside the community during the Bracero Program from 1942 to 1964.

Over the last 10 years, growth has been small but steady in Somerton. Somerton is expected to continue growing, especially with the Cities of Yuma and San Luis growing at such rapid paces. In order to address

[12] City of Somerton, 2005, *Somerton General Plan*, prepared by Partners for Strategic Action, Inc.

[13] U.S. Census Bureau and Arizona Office of Economic Opportunity, https://population.az.gov/population-projections

[14] Description obtained from the following web site: http://arizonan.com/Somerton/

this growth potential, the city has identified a future growth area for planning purposes. Figure 9 is an excerpt from the Somerton General Plan depicts this future growth area and the planned land uses. [15]

The City of Somerton labor force estimate in 2016 was 6,773 with an unemployment rate of 12.7%. Economic activity within the city is predominantly agricultural but also includes light industrial and commercial service. Major employers include Del Sol Market, King Market, Sunset Community Health, Housing America Corporation, Puentes De Amistad, Arizona Department of Economic Security, Somerton School District and the City of Somerton.

[15] Figure 5.1 of the Somerton General Plan found at the end of Section 5.0 after page 37

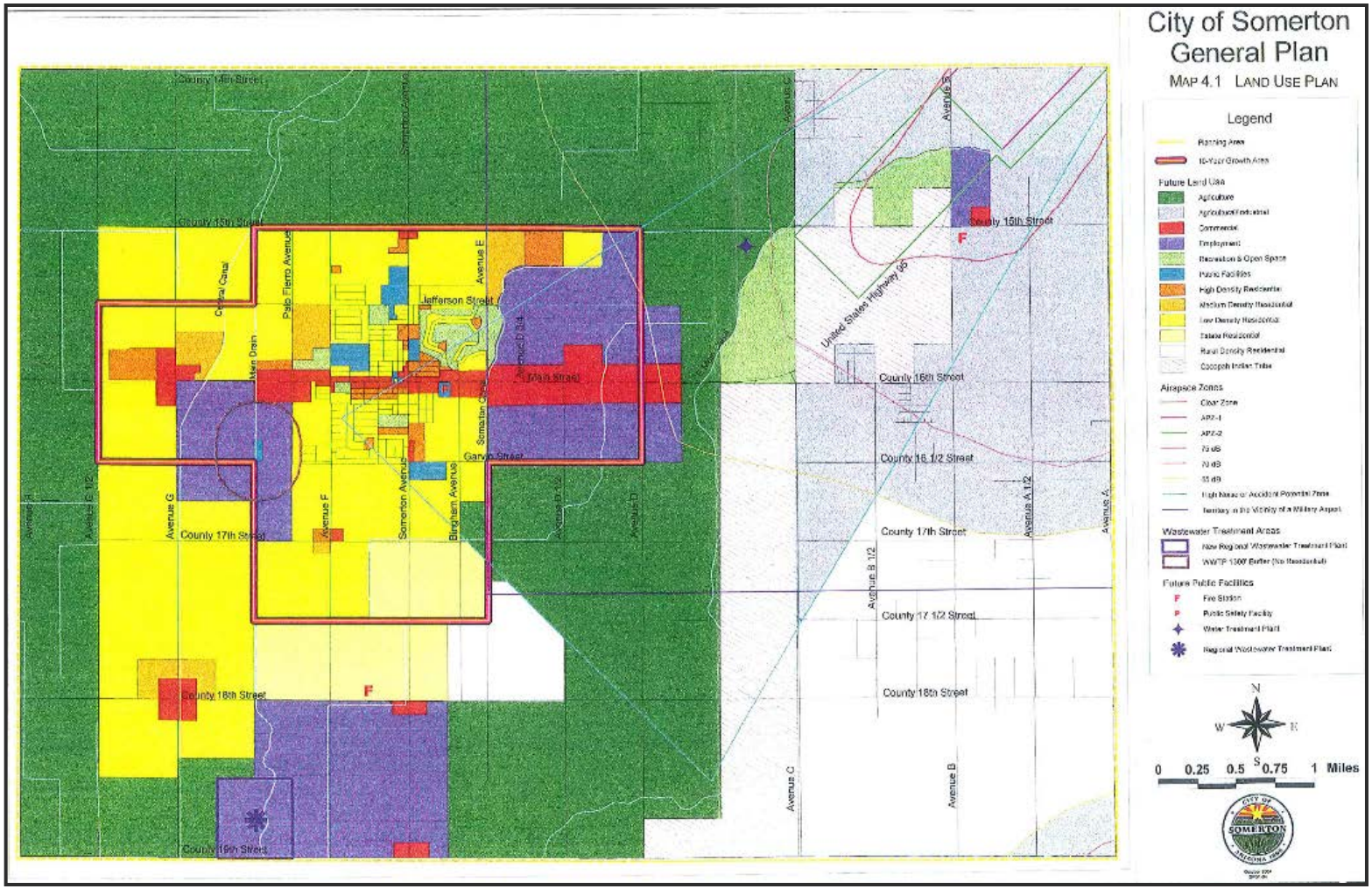


Figure 8. Land Use, City of Somerton Land

3.2.4 Wellton

According to the Town of Wellton General Plan[16], Wellton was officially founded in 1878 and was named for a time when water wells were drilled to service the new Southern Pacific Railroad. The town was incorporated in 1970. Wellton is situated approximately 30 miles east of the City of Yuma and the California border in the extreme southwestern corner of Arizona, as depicted in Figure 2.

The total 2010 population for Wellton is 2,882. Table 1 summarizes population estimates from 1990 to 2040.[17]

Wellton is located 155 miles west of Phoenix and 208 miles west of Tucson. The Gila River is the primary watercourse in the area and is located approximately 1.5 miles north of the town. A smaller, ephemeral watercourse named Coyote Wash runs south to north through the eastern portion of the town. Interstate 8 and the Southern Pacific Railroad pass through the central portion of the town limits along an east-west alignment. The portion of Wellton north of Interstate 8 comprises the original townsite and downtown area. Areas south of Interstate 8 are primarily residential and agricultural areas. Figure 2 depicts the general geographic features and transportation routes within the region surrounding the Town of Wellton.

All of the Town of Wellton is situated within the Sonoran Desert and is characterized by an arid environment typical to much of southwestern Arizona. Across Yuma County, the elevations vary with mountain peaks that are less than 3,000 feet in elevation to a low elevation of 175 feet. Sonoran Desert vegetation is comprised mainly of a mixture of palo verde, cacti, creosotebush, and bursage communities.[18] The river bottoms are primarily comprised of saltbrush and arroweed scrub, with a few sparse stands of mesquite and riparian deciduous woodland.

Figure 10 is an excerpt from the Town of Wellton General Plan depicts this future growth area and the planned land uses.

[16] HDR Engineering, Inc., 2003, *Town of Wellton General Plan 2003-2013*

[17] U.S. Census Bureau and Arizona Office of Economic Opportunity, https://population.az.gov/population-projections

[18] Brown, D.E., University of Utah, 1999, *Biotic Communities; Southwestern United States and Northwest Mexico.*

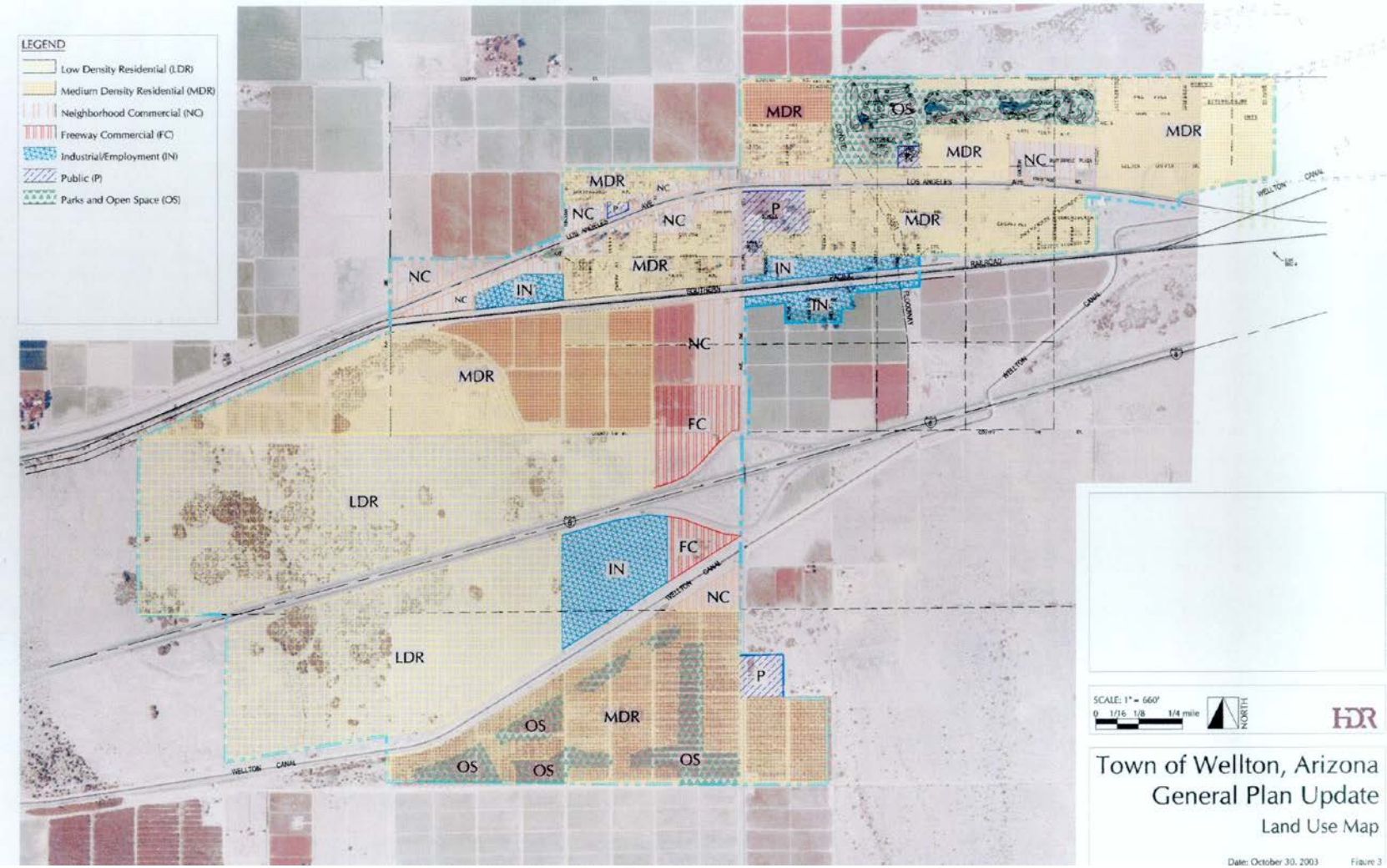


Figure 4. Land Use, Wellton General Plan

3.2.5 Yuma

The City of Yuma is the county seat for Yuma County and is situated at the extreme southwestern corner of Arizona, as depicted in Figure 2. Yuma is located 185 miles west of Phoenix and 237 miles west of Tucson. The Colorado and Gila River confluence is located along the northern limit of the city and several large irrigation canals cross through the city to provide irrigation water to farm fields located to the south and west of Yuma.

The total 2010 population for City of Yuma is 90,660. Table 1 summarizes population estimates from 1990 to 2040.[19]

For many years, Yuma served as the gateway to the new western territory of California, which brought thousands of people from around the world in search of gold, or provide services to those who had it. In 1870, the Southern Pacific Railroad bridged the Colorado River and Yuma became a hub for the railroad. The Ocean-to-Ocean Bridge (or Old Highway 80 Bridge) was the first vehicle bridge across the Colorado River. Prior to the construction of the bridge, cars were ferried across. Present day major highways through the City include Interstate 8, U.S. Highways 95 and 80, and State Highway 95. The Marine Corps Air Station (MCAS) shares one of the longest runways in the country with the Yuma International Airport, and a new MCAS auxiliary field is located in the extreme southern portion of the city boundaries. Figure 2 depicts the general geographic features and transportation routes within the region surrounding the City of Yuma.

The largest landholder in the city is the federal government with approximately 65% in military and Bureau of Land Management holdings. Private landholdings are next at about 30%, with the rest being the State of Arizona. Figure 3 provides a visual depiction of the land ownership within and around the City of Yuma.

The history of Yuma is quite colorful and continues to live on today in a fast-growing and vibrant community. In 1540, just 48 years after Columbus discovered the New World, 18 years after the conquest of Mexico by Cortez, and 67 years before the settlement of Jamestown, Hernando de Alarcon visited the site of what is now the current City of Yuma. He was the first European to visit the area and to recognize the best natural crossing of the Colorado River. Much of Yuma County's later development occurred because of this strategic location. From the 1850's through the 1870's, steamboats on the Colorado River transported passengers and goods to various mines, military outposts in the area, and served the ports of Yuma, Laguna, Castle Dome, Norton's Landing, Ehrenberg, Aubry, Fort Mohave and Hardyville. During this time stagecoaches also carried the mail and passengers on bone-jarring rides through the area. In its early years, Yuma was identified by several names. From 1854 until 1858, Yuma was known as Colorado City, from 1858 until 1873, it was named Arizona City. Yuma received its present name by the Territorial Legislature in 1873 and was incorporated in 1914.

The City limits of Yuma include approximately 120 square miles of developed and undeveloped land. Yuma’s location is primarily surrounded by agriculture lands as represented in Figure 11 and Figure 12.

[19] U.S. Census Bureau and Arizona Office of Economic Opportunity, https://population.az.gov/population-projections

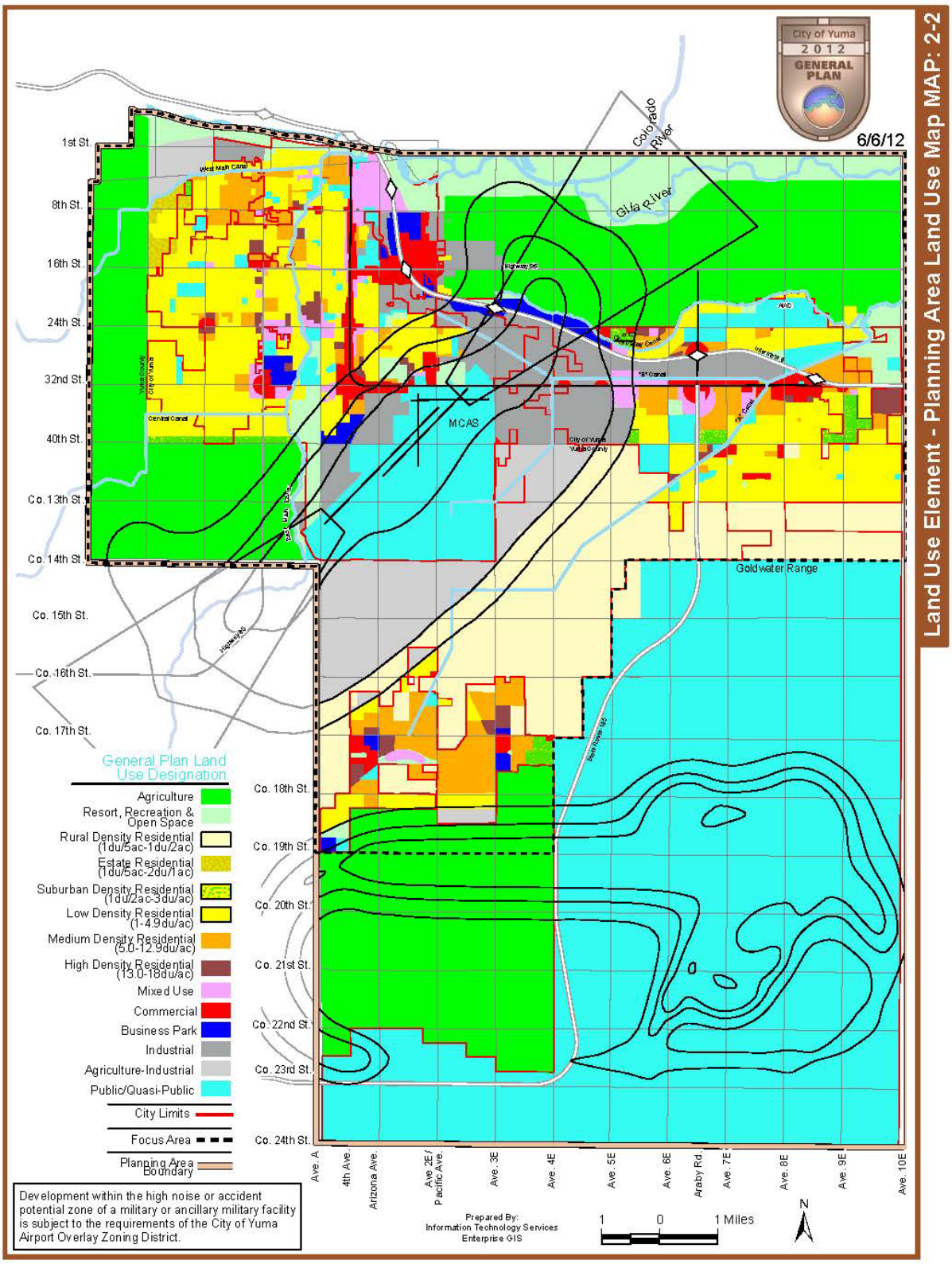


Figure 10. Land Use, City of Yuma

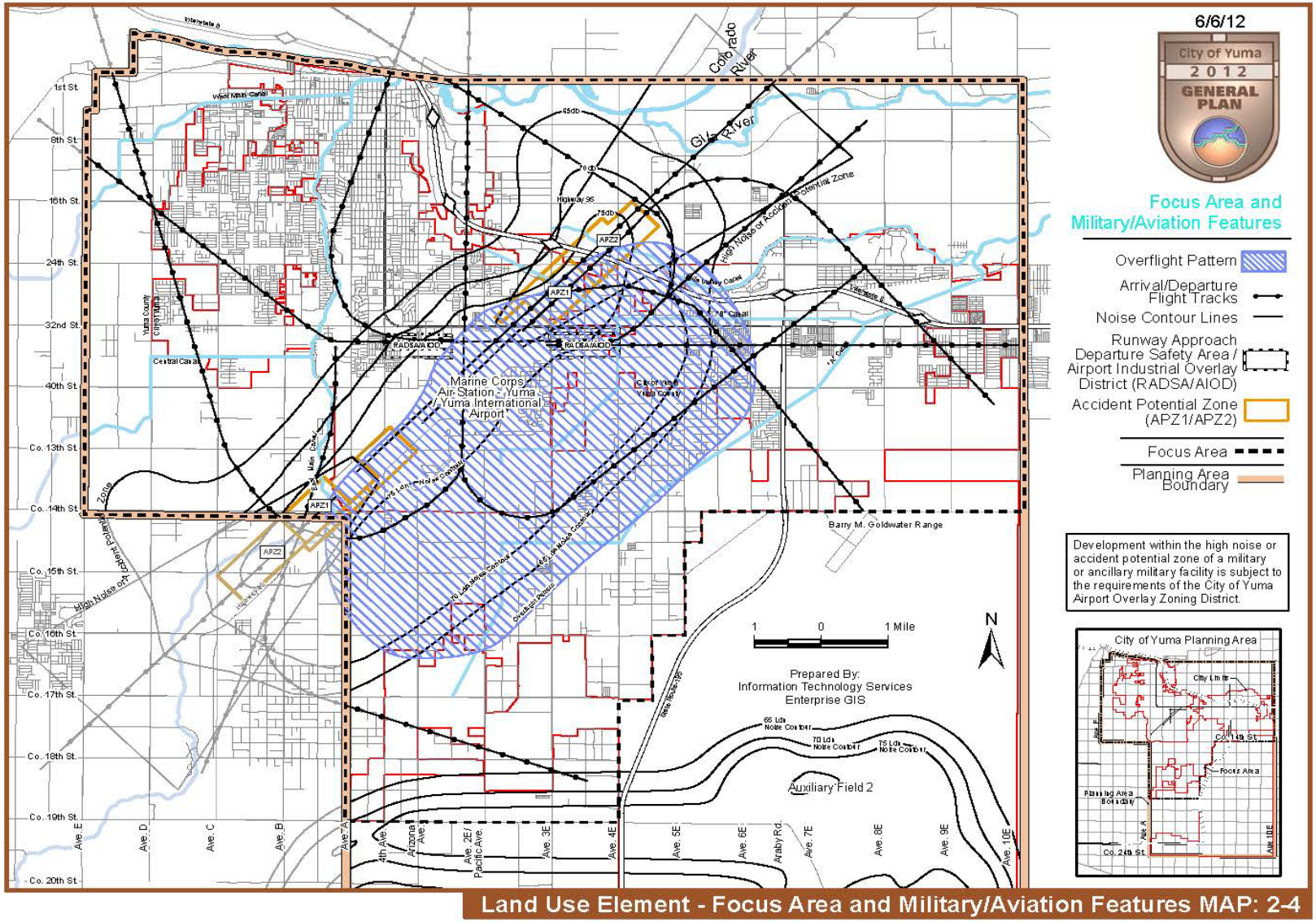


Figure 11. City of Yuma Focus Areas

SECTION 4: PLANNING PROCESS

This section includes the delineation of various DMA 2000 regulatory requirements, as well as the identification of key stakeholders and Planning Team members (refers to the County, local jurisdictions, and the Tribe) within Yuma County. In addition, the necessary public involvement actions that were applied to this process are also detailed.

4.1 Planning Process Description

Yuma County applied for and received a PDM planning grant to fund a multi-jurisdictional effort to review and update the 2010 Plan. Once the grant was received, the county then selected Michael Baker International (Michael Baker) to work with the jurisdictions, including the Cocopah Tribe, and guide the Plan update process. An initial project kickoff call and follow-up call between Michael Baker and Yuma County Emergency Management occurred in February and March of 2017. Discussions included the new plan format, the Planning Team and process, and other administrative tasks. Initial data collection efforts and contacts were also established. A total of three Planning Team meetings/webinars were conducted over the period of April 2017 through April 2018, beginning with the first Planning Team workshop on April 3, 2017. Throughout that period and for several months afterward, the work required to collect, process, and document updated data, make changes to the Plan, and prepare the draft of the Plan was performed. The culmination of the project included individual mitigation strategy workshops, specific to each jurisdiction and the Tribe. 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 2010 Plan. This was initially discussed by the county and Michael Baker prior to the Planning Team kickoff meeting. The previous planning approach included a mix of in person Planning Team meetings and webinars. This was mostly planned this way so that all jurisdictions could participate without having to travel long distances. The previous process of creating one multi-jurisdictional plan for all communities was carried into this new plan update process. Having one combined plan for all participants helps to streamline the process, yet allows the communities to collaboratively work together to come up with solutions to hazards they face together. Additionally, the previous planning approach utilized in 2010 formed a single Planning Team comprised of representatives from all participants, including other agencies and organizations.

4.3 Primary Point of Contact

Table 4-1: Jurisdictional Points of Contact

Jurisdiction	Name	Department / Position
City of San Luis	Eulogio Vera	Public Works Director
City of Somerton	Paul Deanda	Fire Chief
City of Yuma	Michael Erfert Don Willits	YFD / PIO Police Lieutenant
Cocopah Indian Tribe	Michael Fila	Emergency Manager
Town of Wellton	Donald Jones	Police Chief
Unincorporated Yuma County	Tony C. Badilla	Emergency Management Director

4.4 Planning Team

The Planning Team was comprised of one or more representatives from each jurisdiction. 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 2010 Plan. Attendance/participation by each jurisdiction was strongly encouraged for every Planning Team workshop and webinar as the meetings were structured to progress through the planning process. Steps and procedures for updating the 2010 Plan was 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 update planning process, Yuma County Emergency Management (YCEM) organized and identified members for the Planning Team by initiating contact with all participants in the 2010 Plan planning effort. The members of the Planning Team are summarized in Table 3-2.

Table 4-2: Planning Team

Name	Jurisdiction / Organization
Yuma County	
Alfonso Zavala	Sheriff's Office, PIO
Chris Flores	Emergency Management Planner
Jason Phipps	Public Works, Deputy Director
Robert Oberosler	Sheriff's Office, Lieutenant
Pat Headington	Chief Building / Fire Code Official
Paul Melcher	Chief Deputy Administrator
Shannon Gunderman	Administrative Services Director
Tony Badilla	Director of Emergency Management
Ujwal Pandey	Department of Development Services Engineer
Kevin Tunell	Communications Director
Carlos Flores	Information Technology Services GIS Analyst
Daniel Cruz	Information Technology Services GIS Manager
Joseph Waterford	Public Health Emergency Preparedness Planner
Bill Olvera	Public Works Highway Construction Supervisor
Jeremy McCall	Assistant Director of Water Utilities
Don Willits	Police Lieutenant
Michael Erfert	Fire Administrative Officer
Jennifer Albers	Community Development Principal Planner
Wellton	
Donald Jones	Town of Wellton, Police Chief
Somerton	

Table 4-2: Planning Team	
Name	**Jurisdiction / Organization**
Paul De Anda	Fire Chief
Louie Carlos	Fire Inspector
San Luis	
Eulogio Vera	Public Works Director
Angel Ramirez	Fire Chief
Jose Guzman	Planning and Zoning
Cocopah Indian Tribe	
Michael Fila	Emergency Manager
Joseph Jenkins	Police Chief
Others	
Don Black	U.S. Bureau of Reclamation, Environmental Compliance
Frank Macaluso	U.S. Bureau of Reclamation
Susan Austin	State of Arizona
Michael Garner	Michael Baker International

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 Points of Contact for each jurisdiction were encouraged to convene meetings with their local government leadership and staff, as needed, to work through the assignments.

Planning Team Kick-Off Workshop 4/3/2017: The first workshop focused on ensuring the Planning Team understood the goals of this project and that there was adequate future Planning Team representation for all jurisdictions and the Tribe. A five year plan review was held and an initial risk ranking exercise was conducted. The hazards to be profiled were also agreed upon. Post-meeting actions were then reviewed and included discussions relating to Planning Team input necessary, which related to: critical infrastructure and key resources, capability assessments, mitigation strategy, data requests, and public outreach.

Risk Assessment Workshop & Webinar 12/7/2017: The second workshop focused on presenting the results of the risk and vulnerability assessment. Discussions also continued relating to: the goals of this project, Planning Team representation, capability assessments, mitigation strategy and measures, and public outreach. There were two meetings held back to back, one from the Planning Team and the other which overlapped with the LEPC meeting. A post-meeting on-line survey and additional requests were action items following this meeting.

Planning Team Meeting & Webinar 4/3/2018: The third Planning Team meeting was developed to allow participants to understand what was expected of them and their jurisdictions and governments at the upcoming Mitigation Strategy Workshops. Discussions also continued relating to: public outreach survey results, plan maintenance and implementation, community profiles, and final hazard rankings. A post-meeting on-line survey and additional requests were action items following this meeting.

Mitigation Workshops & Webinars May 2018: A final round of individual Mitigation Workshops were held with each participant formally adopting the Plan. These workshops were all-inclusive and the Planning Team representatives from each jurisdiction and the Tribe were integral in including a diverse cross-section of each community. The first half of each workshop focused on updating mitigation action status from the

2010 Plan. The second half of the workshops focused on identifying new or continued mitigation measures for this Plan update.

Mitigation Meeting March 2019: After submitting the plan and receiving a no pass rating from FEMA, there was a day-long meeting held with the Planning Team to discuss the required revisions. All jurisdictions were represented and the necessary information was collected and compiled into the Plan.

4.4.3 Agency/Organizational Participation

The planning process used to develop the 2018 Plan included participation from several agencies and organizations, including the adopting entities that operate within or have jurisdiction over small and large areas of Yuma County. At the start of the Plan update, a list of the agencies and organizations that participated in the development of the 2010 Plan was compiled to provide continuity and institutional knowledge to the planning team and the overall update process. Invitations were sent via an email that was addressed to the original participant or their successor. The invitation list included the following entities:

- Arizona Division of Emergency Management
- City of San Luis (multiple departments)
- City of Somerton (multiple departments)
- City of Yuma (multiple departments)
- Cocopah Indian Tribe
- Town of Wellton Police
- U.S. Bureau of Reclamation
- Yuma County Development Services
- Yuma County Emergency Management
- Yuma County Flood Control District
- Yuma County Public Works
- Yuma County Sheriff's Office
- Michael Baker International

An integral part of the planning process included coordination with agencies and organizations outside of the 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 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, the county-wide community wildfire protection plan, severe weather statistics and incidents, and the Yuma Area Agricultural Council. A summary of the resources obtained, reviewed and compiled into the risk assessment are summarized at the end of each subsection of Section 5.3. Jurisdictions needing these data sets obtained them by 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.

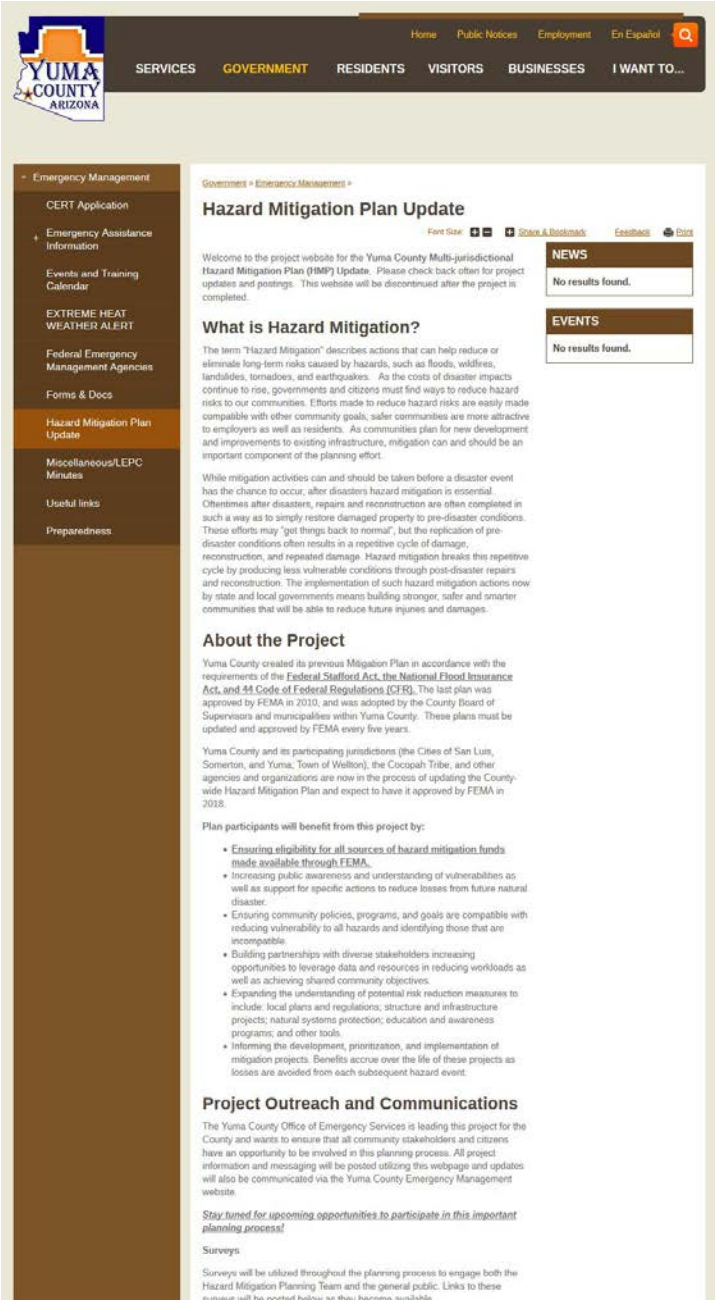
A broad range of public and private stakeholders were invited to participate in the development of the 2018 Yuma County Multi-Jurisdictional Hazard Mitigation Plan update. The public was primarily directed to planning and reference materials that were available on the project website.

The most valuable information obtained from the public came from three surveys. These surveys solicited feedback about topics relating to hazard risk perception & disaster preparedness, mitigation strategies, and comments on 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. The first public survey received over 500 responses and was broadcast via the county's and other jurisdiction's social media accounts. This Public Risk Perceptions survey was aimed at soliciting information from communities about a range of topics, including: what hazards they feel present the most risk to them, have they implemented hazard mitigation, what is the best communication medium to utilize to engage the public, and ideas for mitigation measures.

The second public survey focused on identifying the community's preferences relating to the types of mitigation project implemented and again soliciting suggestions for mitigation measures to consider. Close to 450 responses were received which included over 100 mitigation action ideas. These ideas were reviewed and evaluated by the Planning Team as each community developed their mitigation strategies.

The Cocopah Tribe encouraged participation in the surveys by posting the links to all their social media sites (Facebook, website, etc.). They also sent it out in the Tribal newsletter and spoke about the planning process and surveys at community presentations and events. They also posted fliers with the survey link for community input at governmental buildings. Tribal feedback was incorporated in the Plan in the same fashion the local jurisdictions used as this is a multi-jurisdictional plan and process. All participating jurisdictions/Tribe are equal participants in the Plan and equal members on the Planning Team.



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Hazard Mitigation Plan Update

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Welcome to the project website for the **Yuma County Multi-jurisdictional Hazard Mitigation Plan (HMP) Update**. Please check back often for project updates and postings. This website will be discontinued after the project is completed.

NEWS

No results found.

EVENTS

No results found.

What is Hazard Mitigation?

The term "Hazard Mitigation" describes actions that can help reduce or eliminate long-term risks caused by hazards, such as floods, wildfires, landslides, tornadoes, and earthquakes. As the costs of disaster impacts continue to rise, governments and citizens must find ways to reduce hazard risks to our communities. 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 damages.

About the Project

Yuma 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 2010, and was adopted by the County Board of Supervisors and municipalities within Yuma County. These plans must be updated and approved by FEMA every five years.

Yuma County and its participating jurisdictions (the Cities of San Luis, Somerton, and Yuma; Town of Wellton), the Cocopah Tribe, and other agencies and organizations are now in the process of updating the County-wide Hazard Mitigation Plan and expect to have it approved by FEMA in 2018.

Plan participants 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 these projects as losses are avoided from each subsequent hazard event.

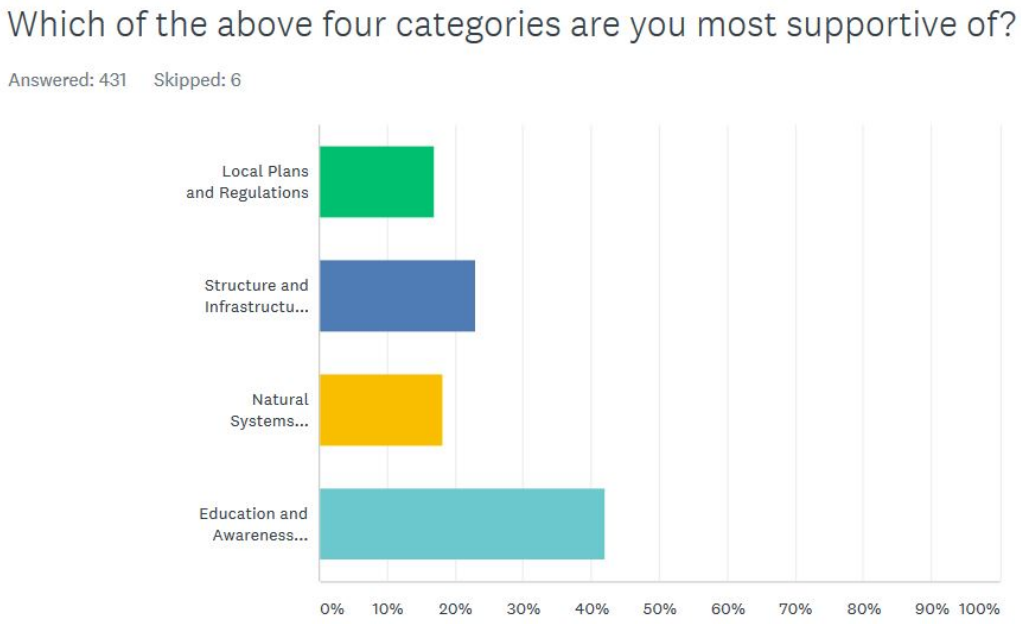
Project Outreach and Communications

The Yuma 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 webpage and updates will also be communicated via the Yuma County Emergency Management website.

Stay tuned for upcoming opportunities to participate in this important planning process!

Surveys

Surveys will be utilized throughout the planning process to engage both the Hazard Mitigation Planning Team and the general public. Links to these



Q7 Do you have any ideas for projects or actions that you would like to see the county or its jurisdictions implement to reduce your community's risk from natural disaster events?

For the purpose of this Plan, the Cocopah Indian Tribal government defines "public" as all public citizens living on Tribal land.

4.6 Reference Documents and Technical Resources

Over the course of the update planning process, all relevant plans, studies, reports, and technical information were obtained and reviewed for incorporation or reference purposes. All current community comprehensive/master plans were consulted, in addition to current capital improvement plans and other emergency management planning documents. For this Plan update, this information was most applicable to the development of each community's mitigation strategy and capabilities.

Table 4-3: Resources Reviewed/Incorporated in the Plan	
Referenced Document or Technical Source	**Description of Reference and Its Use**
AZ Department of Commerce	Reference for demographic and economic data for the county. Used for community descriptions
AZ Department of Emergency and Military Affairs	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	Resource for data on drought conditions and statewide drought management (AzGDTF), and dam safety data. Used in risk assessment. Repetitive and severe repetitive loss data provided.
Arizona Geological Survey	Resource for earthquake and other geological hazards. Used in the risk assessment.
Arizona State Land Department	Source for statewide GIS coverage (ALRIS) and statewide wildfire hazard profile information (Division of Forestry). Used in the risk assessment.
Arizona Wildland Urban Interface Assessment	Source of wildfire hazard profile data and urban interface at risk communities. Considered, but not used in the risk assessment.
Yuma County GIS	Source for GIS data and countywide infrastructure, development and planning data.
City of San Luis General Plan	Source for history, demographic and development trend data for the city.
City of Somerton General Plan 2020	Source for history, demographic and development trend data for the city.
Cocopah Tribe Emergency Operations Plan	Used for information for risk assessment.
Cocopah Tribe Hazard Mitigation Plan	Used as a basis for this plan update.
Cocopah Tribal Transportation Plans	Information on roadways in hazard areas, for risk assessment.
Cocopah Tribe Environmental Protection Plan	Information regarding the effect on the environment from emergencies and disasters, risk assessment.
Cocopah Tribal Planning Office	Used for plan incorporation.
City of Yuma General Plan	Source for history, demographic and development trend data for the city.
Town of Wellton Master Street Plan	Provided current town limit boundaries for maps and risk assessment.
Yuma County Comprehensive Plan	Source for history, demographic and development trend data for the unincorporated county.
Yuma County Flood Control District	Resource for floodplain data. Used in the risk assessment.
Yuma County Community Wildfire Protection Plan	Source of wildfire historical hazard profile data and risk assessment. Full working draft was not available for writing this plan.
Federal Emergency Management Agency	Resource for HMP guidance - How-To series
National Center for Environmental Information	Online resource for weather related data and historic hazard event data. Used in the risk assessment.

Table 4-3: Resources Reviewed/Incorporated in the Plan	
Referenced Document or Technical Source	**Description of Reference and Its Use**
National Integrated Drought Information System	Source for drought related projections and conditions. Used in the risk assessment.
National Weather Service	Source for hazard information, data sets, and historic event records. Used in the risk assessment.
National Wildfire Coordination Group	Source for historic wildfire hazard information. Used in the risk assessment.
Office of the State Climatologist for Arizona	Reference for weather characteristics for the county. Used for community description.

4.6.1 Program Integration

Every effort was made to integrate this planning process into other Tribal planning processes. The Tribe does not have a large planning portfolio but available planning documents and strategies from Housing & Development, Business Development, Cultural Resources Department, Environmental Protection Office, Planning, and Public Works were reviewed and discussed. It was agreed that current and future planning efforts will integrate this Plan where appropriate and beneficial. Effort will be made that this Plan also continue to be integrated with FEMA's Hazard Mitigation Assistance grant program and with other programs and initiatives the Tribe could benefit from in the future, such as the National Flood Insurance Program.

The Cocopah Tribe has a limited land base so it is imperative that planning processes be integrated for better alignment.

SECTION 5: RISK ASSESSMENT

A key element 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. The components of a risk assessment that answer these questions can be found in:

Hazard Identification and Screening

Hazard Profiling

Assessing Vulnerability to Hazards

The risk assessment for Yuma County, the Cocopah Tribe, and 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 several jurisdictions within Yuma County, and are rarely relegated to a single jurisdictional boundary. The vulnerability analysis was performed in a way such that the results reflect vulnerability at an individual jurisdictional/tribal 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 2010 Plan were reviewed by the Planning Team with the goal of refining the list to reflect the natural hazards that pose the greatest risk to the jurisdictions and Cocopah Tribe represented by this Plan. The Planning Team decided to focus on natural hazards for this plan update. The Planning Team also compared and contrasted the 2010 Plan list to the comprehensive hazard list summarized in the 2013 State Plan[20] to ensure compatibility with the State Plan. Table 2 summarizes the hazards profiled in the 2010 Plan, the 2013 State Plan, and this updated 2018 Plan.

Table 5-1. Hazard Identification Lists

2010 Yuma County Plan Hazards	2018 Yuma County Plan Hazards
Flooding	Drought
Severe Wind	Earthquake
Transportation Accident	Extreme Heat
Wildfire	Flooding
	Severe Wind/Dust Storms
	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 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 updated mitigation plan.

5.2 Vulnerability Analysis Methodology

5.2.1 General

The following sections describe the methodologies used to perform the vulnerability analysis portion of the risk assessment. For this Plan, the entire vulnerability analysis was revised to reflect the new hazard categories. Specific changes are noted below and/or in Section 5.3.

For the purposes of this vulnerability analysis, hazard profile maps were developed for Earthquake, Flood, Severe Wind, 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 low were used and were subjectively assigned based on the factors discussed in Probability and Magnitude sections below. For Earthquake, peak acceleration scale of %g was used to reflect hazard level. Within the context of the county limits, the other hazards do not exhibit significant geographic variability and were not categorized as such.

Unless otherwise specified in this Plan, the general cutoff date for new, historic or hazard profile data is the end of September 2017.

5.2.2 Calculated Priority Risk Index (CPRI) Evaluation

One tool used to assess the perceived overall risk of the plan hazards is the Calculated Priority Risk Index (CPRI). The CPRI guides the assessment of key factors such as likelihood, magnitude, duration, and warning time and then calculates a value based on a weighting scheme. Table 4 describes the CPRI risk categories and provides guidance regarding the assignment of values and weighting factors.

Table 5-2. Calculated Priority Risk Index (CPRI)

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%
	Possibly	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	

For the 2018 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 13 completed responses from the jurisdictions and Tribe. CPRI tables are included in each hazards' section with ratings averaged based on the responses from community representatives. It should be noted that these Index

Values are presented as an average of the collective responses received from each jurisdiction or Tribe and should provide a more holistic opinion from each jurisdiction or Tribe, as compared to past Plan updates.

This process differed from that following during past plan updates. Previously, the CPRI values were agreed upon by one or two jurisdictional or Tribal representatives. For this update, both jurisdictional or Tribal 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 2010 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

An asset inventory was performed for the 2010 Plan to establish a fairly accurate baseline data-set for assessing the vulnerability of each jurisdiction's assets to the identified hazards. The asset inventory from the 2010 Plan was reviewed and updated by all jurisdictions as part of the 2018 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 is used to define critical facilities and infrastructure for this Plan:

- Communications Infrastructure
- Gas and Oil Facilities
- Banking and Finance Institutions
- Transportation Networks
- Water Supply Systems
- Government Services
- Emergency Services

Other assets such as public libraries, schools, businesses, museums, parks, recreational facilities, historic buildings or sites, churches, residential and/or commercial subdivisions, 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 identified other assets considered to be critical and 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 is stored in a GIS geodatabase.

The following Table 5 summarizes the facility counts provided by each of the jurisdictions in this Plan.

Table 2-3. Critical/Non-Critical Facilities as of Sept. 2017

	Critical Facilities and Infrastructure					Non-Critical Facilities and Infrastructure					
Jurisdiction	**Electrical Power Systems**	**Transportation Networks**	**Water Supply Systems**	**Government Services**	**Emergency Services**	**Education**	**Cultural**	**Business**	**Residential**	**Recreational**	**Total**
Cocopah Indian Tribe			5	14	1	3	2	4	1	4	34
San Luis	1		2	13	7	11	1	2		4	41
Somerton			1	5	4	6	1	1		1	19
Wellton			2	1	1	2					6
Yuma	1	1	5	20	16	49	1			7	100
Yuma County			8	22	6	12			1		49
Total	2	1	23	75	35	83	5	7	2	16	249

5.2.4 Loss Estimations

For this Plan, overall summary of the vulnerability of the planning area is expressed in narrative form rather than data. The asset inventory (above) remains in the Plan for potential future use.

5.2.5 Development Changes

The 2018 Plan development changes analysis revealed population growth resulting in new development; this however does not include the Cocopah Tribe. Those changes as described by the Planning Team are at the end of each hazard profile.

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 2010 Plan data has been updated, incorporated and/or revised to reflect current data and Planning Team changes. County-wide and regional/community profile maps are provided at the end of the section (if applicable).

5.3.1 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

Arizona has experienced 17 droughts declared as drought disasters/emergencies from 1987 to 2013, and 93 drought events (droughts affecting multiple years are recorded as a distinct event for each year affected)[21]. Figure 13 depicts the most recent precipitation data from the National Centers for Environmental Information (NCEI) regarding average statewide annual precipitation variances from a 30-year mean.[22] Between 1849 and 1905, the most prolonged period of drought conditions in 300 years occurred in Arizona

[21] Source: 2013 State of Arizona Hazard Mitigation Plan

[22] Source: NOAA, NCEI, https://www.ncdc.noaa.gov/cag/statewide/time-series/2/pcp/all/12/1998-2018?base_prd=true&firstbaseyear=1987&lastbaseyear=2018, accessed March 2018.

(NOAA, 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 2018, there have been many more months with below normal precipitation than above normal precipitation.

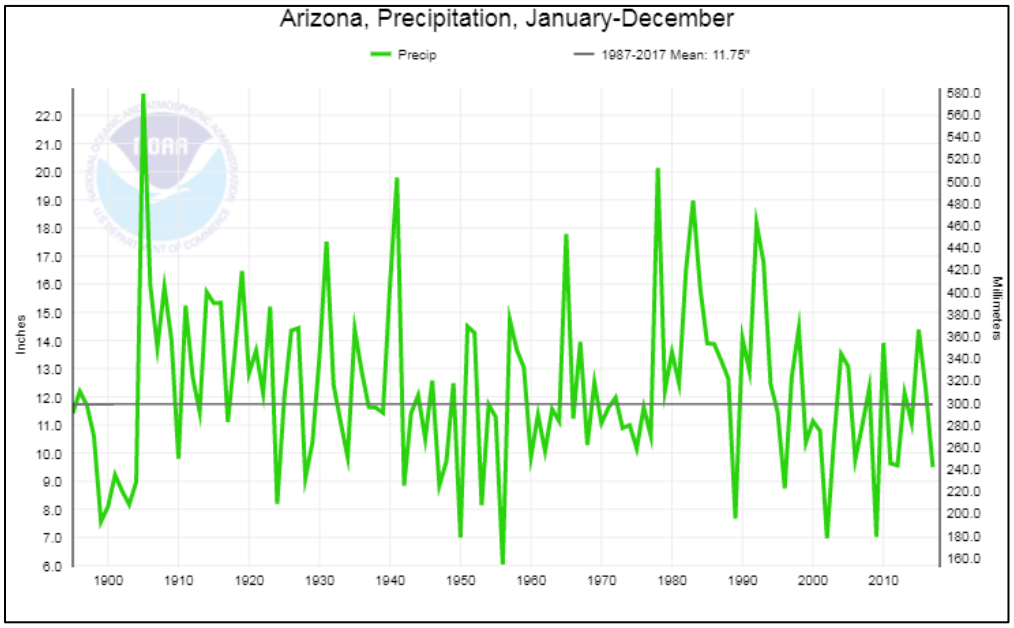
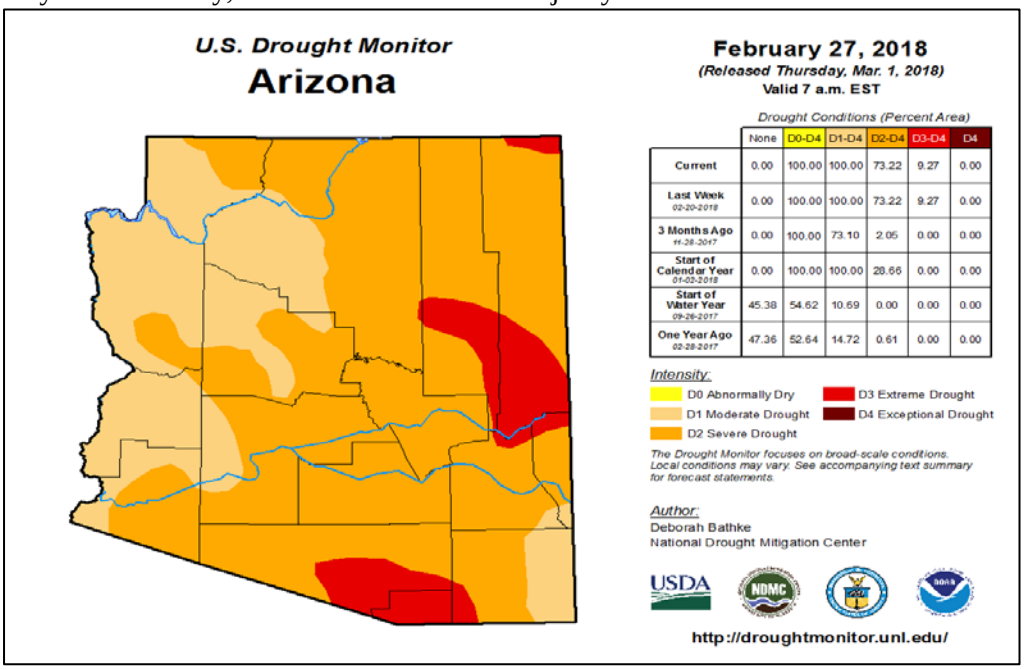


Figure 12. Statewide Precip Variances, 1897-2017 mean from 1895-2018.

The following figures demonstrate the current statewide drought levels and the annual precipitation for the nation. It can be seen that Yuma County is currently experiencing moderate to severe conditions, with higher levels being seen in the central and southeast part of the county. Precipitation for the State of Arizona, and especially Yuma County, is much lower than the majority of the nation.



	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.00	100.00	100.00	73.22	9.27	0.00
Last Week 02-20-2018	0.00	100.00	100.00	73.22	9.27	0.00
3 Months Ago 11-28-2017	0.00	100.00	73.10	2.05	0.00	0.00
Start of Calendar Year 01-02-2018	0.00	100.00	100.00	28.66	0.00	0.00
Start of Water Year 09-26-2017	45.38	54.62	10.69	0.00	0.00	0.00
One Year Ago 02-28-2017	47.36	52.64	14.72	0.61	0.00	0.00

Figure 13. AZ Drought 2017 Monitor

The State of Arizona consistently experiences drought conditions and has often been declared eligible for drought emergency assistance through the U.S. Department of Agriculture. Drought declarations for the entire State have occurred consecutively since 1996, with numerous prior declarations dating back to the time of statehood.

The impacts of a sustained drought affect many aspects of the industry, economy, and natural resources of Yuma County. The most direct impacts are to the agricultural community, the development of domestic water supplies, and hydroelectric generation.

The primary source of irrigation water for the agricultural community within Yuma County is the Colorado River. Secondary water supplies are provided by groundwater pumping. The Colorado River is also a significant source of hydroelectric power generation with distribution administered and operated by the Western Area Power Authority (WAPA) through two local electric utility companies, Arizona Public Service and Wellton Mohawk Irrigation and Drainage District. During extended periods of drought, impoundment levels behind the various dams along the Colorado River can decline to levels such that both agricultural and electric utility resources are affected. In extreme cases of storage reduction, electricity generating turbines could cease to function and the energy needed to pump the Colorado River water into the agricultural distribution systems would not be available. This event would have devastating impacts on much of Arizona and California.

With regard to agriculture, when drought conditions persist such as what is currently being experienced statewide, more demand is placed on groundwater supplies. Other agricultural areas impacted include cattle ranching and rangeland grazing. With ongoing drought, rangeland grasses and other fodder, along with stock tank water supplies, are significantly reduced. This reduction forces ranchers to feed more hay and to truck in water, both of which significantly increase expenses.

From 1995 to 2016, Yuma County farmers and ranchers have received approximately $10.4 million[23] in disaster related assistance funds. According to the USDA, 35 to 55% of the disaster assistance money[24] from 2000-2010 can be attributed to drought related losses. Accordingly, it is realistic to estimate that $3.6 million to $5.7 million of the assistance money is related to drought conditions in the county. These impacts are translated into the general economy in the form of higher food and agricultural goods prices.

Probability and Magnitude

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 very near future expected conditions.

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 Drought.gov[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 Figure 16, 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 17, 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

[23] Environmental Working Group, Farm Subsidy Database, https://farm.ewg.org/region.php?fips=04027

[24] U.S. Department of Agriculture, 2004, *News Release No. fs0199.04*, web link at: http://www.usda.gov/Newsroom/fs0199.04.html

[25] NIDIS U.S. Drought Portal website is located at: https://www.drought.gov/drought/

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 is well suited to the dry, mountainous western United States.

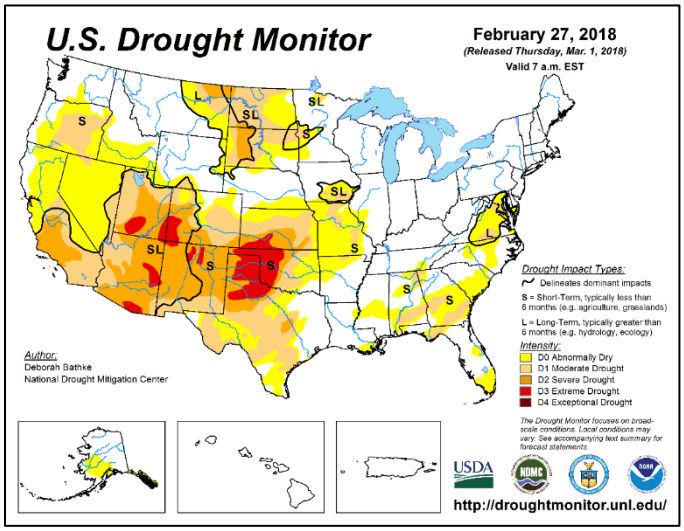


Figure 14. U.S. Drought Monitor Map, February 27, 2018

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. This interagency group reports to the governor on an annual basis about the existing drought status and the potential need for drought declarations. The counties use the monthly drought status reports to implement drought measures 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. Figure 18 present the most current long-term map available as of the writing of this plan. The State Drought Monitoring Technical Committee recognizes moderate and severe drought conditions in the short-term; and severe to exceptional conditions in the long-term. The quarterly drought status update report for October through December 2017 states that a dry winter and meager snowpack caused expansion of drought conditions across the State, and water equivalent ranks with Arizona's driest years, including 2000 and 2006.[26]

[26] Arizona State Drought Monitoring Technical Committee, https://new.azwater.gov/drought/drought-status, accessed March 2018

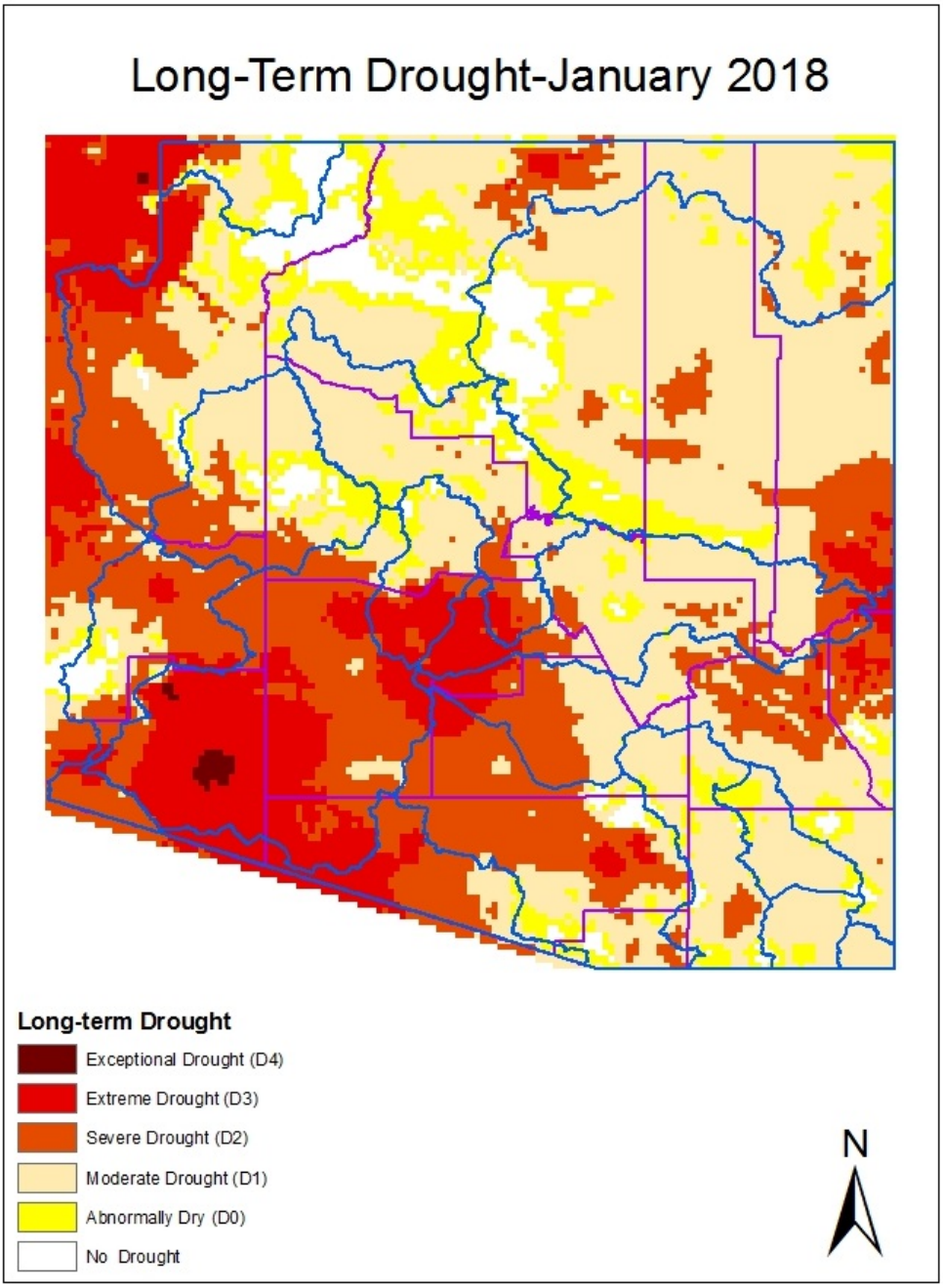


Figure 15. AZ Long Term Drought Status, January 2017

The 2017 Annual Drought Preparedness Report stated that the past year has seen improvements in terms of seasonal precipitation and streamflows, although many parts of the state are still experiencing abnormally dry conditions.

Vulnerability

All jurisdictions and Cocopah Tribe: There is a significant amount of farming in the planning area, requiring significant amounts of water. This makes the planning areas particularly vulnerable to drought as insufficient water supplies may result in a large economic impact due to the loss of agricultural production. Many area residents rely on well water as their primary source of drinking water. The lack of drinking water will force residents to contract outside water supplier to bring in water. Well water also supplies domestic activities (flushing, landscaping, etc.).

Table 5-4. CPRI Results for Drought

Jurisdiction	Probability	Magnitude/ Severity	Warning Time	Duration	CPRI Score
Cocopah Tribe	Likely	Negligible	>24 hours	>1 week	2.2
San Luis	Possibly	Critical	>24 hours	>1 week	2.4
Somerton	Highly Likely	Critical	>24 hours	>1 week	3.3
Yuma County	Possibly to Likely	Limited	>24 hours	>1 week	2.2
Wellton	Highly Likely	Limited	>24 hours	>1 week	3.0
Yuma	Possibly	Limited - Critical	>24 hours	>1 week	2.2

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 Yuma County. Instead, drought vulnerability is primarily measured by its potential impact to certain sectors of the County economy and natural resources include the following:

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

The impacts of drought to critical and non-critical facilities and building stock is generally indirect, in that drought is often a contributing factor to other hazards such as flooding 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 decreases the interception of rainfall and increases the flooding hazard. The sectors most directly impacted by drought are agriculture, ranching, potable water supplies, and recreation/tourism. The vulnerability and potential impact for this risk assessment will focus primarily on the potential economic impacts to agriculture and ranching. According to the Arizona Agricultural Statistics, which is a branch of the National Agricultural Statistic Service (NASS) and the U.S. Department of Agriculture (USDA), the 2012 market value of agricultural products in Yuma County was $985 million.[27] It is plausible to assume that all of the Yuma County agriculture is vulnerable to drought. Yuma County farmers and ranchers received approximately $10.4 million in USDA disaster assistance over the past 20 years, with an average of approximately $615,000 paid out annually during those years. Other economic losses associated with drought could include increased domestic water

[27] USDA Census of Agriculture, 2012 Census Volume 1, Chapter 2: County Level Data; https://www.agcensus.usda.gov/Publications/2012/Full_Report/Volume_1,_Chapter_2_County_Level/Arizona/st04_2_001_001.pdf

supply costs, increased wildfire risk and firefight costs, and impacts to tourism. There are no readily available references, however, for estimating these costs in relation to drought.

Changes in Development

Population growth in Yuma County requires additional surface and ground water to meet the demands of potable, landscape, and industrial uses. Since the last plan, all non-tribal jurisdictions have experienced significant growth in population and associated developments, placing a larger strain on the limited water supply and increasing regional vulnerability to drought. The Cocopah Indian Tribe has not experienced major changes in either its population or associated developments. The tribe's vulnerability to drought, on the other hand, has increased with the rest of the jurisdictions because water resources are interdependent and the strain on water supplies is felt across all jurisdictions. Moving forward, it is unlikely that significant growth will occur in the ranching and farming sectors given the current 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 Yuma County will recognize drought as a potential constraint.

Sources

AZ Dept of Water Resources, 2017, *Arizona Drought Preparedness Annual Report*, https://new.azwater.gov/sites/default/files/media/2017%20Arizona%20Drought%20Preparedness%20Annual%20Report.pdf

AZ Division of Emergency Management, 2013, *State of Arizona Hazard Mitigation Plan*

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Environmental Working Group, 2016, Farm Subsidy Database, https://farm.ewg.org/region.php?fips=04000&statename=Arizona. Accessed March 2018

National Oceanic and Atmospheric Administration, National Centers for Environmental Information, Climate at a Glance, https://www.ncdc.noaa.gov/cag/statewide/time-series/2/pcp/all/12/1998-2018?base_prd=true&firstbaseyear=1987&lastbaseyear=2018. Accessed March 2018.

5.3.2 Earthquake

Description

An earthquake is a sudden, rapid shaking of the earth caused by the movement of tectonic plates. This shaking can cause buildings and bridges to collapse; disrupt gas, electric, and phone service; and sometimes trigger landslides, flash floods and fires. Buildings with foundations resting on unconsolidated landfill, old waterways, sandy soils with high water tables, or other unstable soil types are most at risk. Buildings or trailers and manufactured homes not tied to a reinforced foundation anchored to the ground are also at risk since they can be shaken off their mountings during an earthquake. Earthquakes can occur at any time of the year and usually result in either a ground surface rupture, strong ground motion, slope failure, and/or liquefaction.

Liquefaction caused by seismic activity is a significant hazard for the Yuma area. Liquefaction is the process wherein soils transform into a liquid state due to ground shaking from an earthquake. Structural failures due to liquefaction are due to lateral spread, flow failure, ground oscillation, and/or loss of bearing strength. The three primary criteria that must be satisfied for liquefaction to occur are; ground shaking during an earthquake, the presence of sandy soils, and shallow ground water. The Yuma and Gila valley regions of Yuma County meet these criteria and have been identified as potential liquefaction zones. Figure 20 is a map [28] of Yuma County depicting liquefaction hazard areas that were determined using these critical factors.

The Yuma area is located in relatively close proximity to several major geologic fault zones with historic seismic activity. All of the faults are related to tectonic movement between the North American Plate and the Pacific Plate. The seismic hazard for the Yuma region is considered the highest in Arizona because of its proximity to these faults. The major faults having the most potential for generating ground motion in the Yuma area are the San Jacinto, San Andreas, Elsinore, Cerro Prieto, Imperial, Sand Hills, and Algondones Faults and the Brawley Seismic Zone.

History

These faults have produced several damaging earthquakes during the last 150 years and there is reasonable probability that damaging levels of seismic shaking will occur in the next 50 years. The relative locations of these regional faults with respect to Yuma County are indicated on Figure 21.

Earthquakes have been documented for the Yuma Region since 1776 when the explorers on the Anza expedition landed at Fort Yuma. Figure 22 indicates the locations of several historic earthquakes and their approximate magnitudes. Figure 26 through Figure 30 at the end of this hazard profile show the location of historic earthquake epicenters, along with their recorded magnitude, at both a countywide and community scale. Figure 23 is an excerpt from the Ninyo & Moore (N&M) report summarizing various additional historic earthquake events that have impacted the Yuma area in the last 150 years. There have been no significant earthquakes since the last plan, the following are some of the more recent or notable events:

- In April 2010, the Easter Sunday 7.2 earthquake swayed high-rises in downtown Los Angeles and San Diego and was felt across Southern California and Arizona. According to the U.S Geological Survey, the earthquake struck at 3:40 p.m. in Baja California, Mexico, about 19 miles southeast of Mexicali. The quake was felt as far north as Santa Barbara. A police dispatcher in Yuma, Arizona, said the quake was very strong here, but no damage was reported (U.S & World News). Additionally, severe loss of property occurred in San Luis Rio Colorado and neighboring Imperial County, causing millions and possibly billions of dollars in damage - less than 50 miles away. (Yuma County)

[28] Bausch, D.B., Brumbaugh, D.S., 1996, *Yuma Community Earthquake Hazard Evaluation*, Arizona Earthquake Information Center, Northern Arizona University.

- On July 29, 2008, Chino Hills, California Earthquake, a M5.4 earthquake shook Southern California. The earthquake was the strongest in the region since the Northridge earthquake in 1994. Shaking was felt as far as Las Vegas, Nevada and Yuma, Arizona. Buildings swayed in downtown Los Angeles and area amusement parks were evacuated. A minor landslide near Route 91 in the Anaheim Hills caused some traffic congestion, but no injuries or structural damage was reported.
- In May 1940, a 7.0 M_I earthquake ruptured the Imperial Fault and caused significant liquefaction in the Yuma area.
- In 1872, a 5.8 M_I quake was felt, causing minor damage to a store and saloon located on Main Street in the City of Yuma.
- In 1852, a 7.0 M_I earthquake shifted the course of the Colorado River away from the Fort, diminishing its domination of the ferry crossing.

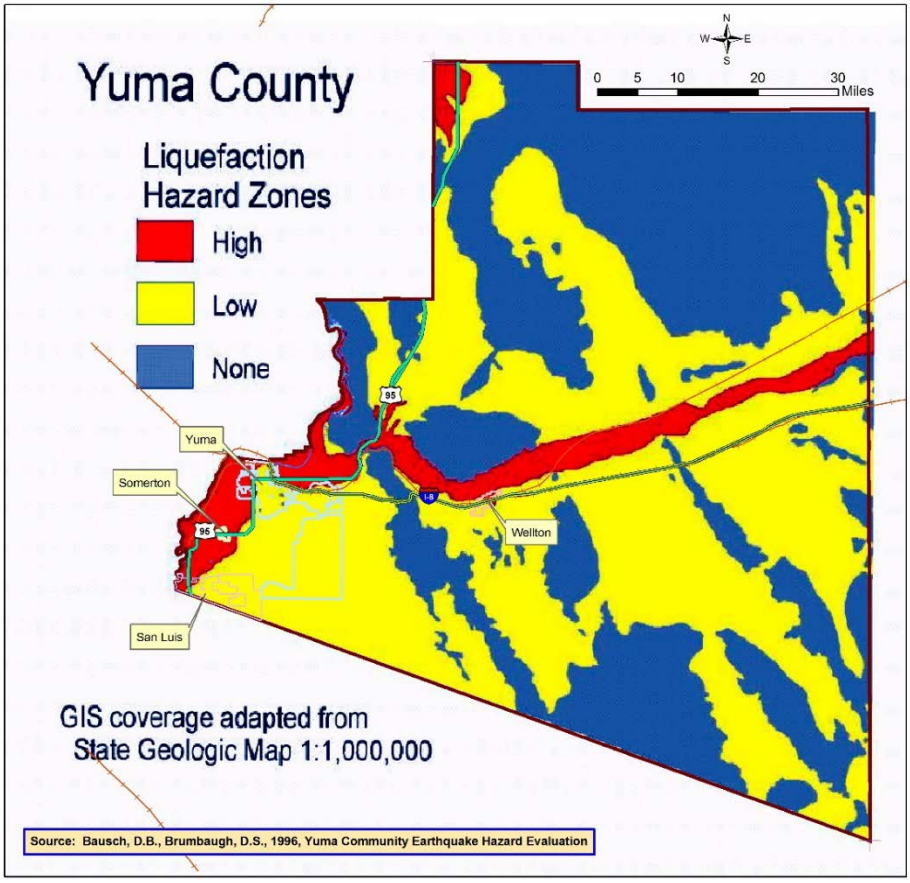

Figure 16. Liquefaction Hazard Map, Yuma County

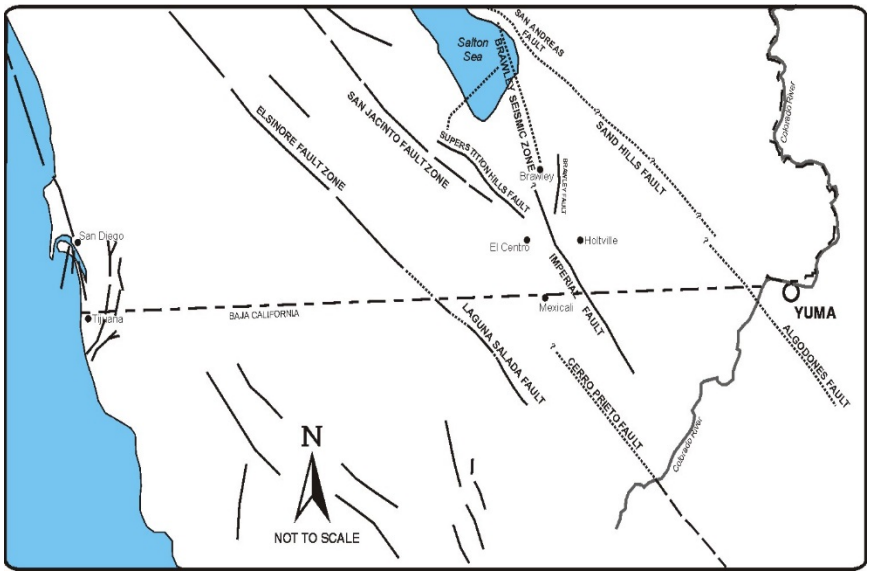

Figure 17. Fault locations in Yuma

Figure 18. Locations of Historic Earthquakes in/near Arizona

TAO Emergency Management Consulting
Earthquake and Flooding Hazard Review, City of Yuma

September 7, 2001
Project No. 600283001

Table 1 – Historic Earthquakes in the Yuma Region, M>5.5

Event Name	Day	Year	Epicenter Latitude (Degrees)	Epicenter Longitude (Degrees)	Distance from Yuma (miles)	Reported Magnitudes M_W	M_S	M_L	M_I
Fort Yuma	***11/29***	***1852***	*32.5?*	*115.0?*	***25 to 50***	*(7+)*			*7.0*
	05/03	*1872*	*33.0?*	*115.0?*	*??*				*5.8*
	11/15	*1875*	*32.5*	*115.5*	*51*				*6.2*
	07/30	*1891*	*32.0*	*115.0*	*52*				*6.0*
Laguna Salada	*02/24*	*1892*	*32.6*	*115.6*	*58*	*(7)*			*7.0*
	04/19	*1906*	*32.9*	*115.5*	*51*		*6.2*		*5.8*
Imperial Valley	*06/23*	*1915*	*32.8*	*115.5*	*50*		*6.0*		*5.6*
Imperial Valley	*06/23*	*1915*	*32.8*	*115.5*	*50*		*5.9*		*5.6*
Volcano Lake	*11/21*	*1915*	*32.0*	*115.0*	***52***	*(7)*			*7.1*
	11/07	*1923*	*32.5*	*115.5*	*51*			*5.5*	
	01/01	*1927*	*32.5*	*115.5*	*51*			*5.8*	
	01/01	*1927*	*32.5*	*115.5*	*51*			*5.5*	
Laguna Salada	*12/30*	*1934*	*32.25*	*115.50*	*58*	***6.4***		*6.5*	
Cerro Prieto	***12/31***	***1934***	*32.00*	*114.75*	***49***	***7.1***		*7.1*	
	02/24	*1935*	*31.98*	*115.20*	*59*			*6.0*	*5.3*
El Centro	***05/19***	***1940***	*32.73*	*115.50*	*33**	***7.0***	*7.2*	*6.2*	*7.0*
Fish Creek Mountain	*10/21*	*1942*	*32.97*	*116.00*	*81*	***6.6***		*6.5*	*6.3*
	10/22	*1942*	*33.23*	*115.72*	*72*			*5.5*	
Brawley Seismic Zone	*07/29*	*1950*	*33.12*	*115.57*	*60*			*5.5*	
	01/24	*1951*	*32.98*	*115.73*	*66*			*5.6*	
	06/14	*1953*	*32.95*	*115.72*	*64*			*5.5*	
	02101	*1954*	*32.30*	*115.30*	*47*			*5.6*	
	12/01	*1958*	*32.25*	*115.75*	*71*			*5.8*	
	08/07	*1966*	*31.80*	*114.50*	*63*			*6.3*	
Imperial Valley	***10/15***	***1979***	*32.61*	*115.32*	***39***	***6.5***	*6.9*	*6.6*	
Brawley Aftershock	*10/15*	*1979*	*32.98*	*115.55*	*56*			*5.8*	
Victoria	***06/09***	***1980***	*32.20*	*115.08*	***43***	***6.4***	*6.4*	*6.1*	
Westmorland	*04/26*	*1981*	*33.10*	*115.63*	*63*	*5.9*	*6.0*	*5.6*	
	02/06	*1987*	*32.37*	*115.30*	*44*			*5.4*	
Elmore Ranch	*11/23*	*1987*	*33.08*	*115.78*	*70*	*5.9*	*6.2*	*5.8*	
Superstition Hills	*11/24*	*1987*	*33.01*	*115.84*	*72*	***6.5***	*6.6*	*6.0*	

Notes:
1.) Earthquake information primarily from Ellsworth (1990) and USBR (1976)
2.) Magnitude Scales: M_W - moment magnitude, M_L - Local (Richter) magnitude, M_S – surface-wave magnitude
M_I - estimated from felt area intensity. Moment magnitudes are considered a better measure of the seismic energy released during an earthquake.
4.) Before 1930, Epicenters of earthquakes are approximate, indicated to nearest 0.5 to 0.1 degree.
* Closest rupture distance

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Ninyo & Moore

Figure 19. Historic Earthquake Events Impacting Yuma area, Past 150 years

Probability/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 Table 7.

Table 5-5. Modified Mercalli Intensity Scale

Scale	Intensity	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
VIII	**Destructive**	Moving cars uncontrollable, masonry fractures, poorly constructed buildings damaged	0.34 – 0.65	< 6.9

Scale	Intensity	Effects	PGA (g)	Richter Scale Magnitude
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.

Related Hazards

While the public may not be very concerned about flooding in the desert, if there was a strong earthquake serious flooding could result from damages to water canals. The following figure indicates an immediate potential in the "Ocotillo" Neighborhood that is west of Araby Road (Hwy 195), south of 32nd street. This canal carries a lot of water and if it failed due to strong ground shaking we could see flooding amongst the home closest to the canal.

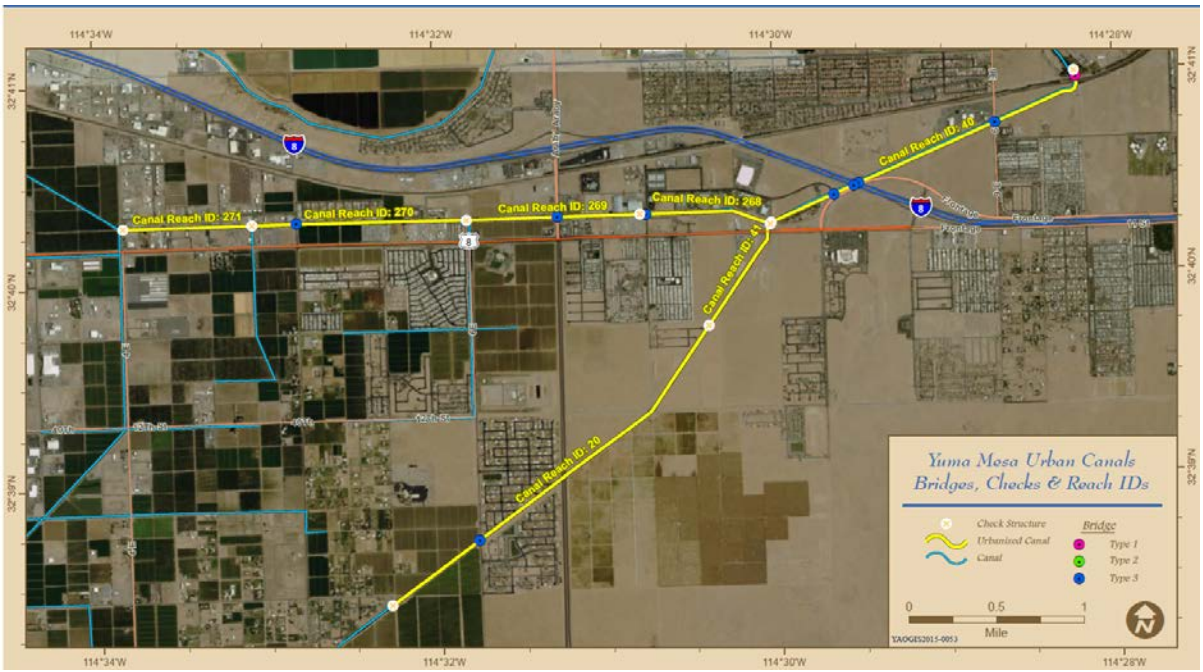

Figure 20. Yuma Mesa Canals

The next figure indicates flooding potential south of 1st street and in the homes along the Mesa's edge. The flooding potential depends on how high the canal is above the adjacent backyards. The canal in the middle is a smaller canal and the potential is not as great.

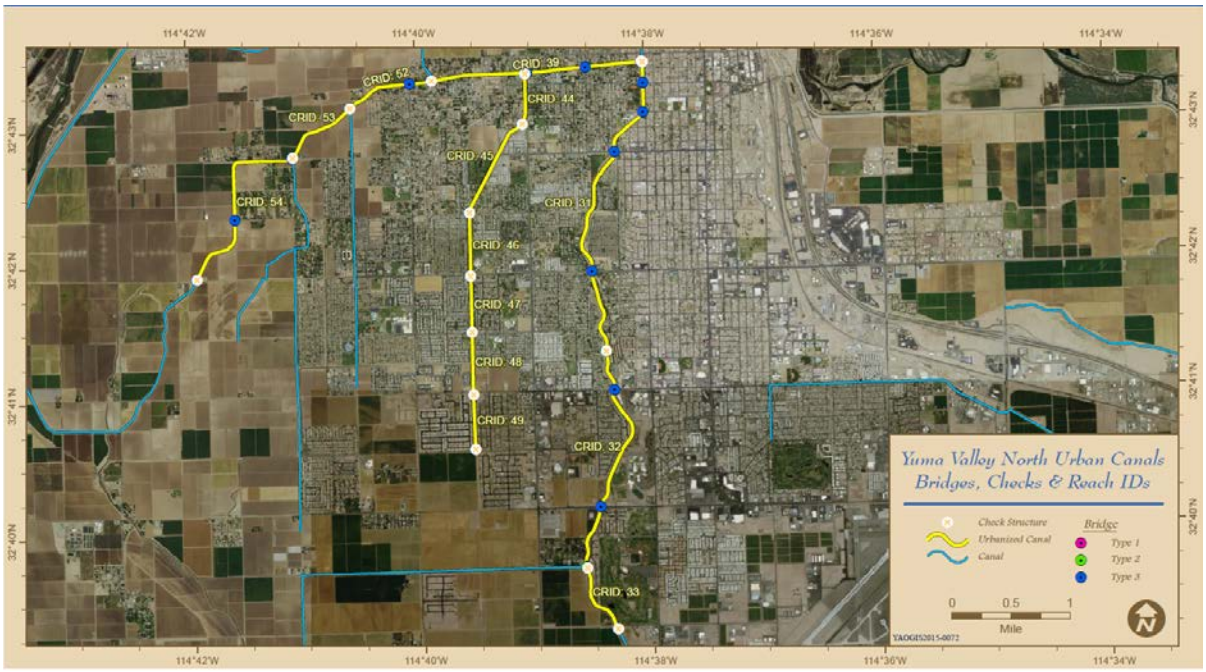

Figure 21. Yuma Valley Canals

Vulnerability

- Yuma County: Yuma County is located in an earthquake prone region making its public buildings and residential homes susceptible to seismic damage. Interstate 8 is the main transportation route throughout the County and any damage to overpasses and roads along this interstate will impede first responder activity and have a major impact on intrastate and interstate commerce, resulting in a direct impact on the county's economy. Structures and critical infrastructure in the planning area are also susceptible to the detrimental effects of soil liquefaction caused by earthquakes. Gas and oil pipelines that travel between Yuma County and the State of Texas are especially vulnerable to damages caused by earthquakes.
- City of San Luis: The jurisdiction has a port of entry that could be closed by road damages caused by earthquakes. These road closures may significantly impact commerce and transportation routes for residents who live and work on the other side of the city.
- City of Somerton: The community's homes and critical infrastructure are susceptible to damages caused by soil liquefaction from earthquakes.
- Town of Wellton: About half of the town has increased vulnerability to earthquakes due to the presence of historic buildings and a large population of elderly residents.
- City of Yuma: As mentioned above in the County description, the City of Yuma also has gas and oil pipelines that travel between its jurisdiction and Texas. Communication cables and a transfer station for power distribution are also vulnerable to seismic activity caused by earthquakes. Disruption in these services can result in severe public health and safety impacts during the summer months.
- Cocopah Indian Tribe: As stated for the County, the tribal lands are located in an earthquake prone region making its public buildings and residential homes susceptible to seismic damage. Any damage to overpasses and roads around Interstate 8 will also impede first responders and have a major impact on the area's agricultural economy that is supported by intrastate and interstate commerce. Structures and critical infrastructure in the planning area are also susceptible to Damages to critical infrastructure and homes caused by soil liquefaction are also a major concern. The tribal lands also contain gas and oil pipelines that are vulnerable to earthquakes.

Table 5-6. CPRI Results for Earthquake

Jurisdiction	Probability	Magnitude/ Severity	Warning Time	Duration	CPRI Score
Cocopah Tribe	Highly Likely	Limited	<6 hours	>1 week	3.4
San Luis	Likely	Limited	<6 hours	>1week	3.0
Somerton	Highly Likely	Catastrophic	<6 hours	<24 hours	3.8
Yuma County	Likely - Highly Likely	Critical	<6 hours to 12 hrs	<24 hours	3.3
Wellton	Possibly	Critical	<6 hours	<6 hours	2.5
Yuma	Possibly to Likely	Negligible	<6 hours	<6 hours	2.1

Loss Estimations

The most appropriate risk assessment methodology for seismic hazards involves scenario modeling using FEMA's Hazus loss estimation software. Hazus is a very useful planning tool because it provides an acceptable means of forecasting earthquake damage, loss of function of infrastructure, and casualties, among many other factors. A new Hazus analysis was conducted by FEMA at a national level for the United States in April 2017. The 'Hazus Estimated Annualized Earthquake Losses for the United States (FEMA Publication 366)' was developed by FEMA's Hazus Team, the National Earthquake Hazards Reduction

Program (NEHRP), and the United States Geological Survey (USGS) using Hazus data from Version 3.0, 2010 U.S. Census Data, and updated USGS Probabilistic Earthquake Hazard Maps. This update serves as a more accurate estimate of losses than older versions of Hazus.

Figure 31 through Figure 34 include the total exposure each community faces due to a potential earthquake. Exposure demonstrates a worst case scenario, taking into account all exposed structures. These exposure maps show that the City of Yuma has the highest amount of exposure risk if an earthquake should occur. Figure 35 through Figure 38 include the total estimated losses for each community. Again, the City of Yuma is shown as having the highest number of estimated losses should an earthquake occur. Figure 39 through Figure 42 include an estimated number of displaced households for each community. This data shows that the City of Somerton will experience the highest number of displaced households in the county.

Development Trends and Changes

It is reasonable to expect that future earthquakes as large as 7.2 will occur in or nearby Yuma 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.

With the exception of the Cocopah Tribe, all jurisdictions have experienced significant population growth and development since the last plan. Most of the development occurred after 2011 in the residential sector. The increase in population size and associated developments has increased each jurisdiction's vulnerability to earthquakes. The Planning Team estimates that a third of the County's lands are exposed to seismic risk. They also estimate that 80% of the population is vulnerable to earthquakes. On the other hand, the minimal changes to the Cocopah Tribe's population and associated developments have kept its vulnerability to earthquakes relatively stable.

The City of Yuma is estimated to experience a 46% increase in population from 2010 to 2040, as well as experience the most in losses and have the highest exposure in the event of a major earthquake. Additionally, the City of Somerton is estimated to experience an 88% increase in population from 2010 to 2040, as well as experience the highest number of displaced households in the event of a major earthquake. In order to reduce the risk of new developments to earthquakes, structures located in areas prone to liquefaction should adhere to the most current seismic building codes. It is also recommended that if development should occur on any of these properties, a geotechnical investigation should be required in order to address the liquefaction potential and provide recommendations for mitigation.

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Profile Maps

Figure 26 – Earthquake Hazard Countywide

Figure 27 – Earthquake Hazard Yuma

Figure 28 – Earthquake Hazard Somerton

Figure 29 – Earthquake Hazard San Luis

Figure 0-18 – Earthquake Hazard Wellton

Figure 31 – Earthquake Total Exposure Yuma

Figure 32 – Earthquake Total Exposure Somerton

Figure 33 – Earthquake Total Exposure San Luis

Figure 34 – Earthquake Total Exposure Wellton

Figure 35 – Earthquake Total Losses Yuma

Figure 36 – Earthquake Total Losses Somerton

Figure 37 – Earthquake Total Losses San Luis

Figure 38 – Earthquake Total Losses Wellton

Figure 39 – Earthquake Displaced Households Yuma

Figure 40 – Earthquake Displaced Households Somerton

Figure 41 – Earthquake Displaced Households San Luis

Figure 42 – Earthquake Displaced Households Wellton

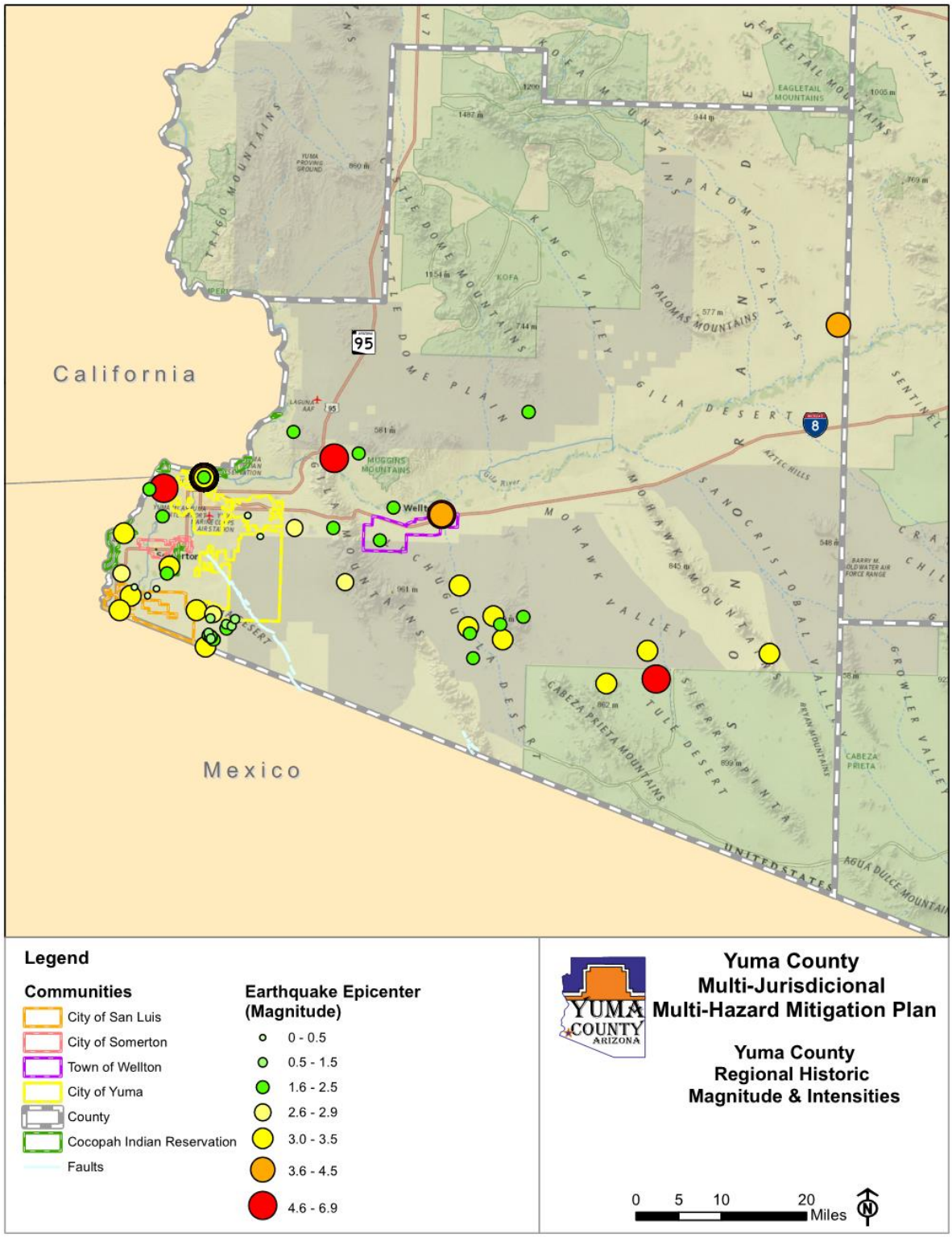

Figure 22. Yuma Co Historic Earthquakes Magnitude & Intensities

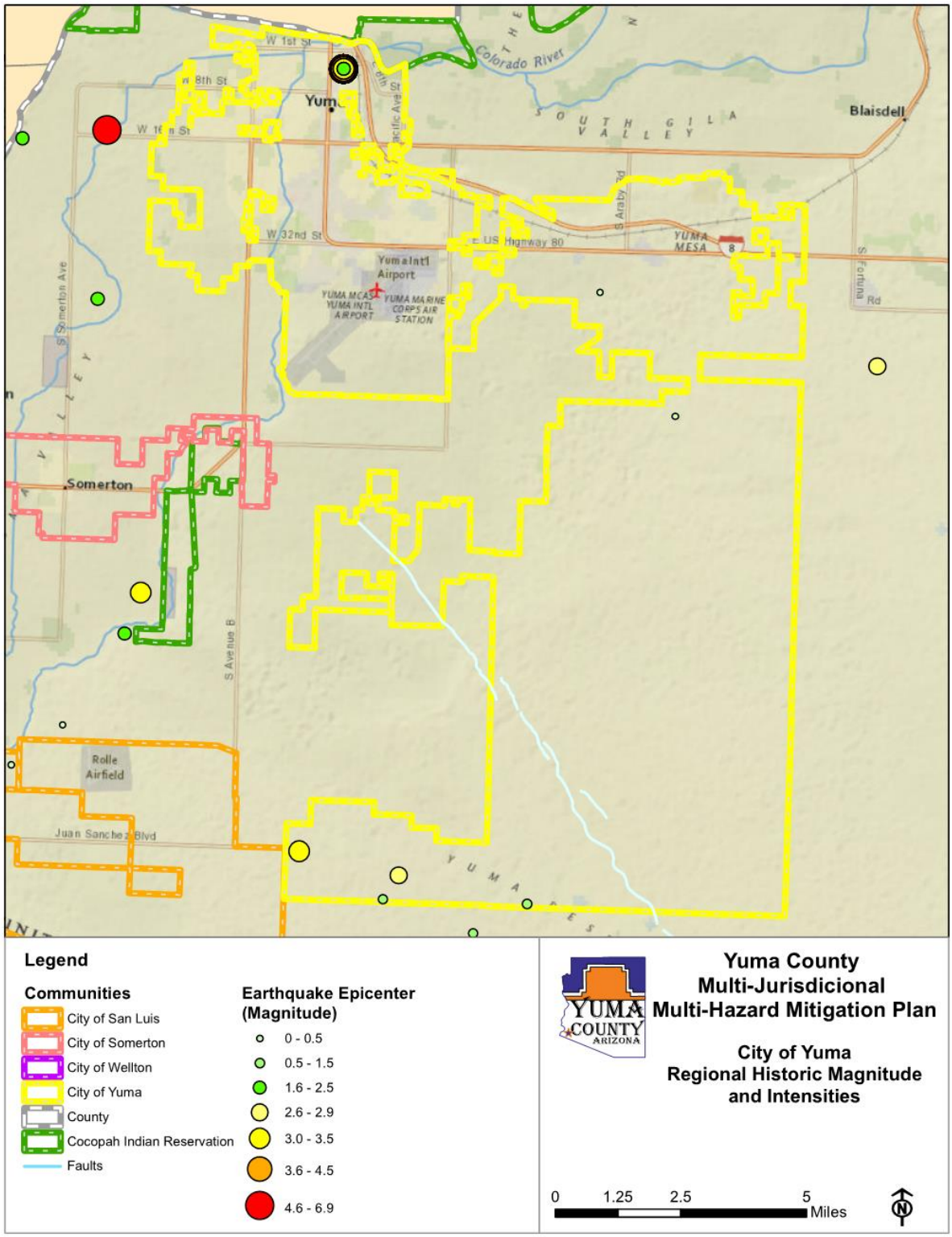

Figure 23. City of Yuma Historic Earthquakes Magnitude & Intensities

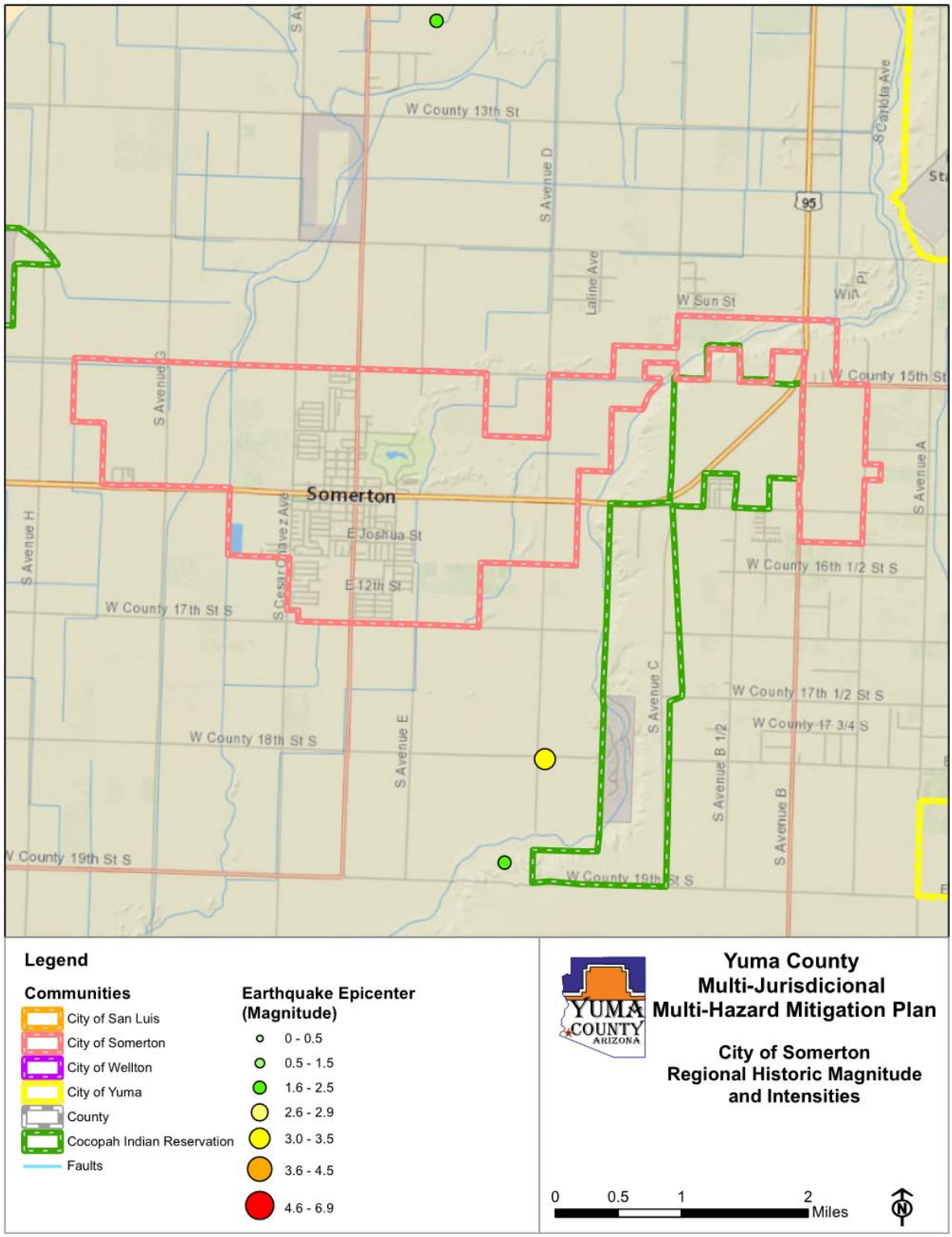

Figure 24. City of Somerton Historic Earthquakes Magnitude & Intensities

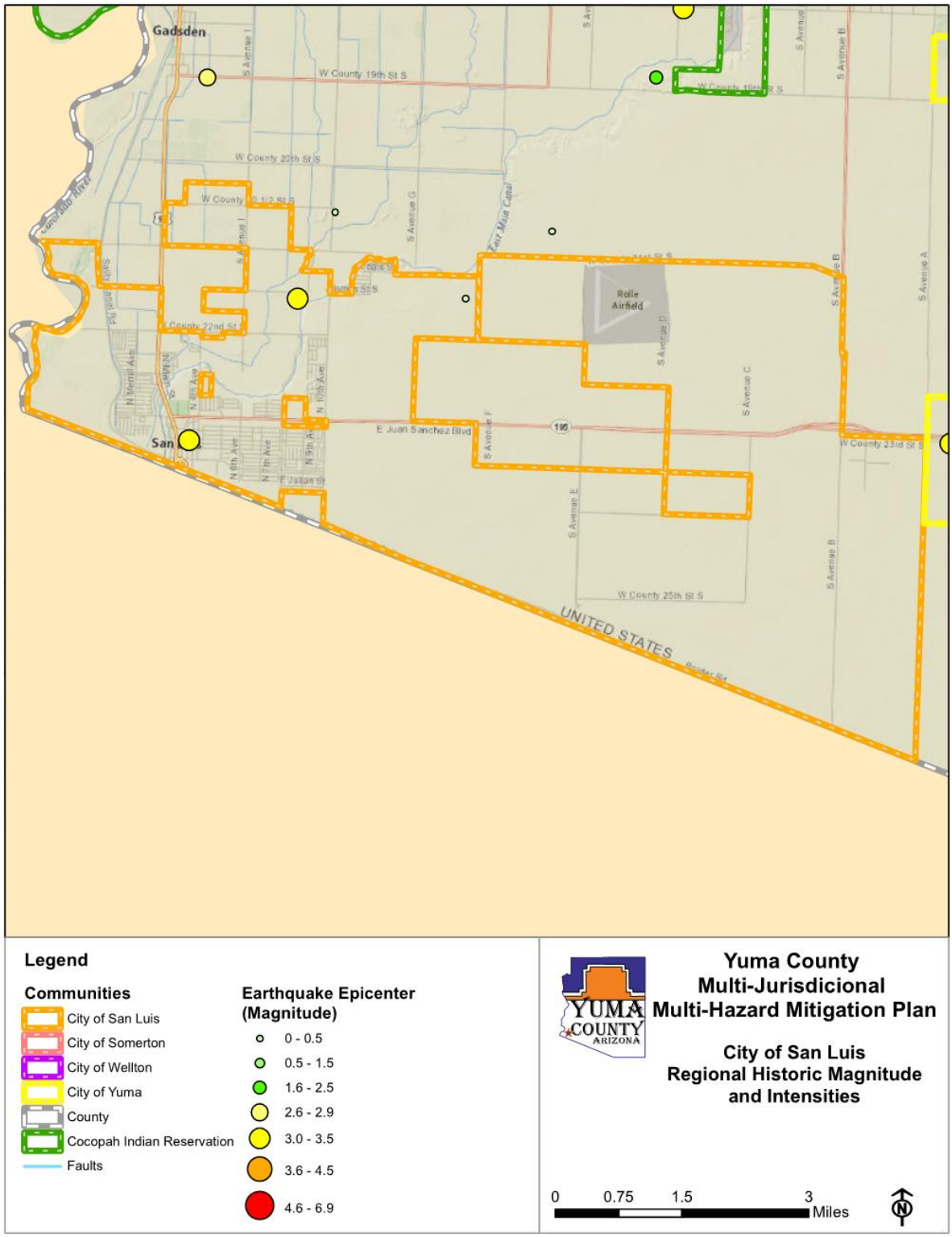

Figure 25. City of San Luis Regional Historic Earthquakes Magnitude & Intensities

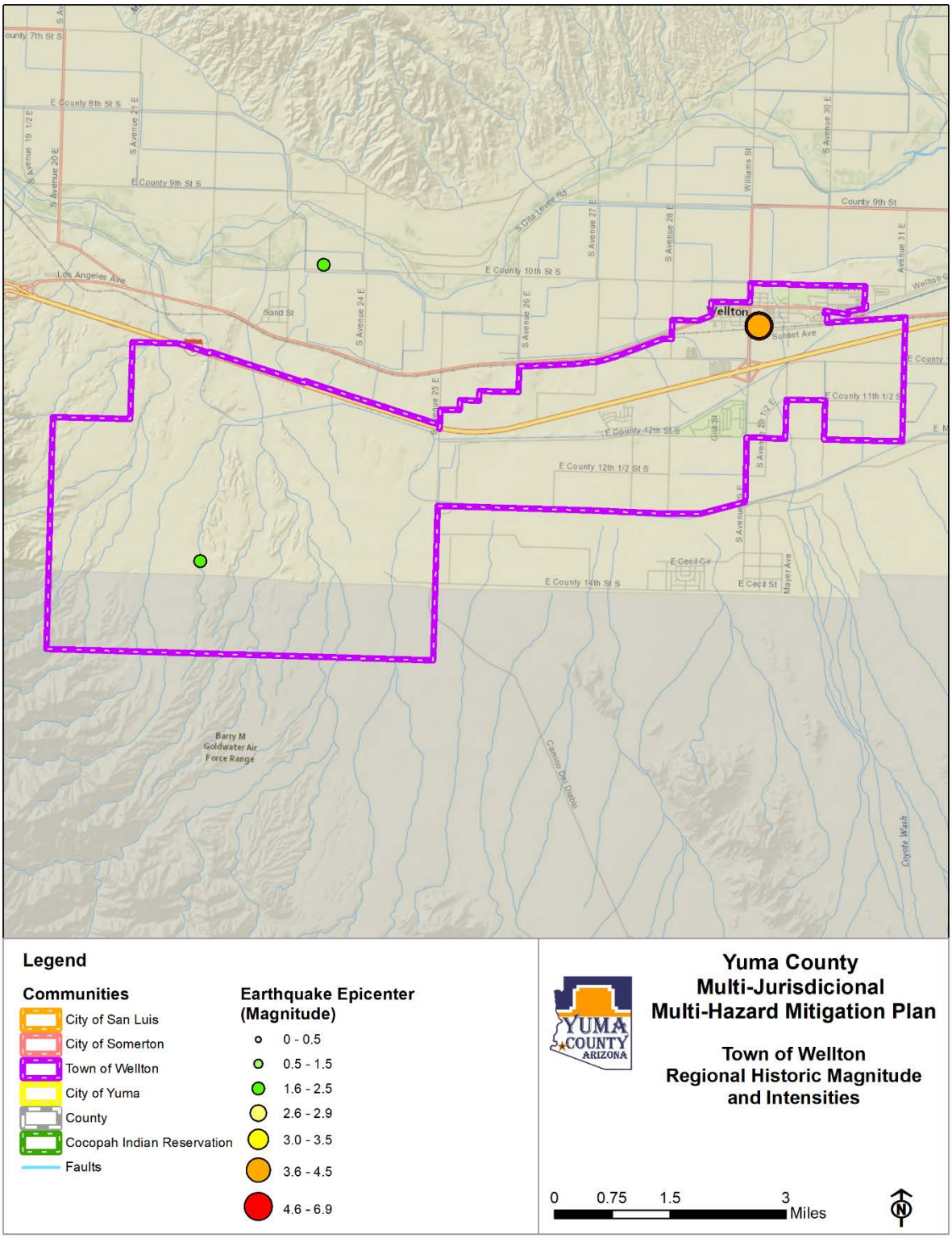

Figure 26. Town of Wellton Historic Earthquakes Magnitude & Intensities

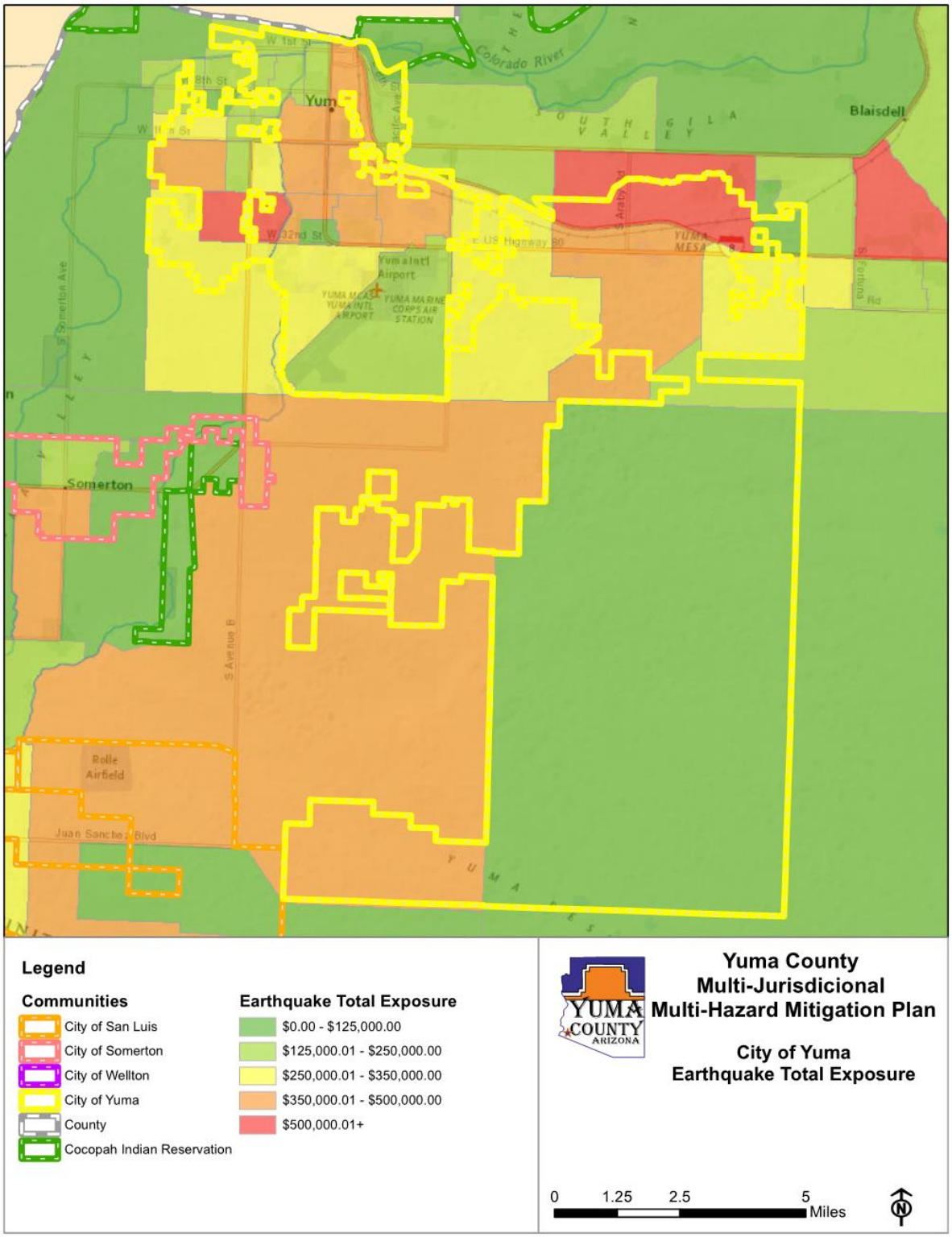

Figure 27. City of Yuma Earthquake Exposure

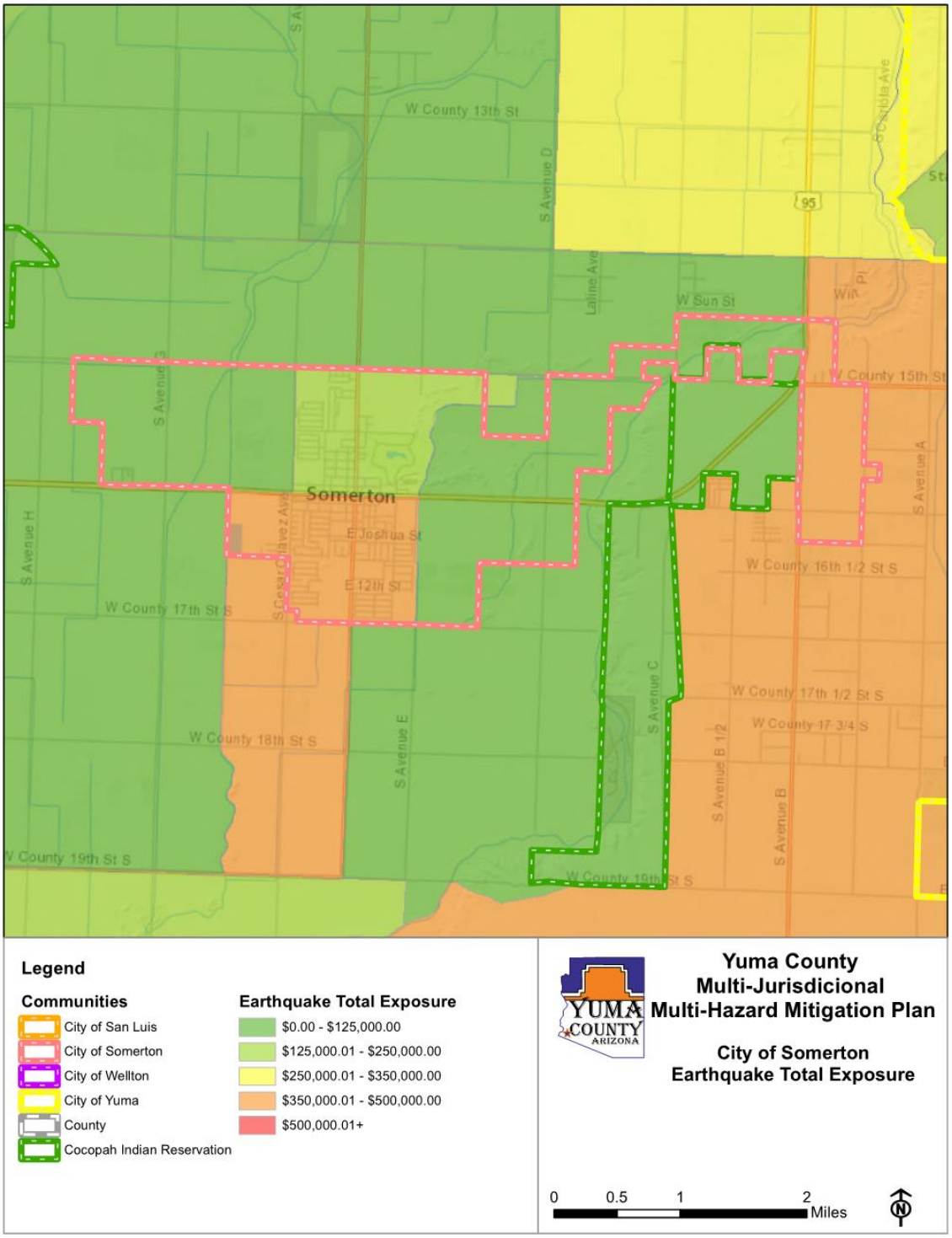

Figure 28. City of Somerton Earthquake Exposure

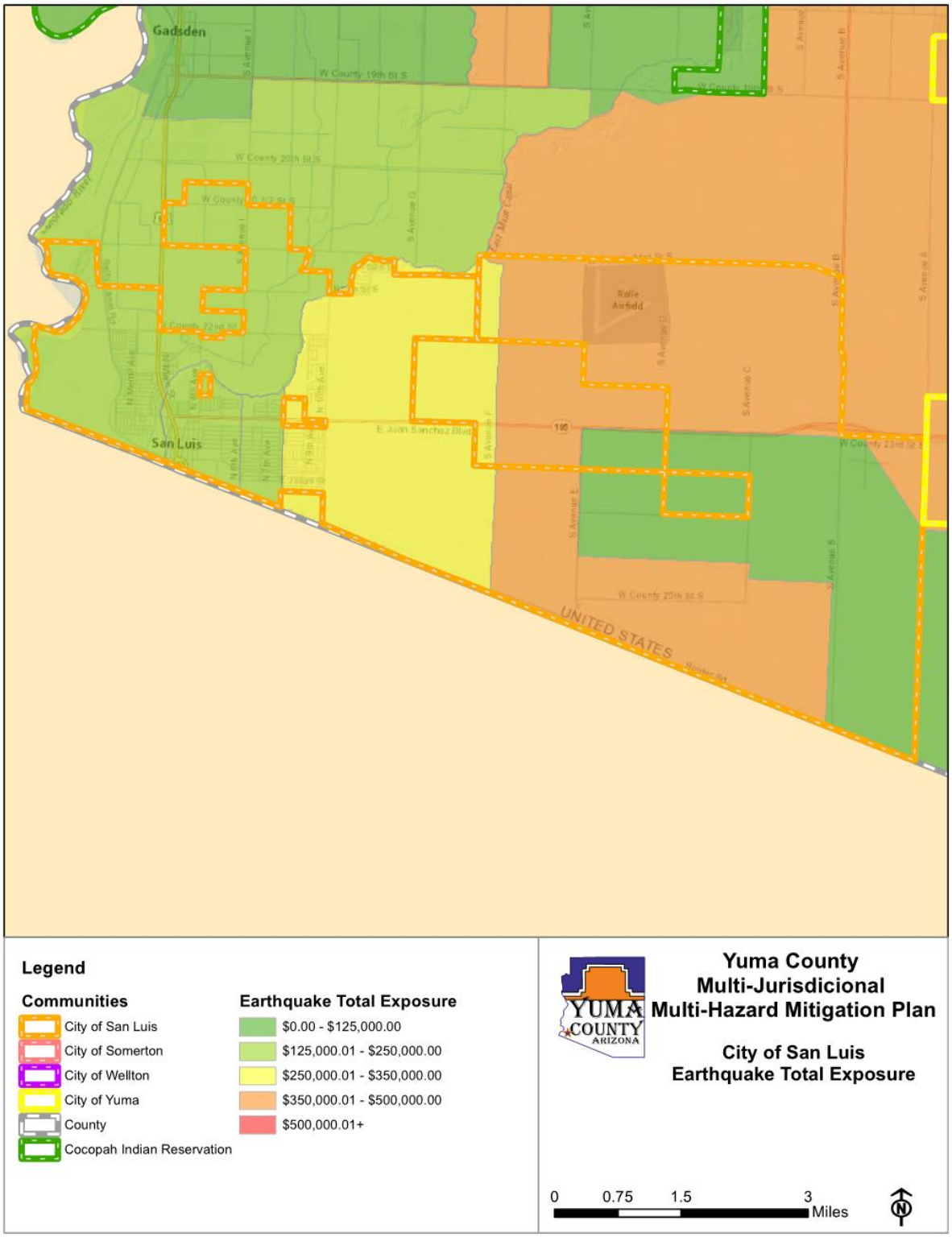

Figure 29. City of San Luis Earthquake Exposure

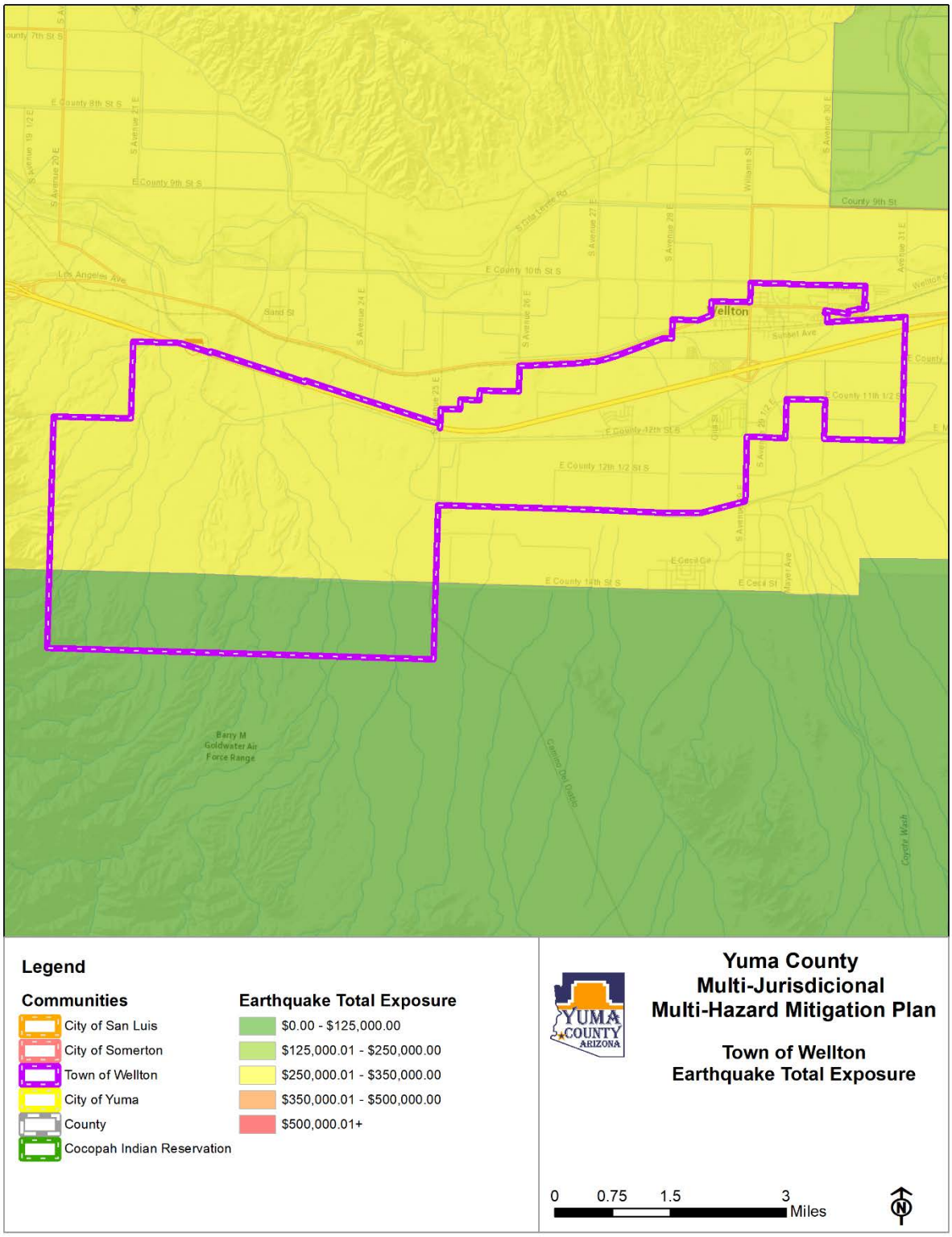

Figure 30. Town of Wellton Earthquake Exposure

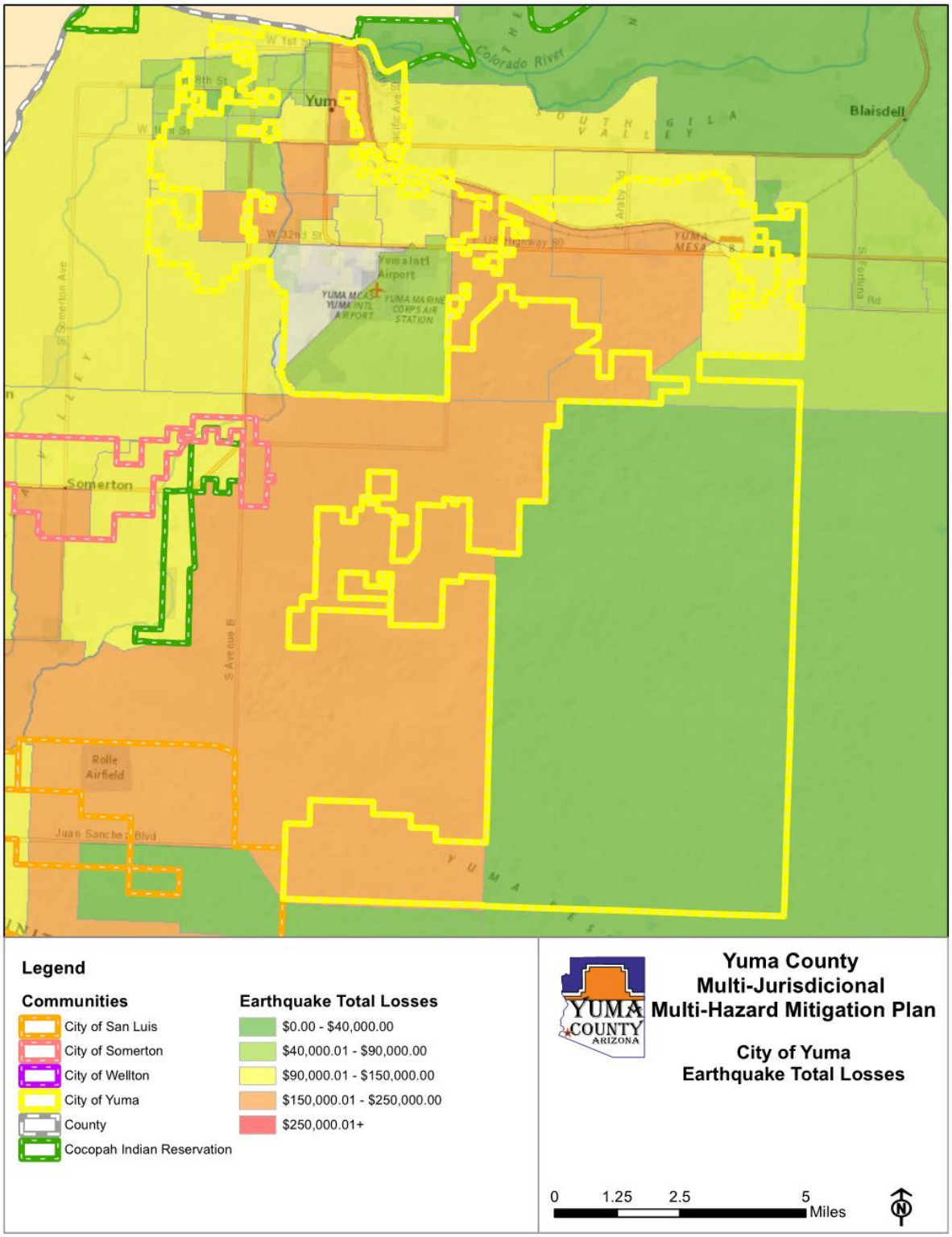

Figure 31. City of Yuma Earthquake Losses

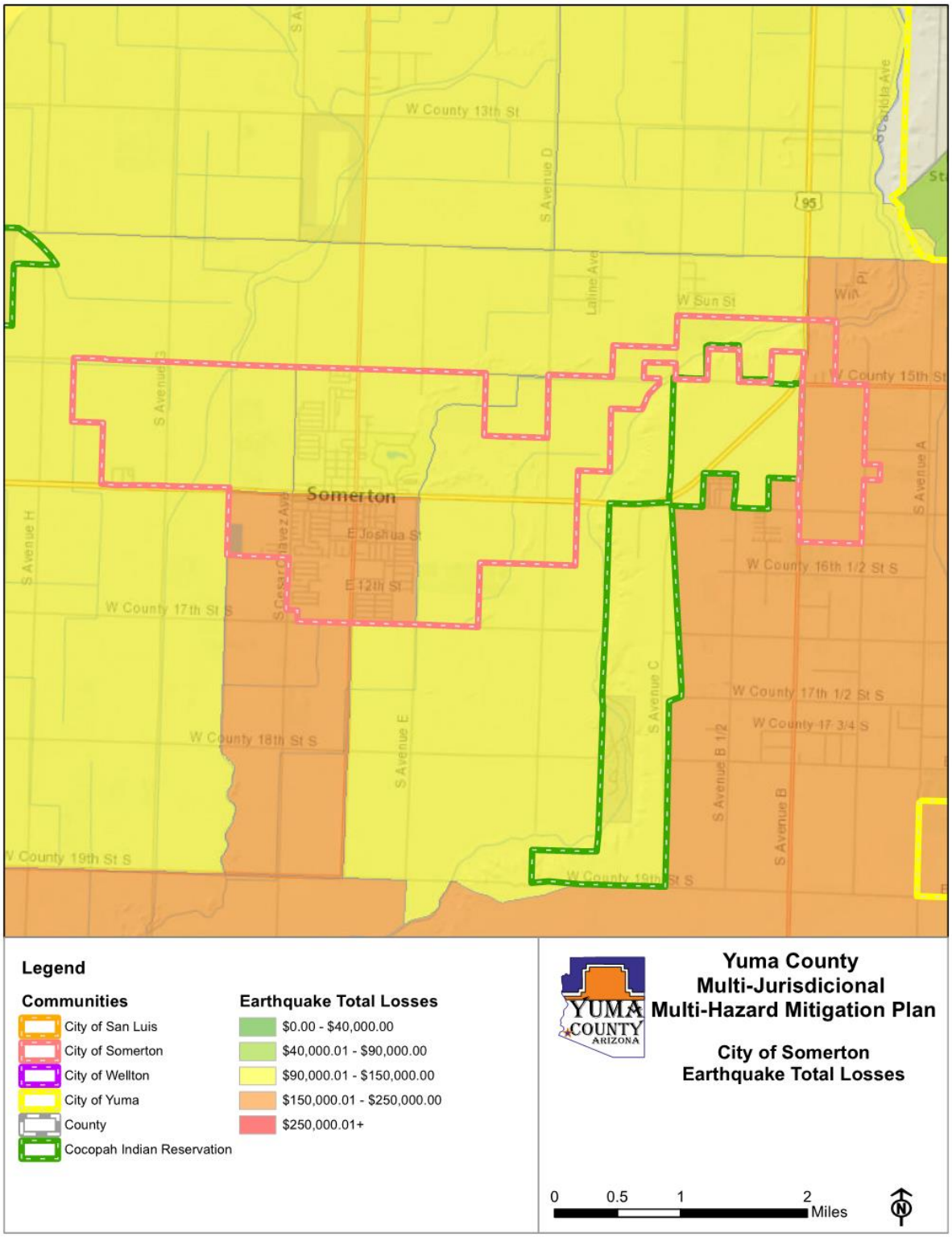

Figure 32. City of Somerton Earthquake Losses

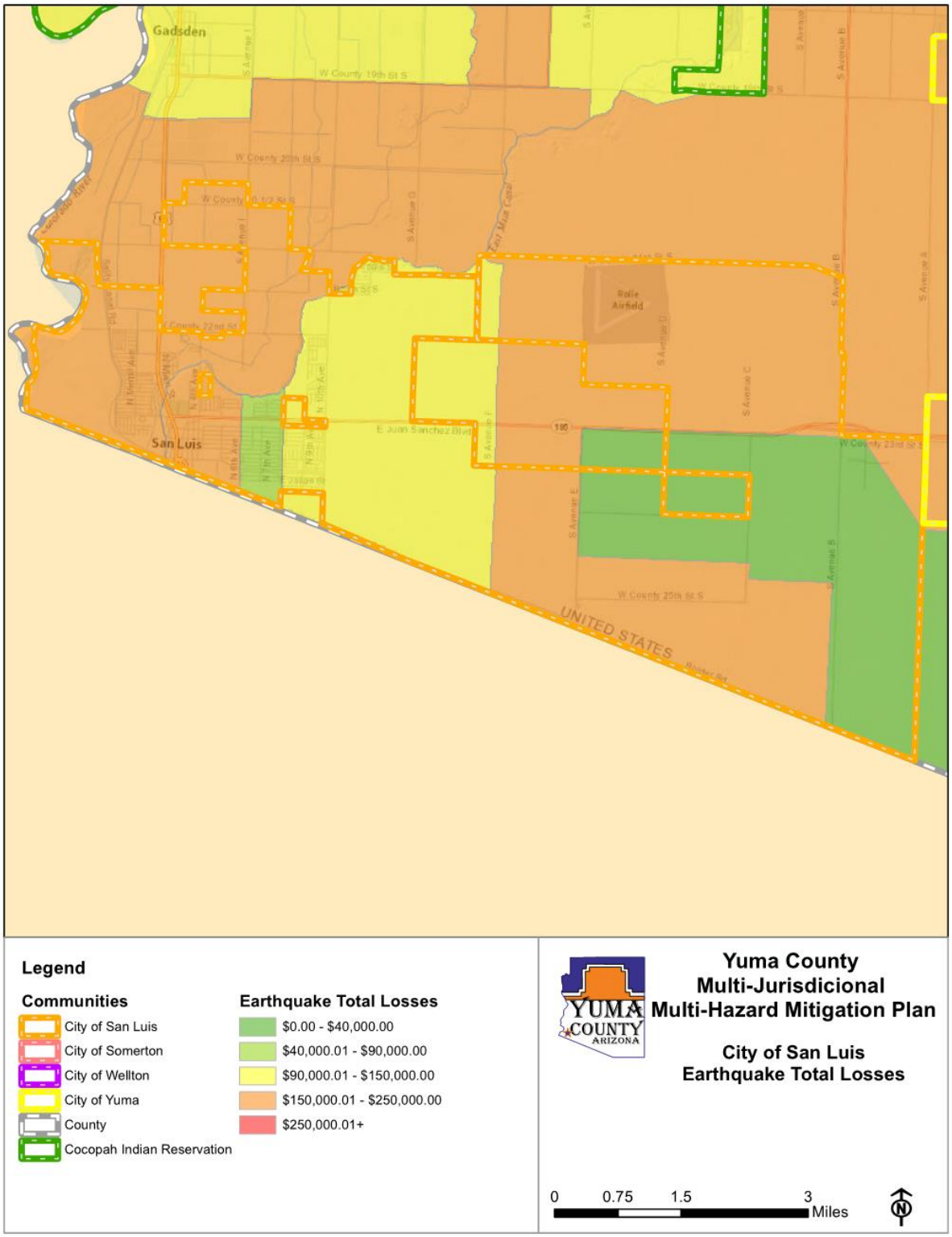

Figure 33. City of San Luis Earthquake Losses

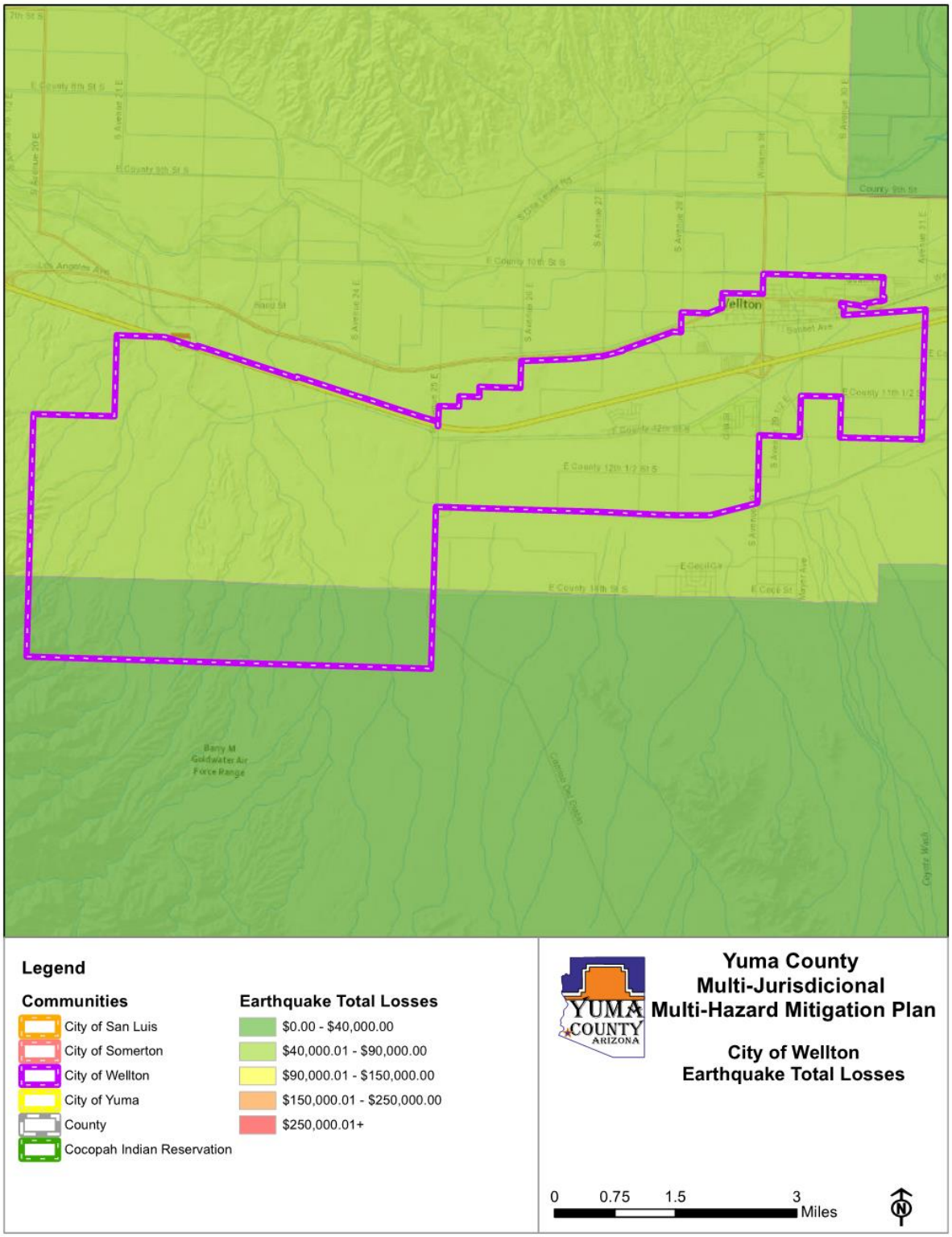

Figure 34. City of Wellton Earthquake Losses

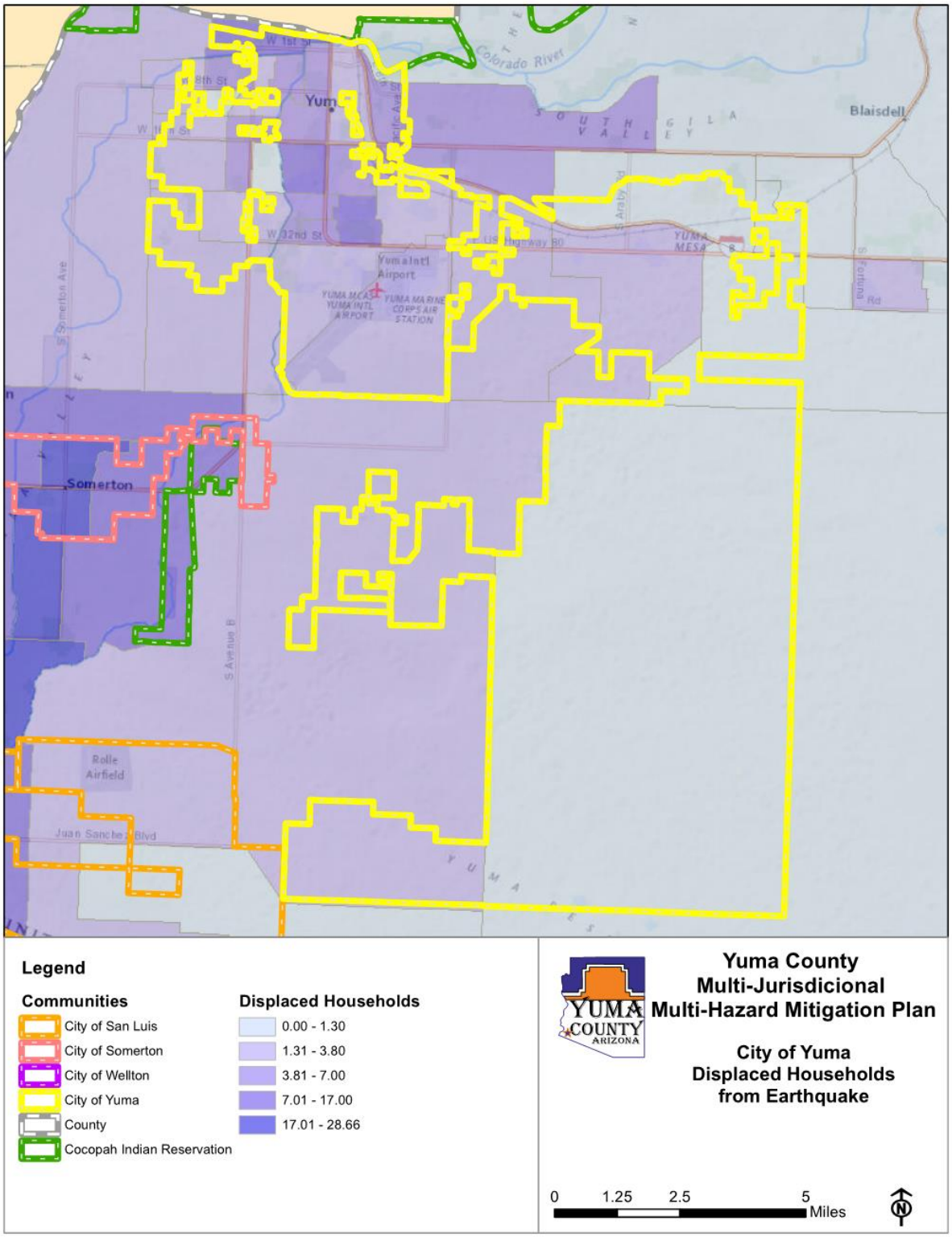

Figure 35. City of Yuma Displaced Households from Earthquake

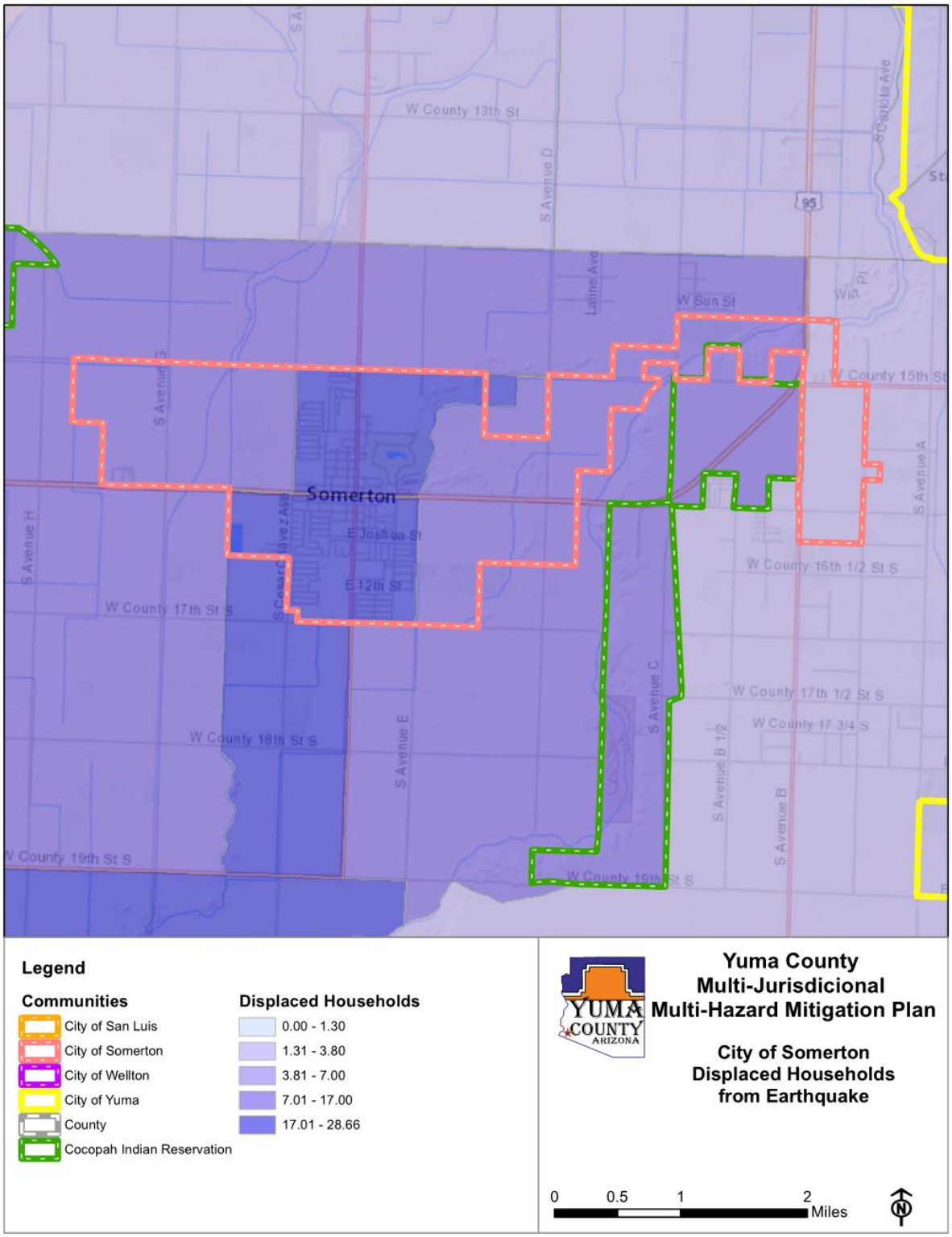

Figure 36. City of Somerton Displaced Households from Earthquake

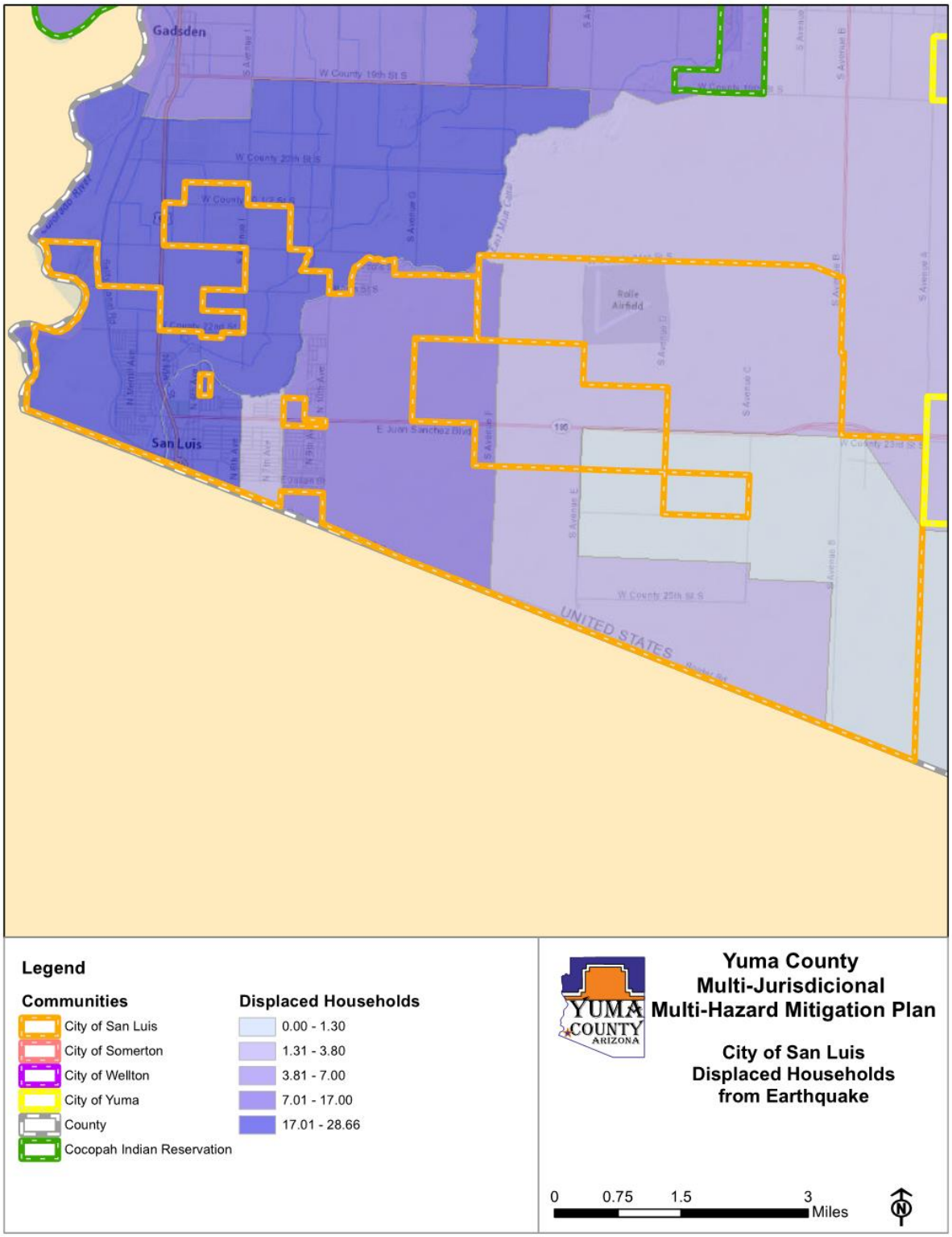

Figure 37. City of San Luis Displaced Households from Earthquake

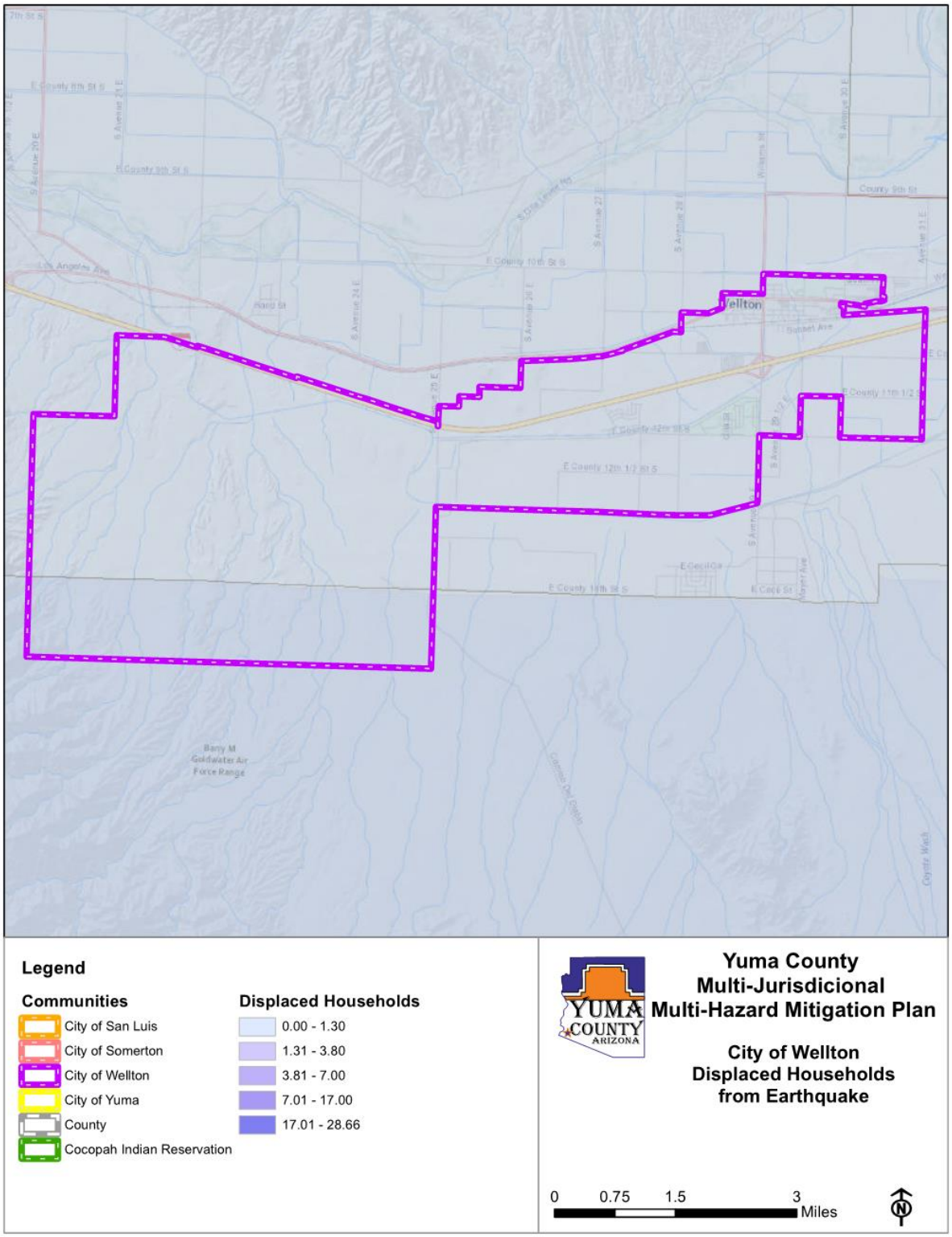

Figure 38. City of Wellton Displaced Households from Earthquake

5.3.3 Extreme Heat

Description

Extreme heat can be described as temperatures that hover 10°F or more above the average high temperature for a region at least for several weeks, most often occurring during the summer season. A heat wave is a period of excessive heat, which can lead to illness and other stress to vulnerable people and those who experience prolonged exposure to the heat. High humidity, which rarely accompanies heat waves in Yuma County, can make the effects of heat even more harmful. While heat-related illness and death can occur from exposure to intense heat in just one afternoon, heat stress on the body has a cumulative effect. Consequently, the persistence of a heat wave increases the threat to public health.

Extreme heat events are a considerable public health concern and are one of the leading weather-related killers in the United States. Although extreme heat events can occur in May or September, they are most common between June and August when above average temperatures are sustained for a prolonged period. During extended periods of very high temperatures, or high temperatures coupled with high humidity, individuals can suffer a variety of health problems, including heatstroke, heat exhaustion, and heat cramps. Rising temperatures and increased sunlight can also cause more occurrences of freshwater algae blooms. Algae blooms occur when there is a rapid increase in algae, and can be harmful when humans or animals make contact with the affected water.

NOAA's National Centers for Environmental Information (NCEI – formerly known as National Climatic Data Center [NCDC]) documents the occurrence of storms and other significant weather phenomena having sufficient intensity to cause loss of life, injuries, significant property damage, and/or disruption to commerce. NCEI receives this information from The National Weather service, who obtains their information from a variety of sources, which include but are not limited to: county, state and federal emergency management officials, local law enforcement officials, skywarn spotters, NWS damage surveys, newspaper clipping services, the insurance industry and the general public, among others. This database represents the best available data source for a number of hazards profiled in this plan including tornados, hail, lightning, severe storms, and extreme temperature events.

NOAA's Heat Index measures the severity of hot weather by estimating how hot it feels to humans. By combining air temperature and relative humidity, the Heat Index is directly related to skin temperature. The ambient temperature is quantified by examining the relation between relative humidity versus skin temperature. If the relative humidity is higher (or lower) than the base value, the apparent temperature is higher (or lower) than the ambient temperature. Table 9 outlines the common heat disorders associated with apparent temperature values during extreme heat events.

Table 5-7. Heat Disorders[29]

Danger Category	Heat Disorders	Apparent Temp (°F)
I Caution	Fatigue possible with prolonged exposure and physical activity	80-90
II Extreme Caution	Sunstroke, heat cramps, and heat exhaustion possible with prolonged exposure and physical activity	90-105
III Danger	Sunstroke, heat cramps, and heat exhaustion likely; heatstroke possible with prolonged exposure and physical activity	105-130
IV Extreme Danger	Heatstroke or sunstroke imminent	>130

Like extreme cold events, young children, the elderly, outdoor laborers, low-income families, the homeless, and the infirm are the most likely to suffer the negative effects of extreme heat. The National Weather Service initiates alerts based on the Heat Index as shown in Table 10 below.

Table 5-8. National Weather Service Heat Alerts[30]

Intensity	Detailed Description
Heat Advisory	Typically between 105°F to 110°F (41°C to 43°C) for three hours or more during the day and at or above 75°F (24°C) at night.
Excessive Heat Warning	Typically above 105°F (41°C) for three hours or more during the day and at or above 80°F (27°C) at night.

Extreme heatwaves often cause power outages which can affect entire regions within a state. Arizona is no stranger to these types of events. A severe outage can bring a community to a standstill; impacting businesses, residential home utilities, and traffic light infrastructure. In the case that backup generators are not present or working, community members may be left without cooling systems and are more likely to suffer from heat-related illnesses. A power outage can also impact critical infrastructure such as hospitals and schools.

History

According to the Arizona Department of Health Services (ADHS), 1,272 people have died from heat exposure in the State due to excessive temperatures from 2005 to 2015.[31] Most of these deaths occurred during the hot summer months of June, July, and August and 38% of deaths were from people who were aged 65 or older.

As previously mentioned, Yuma County experiences high temperatures and sometimes excessive heat wave events more than most areas within the United States. The NCEI historic events database records only three excessive heat events in the County. These events occurred on July 29, 2012 and June 28, 2013. Descriptions of these events state that temperatures exceeded 110 degrees.

Probability and Magnitude

[29] Source: NOAA

[30] Source: National Weather Service

[31] Arizona Department of Health Services, 2017, *Mortality and Morbidity from Exposure to Excessive Natural Heat in Arizona, 2005-2015*, http://www.azdhs.gov/documents/preparedness/epidemiology-disease-control/extreme-weather/heat/mortality-morbidity-exposure-excessive-heat-az-2005-2015.pdf

There are no commonly accepted return period or non-exceedance probability for defining the risk from extreme heat (such as the 100-year or 1% annual chance of flood). Temperature, taken together with other key climate factors such as humidity and precipitation, is typically described statistically in aggregate over 30 years or more to determine probabilities. Since temperatures vary significantly by day, season, and year, aggregate data is necessary to understand current and future probability of extreme heat events.

Yuma County is one of the hottest cities in the United States. The average temperature over the 30-year period from 1981-2010 was 75.9°.[32] Average summer temperatures range from 89° to just over 94 °, with average summer high temperatures ranging from 103 to over 106°. Record high temperatures in Yuma County have reached over 120°.[33] Figure 43 shows the annual average maximum temperatures in the City of Yuma from 1955 to 2018 relative to the 1981 to 2010 30-year average. Figure 44 shows the annual average minimum temperatures in the City of Yuma from 1955 to 2018 relative to the 1981 to 2010 30-year average. Although there are gaps in the data, it is evident that both the average maximum and minimum temperatures have trended upwards in Yuma. Additionally, the 30-year average minimum temperature has increased by approximately one degree from 1971-2000 to 1981-2010, and the maximum temperature has increased by approximately 0.5 degrees.

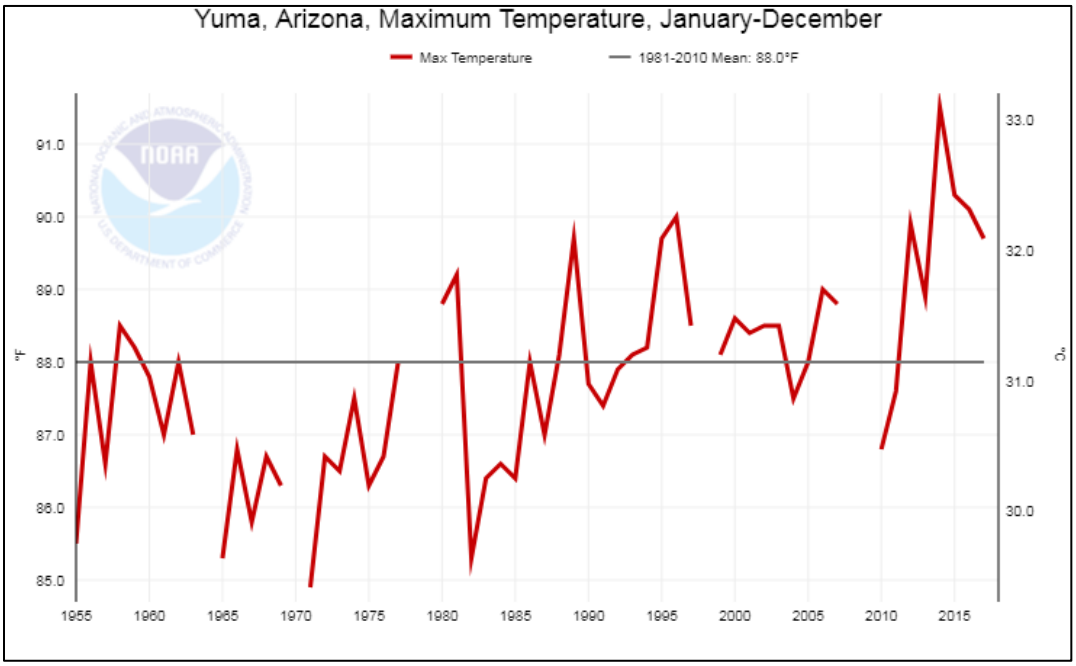

Figure 39. City of Yuma Annual Maximum Temperatures, 1955-2010

[32] NOAA, NCEI, Yuma MCAS weather station, https://www.ncdc.noaa.gov/cdo-web/datatools/normals. Accessed March 2018

[33] Prism Climate Group, http://prism.oregonstate.edu/explorer/. Accessed March 2018.

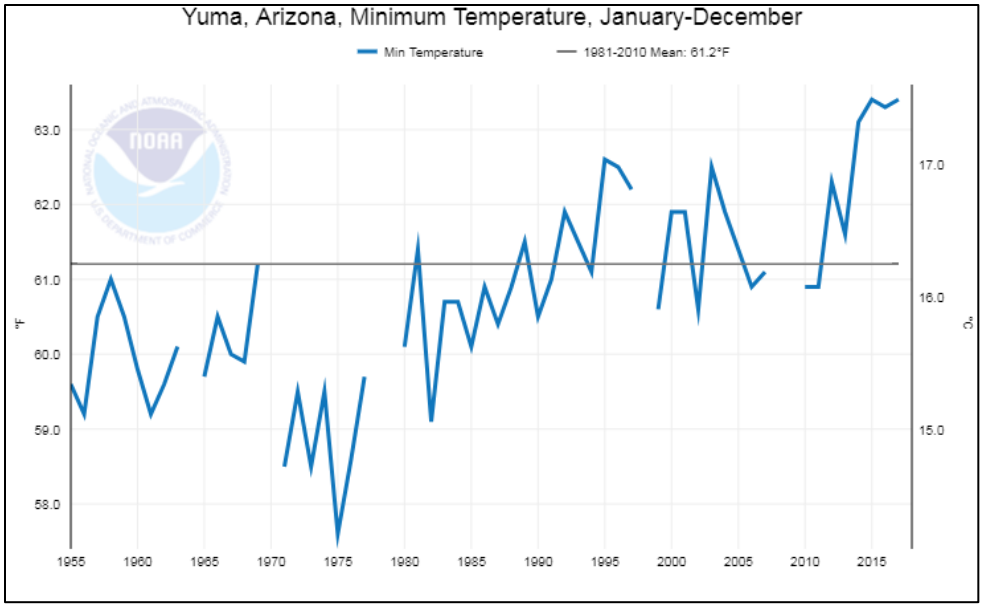

Figure 40. City of Yuma Average Annual Minimum Temperatures, 1955 to 2018

Additionally, maximum temperatures are expected to continue to rise in Arizona and Yuma County. Table 11 shows projections of July average daily maximum temperatures for 2010, 2030, 2060 and 2090 under four climate scenarios of low to high emissions (RCP 2.6 through RCP 8.5). Even under a low emissions scenario, Yuma County July daily maximum temperatures are predicted to rise to 108° by 2030.[34]

Table 5-9. July Daily Maximum Temperature Projections

	RCP 2.6				RCP 4.5				RCP 6.0				RCP 8.5			
	2010	2030	2060	2090	2010	2030	2060	2090	2010	2030	2060	2090	2010	2030	2060	2090
Apache	88.5	91.6	90.1	89.8	89.1	91.0	89.2	91.8	87.3	91.0	90.9	97.2	90.5	92.8	93.2	95.4
Cochise	93.2	96.4	94.5	94.5	93.2	95.2	93.9	96.8	93.0	94.8	94.8	101.8	95.0	96.8	97.2	99.7
Coconino	90.0	94.1	93.4	92.8	91.4	92.8	91.9	94.8	89.6	92.8	93.0	98.2	92.3	94.1	95.4	97.7
Gila	94.3	97.9	96.3	96.3	94.8	96.8	95.2	98.6	93.9	96.6	96.6	102.60	96.4	97.9	98.6	101.1
Graham	94.5	97.9	95.9	95.9	95.0	96.8	95.2	98.2	94.3	96.6	96.3	103.3	96.4.0	98.2	98.8	101.3
Greenlee	90.7	94.1	91.9	91.8	91.0	93.0	91.6	94.1	90.5	93.0	92.5	99.9	92.7	94.6	95.2	97.3
La Paz	105.3	109.2	108.7	109.4	106.3	108.3	108.0	110.7	107.2	108.7	108.9	113.5	107.8	108.5	110.3	113.9
Maricopa	104.4	108.5	107.4	108.0	105.4	107.2	106.5	109.8	105.8	107.6	107.4	112.6	106.9	107.4	109.0	112.6
Mohave	97.9	102.6	101.8	101.7	99.7	100.9	100.8	103.5	98.4	101.3	101.7	106.3	100.6	101.8	103.6	106.5
Navajo	90.7	94.3	93.0	92.5	91.6	93.4	91.6	94.6	89.6	93.2	93.4	99.1	92.8	94.8	95.5	97.7
Pima	99.5	103.5	101.8	102.6	100.2	102.2	100.9	104.7	100.4	102.0	101.8	107.8	101.7	102.4	103.8	107.4
Pinal	102.2	106.0	104.4	104.7	102.9	104.7	103.5	106.9	102.7	104.7	104.5	110.5	104.5	105.4	106.5	109.8
Santa Cruz	92.1	95.4	93.4	93.9	92.3	94.1	93.4	96.3	91.9	93.4	93.7	100.0	93.9	95.0	95.9	99.0
Yavapai	94.3	98.4	97.5	97.5	95.5	97.2	96.4	99.7	95.0	97.5	97.2	102.6	96.8	97.9	99.1	102.2
Yuma	104.7	108.7	108.0	108.9	105.4	108.0	107.4	110.1	106.9	108.3	108.3	112.5	106.7	107.4	109.4	113.4

Vulnerability

[34] Arizona State University and Arizona Department of Health Services, 2015, *Arizona Extreme Weather, Climate and Health Synthesis Report*, http://www.azdhs.gov/documents/preparedness/epidemiology-disease-control/extreme-weather/pubs/climate-and-health-profile-synthesis-report-2015.pdf

- Yuma County: The County has a large elderly population that is particularly vulnerable to heat-related illnesses. The County's homeless population, although not as large, is also vulnerable to extreme heat as these individuals do not have reliable access to shelter from high temperatures. There are many County residents who live in mobile homes and older structures with poor insulation and are at risk to extreme heat because they frequently over heat their air conditioning units. First responders are also vulnerable to extreme heat conditions because they are often outside when providing emergency services.
- City of San Luis/ City of Somerton/ Town of Wellton/ City of Yuma: As discussed above in the County description, these jurisdictions also have a large elderly population that is vulnerable to extreme heat conditions. First responders working in these jurisdictions are also at risk in these jurisdictions.
- Cocopah Indian Tribe: In addition to the vulnerabilities mentioned in the County description, extreme heat places many members of the Cocopah tribe who rely on temperature sensitive medication, such as insulin, at risk. The tribe also has a large number of its members living in old structures that provide only limited relief from the extreme heat conditions.

Table 5-10. CPRI Results for Extreme Heat

Jurisdiction	Probability	Magnitude/ Severity	Warning Time	Duration	CPRI Score
Cocopah Tribe	Highly Likely	Limited	<6 hrs	<1 week	3.3
San Luis	Unlikely	Critical	<6 hrs	<1 week	2.3
Somerton	Highly Likely	Catastrophic	>24 hrs	>1 week	3.6
Yuma Co	Possibly - Likely	Limited - Critical	12 - 24 hrs	<1 week	2.6
Wellton	Likely	Critical	<6 hrs	>1 week	3.3
Yuma	Likely	Limited	6 - 24 hrs	<24 hrs	2.5

Loss Estimations

Although estimated property losses associated with extreme temperature hazards are anticipated to be minimal across the county, extreme heat events do present a significant life and safety threat to the community. Heat casualties are usually caused by lack of adequate air conditioning and/or heat exhaustion. Extreme heat tends to affect the elderly, infirm, homeless, or low-income families the most, as these populations frequently live on low fixed incomes and cannot afford to run air conditioning on a regular basis. These socially vulnerable populations are often isolated, with no immediate family and/or limited mobility, which makes it more difficult for them to remove themselves from danger. As stated before, NCEI recorded a total of three excessive heat events in Yuma County.

According to the U.S. Census, 20.7% if the County's population is below the poverty level and 16.2% are aged 65 or older. The excessive heat event recorded on July 9, 2012, caused one elderly person to die in his home, but no injuries, property or crop damage were reported.

Because there is no defined geographic boundary for extreme temperature hazards, all of the people and infrastructure within Yuma County are exposed to extreme temperatures. Those with elevated risk and potential loss are the homeless, infirm, elderly, and low income families. Given the lack of historical data and limited likelihood of structural losses in the county resulting from extreme heat, and that placing a dollar amount on the cost of a human life are beyond the scope of the Plan, annualized economic losses for the planning area due to extreme heat is currently considered unquantifiable.

However, due to the regional nature of extreme heat, jurisdictions and Tribes with higher numbers of socially vulnerable residents are expected to experience magnified impacts of extreme temperatures. This includes places with high numbers of elderly residents, low income families, and homeless

individuals/outdoor laborers. Additionally, as temperatures continue to rise, the increased stress on the power supply may cause blackouts causing loss of air conditioning when it is needed most. This may increase exposure to extreme heat to populations without back-up generators.

Changes in Development

Extreme heat events are highly likely to continue to occur in Yuma County. Extreme heat typically does not have an impact to structures. With the exception of the Cocopah Tribe, all jurisdictions have experienced significant population growth since the last plan. The population growth raises the vulnerability of all non-tribal jurisdictions to extreme heat. On the other hand, the Cocopah Tribe's vulnerability to extreme heat has remained relatively constant due to the minimal change in its population.

Use of air conditioning can help mitigate some exposure to extreme heat. However, increased use of air conditioning due to a growing population may lead to more stress on the energy supply, contributing to power outages. Additionally, the conversion of rural and agricultural land to urban developments may lead to the urban-heat island effect of a once rural area. As urban areas develop, buildings, roads, and other infrastructure replace open land and vegetation. These changes cause urban regions to become warmer than their rural surroundings, forming an "island" of higher temperatures in the landscape. According to the U.S. Environmental Protection Agency (EPA), "Heat islands occur on the surface and in the atmosphere. On a hot, sunny summer day, the sun can heat dry, exposed urban surfaces, such as roofs and pavement, to temperatures 50–90°F (27–50°C) hotter than the air, while shaded or moist surfaces - often in more rural surroundings - remain close to air temperatures."[35]

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Prism Climate Group, http://prism.oregonstate.edu/explorer/. Accessed March 2018.

Profile Maps

No profile maps are provided.

[35] EPA, *Learn About Heat Islands*, https://www.epa.gov/heat-islands/learn-about-heat-islands. Accessed March 2018

5.3.4 Flooding

Description

For the purpose of this Plan, the hazard of flooding addressed in this section will pertain to floods that result from precipitation/runoff, dam failure, and levee failure related events. The two seasonal atmospheric events that tend to trigger floods in Yuma 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.
- *Summer Monsoon*: The second atmospheric condition that brings flooding to Arizona is the annual summer monsoon. 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 can be primarily categorized as either riverine, sheet flow, or local area flows. Riverine flooding occurs along established watercourses when the bankfull capacity of a wash is exceeded by storm runoff and the overbank areas become inundated. The major riverine watercourses are the Colorado River and the Gila River, which converges with the Colorado River in Yuma. The Colorado River drains watersheds from Wyoming, Utah, Colorado, Nevada, New Mexico and Arizona. The Gila River has a large drainage with the source beginning in western New Mexico on the western slopes of the Continental Divide. There are also areas within the County where the watercourse is broad and generally shallow with ill-defined low flow paths and broad sheet flooding. 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 source or potential cause of flooding in Yuma County is through dam and levee failure events. Due to the unlikely occurrence of this type of flooding in Yuma County, the Team wanted to recognize these event types and are designated under flooding and not addressed separately. The following is a description and situation of dam and levee failure potential:

- *Dam Failure*: FEMA Dam Safety defines dam failure as a catastrophic type of failure characterized by the sudden, rapid, and uncontrolled release of impounded water or the likelihood of such an uncontrolled release. It is recognized that there are lesser degrees of failure and that any malfunction or abnormality outside the design assumptions and parameters that adversely affect a dam's primary function of impounding water is properly considered a failure. These lesser degrees of failure can progressively lead to, or heighten, the risk of catastrophic failure. There are 6 major dams on the Colorado River that can impact the Colorado River Flood Conditions at Yuma County. All 6 are owned by the Bureau of Reclamation. They are; Glenn Canyon Dam, Hoover Dam, Davis Dam, Parker Dam, Senator Wash Dam, and Imperial Dam. In some cases the dams are operated and maintained by a contracted entity. One such case is the Imperial Dam, which is contracted to Imperial Irrigation District to operate and maintain for the Bureau of Reclamation. In all cases the personnel at each dam follow the Dam Safety Guidelines and Policy set forth by the Bureau of Reclamation. Each of these dams has a written Emergency Action Plan for handling such emergencies as dam failures and/or Colorado River Floods.

- Other River systems affecting the Yuma County area include the Verde, Salt, and Gila Rivers. Flood waters released through these river systems converge on the Gila River and are captured by Painted Rock Dam, southwest of Phoenix. Painted Rock Dam is owned and operated by the Army Corps of Engineers, Los Angeles District. The Army Corps of Engineers maintain a separate flood operating plan for the Painted Rock Dam on the Gila River.
- *Levee Failure:* FEMA defines levees as man-made structures, usually earthen embankments that are designed and constructed in accordance with sound engineering practices to contain, control or divert the flow of water so as to provide protection from temporary flooding (FEMA, 2009). National flood policy now recognizes the term "levee" to mean only those structures which were designed and constructed according to sound engineering practices, have up to date inspection records and current maintenance plans, and have been certified as to their technical soundness by a professional engineer. FEMA has classified all other structures that impound, divert, and/or otherwise impede the flow of runoff as "non-levee embankments". In Yuma County, these might be comprised of features such as roadway and railway embankments, canals, irrigation ditches and drains, and agricultural dikes.

  FEMA urges communities to recognize that all areas downstream of levees and embankments are at some risk of flooding. There are no guarantees that a levee or embankment will not fail or breach if a large quantity of water collects upstream.

  Mechanisms for levee failure are similar to those for dam failure. Failure by overtopping could occur due to an inadequate design capacity, sediment deposition and vegetation growth in the channel, subsidence, and/or a runoff that exceeds the design recurrence interval of the levee. Failure by piping could be due to embankment cracking, fissures, animal boroughs, embankment settling, or vegetal root penetrations.

History

Flooding is clearly a major hazard in Yuma County as shown in Table 3. Yuma County has been part of 8 presidential disaster declarations due to flooding. The following incidents represent examples of major flooding that has impacted the County:

- On September 8th, 2015, scattered thunderstorms moved into the City of Yuma, as well as surrounding communities in Somerton, during the late afternoon and evening hours. Due to elevated moisture levels carried over from Hurricane Linda, the thunderstorms produced heavy than normal rainfall that reached rates in excess of two inches of accumulation per hour. A trained spotter three miles northeast of Somerton measured 4.6 inches of rain within two hours ending at 1900. The heavy rains led to flash flooding in and around the City of Yuma resulting in the issuance of a Flash Flood Warning at 1802. At 2000, local media stations reported that people were leaving flooded homes south of highway 95 between Joshua Street and Bingham Avenue. The flash flooding took place about a mile southeast of the City of Somerton. Fortunately, there were no injuries reported due to the flooding. Property damages are listed at $100,000.
- On August 24th, 2013, copious amounts of atmospheric moisture dissipating from tropical storm Ivo spread into southwest Arizona. As the moisture combined with unstable air mass, heavy thunderstorms developed over Yuma during the evening hours. Weather services indicated that rain fall rates in excess of one inch per hour resulted in flooded streets and washes in the City of Yuma and neighboring Fortuna Foothills. Additionally, a trained weather spotter two miles east of the Fortuna Foothills reported that major flash flooding occurred on county road 15E about two miles south of Interstate 8. Unfortunately, this report was not received until the evening of August 25th. While no Flash Flood Warning was issued during this event, an Urban and Small Stream Flood Advisory had been in effect to notify nearby residents. No reports of accidents or injuries were received due to the flooding. Property damages are listed at $25,000.

- In March 2010, the City of Yuma had winter storm runoff which caused damage to roads, retention basins, parks, and other public facilities. Damages are listed at $300,000.
- In September 1997, Yuma County prepared for the arrival of Hurricane Nora, which was expected to be the worst rainstorm to ever hit the State of Arizona. By the time Hurricane Nora made its way into Yuma County it had weakened and was downgraded to a tropical storm. The remnants of the hurricane delivered over three inches of rain in a 48-hour period and caused significant problems including downed trees, loss of electrical power, restricted access for emergency crews, and severe flooding problems and wind damage. It is estimated that over $200 million in damages were sustained, with most of the damages occurring to agricultural crops.
- In September 1994, a series of thunderstorms moved through the Yuma area during the early morning hours. Rainfall amounts up to 2.5 inches led to the flooding of four homes about eight miles south of Yuma. Several roads in Somerton and U.S. 95 about eight miles northeast of Yuma were closed due to flooding. Two cars were pushed off U.S. 95 at Fortuna Wash, but the motorists were rescued unharmed. Also, localized strong winds knocked over at least five power poles on County Road 14 in Somerton. The Yuma County Extension Agent estimated crop damages from the flood approaching $1 million, mainly cotton.
- In 1993, heavy rain fell over most of north, central and southeastern Arizona resulting in significant flooding along most major watercourses. In Yuma County, raging flood waters, sediment deposition and extensive bank erosion caused severe damage to public infrastructure and structural damage to private property, agricultural crops and land, economic loss and environmental damage. Water released from dams along the Salt and Verde Rivers converged at Painted Rock Dam, which is a flood control reservoir located in Maricopa County just north of Yuma County. To alleviate upstream flooding, the US Army Corps of Engineers (USACE) began gradually increasing discharges at Painted Rock, with a peak release rate of 27,500-cfs on February 28, 1993. The Gila River system below Painted Rock Dam was unable to handle these discharge amounts and went over its banks in some areas in spite of concentrated flood fighting efforts by several agencies. According to USACE Flood Damages Report[36], Yuma County had $130 million+ in public infrastructure, agricultural, private property, economic and environmental damages. The flooding prompted a federal disaster declaration for almost the entire state
- In 1983, exceedingly large amounts of runoff caused by rapidly melting snow from record snowfalls and late rains resulted in unusually high volumes of water entering the Colorado River basin. These extraordinary amounts of water required the upper reservoirs to release unprecedented volumes of water into the lower Colorado River system. The releases caused the Colorado River to flood low-lying areas, erode riverbanks, and raise adjacent ground water levels. Flood damage to urban and agricultural lands extended 250 miles beginning at Davis Dam to the Mexican border. Groundwater seepage caused surface ponding. Damage to recreational facilities was widespread, affecting beaches, campsites, boat docks, launch sites, and businesses servicing these activities. Septic tank systems and water treatment systems were also damaged. This Presidential declared disaster resulted in $13 million to the city and county of Yuma.
- In 1976, Hurricane Kathleen, which had just been downgraded to a tropical storm status, lashed Yuma with up to 76 mph wind gusts and dropped half of the annual rainfall in one hour. This tropical storm inflicted over $2 million in damages in Yuma.

Probability and Magnitude

Flooding events are typically measured in terms of magnitude and the statistical probability that they will

[36] US Army Corps of Engineers, Los Angeles District, 1994, *Flood Damage Report – State of Arizona – Floods of 1993*

occur. The 1% annual chance flood event also known as the '100-year flood', has a 1 in 100 chance of being equaled or exceeded in any one year and has an average recurrence interval of 100 years. It is important to note that this it does not mean that a flood of such a magnitude will happen exactly every 100 years. Sometimes, only a few years may pass between one 1% annual chance flood and another while two other 1% annual chance floods may be separated by 150 years. The 0.2% annual chance flood event, or the '500-year flood', represents a 0.2% chance (or 1 in 500 chance) of occurring in a given year.

Figures 46 through Figure 50 show the 100-yr and 500-yr flood hazards in the planning area. This shows that the community most impacted by the 100-yr flood hazard is the Town of Wellton. There are also areas in the City of Yuma and the City of San Luis that could be impacted by the 100-yr flood event.

Based on this information, the Planning Team believes it is appropriate and prudent to focus mitigation efforts to the 100-year flood probability and associated impacts.

Vulnerability

- Yuma County: Critical transportation routes in the foothill region of the County are routinely flooded, damaging roads and negatively impacting the County's economy. Residential structures near the Colorado and Gila River corridors are also vulnerable to flooding, especially those built before the implementation of new flood plain codes in the 1970s.
- City of San Luis/ City of Somerton/ Town of Wellton: Crops grown in these jurisdictions are vulnerable to damages caused by flooding. This presents a potential for large economic losses for local businesses.
- City of Yuma: Flooding presents significant groundwater problems for the City. Managing the ground water requires pumps, operated by county engineers, to remove the excess water collected during flooding events. Groundwater issues have and will continue to contribute to a variety of soil and water related problems that can negatively impact the City's terrestrial and aquatic ecosystems.
- Cocopah Indian Tribe: Flooded roads frequently isolate communities in the northern and eastern regions of the tribal lands, posing a threat to the safety of tribal members. The entirety of the northern region is located in a flood zone, which frequently experiences damaging flooding events with heavy rain fall. The northern region also contains many sacred tribal sites which are regularly under threat of flooding.

Table 5-11. CPRI Results for Flooding

Jurisdiction	Probability	Magnitude/ Severity	Warning Time	Duration	CPRI Score
Cocopah Tribe	Highly Likely	Limited	12 - 24 hrs	<1 week	3.0
San Luis	Possibly	Limited	6 - 12 hrs	<1 week	2.3
Somerton	Likely	Critical	<6 hrs	<24 hrs	3.1
Yuma Co	Likely/Highly Likely	Critical/Catastrophic	6 - 24 hrs	<1 week	3.5
Wellton	Possibly	Limited	<6 hrs	<1 week	2.4
Yuma	Possibly - Likely	Limited - Critical	6 - 24 hrs	<1 week	2.6

Loss Estimations

The Level 1 Hazus analysis at the County level was utilized for this plan. This analysis includes 2010 census block information along with the 100-year flood depth grid. There are an estimated 79,915 buildings in the county with a total building replacement value (excluding contents) of almost $14 million (2010 dollars). Approximately 95% of the buildings are associated with residential housing.

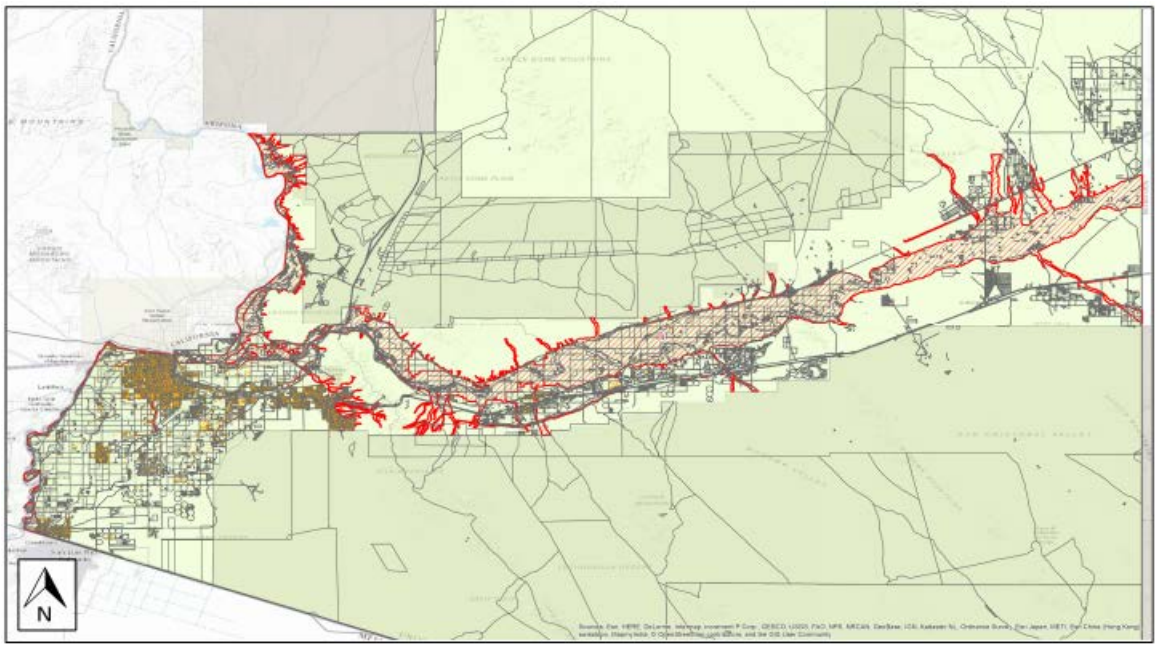

Figure 41. 100-yr Flood Study Region Overview Map

The Hazus analysis estimates that 756 buildings will be at least moderately damaged, and 213 buildings will be completely destroyed. Total building losses are estimated to be over $144 million with just over 72% of the losses being made up of residential occupancies. All communities are at risk to a 100-year or 500-year flood event, and the City of Wellton is at the highest risk for a 100-year flood event. Loss estimates demonstrate further analysis of structural losses using the depth of flooding and the types of structures estimates to be impacted by losses. The City of Yuma is shown as having the highest number of estimated losses should a 100-year flood occur.

There are six critical facilities that may be impacted by a 100-yr flood event, as shown below. Three are located in the City of Yuma, two in Roll (Yuma County), and one in the City of San Luis.

Table 5-12. Critical Facilities in the 100-yr Floodplain

Facility	City
San Luis West Wastewater Treatment Plant	San Luis
G.W. Carver Elementary School	Yuma
John Morris Recreation Cottage	Yuma
Cocopah Water Tower North	Yuma
Library	Roll
Mohawk Valley Elementary School	Roll

National Flood Insurance Program Participation

Participation in the NFIP is a key element of any community's local floodplain management and flood mitigation strategy. Yuma County and three of the four incorporated jurisdictions participate in the NFIP at varying levels. The Cocopah Indian Tribe does not 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, 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. Yuma County and some other communities have adopted standards that are more stringent than the federal minimum to ensure better flood mitigation practices. 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. Table 38 summarizes the NFIP status and statistics for each of the jurisdictions and the Cocopah Tribe in this Plan.[37]

Table 5-13. NFIP Status and Statistics

Jurisdiction	Community ID	NFIP Entry Date	Current Effective Map Date
Yuma County	040099	12/15/1983	1/16/2014
City of Yuma	040102	7/5/1983	1/16/2014
City of Somerton	040114	8/28/2008	NSFHA
Town of Wellton	040112	7/1/2008	1/16/2014
City of San Luis	Not a NFIP participant		
Cocopah Indian Tribe	Not a NFIP participant		

Repetitive Loss Properties

Repetitive Loss (RL) properties are those NFIP-insured properties that since 1978 have experienced multiple flood losses. FEMA tracks RL properties and in particular to identify Severe RL (SRL) properties. RL properties demonstrate a track record of flooding 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. There are no RL or SRL properties in Yuma County.[38]

Changes in Development

With the exception of the Cocopah Tribe, all jurisdictions have experienced significant population growth, and are projected to continue to grow. This increase in population size and associated developments, since the last plan, has raised every jurisdiction's vulnerability to flooding. On the other hand, the vulnerability of the Cocopah Tribe has remained relatively constant due to the minimal change in its population and developments. Countywide, the population is projected to increase by 57% from 2010 to 2040, which raises the chance of development in the floodplain. The City of Yuma is estimated to experience the highest estimated losses from a 100-year flood event, and has a projected population increase of 46% from 2010 to 2040. However, for most Yuma County jurisdictions, adequate planning and regulatory tools are in place to regulate future development. The YCFCD is very proactive in delineating floodplains ahead of development in the less populated areas of the County, and works cooperatively with all incorporated jurisdictions to update and refine existing floodplain mapping as needed.

Since the last plan, all housing developments in the county have been in compliance with drainage and floodplain regulations. This has/will minimize county resident's exposure to flooding. Since 2011 approximately 700 homes have been built in unincorporated areas and over a thousand in a new subdivision in San Luis. Somerton had 700 new structures built that have been in compliance with current building codes. Wellton had 250 new structures built to current codes. Additionally, the City of Yuma saw an

[37] FEMA, Community Status Book Report, Arizona, https://www.fema.gov/cis/AZ.pdf. Accessed March 2018

[38] Arizona Department of Emergency and Military Affairs, March 2018

increase of approximately 300/year since 2011. This increases risk to population, but minimized risk to new structures because they were in compliance to codes. Further, all commercial and industrial develop has been in compliance with current codes.

Sources

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

FEMA, April 2017, Hazus Estimated Annualized Earthquake Losses for the United States

Profile Maps

Figure 46 – Floodplain Hazard Countywide

Figure 47 – Floodplain Hazard City of Yuma

Figure 48 – Floodplain Hazard City of San Luis

Figure 49 – Floodplain Hazard City of Somerton

Figure 50 – Floodplain Hazard City of Wellton

Figure 51 – Flood Total Losses Yuma

Figure 52 – Flood Total Losses Somerton

Figure 53 – Flood Total Losses Wellton

Figure 54 – Flood Total Losses San Luis

Figure 42. Yuma County Floodplain Hazard Map, 2014

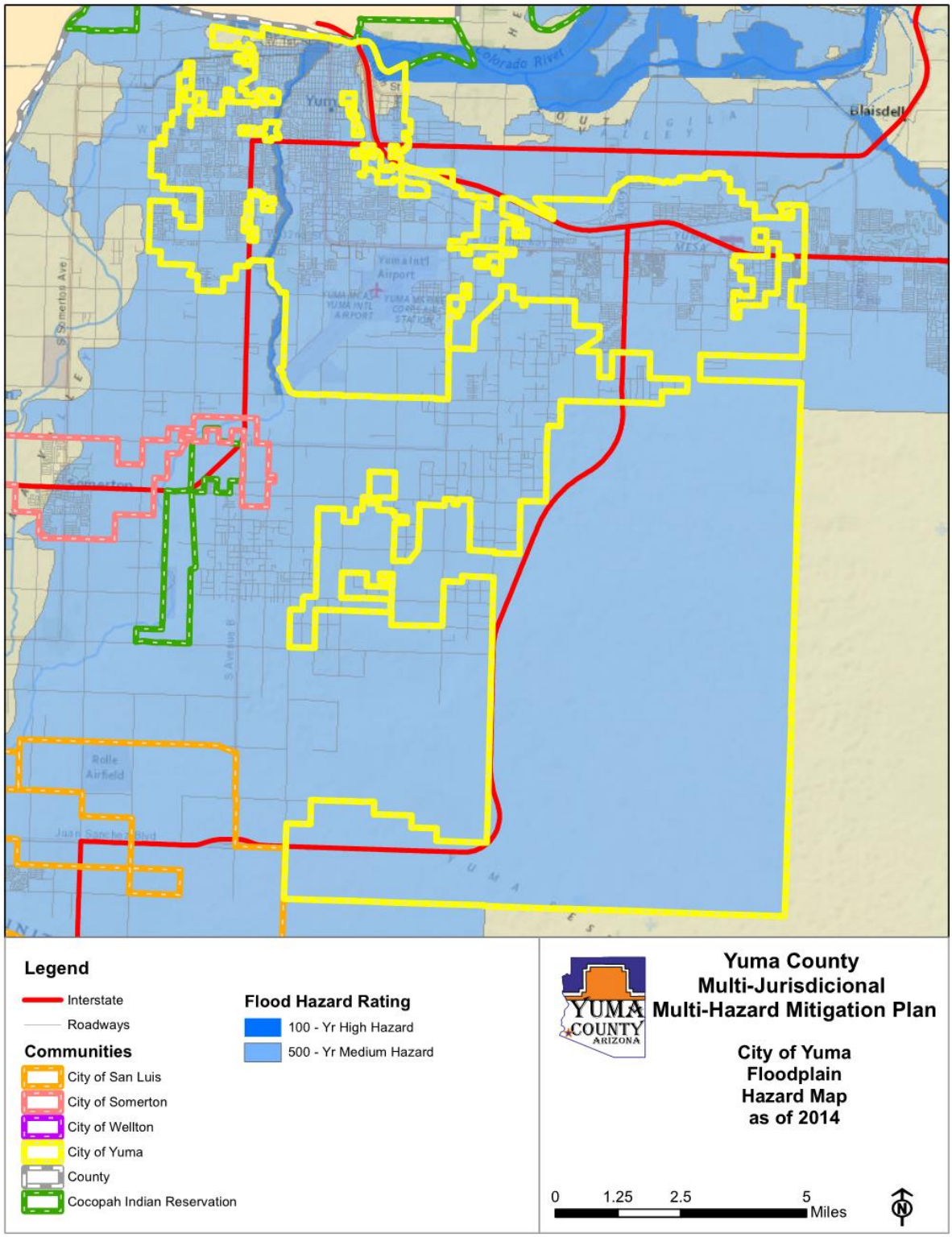

Figure 43. City of Yuma Floodplain Hazard Map, 2014

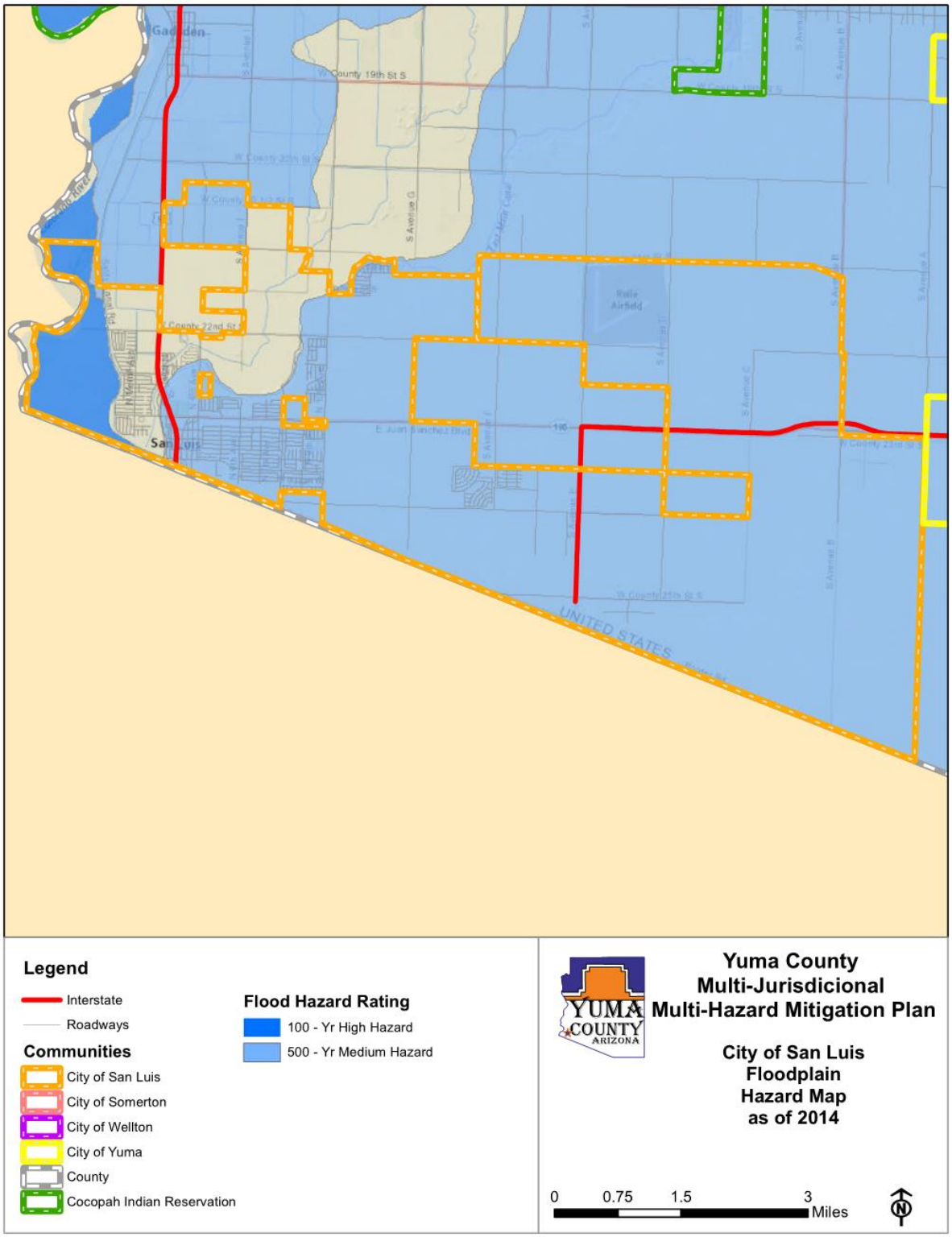

Figure 44. City of San Luis Floodplain Hazard Map, 2014

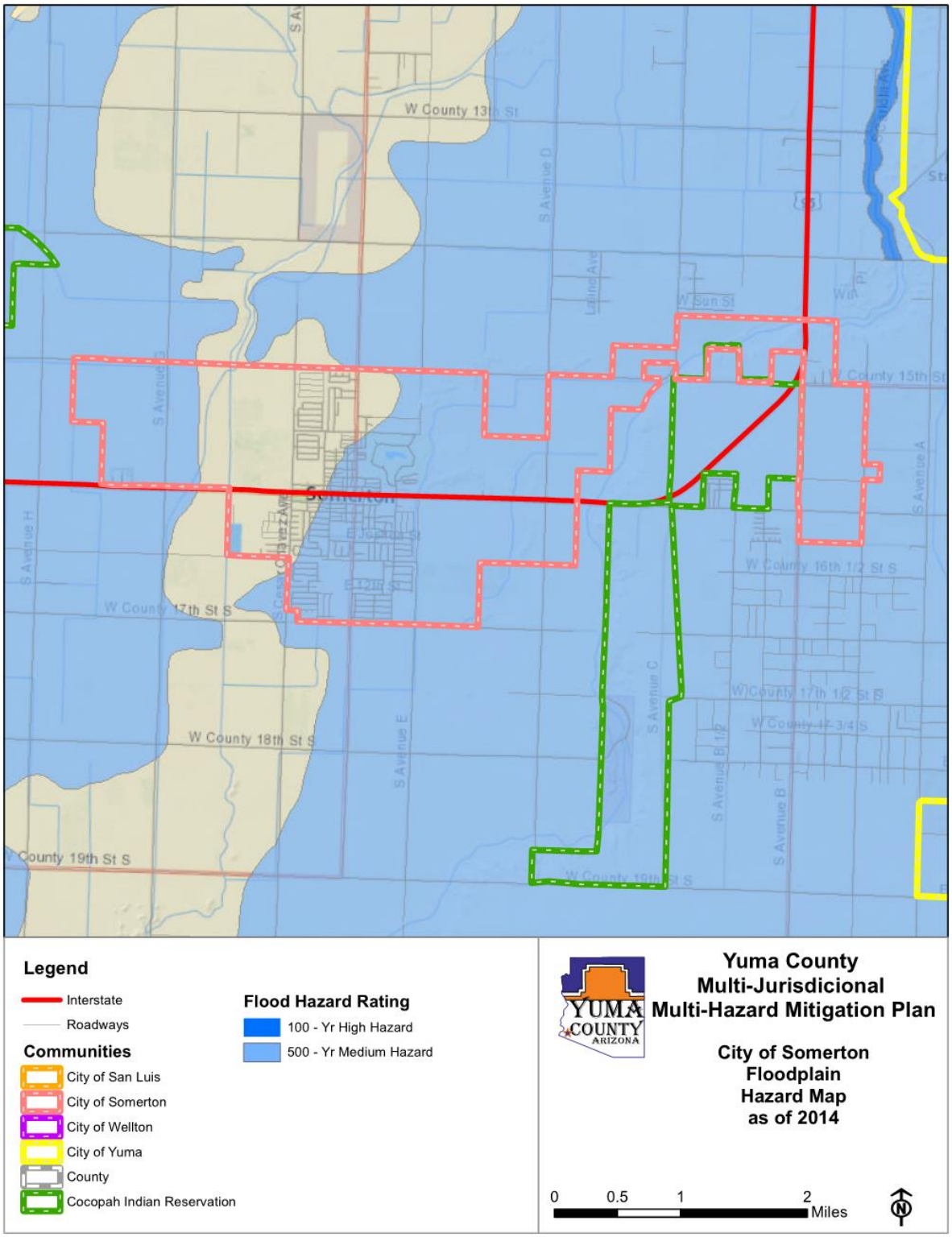

Figure 45. City of Somerton Floodplain Hazard Map, 2014

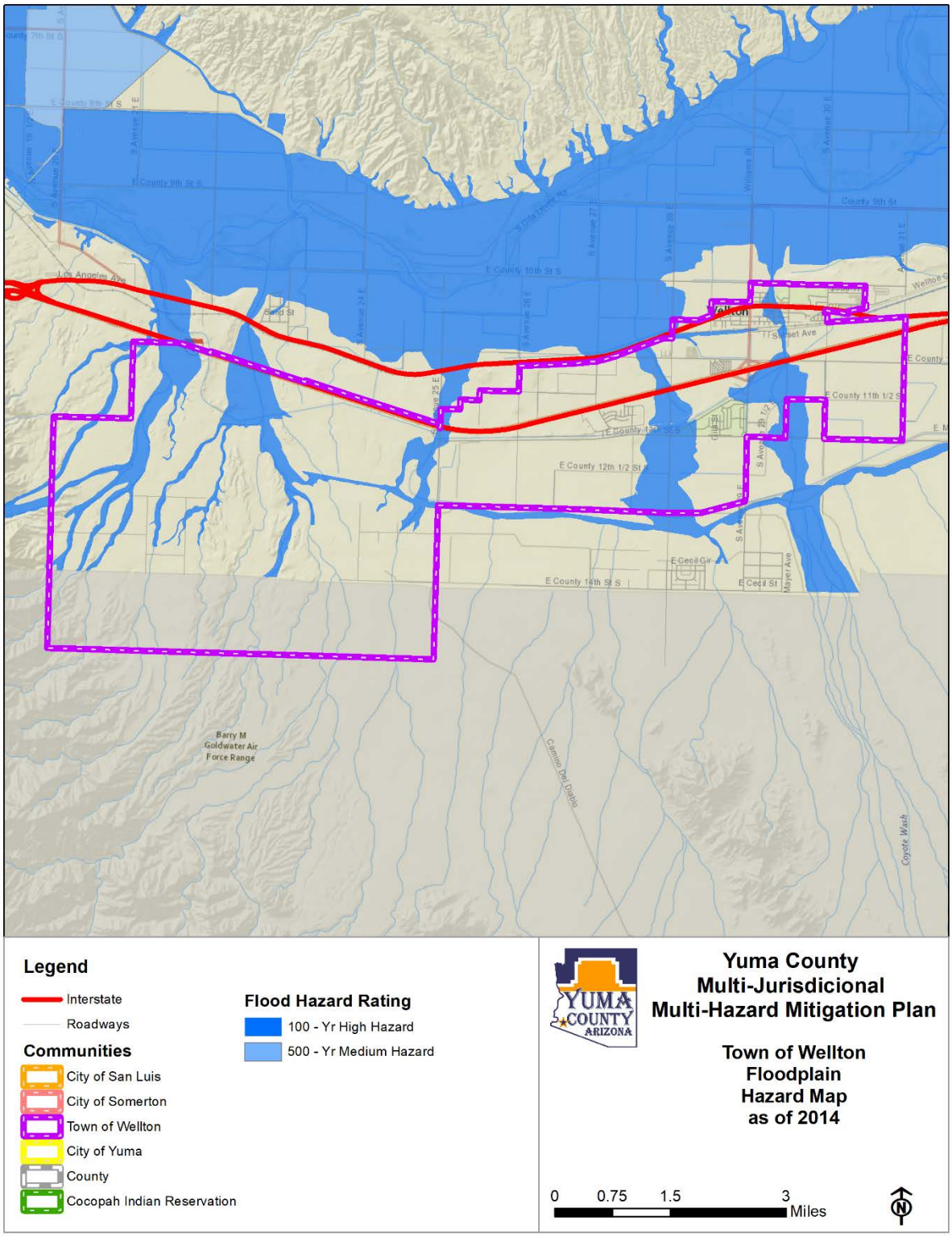

Figure 46. Town of Wellton Floodplain Hazard Map, 2014

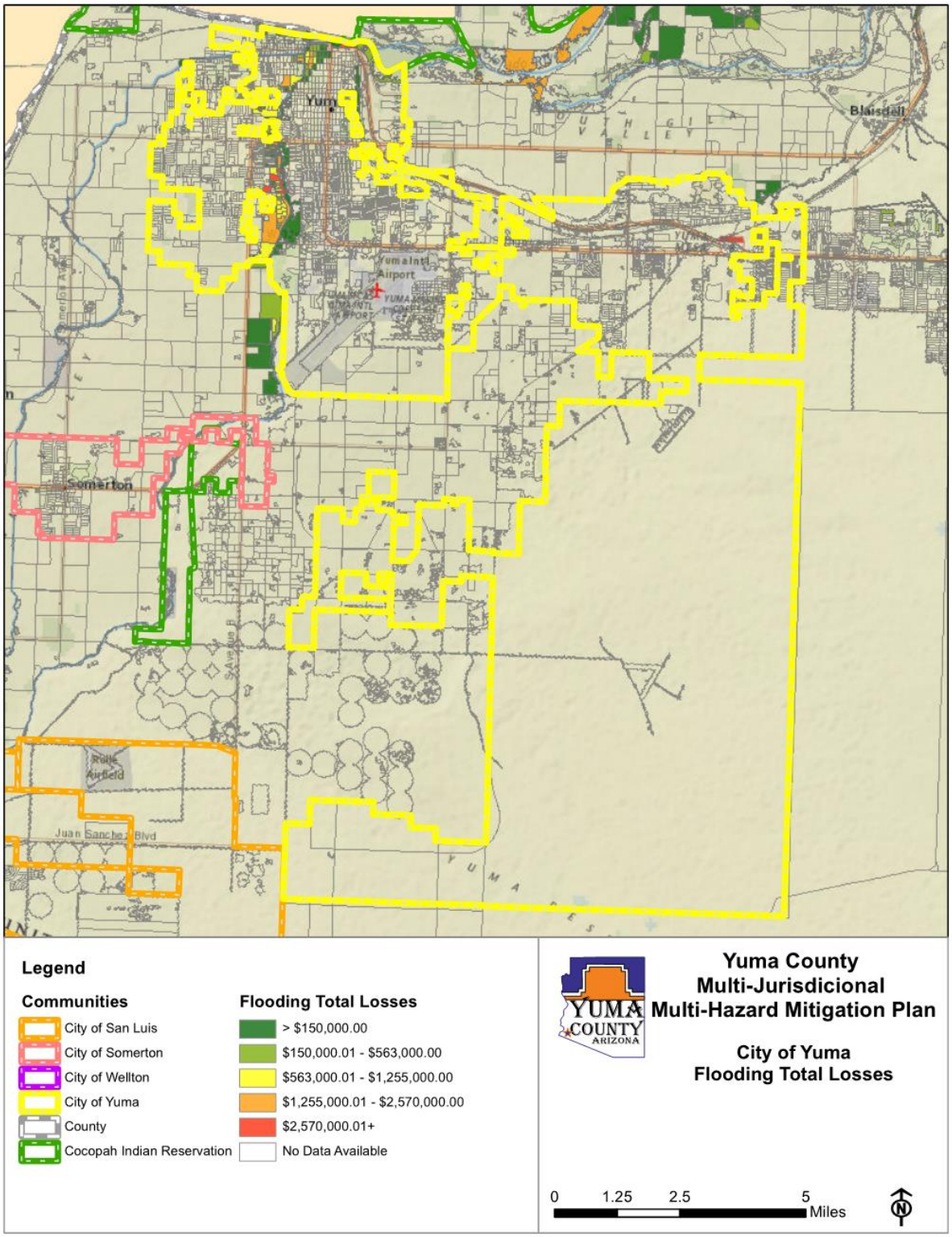

Figure 47. City of Yuma Flooding Total Losses

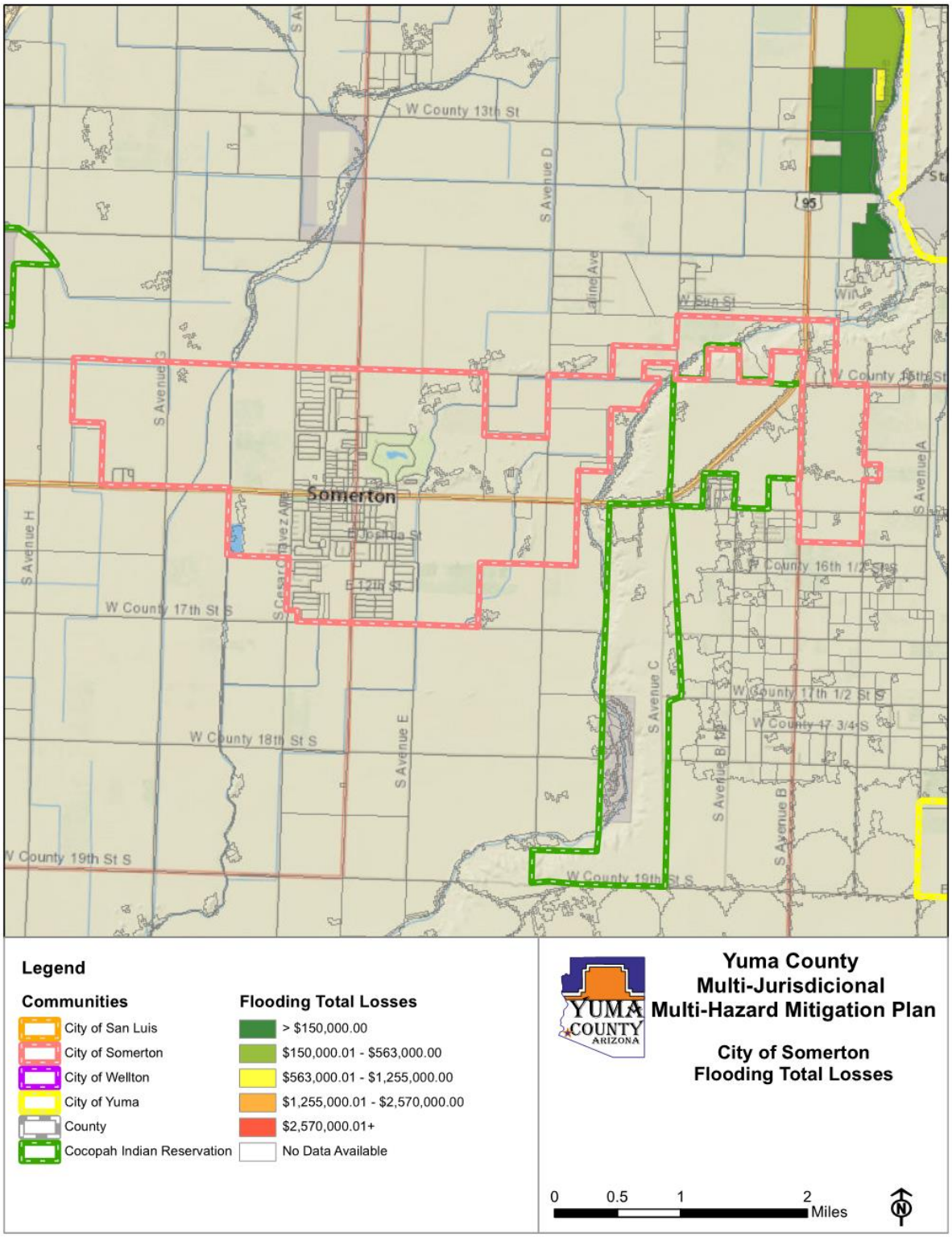

Figure 48. City of Somerton Flooding Total Losses

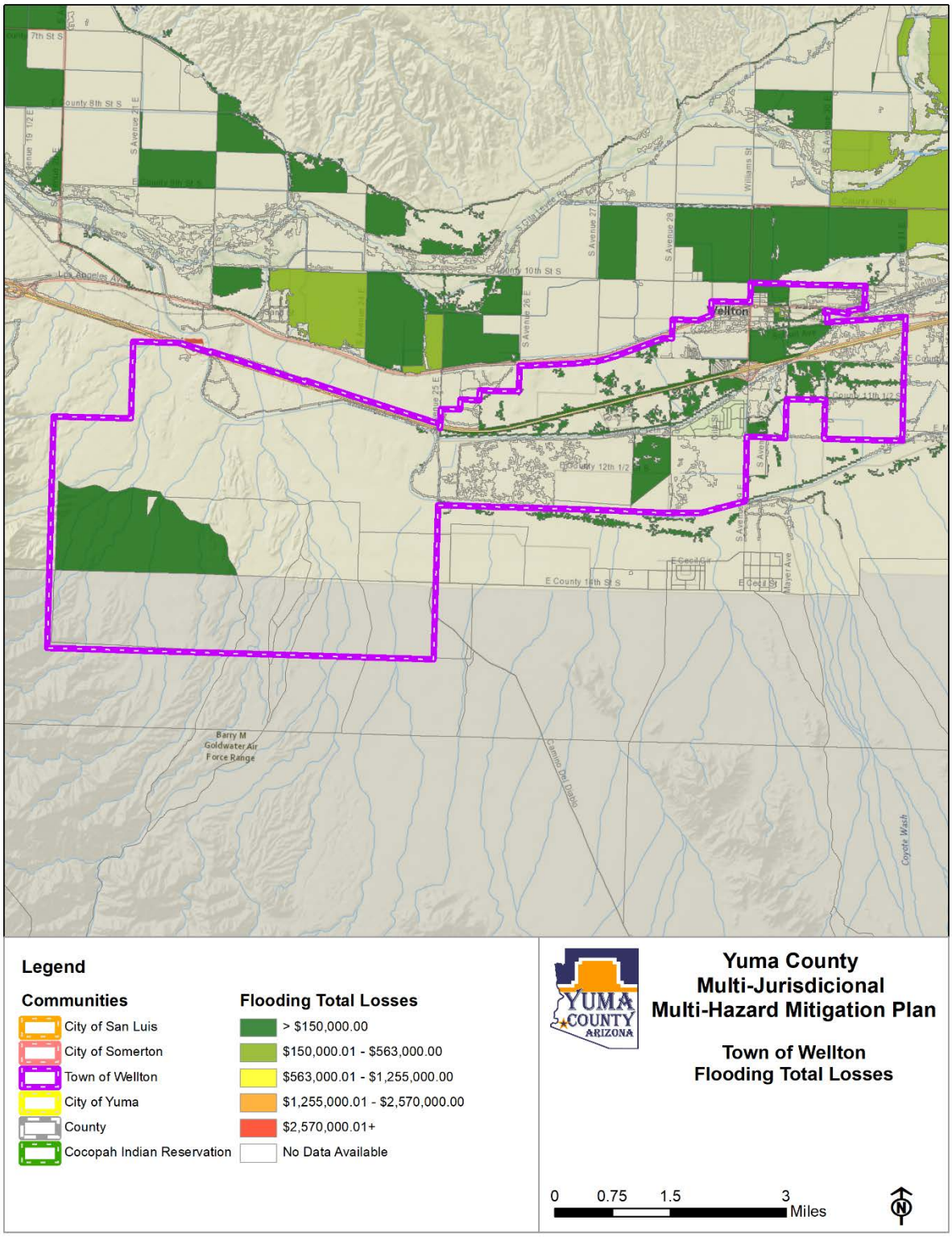

Figure 49. Town of Wellton Flooding Total Losses

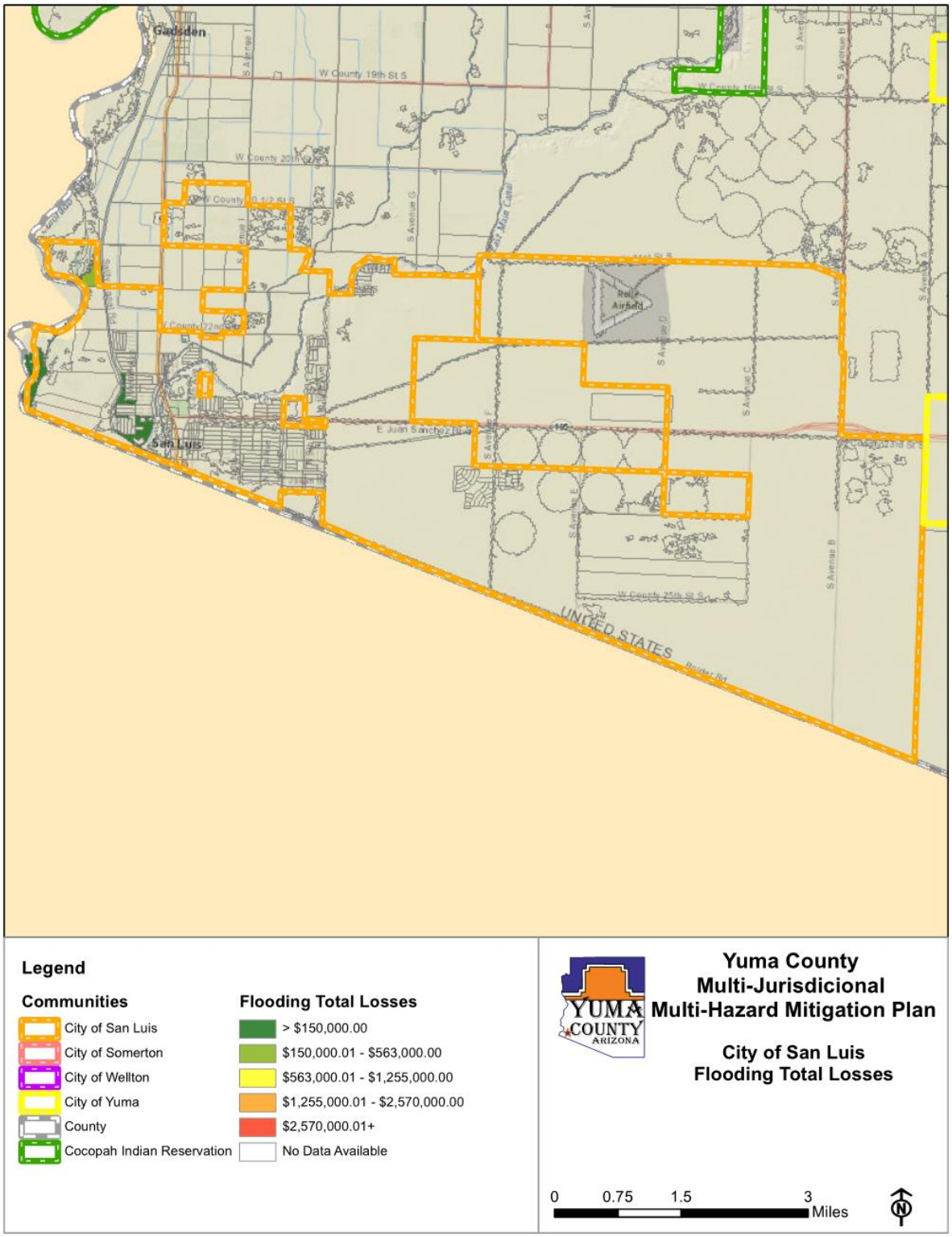

Figure 50. City of San Luis Flooding Total Losses

5.3.5 Severe Wind

Description

The hazard of Severe Wind encompasses all climatic events that produce damaging winds. For Yuma 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 Yuma County, tornadoes are the least common severe wind to accompany a thunderstorm.

History

According to Table 3, Yuma County has not been included in state and/or federal disaster declaration specifically involving severe wind or dust storm events, but have been connected with flooding events. NCEI records show that there have been a total of 184 events related to High Wind, Thunderstorm Wind, Strong Wind, and Dust Storms. Of these events, no deaths have occurred, 12 people were injured, property damage was just over $20 million and crop damage was $55,000. The following are examples of documented past events:

- In September 2017, scattered thunderstorms developed in the city of Yuma during the afternoon hours on September 8th, and one of the stronger storms produced gusty and damaging microburst winds estimated to be as high as 70 mph. Gusty microburst winds downed nine power poles at the Yuma Palms Mall. Some of the downed poles trapped people in their cars; fortunately, no injuries were reported. Total estimated property damage was $87,000 (NCEI, 2018).
- In August 2017, thunderstorms developed to the east of Yuma, and close to the town of Wellton, during the afternoon hours on August 3rd. Some of the stronger storms produced gusty and damaging microburst winds. Five power poles were blown down about five miles to the west of Wellton and just north of Interstate 8. At the same time, a trained spotter reported several power poles down slightly further to the west, about 4 miles to the east of the town of Ligurta. The poles were located along

Avenue 24. The microburst wind gusts that downed the poles were estimated to be as high as 70 mph. Total estimated property damage was $70,000 (NCEI, 2018).

- In September 2015, scattered thunderstorms developed across southwestern Yuma county during the afternoon hours on September 8th, and some of them affected the downtown Yuma area. Due to elevated moisture and instability values, the stronger storms produced damaging microburst winds with gusts estimated as high as 70 mph. According to a report from a local utility company, damaging microburst winds downed 43 power poles just north of the Yuma International Airport, between Avenues 1E and 3E. A Severe Thunderstorm Warning was not yet in effect, but a Significant Weather Advisory had been issued for the Yuma area when the power poles were blown down. Total estimated property damage was $225,000 (NCEI, 2018).
- In July 2015, strong thunderstorms developed during the afternoon hours along the Interstate 8 corridor and they affected the communities of Roll and Tacna. The storms produced gusty microburst outflow winds that were estimated to be as high as 70 mph. According to a trained weather spotter, the damaging winds led to significant damage to trees, power poles, roofs and buildings in the Roll area. The downed power poles caused a power outage that lasted for several days, according to the Wellton-Mohawk Irrigation District. At a local airfield, at least one small plane suffered substantial damage. Total estimated property damage was $250,000 (NCEI, 2018).
- In August 2014, strong thunderstorms developed across portions of southwest Arizona during the evening hours on August 11th, and some of them affected the community of Fortuna Foothills to the east of Yuma. The stronger storms generated gusty damaging microburst winds in excess of 60 mph. According to trained weather spotter about two miles northwest of the Fortuna Foothills, thunderstorm wind gusts measured at 65 mph caused patio roof damage to his home. Additionally, a local broadcast media report indicated that thunderstorms winds caused extensive damage to mobile homes in Fortuna Foothills. Total estimated property damage was $50,000 (NCEI, 2018).
- In May 2012, a low-pressure system moved south into southwestern Arizona during the evening hours on May 7th, and triggered some high-based convection in the Yuma area. Fourteen power poles were downed at County 14th Street and Avenue 2E in the Tierra Mesa subdivision. In addition, fence and barn roof damage was reported near County 16th Street and Avenue A. There was no indication of thunderstorms in the Yuma area overnight, and no lightning was observed. However, the atmospheric conditions allowed the gusty winds to take on the characteristics of a damaging microburst. Total estimated property damage was $120,000 (NCEI, 2018).
- In August 2011, scattered high based thunderstorms developed across southwestern Arizona, including the Yuma area, during the evening hours on August 27th. The storms generated gusty wind in excess of 58 mph which produced some damage across portions of Yuma. Numerous large trees and power poles were blown down across the city. Total estimated property damage was $75,000 (NCEI, 2018).
- In August 2010, severe thunderstorms moved across parts of the city of Yuma, with damaging winds, large hail, and low visibilities due to heavy rain. As reported in the Yuma Sun, the Garden Landscaping Company at 830 South Orange Avenue was mostly destroyed by thunderstorm microburst winds, estimated to be near 75 knots. Damage was also reported at the O.G. RV Resort. Several schools in the Yuma area sustained considerable wind and water damage. Additionally, zero visibility reported in rain along with gusty winds estimated at up to 80 mph. Damage was reported to homes and businesses with numerous trees uprooted. A huge pine tree fell on a house at the corner of 8th Avenue and 10th Street. Entire carports were torn from their foundations. A roof on a home in the 1100 block of Appaloose Lane was completely torn off of its rafters. The ceramic tiles on the top of the entrance to El Charro Cafe, 601 West 8th Street, were severely damaged. The roof of a self-serve car wash collapsed. There were several reports of car windshields broken due to flying debris. At the old Foxworth Galbraith hardware store, entire structures collapsed and lay mangled on the ground where

the outdoor lumber section had been. APS reported up to 16,660 customers were without power at the height of the storm. Total property damage was estimated at $11 million (NCEI, 2018).

- In January 2010, Strong winds associated with a line of thunderstorms caused considerable damage to property and some minor injuries. There were numerous reports of large trees blown down in Yuma. Total property damage was estimated at $400,000 (NCEI, 2018).
- In October 2009, winds increased during the late afternoon hours and caused a power outage to the area of San Luis and Somerton. The outage initially affected 16,000 customers in southern Yuma County. Winds associated with the passage of a sharp cold front gusted to over 30 mph and resulted in a power outage in the Yuma area. The property damage was estimated at $10,000 (NCDC, 2009).
- In August 2009, several downed power poles. Eight people sustained minor injuries after the strong winds damaged numerous mobile homes in Dateland. Sun Country Acres mobile home park, located two miles north of Interstate 8 on Avenue 64E, reported that every mobile home in the park was damaged in some way, many having broken windows. Most of the injuries were to the head and back and cuts from broken glass (NCDC, 2008).
- In July 2009, thunderstorm winds created a huge dust storm that affected much of the Yuma area with near zero visibility. Wind speeds were estimated to be over 60 mph, with considerable damage to property. At least one home was damaged, with trees and power lines downed by strong winds. During the peak of the storm, 5,200 customers were without power. The Yuma airport recorded a peak gust of 48 mph just before 5 p.m. A large complex or area of storms moved to the west and into Yuma late on Saturday afternoon. The property damage was estimated at $100,000 (NCDC, 2008).
- In September 2008, Somerton police reported power lines down due to very strong winds from thunderstorms. At the peak of the storm, between 2,500 and 3,000 APS customers were without power. A large tree in the 3300 block of 15th Avenue in The Dunes subdivision was knocked down. Power outages were also reported on the Cocopah Reservation at County 18th Street and Avenue D and in the north end of the city of Yuma. Showers and thunderstorms developed across much of southwest and south-central Arizona. A few storms became severe, with strong winds, hail and very heavy downpours. This event caused $150,000 in property damages (NCDC, 2008).
- In August 2008, trees were uprooted and a semi-trailer was turned over. A peak gust of 57 mph was measured at the Yuma airport. About 1,000 APS customers were left without power due to these thunderstorm winds. Power poles were blown down in the Mohawk area. Strong winds associated with severe thunderstorms affected parts of Yuma late Thursday night and early Friday morning. These storms were part of a huge system that moved through the Phoenix area earlier that night. Damage estimates were at $150,000. (NCDC, 2008)
- In September 2007, numerous trees and as many as 11 power poles reported down due to strong winds. Peak gusts to 84 mph were recorded at the Yuma airport. Arizona Public Service reported about 9,600 people was left without power Sunday morning. Yuma Police responded to more than 120 emergency calls for service, most of which were storm related. Numerous eyewitnesses described the area around the 100 block of West 27th Place as the worst-hit section of town. Condos in that area had considerable roof damage with ceilings collapsing onto living rooms and dining rooms. Large hail and localized flooding was also reported in Yuma. Thunderstorms resulted in considerable damage in portions of Yuma after winds gusted to 84 mph at the Yuma Airport. This event caused $1,500,000 in property damage (NCDC, 2008)
- On August 13, 2001 at approximately 2:25 p.m., the Yuma County Sheriff's Office received a 9-1-1 call stating there had been an accident involving a Sheriff's Office patrol vehicle at milepost 54 on U.S. Highway 95, north of Yuma. Emergency units responded to the scene where they discovered that a single vehicle had traveled off the roadway and rolled over. At that time, the preliminary

investigation indicated the vehicle left the roadway and turned over one and one-quarter times. The driver and sole occupant, Senior Deputy Michael Meyer was still seat-belted in his patrol vehicle when found by motorists who immediately called for assistance. Senior Deputy Meyer was pronounced dead at the accident scene.

Senior Deputy Meyer had been employed by the Sheriff's Office for four years and was in charge of the Water Safety Division. Northern Yuma County was a regular patrol assignment for Deputy Meyer who was ever aware of the changing desert conditions. A heavy storm was blowing through the area and it was Senior Deputy Meyer's habit to check the washes and the roads for flooding and damage on such occasions. (http://www.yumacountysheriff.org/index.html)

- In September 1993, the second severe thunderstorm to hit the Yuma area over the Labor Day weekend affected the southeast and east sections. The strong microburst winds destroyed at least three metal warehouses and blew down power lines. As many as 10 recreational vehicles were damaged at an RV resort. Damage to the warehouses was estimated to be at least $1 million. Overall damage estimates are at $5 million (NCDC, 2008)

Probability and Magnitude

Most severe wind events are associated with thunderstorms as previously mentioned. The probability of a severe thunderstorm occurring with high velocity winds increases as the average duration and number of thunderstorm events increases. According to NCEI, 153 thunderstorm wind events have been recorded for Yuma County since 1950 yielding an average of about 2.25 damaging or potentially damaging thunderstorm events per year. Reported damages from wind events associated with thunderstorms since 1950 were over $19.6 million in property damage, or approximately $290,000 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 on the order of hours, while a severe thunderstorm warning typically provides an hour or less warning time. All of the 153 thunderstorms that have been recorded over the last 68 years would qualify as a severe thunderstorm.

The probability of tornadoes occurring is much less frequent than thunderstorms. For the same 68-year period, NCEI reports only 11 tornadoes, this is the average of less than one tornado every four years. Reported property damages associated with those tornadoes add up to over $280,000.

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 15. 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.

Table 5-14. Enhanced Fujita Tornado Scale

Enhanced Fujita Category	Wind Speed	Potential Damage
EF0	65-85 mph	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 mph	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 mph	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 mph	Devastating damage: Well-constructed houses and whole frame houses completely leveled; cars thrown and small missiles generated.
EF5	>200 mph	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.

Table 5-15. Fujita Tornado Scale[39]

Category	Wind Speed	Description of Damage
F0	40-72 mph	Light damage. Some damage to chimneys; break branches off trees; push over shallow-rooted trees; damage to sign boards.
F1	73-112 mph	Moderate damage. The lower limit is the beginning of hurricane speed. Roof surfaces peeled off; mobile homes pushed off foundations or overturned; moving autos pushed off roads.
F2	113-157 mph	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light-object missiles generated.
F3	158-206 mph	Severe damage. Roofs and some walls torn off well constructed houses; trains overturned; most trees in forest uprooted; cars lifted off ground and thrown.
F4	207-260 mph	Devastating damage. Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.
F5	261-318 mph	Incredible damage. Strong frame houses lifted off foundations and carried considerable distance to disintegrate; automobile-sized missiles fly through the air in excess of 100-yards; trees debarked.

All of the recorded tornadoes in Yuma County occurred prior to 2006 and are recorded based on the Fujita Scale (Table 16) rather than the Enhanced Fujita Scale. Of the 11 recorded tornadoes, four were category

[39] FEMA, 1997

F0, 3 were category F1, and 1 was categorized as F2. The only F2 tornado recorded in the history of Yuma County, occurred on August 17, 1959 and caused $250,000 in property damage.

Figure 55 through Figure 59 depict where historical severe wind events and tornado events have occurred as of 2016. The maps show severe wind speed at the time of the event as well as and the Fujita scale when a historical tornado event has occurred. It's clear from looking at this map, that the City of Yuma experiences the highest number of recorded high wind events, along with several areas along Interstate 8. Each community's risk from tornadoes is hard to determine, because historically tornadoes have occurred in random parts of the county.

Vulnerability

- Yuma County: There are a series of radio and microwave communications towers in the region that are susceptible to damages caused by high winds. The loss of these towers can result in disruptions to not only public communications but also disruptions to first responder communications which increase the vulnerability to the public and their safety.
- City of San Luis: Many elderly residents in San Luis live in older homes with poor physical integrity which make them highly vulnerable to damages caused by high winds. The fact that these residents are elderly puts them at a much higher risk than others.
- City of Somerton: Power and transmission lines in the South County region of Somerton are vulnerable to damages caused by high winds. Damage to these lines will disrupt electrical power to not only Somerton but also to the Cocopah reservation and the City of San Luis.
- Town of Wellton: The area regularly experiences structural damage caused by palm trees during wind events. The large number of mobile homes in Wellton is particularly vulnerable to these damages and flying debris as they are not as sturdy as other structures. Flying debris also causes damage to rail crossings, interstate routes, and power lines throughout the town.
- City of Yuma: The City of Yuma shares the same vulnerabilities to high winds as the Town of Wellton.
- Cocopah Indian Tribe: Many of the homes and power lines on the Cocopah reservation are older and fragile, making them highly vulnerable to damage caused by severe winds. The northern region of the reservation has a large amount of unsecured RVs that have been and continue to be damaged and/or displaced by strong winds. Dust storms often associated with high winds limit visibility and pose hazardous driving conditions. Additionally, children and elderly tribe members are susceptible to respiratory ailments caused by dusty conditions generated by high winds.

Table 5-16. CPRI Results for Severe Wind

Jurisdiction	Probability	Magnitude/ Severity	Warning Time	Duration	CPRI Score
Cocopah Tribe	Highly Likely	Limited	12 to 24 hrs	<24 hrs	2.9
San Luis	Likely	Limited	12 to 24 hrs	<1 week	2.6
Somerton	Likely	Limited	<6 hrs	<6 hrs	2.7
Yuma County	Likely/Highly Likely	Critical	6 to 24 hrs	<24 hrs	3.2
Wellton	Likely	Limited	<6 hrs	<6 hrs	2.7
Yuma	Likely/Highly Likely	Limited to Critical	<6 hrs	<6 hrs	3.0

Loss Estimations

Exposure to severe wind events and dust storms is generally the same across the County. Based on the historic record over the last 68 years, it is feasible to expect average annual losses of almost $300,000

(county-wide). It is difficult to estimate losses for individual jurisdictions within the County due to the lack of discrete data.

Development Changes

With the exception of the Cocopah Tribe, all jurisdictions have experienced significant population growth over the past decade, and are projected to continue to grow. Countywide, the population is projected to increase by 57% from 2010 to 2040. Future development will 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 can help to mitigate against losses.

Since the last plan, all non-tribal jurisdictions have experienced large population growth and development. Although many of the new developments were built using stronger materials and stricter building codes, the developments (which include mobile homes) are still somewhat vulnerable to damages caused by severe winds. The minimal changes in population size and development on the Cocopah reservation have kept the tribe's vulnerability to severe wind conditions the same.

Sources

Arizona Division of Emergency Management, 2013, State of Arizona Hazard Mitigation Plan

NCEI, 2018, Storm Events Database, accessed via the following URL:
https://www.ncdc.noaa.gov/stormevents/

Profile Maps

Figure 55 – Historical Severe Wind & Tornado Countywide

Figure 56 - Historical Severe Wind & Tornado Yuma

Figure 57 - Historical Severe Wind & Tornado San Luis

Figure 58 - Historical Severe Wind & Tornado Somerton

Figure 59 - Historical Severe Wind & Tornado Wellton

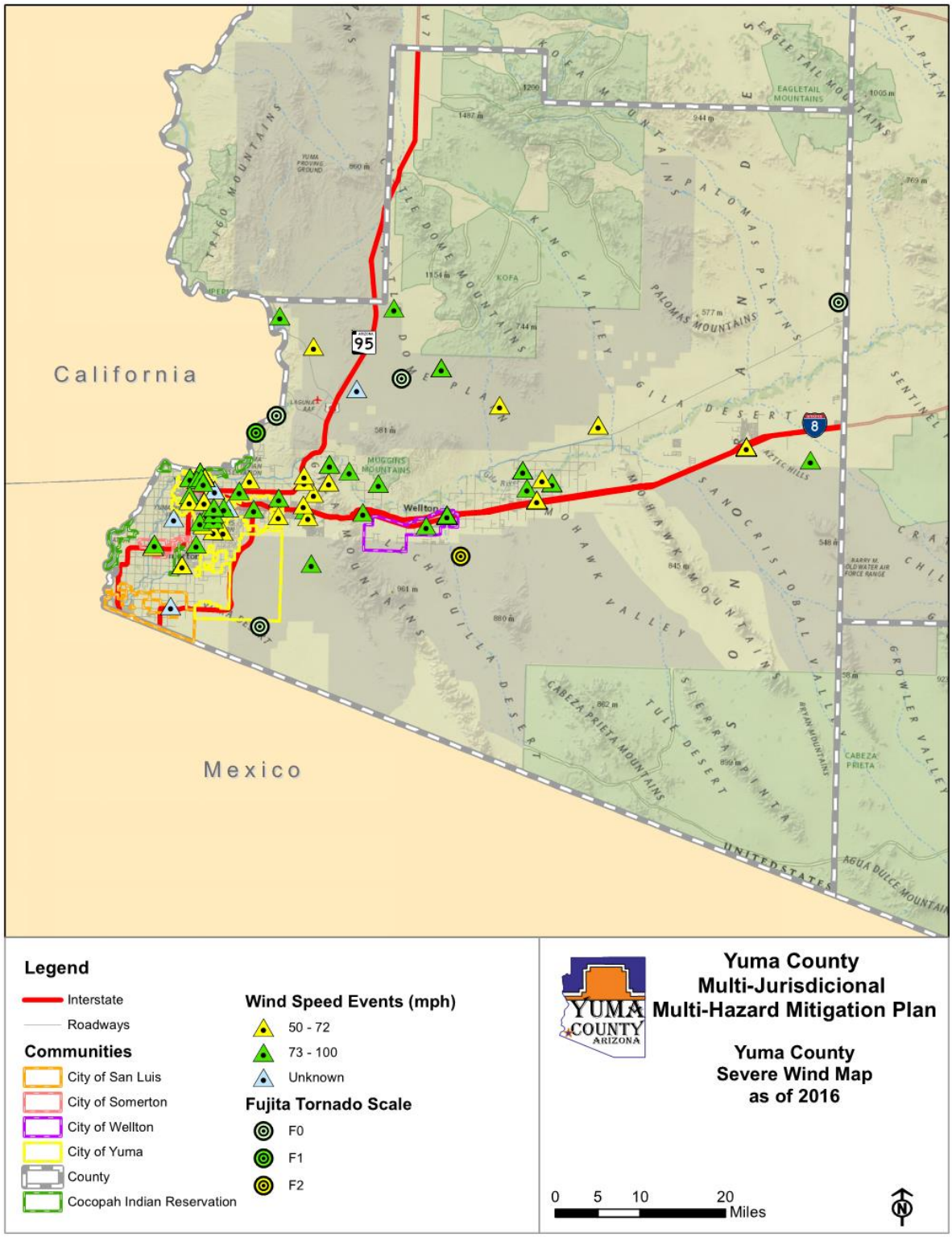

Figure 51. Yuma County Severe Wind Map, 2016

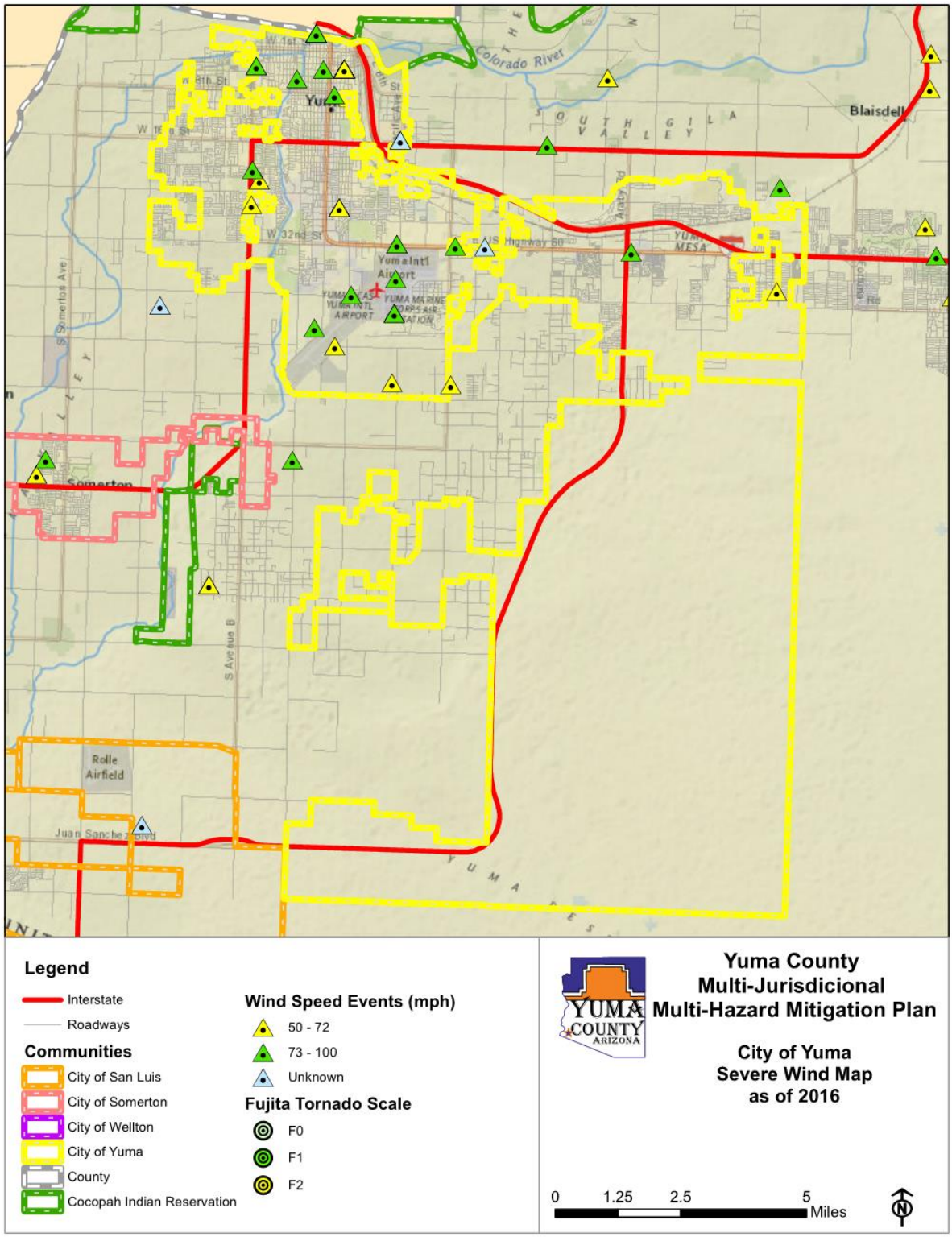

Figure 52. City of Yuma Severe Wind Map, 2016

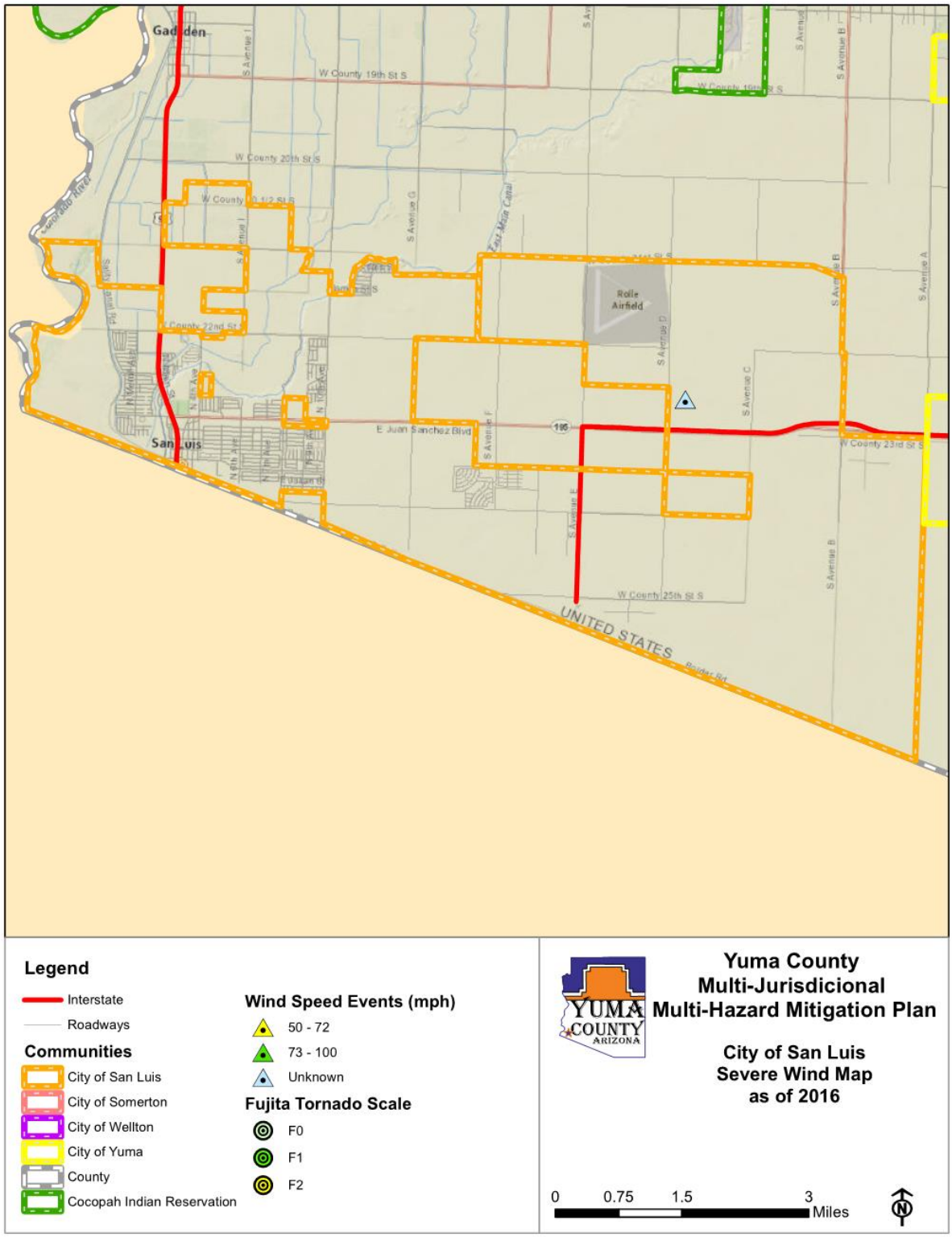

Figure 53. City of San Luis Severe Wind Map, 2016

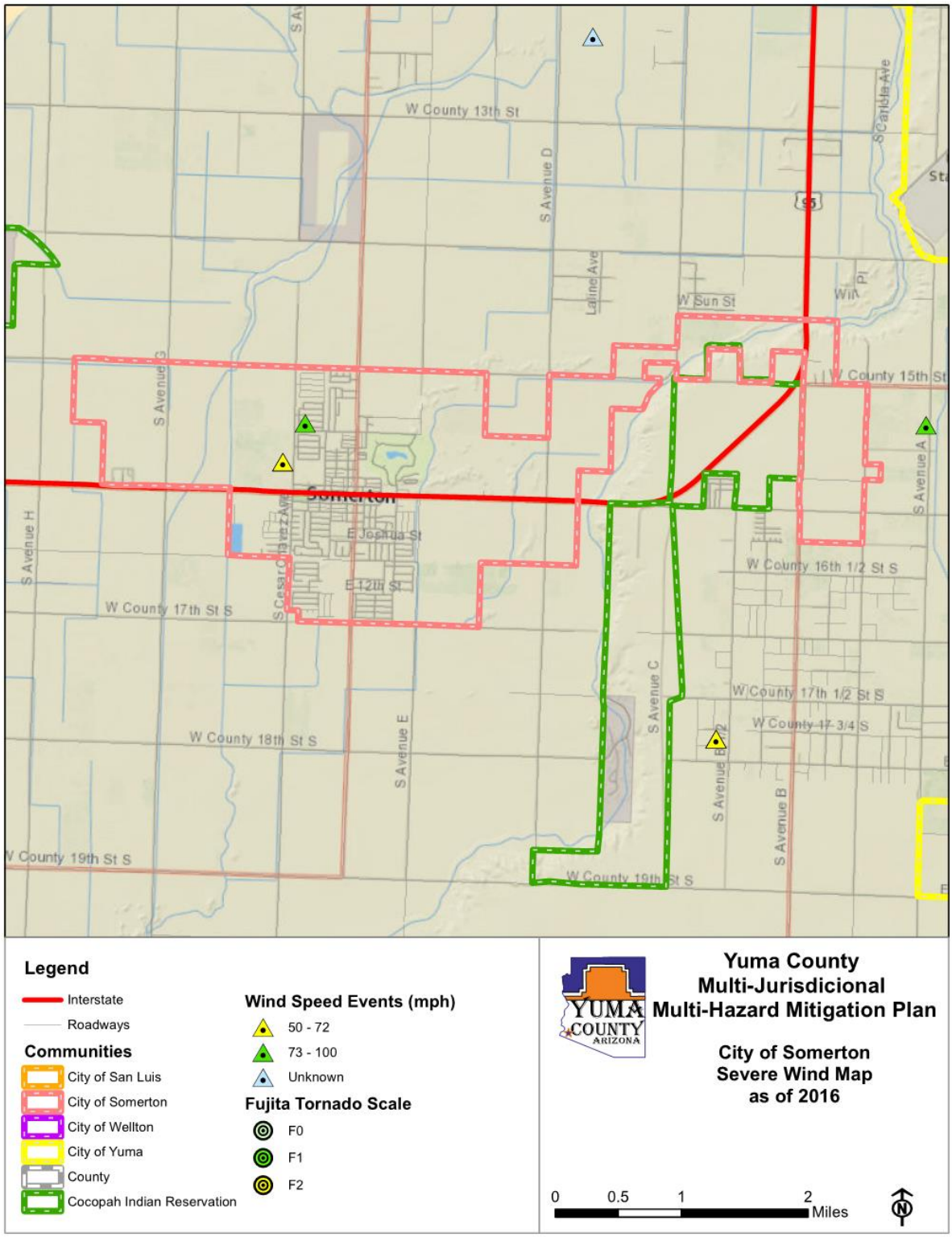

Figure 54. City of Somerton Severe Wind Map, 2016

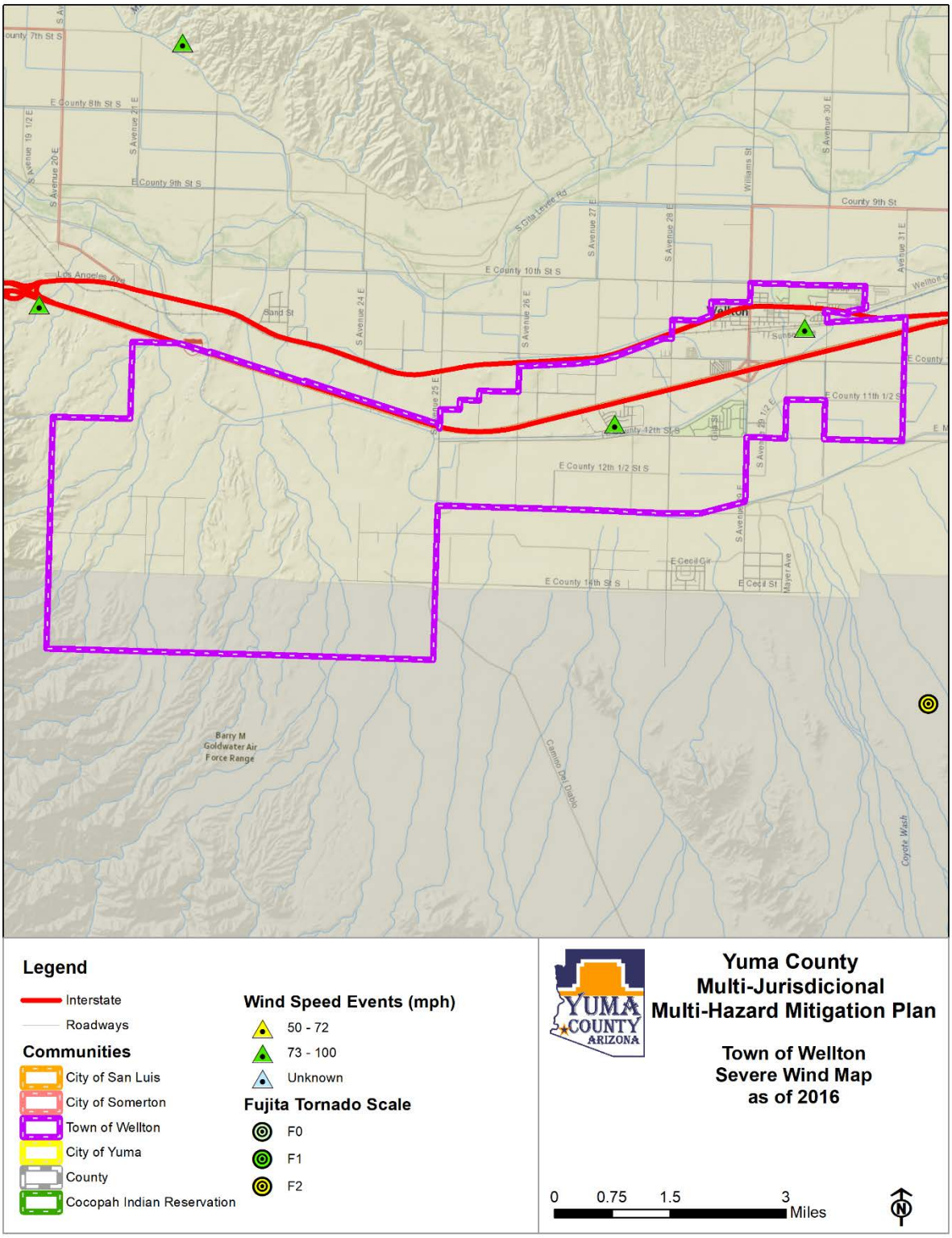

Figure 55. Town of Wellton Severe Wind Map, 2016

5.3.6 Wildfire

Description

A wildfire is an uncontrolled fire spreading through wildland vegetative fuels and/or urban interface areas where fuels may include structures. They often begin unnoticed, spread quickly, and are often generating smoke that may fill the area for miles around. Wildfires can be human-caused through acts such as arson or campfires, or can be caused by natural events such as lightning. If not promptly controlled, wildfires may develop into an emergency. Even small fires can threaten lives, resources, and destroy improved properties.

The indirect effects of wildfires can also be catastrophic. In addition to stripping the land of vegetation and destroying forest resources and personal property, large, intense fires can harm the soil and waterways. Soil exposed to intense heat may temporarily lose its capability to absorb moisture and support life. Exposed soils in denuded watersheds erode quickly and are easily transported to 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.

Wildfire hazards within Yuma County are typically limited to the Colorado and Gila River floodplains and the more densely vegetated areas adjacent to some of the larger ephemeral watercourses. Fires burning through the heavily vegetated floodplain areas can be very difficult to fight, especially in areas where water is not readily available. Increases in development pressure along popular Colorado River locations like Martinez Lake, are expanding the wildland-urban fire interface areas in those locations.

History

The Sonoran Desert vegetation typically found in Yuma County is less dense than other areas of the state. That fact, combined with relative density of urban area, makes wildfire risk within the County relatively low when compared to the more densely forested areas of the state. According to the County's 2010 Community Wildfire Protection Plan (CWPP), 11 wildfire events have occurred causing $2,315,000 in losses. The majority of these wildfires were less than 10 acres. Below are historic wildfire events that have occurred in Yuma County, with no significant occurrences since the last plan:

- In July 2009, a fire in the Martinez Lake area threatened multiple structures on Swede Hill. Because of the high number of people present during the July 4th festivities, no structures were lost. (Draft CWPP, 2010)
- In September 2009, lightning struck a home near highway 95 and 5E, resulting in a structure fire.
- In May 2007, a 426 acre fire burned along the Gila River. It was started by natural causes (BLM, 641403).
- In October 2005, a human-caused fire called the King Valley Fire burned 26,000 acres (FWS, 52471).
- In July 2001, a 61 acre fire occurred in vicinity of canal at the end of 12th Street to 4th Ave Bridge on the east and 22nd Ave on the west. It also spread to Yuma West Wetlands along Colorado River (URS, 2003).
- In April 1992, The Whiterock fire burned 2,400 acres and was human-caused (FWS, 27270).

Interesting to note, $5.8 million have been expended through the Recovery Section of Arizona Division of Emergency Management for response activities of 19 declared wildfire events that included Yuma County as identified in Table 3, however, no damage costs were associated with these events.

Probability and Magnitude

The probability and magnitude of wildfire incidents for Yuma 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.

Wildfire hazard areas have been identified by the State of Arizona as a part of the 2003/04 Arizona Wildland Urban Interface Assessment (AWUIA) project (Fisher, 2004). The increasing growth of Arizona's rural populations, urban sprawl, and increasing wildland fuel loads ads to create a mix of situations that is known as the wildland urban interface (WUI). The purpose of the AWUIA was to attempt to conduct an analysis on a statewide basis using a common spatial model, for validation of those communities listed in the federal register as WUI and further identify possible other communities at risk. For Yuma County the results determined that the entire County was in a low hazard area. The Team did not think this accurately portrayed the wildfire conditions in Yuma County.

The wildfire hazards map, included in this profile, depict where historical wildfires have occurred from 1992-2015. The map also shows the magnitude of these historical events. It's clear from looking at this map, that areas on the western side of the county, north of the City of Yuma, have experienced a relatively large number of wildfire events compared to the rest of the county.

The County's CWPP was developed in cooperation with jurisdictions and Tribes throughout the County in order to establish the community's magnitude of risk and a baseline for effective mitigation against wildfire damages in the WUI. Through extensive GIS analysis and research, the CWPP concluded that the City of Yuma and the City of San Luis are at moderate risk for wildfire hazards, and the remaining communities are low. The CWPP rated several areas within the county that are thought have be subject to wildfire hazard. Martinez Lake and Fisher's Landing were rated high, while Hidden Shores Village and the Riverfront RV Park were rated moderate.

Vulnerability

- All jurisdictions and the tribe: Residential and commercial properties close to the Gila and Colorado River corridors are particularly vulnerable to wildfire fueled by the overgrowth of trees and vegetation areas. Poor air quality due to smoke and ash from wildfires can cause respiratory problems to vulnerable populations, including children and the elderly.

Table 5-17. CPRI Results for Wildfire

Jurisdiction	Probability	Magnitude/ Severity	Warning Time	Duration	CPRI Score
Cocopah Tribe	Likely	Limited	12 to 24 hours	<1 week	2.6
San Luis	Possibly	Negligible	<6 hours	<1 week	2.1
Somerton	Likely	Negligible	<6 hours	<24 hours	2.5
Yuma County	Possibly - Likely	Limited	<6 hours to 12 hrs	<24 hours- 1 wk	2.6
Wellton	Possibly	Limited	<6 hours	<1 week	2.4
Yuma	Possibly - Likely	Negligible - Limited	<6 hours	<24 hours	2.4

Loss Estimations

Estimating each community's exposure was conducted using the Arizona Wildfire Risk Assessment Portal (AZWRAP). The AZWRAP database has been used as the primary mechanism for the Arizona State Forestry to deploy wildfire risk information and create awareness of wildfire hazards across the state. AZWRAP is comprised of a suite of applications that provide the user access to wildland fire risk assessment data, which was finalized in 2013. By utilizing the wildfire risk index portion of this data,

wildfire risk can be seen at the local level for communities within Yuma. Figure 61 through Figure 64 show areas within each of the communities that have been determined to be of low to high risk for wildfire. It can be seen that all jurisdictions have areas that are determined to be of very high or even extreme risk from wildfires. The largest portion of extreme risk is seen in the northwestern portion of the City of San Luis.

Additionally, 11 critical facilities were identified to be at risk for wildfire. Seven of these are located in the City of Yuma, one in the City of San Luis, one in the City of Somerton, and two in Yuma County. The City of Yuma General Services building is located in an extreme wildfire risk area. These results are portrayed in Table 19 below.

Table 5-18. Critical Facilities at Risk to Wildfire

Facility	Jurisdiction	Risk
General Services	Yuma	Extreme
South County Complex	San Luis	Very High
Aztec High School	Yuma	Very High
PrimeCare Urgent Care Facility	Yuma	Very High
DaVita Edge River Dialysis	Yuma	Very High
Adult Probation	Yuma	Very High
North End Community Center	Yuma	Very High
Gadsden Elementary School	Yuma County	High
Cocopah Social Services	Somerton	High
Public Works - Roll Yard	Yuma County	High
Figueroa Treatment Plant	Yuma	High

Development Changes

The entire region has some level of exposure to wildfire. With the exception of the Cocopah Tribe, all jurisdictions have experienced significant population growth resulting in new residential and commercial development. The region is also expected to continue to grow. For example, the City of Yuma estimates they issued approximately 2,500 building permits since 2011. This level of development, combined with those of other jurisdictions, clearly increases risk and vulnerability to people and property due to wildfire.

By its very definition, the WUI represents the fringe of urban development at it intersects with the natural environment. Future development is expected to convert traditionally rural or agricultural areas to urban developments, which may increase the amount of people living in the WUI and increase Yuma County's risk to wildfire. According to the CWPP, the City of Yuma and the City of San Luis are both overall at moderate risk to wildfire, and the City of San Luis has the largest portion of extreme risk compared to other communities. The City of Yuma is projected to experience a 46% increase in population from 2010 to 2040, and the City of San Luis is projected to experience a 160% increase in population from 2010 to 2040.

Sources

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

Yuma County Community Wildfire Protection Plan, 2010, http://www.yumacountyaz.gov/home/showdocument?id=7728

Arizona Department of Forestry and Fire Management, 2013, Arizona Wildfire Risk Assessment Portal, https://arizonawildfirerisk.com/

Profile Maps

Figure 60 – Wildfire Countywide Historical Fires

Figure 61 – Wildfire Risk City of Yuma

Figure 62 – Wildfire Risk City of San Luis

Figure 63 – Wildfire Risk City of Somerton

Figure 64 – Wildfire Risk City of Wellton

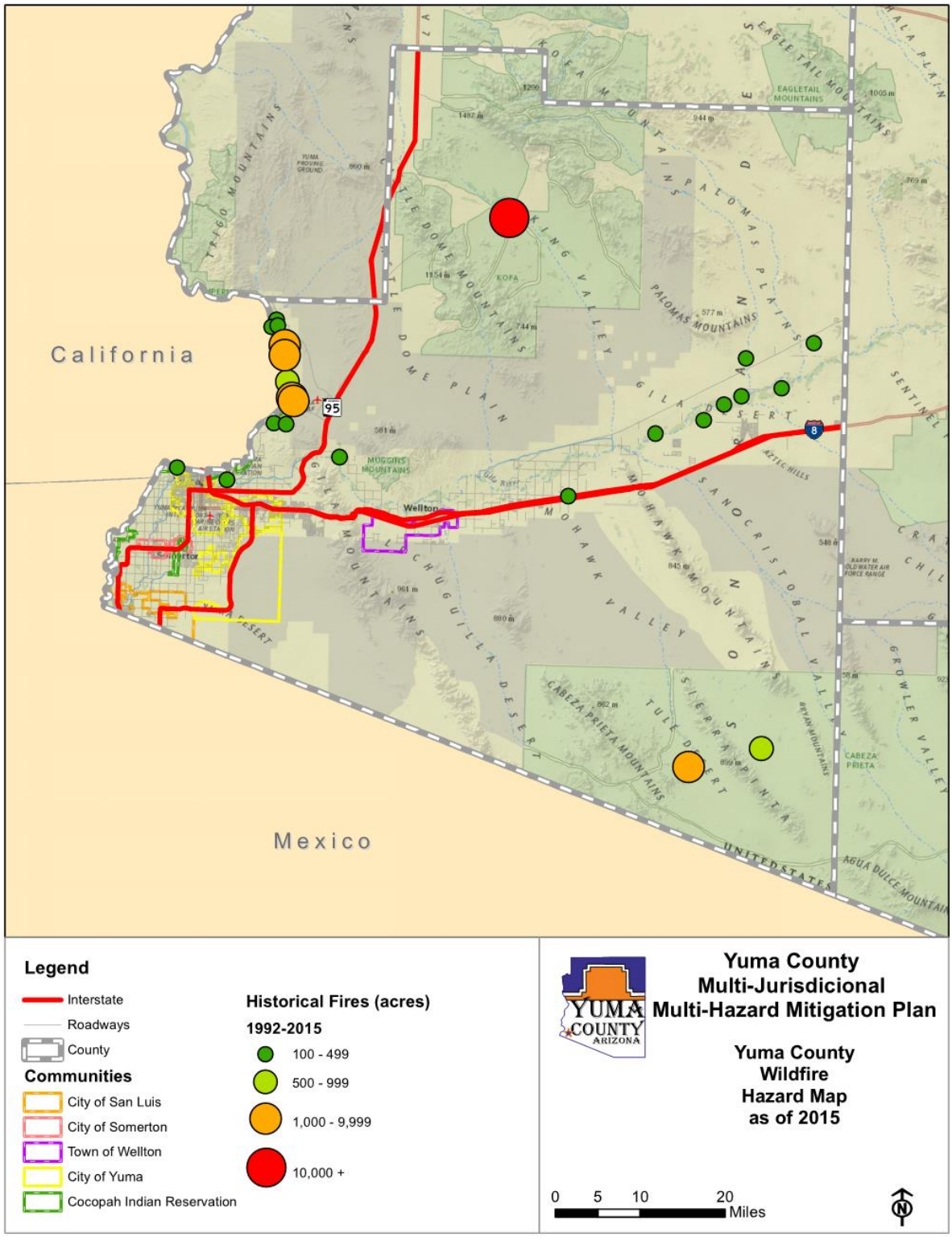

Figure 56. Yuma County Historic Wildfire Map, 2015

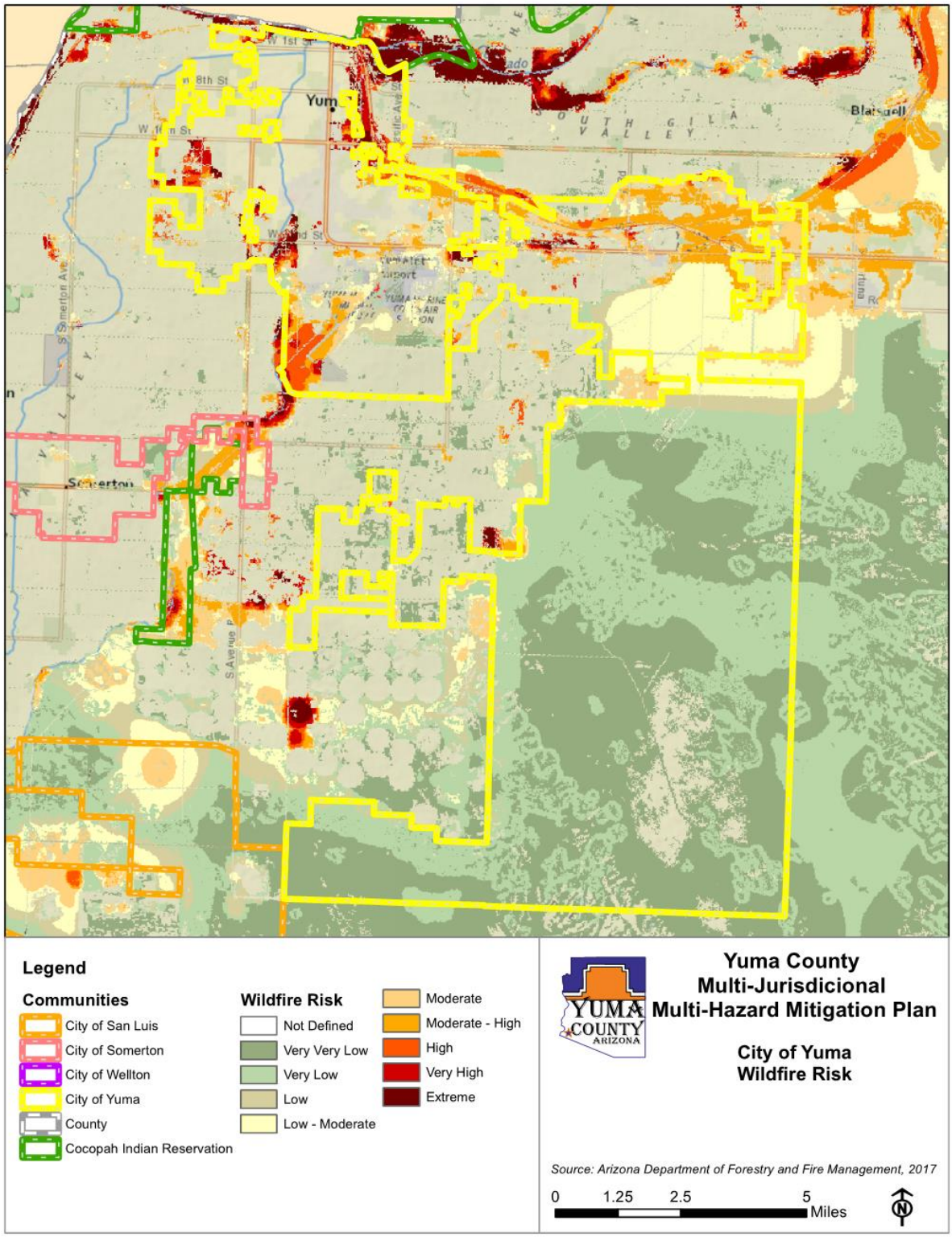

Figure 57. City of Yuma Wildfire Risk

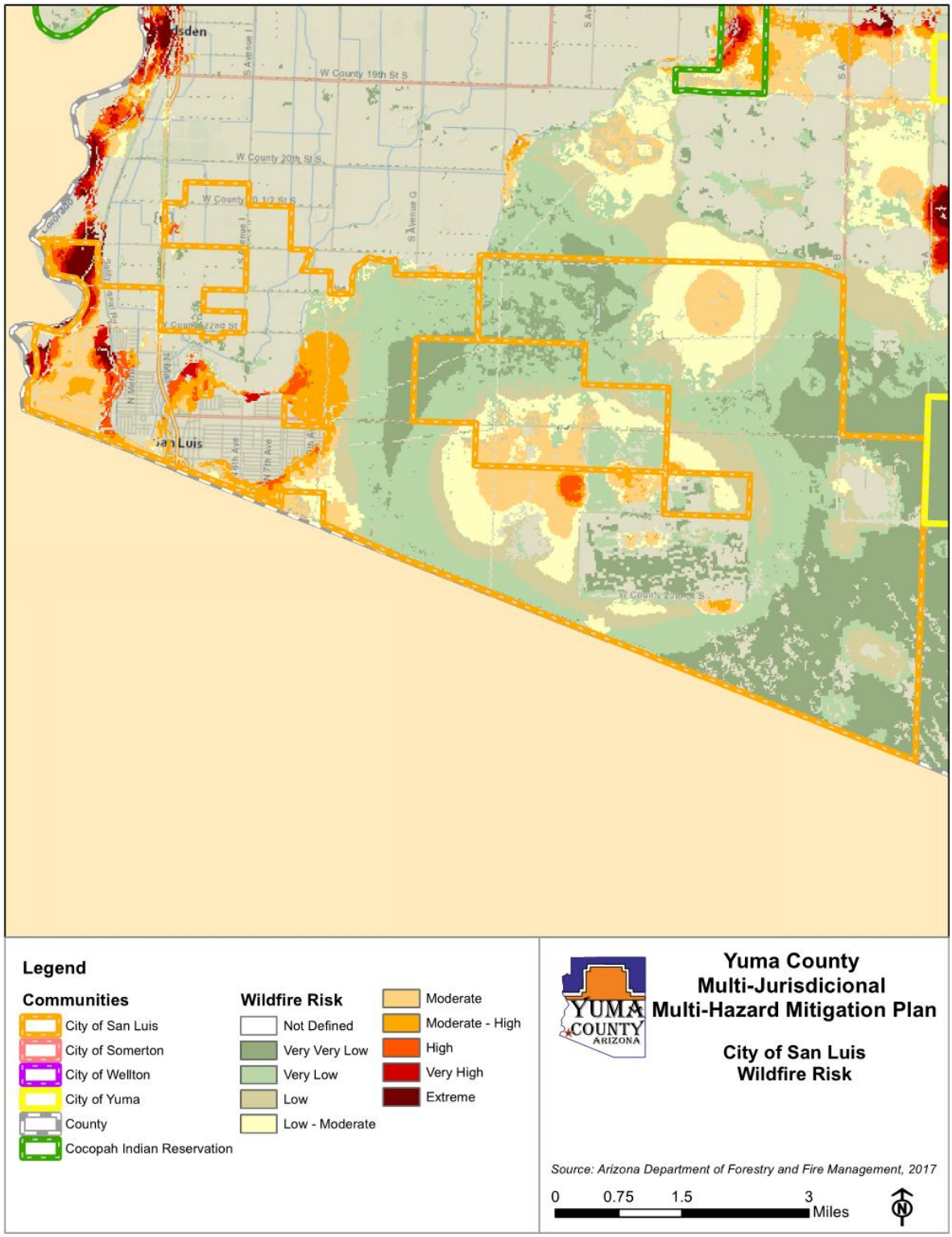

Figure 58. City of San Luis Wildfire Risk

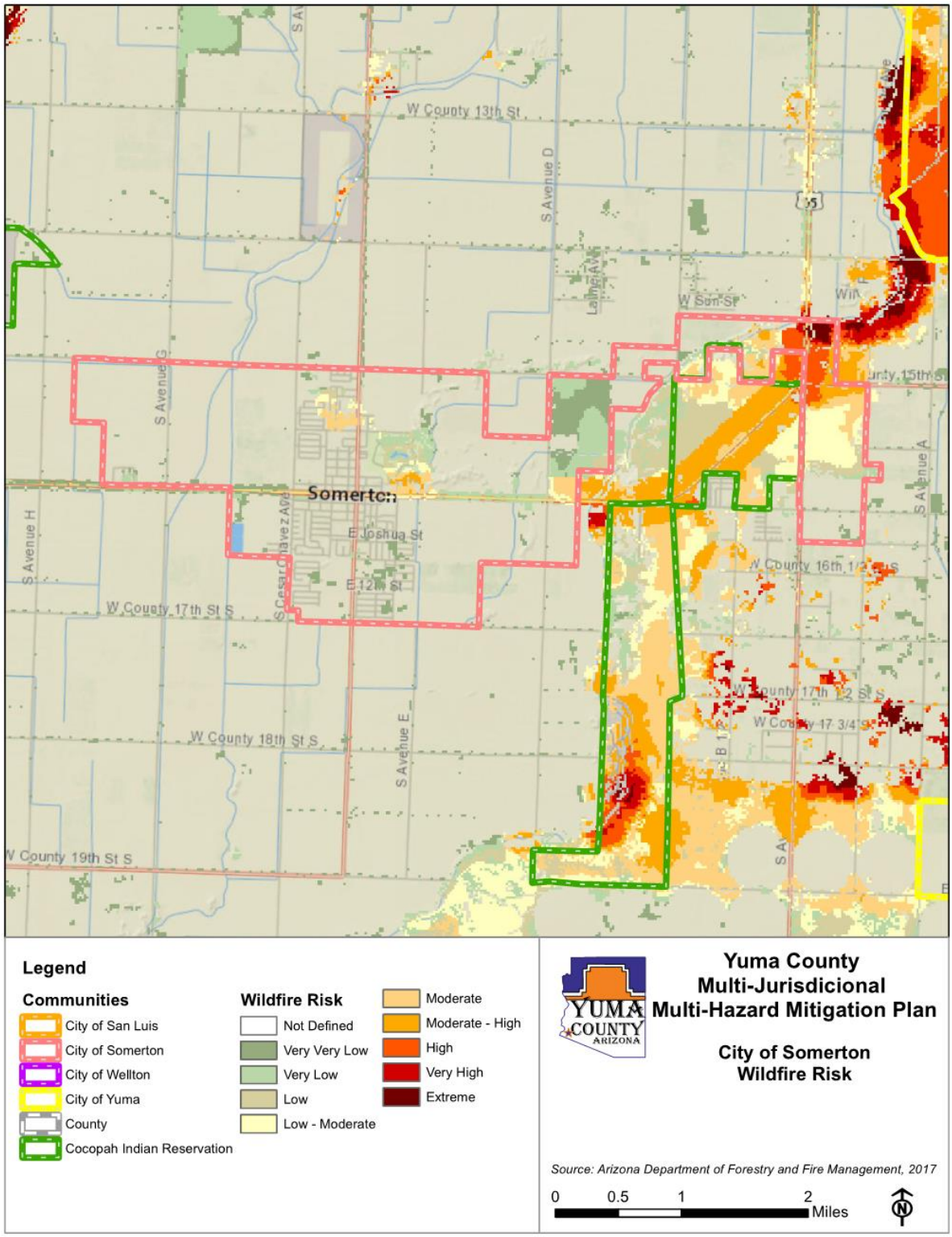

Figure 59. City of Somerton Wildfire Risk

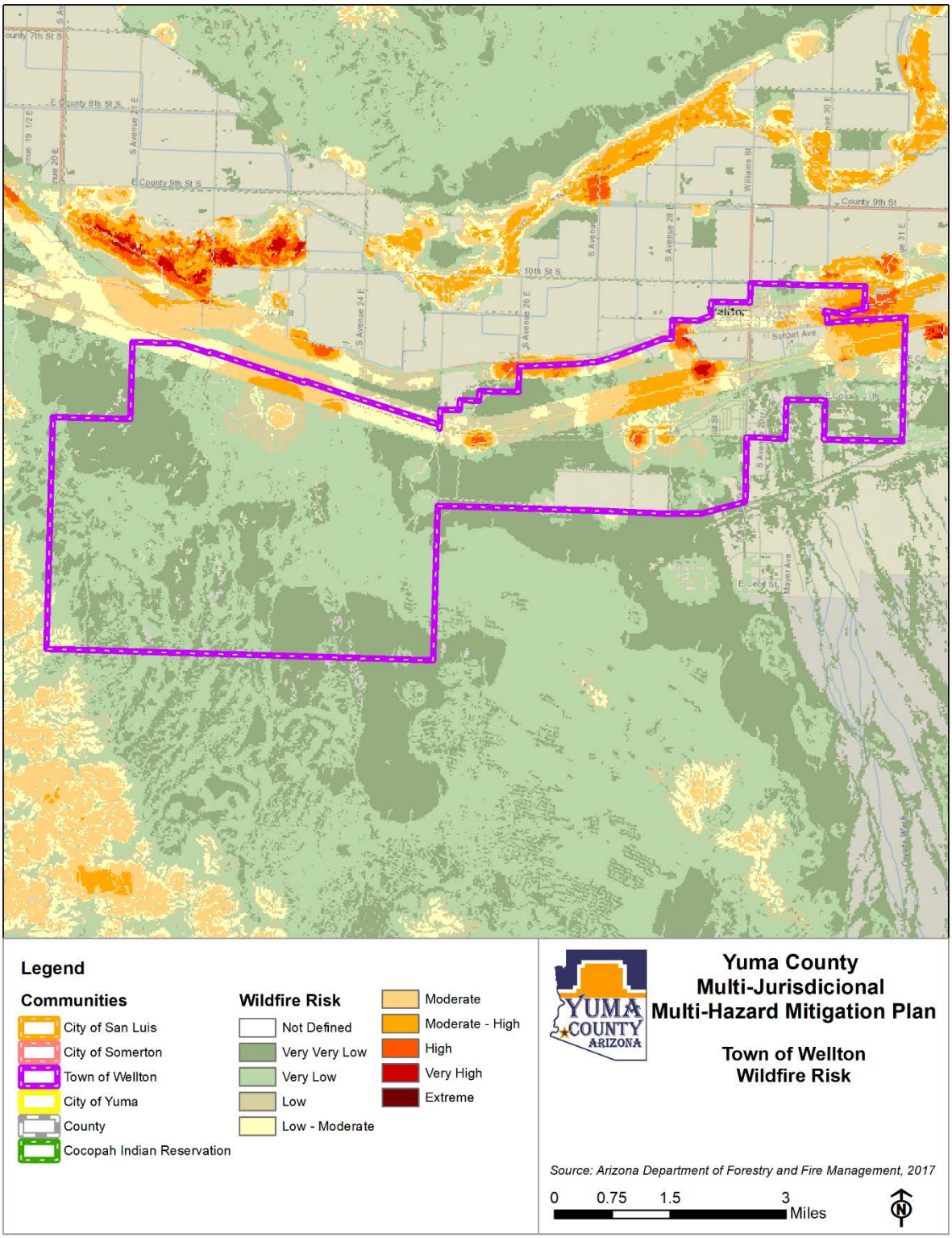

Figure 60. Town of Wellton Wildfire Risk

5.4 Risk Assessment Summary

The jurisdictional variability of risk associated with each hazard assessed in Section 5.3 is demonstrated by the various CPRI and loss estimation results. Accordingly, each jurisdiction has varying levels of need regarding the hazards to be mitigated, and may not consider all of the hazards as posing a great risk to their individual communities. Table 20 summarizes each community's overall risk ranking per hazard.

Table 5-19. Hazards to be Mitigated

Jurisdiction	Drought	Earthquake	Extreme Heat (Power Outage)	Flooding	Severe Wind / Dust Storms	Wildfire
Cocopah	M	H	H	H	H	H
San Luis	M	H	H	M	H	L
Somerton	M	H	H	M	H	L
Unincorporated Yuma County	M	M	H	M	H	L
Wellton	M	M	M	L	H	L
Yuma	L	H	H	M	M	L

The Cocopah Indian Tribe has used the 2010 plan to update identified deficiencies which were completed with the exception of two previous identified items. Both these items is being accomplished this year through a grant to purchasing a back-up generator for the community center (C-2 pg. 144) and drought plan and fire breaks are still being carried over and will be coordinated within their environmental protection office (C1, pg. 144).

SECTION 6: MITIGATION STRATEGY

The mitigation strategy includes mitigation measures that are likely to reduce or possibly remove the community's exposure to hazard risks. The primary components of the mitigation strategy are:

Goals and Objectives
Capability Assessment
Mitigation Actions/Projects and Implementation Strategy

The entire 2010 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 Goals and Objectives

An assessment of the 2010 goals and objectives was made by the Planning Team with consideration of the following[40]:

- Do the goals and objectives identified in the 2010 Plan reflect the updated risk assessment?
- Did the goals and objectives identified in the 2010 Plan lead to mitigation projects and/or changes and policy that helped the jurisdiction(s) to reduce vulnerability?
- Do the goals and objectives identified in the 2010 Plan support any changes in mitigation priorities?
- Are the goals and objectives identified in the 2010 Plan reflective of current State goals?

As a conclusion to the discussions, the Planning Team chose to continue utilizing the 2010 Mitigation Strategy to help focus the identification and development of new Mitigation Measures for this 2018 Plan. However, the Mitigation Strategy for the 2018 Plan reflects the increasing population and associated development, as well as the changes in hazards identified in the Risk Assessment.

Elements of this Mitigation Strategy are:

GOAL: Reduce or eliminate the risk to people and property from natural and human caused hazards.

- **Objective 1:** Reduce or minimize risks that threaten life and property in the incorporated, unincorporated, and Tribal jurisdictions within Yuma County.
- **Objective 2:** Reduce risk to critical facilities and infrastructure from natural hazards.
- **Objective 3:** Promote hazard mitigation throughout the incorporated, unincorporated, and Tribal jurisdictions within Yuma County.
- **Objective 4:** Increase public awareness of hazards and risks that threaten the incorporated, unincorporated, and Tribal jurisdictions within Yuma County.

6.2 Capability Assessment

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

- Legal and Regulatory Review – the legal and regulatory capabilities, including ordinances, codes, plans, manuals, guidelines, and technical reports that address hazard mitigation activities.
- Technical Staff and Personnel – and evaluation and description of the administrative and technical capacity of the jurisdiction's staff and personnel resources.

[40] FEMA, 2013, *Local Mitigation Planning Handbook*

- Fiscal Capability – 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 Measures – the final part of the capability assessment is a summary review of prior mitigation measures and/or projects that have been completed over the last five or so years.

The Planning Team reviewed the information provided in the 2010 Plan and decided to simply review and update the content, with only minor edits to the table structures. This assessment will serve as an updated baseline for each community's mitigation capabilities and helps to identify opportunities for future improvements, should resources become available. Currently, no jurisdiction has the ability to expand and improve on these existing capabilities. Additionally, the Cocopah Indian Tribe capabilities are consistent with the capabilities of the previous 2010 plan with no changes. The Cocopah Indian Tribe continues to work with other agencies by providing coordinated response to their Tribal land.

6.2.1 Jurisdictional Capabilities

The following Tables summarize the legal and regulatory mitigation capability for each jurisdiction. Three separate tables have been developed for each jurisdiction. The tables identify current codes; mitigation relevant ordinances; plans; studies/reports, staff/personnel resources, and the fiscal capability and budgetary tools available to each jurisdiction. Those tables are below:

Table 6-1. Legal/Regulatory Capabilities, San Luis

Regulatory	Description	Responsible Department/Agency
CODES	Uniform Fire Code - NFPA 1: 2003 National Electrical Code: 2008 Intl Property Maintenance Code: 2003 Intl Plumbing & Mechanical Codes 2006 Intl Building & Existing Building Codes 2003 Intl Residential Code for One & Two-Family Dwellings: 2003	San Luis Planning and Zoning Dept, Fire Dept
ORDINANCES	Zoning Ordinance Subdivision Ordinance Site Plan Review Requirements	City of San Luis, Planning and Zoning Dept Public Works Dept
PLANS, MANUALS, and/or GUIDELINES	San Luis General Plan Water System Master Plan Waste Water Master Plan Wellhead Protection Plan YMPO 2003-2026 Regional Transportation Plan	San Luis P&Z, revisit in 2020 San Luis Public Works YMPO
STUDIES	[Refer to Yuma County Capability Assessment for available studies that affect this community]	

Table 6-2. Technical Staff/Personnel Capabilities, San Luis

Staff/Personnel Resources	Department/Agency - Position
Planner/engineer with knowledge of land development/management practices	• Planning & Zoning Dept personnel • Public Works Dept personnel
Engineers/professional trained in construction practices related to buildings and/or infrastructure	• Planning & Zoning Dept personnel • Public Works Dept personnel
Planners or engineer with and understanding of hazards	• Planning & Zoning Dept personnel • Public Works Dept personnel • Fire/Police Dept personnel
Floodplain Manager	• Yuma Co Flood Control District Manager
Surveyors	• James Davey and Associates, Inc. – City Engineer
Staff with education or expertise to assess the community's vulnerability to hazards	• Planning & Zoning Dept personnel • Public Works Dept personnel • Fire/Police Dept personnel
Personnel skilled in GIS and/or HAZUS	• James Davey and Associates, Inc. – City Engineer • Planning and Zoning Dept – GIS Specialist
Grant writer(s)	• Economic Development and Grants Coordinator

Table 6-3. Fiscal Capabilities, San Luis

Financial Resources	Accessible or Eligible to Use?	Comments
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	
Impact fees for homebuyers or new developments/homes	Yes	
Incur debt through general obligation bonds	Yes	
Incur debt through special tax bonds	Yes	
Incur debt through private activity bonds	Yes	

Table 6-4. Legal/Regulatory Capabilities, Somerton

Regulatory	Description	Responsible Department/Agency
CODES	2003 International Bldg Code 2003 International Residential Code 2003 International Property Maintenance Code 1: Fire Code, 2012 Edition, NFPA 101: Life Safety Code, 2012 Edition National Electric Code 1994 Uniform Plumbing	Fire Dept Community Development Dept
ORDINANCES	Zoning Ordinance Adopted 2015 Subdivision Ordinance Adopted 2015	Community Development Dept
PLANS, MANUALS, and/or GUIDELINES	Emergency Response Plan 2006 City of Somerton General Plan 2010 Sewer Line Collection System Cleaning and Inspection 2009/2010	Fire Department Community Development Department Public Works Dept
STUDIES	[Please refer to Yuma County Capability Assessment Table 6-1-5 for available studies that affect this community.]	Yuma County

Table 6-5. Technical Staff/Personnel Capabilities, Somerton

Staff/Personnel Resources	Department/Agency - Position
Planner(s) or engineer(s) with knowledge of land development and land management practices	• Community Development Dept – Carmen Juarez, Director • Public Works Dept – Sam Palacios, Public Works Director
Engineer(s) or professional(s) trained in construction practices related to buildings and/or infrastructure	• Public Works Dept – Sam Palacios, Public Works Director • Engineering Consultant Firm, City Engineer
Planner(s) or engineer(s) with and understanding of natural and/or human-caused hazards	• Public Works Dept – Public Works Director • Engineering Consultant Firm
Floodplain Manager	• Sam Palacios, Public Works Director • Engineering Consultant Firm
Surveyors	• Engineering Consultant Firm
Staff with education or expertise to assess the community's vulnerability to hazards	• Public Works Dept • Fire Department • Police Department
Personnel skilled in GIS and/or HAZUS	• Community Development Dept/Public Works Dept
Emergency manager	• Paul De Anda, Fire Chief
Grant writer(s)	• Community Development Dept – Carmen Juarez, Director • Planning and Zoning Dept – Vacant no funding at this time, City Planner

Table 6-6. Fiscal Capabilities, Somerton

Financial Resources	Accessible or Eligible to Use?	Comments
Community Development Block Grants	Yes	
Capital Improvements Project funding	Yes (When grants are available)	

Authority to levy taxes for specific purposes	Yes	
Fees for water, sewer, gas, or electric service	Yes	
Impact fees for homebuyers or new developments/homes	Yes	

Table 6-7. Legal/Regulatory Capabilities, City of Yuma

Regulatory	Description	Responsible Department/Agency
CODES	Adopted IBC 2012 in April 2013 Adopted NFPA 1 Fire Code, NFPA 1, in October, 2003	Community Development /Building Safety Yuma Fire Dept /Community Risk Reduction
ORDINANCES	Floodplain, Stormwater, Industrial Waste, Water Emergencies, Zoning Ordinance, Subdivision and Site Plan Review Reqs, Disaster Declaration Ordinance	Engineering Dept Public Works/Streets Utilities Community Development Community Development City Administration
PLANS, MANUALS, and/or GUIDELINES	City of Yuma 2012 General Plan YMPO 2014-2037 Regional Transportation Plan Construction Standard Detail Drawings Floodplain Management Stormwater Management Program	Community Development Yuma Metropolitan Planning Organization Engineering Dept
STUDIES	[Refer to Yuma Co Capability Assessment Table 6-1-5 for available studies]	

Table 6-8. Technical Staff/Personnel Capabilities, City of Yuma

Staff/Personnel Resources	Department/Agency - Position
Planners or engineers with knowledge of land development/management practices	Community Development Dept – Laurie Lineberry Engineering Department – Andrew McGarvie
Engineers or professionals trained in construction practices related to buildings and/or infrastructure	Community Development Dept – Laurie Lineberry Building Official – Randy Crist
Planner or engineers with and understanding of natural and/or human-caused hazards	Community Development Dept – Jennifer Albers Engineering Dept – Andrew McGarvie
Floodplain Manager	Engineering Department – Andrew McGarvie
Surveyors	Engineering Department – Andrew McGarvie
Staff with education or expertise to assess the community's vulnerability to hazards	City and Co Emergency Management Engineering Dept Community Development Dept
Personnel skilled in GIS and/or HAZUS	Community Development Dept, Information Technology Services Dept
Scientists familiar with the hazards of the community	Lab WPCF Figueroa
Emergency manager	City and Co Emergency Management personnel
Grant writer(s)	Administration, Parks and Recreation Dept, Public Works Dept, Fire Dept

Table 6-9. Fiscal Capabilities, City of Yuma

Financial Resources	Accessible or Eligible to Use?	Comments
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 only
Impact fees for homebuyers or new developments/homes	Yes	Fees for new development only

Financial Resources	Accessible or Eligible to Use?	Comments
Incur debt through general obligation bonds	Yes	
Incur debt through special tax bonds	Yes	

Table 6-10. Legal/Regulatory Capabilities, Wellton

Regulatory	Description	Responsible Department/Agency
CODES	2009 International Building Code and Related Codes adopted 4/1/14, Ordinance #114 (supersedes previous codes.)	Town Manager
ORDINANCES	Town of Wellton Zoning Ordinance adopted 11/20/84, Ordinance #39 (with subsequent amendments). Uses Yuma Co Standards for Subdivisions	Town Manager
PLANS, MANUALS, and/or GUIDELINES	Town of Wellton General Plan 2013-2023 Emergency Operations Plans Storm Response Plan Water Emergency Operations Plan 2016 Adopted the AZ Emergency Response Plan on March 19, 1985 and the Water Dept Emergency Standard Operating Procedures in July 2014.	Town Manager Town Manager/Police Chief Town Manager Town Manager Town Manager
STUDIES	[Please refer to Yuma Co Capability Assessment Table 6-1-5 for available studies that affect this community.]	

Table 6-11. Technical Staff/Personnel Capabilities, Wellton

Staff/Personnel Resources	Department/Agency - Position
Planners or engineers with knowledge of land development and land management practices	Contract with consultants as needed.
Engineers or professionals trained in construction practices related to buildings and/or infrastructure	Town Engineer is appointed by the Town Council on 7/22/70, Ordinance #2 and ARS 9-238.
Planners or engineers with and understanding of natural and/or human-caused hazards	As directed/appointed by Town of Wellton Police Chief - received training as a Terrorism Liaison Office which includes training on vulnerability assessments for natural and human-caused hazards.
Floodplain Manager	The Town of Wellton is under the jurisdiction of the Yuma Co Flood Plain District.
Surveyors	Town Manager
Staff with education or expertise to assess the community's vulnerability to hazards	Town Manager Police Chief
Personnel skilled in GIS and/or HAZUS	Mutual Aid
Scientists familiar with the hazards of the community	As needed by contract.
Emergency manager	Town of Wellton Chief of Police
Grant writer(s)	As directed by Town Manager/Council

Table 6-12. Fiscal Capabilities, Wellton

Financial Resources	Accessible or Eligible to Use?	Comments
Community Development Block Grants	Yes	We are eligible for CDBG funds every other year as outlined in our Method of Distribution developed by WACOG and approved by the AZ Dept of Housing.

Financial Resources	Accessible or Eligible to Use?	Comments
Capital Improvements Project funding	Yes	Subject to voter approval.
Authority to levy taxes for specific purposes	Yes	Subject to voter approval.
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	Subject to voter approval
Incur debt through special tax bonds	Yes	

Table 6-13. Legal/Regulatory Capabilities, Unincorporated Yuma County

Regulatory	Description	Responsible Department/Agency
CODES	2012 Intl Existing Bldg Code adopted 6/17/2013 2003 Intl Fire Code adopted 5/16/05 2012 Intl Residential Code adopted 6/17/2013 2009 Intl Energy Conservation Code adopted 6/17/2013 2012 Intl Mechanical Code adopted 10/5/2015 2012 Intl Fuel Gas Code adopted 10/5/2015 2012 Intl Plumbing Code adopted 10/5/2015 2006 Intl Code Council Electric Code Administrative Provisions adopted 7-20-09 2014 Natl Electric Code adopted 10/5/2015	Yuma Co Dept of Development Services, Building Safety Division
ORDINANCES	*Yuma Co Zoning Ordinance* adopted Aug 20, 2006 amendments through Apr 20, 2017 *Yuma Co Subdivision Zoning Ordinance* approved Sept 15, 2008 with amendments thru Jan 20, 2015	Yuma Co Planning and Zoning
	Yuma Co AZ Floodplain Regulations, Yuma Co Flood Control District adopted Feb 1984, rev Mar 3, 1997; rev Aug 2005, Aug 2006, Nov 5, 2012 *Public Works Standards for Yuma Co Volume III Guide for Preparation of Drainage Reports and Grading Plan, revised Aug 2005, Aug 21,2006*	Yuma Co Flood Control District
PLANS, MANUALS and/or GUIDELINES	*Yuma Co 2020 Comprehensive Plan* adopted Mar 26, 2012 Amendments thru Jan 2017 *Master Plan for Yuma Co Roads* adopted Aug 1, 1998 *Public Works Standards for Yuma Co Vol I, Construction Standards* adopted July 18, 1988 *Public Works Standards Volume II, Specifications* adopted Sept 7, 1993 *Public Works Standards Volume III Guide for Preparation of Drainage Reports and Grading Plan* adopted Apr 1, 1996, updated 2005, Aug 21, 2006	Yuma Co Planning and Zoning

Table 6-14. Technical Staff/Personnel Capabilities, Unincorporated Yuma County

Staff/Personnel Resources	Department/Agency - Position
Planner(s) or engineer(s) with knowledge of land development and land management practices	Yuma Co Dept of Development Services, Engineering Division (Co Engineer) and Yuma Co Planning and Zoning Division (Planning Director)
Engineer(s) or professional(s) trained in construction practices related to buildings and/or infrastructure	Yuma Co Dept of Development Services, Engineering Division (Co Engineer) and Building Safety (Chief Building Official) and Yuma Co Planning and Zoning Division (Planning Director)
Planner(s) or engineer(s) with and understanding of natural and/or human-caused hazards	Yuma Co Dept of Development Services, Engineering Division, Building Safety and Flood Control (Co Engineer and Chief Building Official) and Yuma Co Planning and Zoning Division (Planning Director)
Floodplain Manager	Yuma Co Dept of Development Services, Engineering Division, Flood Control Manager

Staff/Personnel Resources	Department/Agency - Position
Staff with education or expertise to assess the community's vulnerability to hazards	Yuma Co Dept of Development Services, Engineering Division (Co Engineer) and Yuma Co Planning and Zoning Division (Planning Director)
Personnel skilled in GIS and/or HAZUS	Yuma Co Dept of Development Services, GIS Division, GIS Supervisor
Scientists familiar with the hazards of the community	US Department of Agriculture, Yuma Co Natural Resources Conservation District
Emergency manager	Yuma Co Office of Emergency Management
Grant writer(s)	Yuma Co Dept of Development Services, Grants Section, Community Planning Coordinator and Grants Administrator

Table 6-15. Fiscal Capabilities, Unincorporated Yuma County

Financial Resources	Accessible or Eligible to Use?	Comments
Community Development Block Grants	Yes	Only in qualified low income to medium income communities and emergency declaration designated areas.
Capital Improvements Project funding	Yes	
Authority to levy taxes for specific purposes	Yes	For declared emergencies.
Incur debt through general obligation bonds	Yes	Only through a bond election.
Incur debt through special tax bonds	Yes	
Withhold spending in hazard-prone areas	Yes	
Other	Yes	Creation of improvement districts and special districts.

Table 6-16. Legal/Regulatory Capabilities, Cocopah Indian Tribe

Regulatory	Description	Pre or Post Disaster	Responsible Department/Agency
Codes	2003 Int'l Building Code Commercial & Residential 2003 Int'l Property Maintenance Code 2003 Uniform Fire Code (UFC Fire Protection , NFPA Life Safety Code) 1996 National Electric Code 1994 Uniform Plumbing Code	Pre and Post	We use Somerton Building Inspector when needed (They use their codes) Cocopah Housing Department
Ordinances	Review and administration through Cocopah Planning Dept and Tribal Council Federal EPA enforcement of pesticides BIA Fire Ordinance Site Plan Review – Cocopah Indian Housing & Development Corp	Pre and Post	Planning Environmental Protection Office Office of Emergency Management/Planning Housing Department
Regulations	Cocopah Development Code (in development)	Pre and Post	Planning
Plans, Manuals, Guidelines	2012 Emergency Response Plan	Pre and Post	Cocopah OEM

Table 6-17. Technical Staff/Personnel Capabilities, Cocopah Indian Tribe

Staff/Personnel Resources	Department/Agency - Position
Planners or engineers with knowledge of land development and land management practices	Cocopah Planning Dept – Director & Assistant Planner Cocopah Planning and Business Development – Manager
Engineers or professionals trained in construction practices related to buildings and/or infrastructure	Outside consultants Somerton Building Inspector
Planners or engineers with and understanding of natural and/or human-caused hazards	Environmental Protection Office – Director Office of Emergency Mgmt - Emergency Manager Police Department - Chief
Floodplain Manager	Environmental Protection Office – Director
Surveyors	Outside consultant
Staff with education or expertise to assess the community's vulnerability to hazards	Environmental Protection Office – Director Public Works Department – Director Police Department – Chief Cocopah/Somerton Fire Department – Chief Office of Emergency Mgmt – Director
Personnel skilled in GIS and/or HAZUS	Planning Department – Assistant Planner Cultural Resources Office - Manager
Scientists familiar with the hazards of the community	Environmental Protection Office – Director Cultural Resources Office - Manager
Emergency manager	Office of Emergency Mgmt – Director
Grant writer(s)	Each department has responsibilities for grants and reliance on outside consultants.
Others	Casino Security – Chief of Casino Security

Tribal regulatory tools such as regulations and laws related to hazards and hazard mitigation have not significantly changed. However, some programs have changed such as losing grant office and grants writer. As a result, each department now handles grant writing and management themselves.

6.2.2 Tribal Funding Sources

Financial tools or resources that the Cocopah Tribe could potentially use to help fund mitigation activities and loss prevention are discussed in this section. During the development of this Plan, the Tribe conducted an assessment of the funding capabilities for hazard mitigation projects. A list of existing and potential funding sources was developed and analyzed. The other funding sources may potentially be used in the future to fund mitigation efforts.

Existing Funding Sources

- Bureau of Indian Affairs: Assistance with fire suppression and fire breaks
- Bureau of Land Management: Assistance with fire suppression and fire breaks
- Tribal Homeland Security Grant Program: Back-up generator for community center (cooling and sheltering), emergency planning, training, education, and exercises.
- Indian Environmental General Assistance Program (GAP): Fire breaks and brush clearing
- Tribal general funds: Labor costs, equipment, fire breaks and brush clearing, maintain facilities for sheltering and cooling, emergency planning, training, education, and exercises.
- Public Works: Lift stations for generators

Potential Funding Sources

- Emergency Management Performance Grant
- U.S. Army Corp of Engineers
- Public Health Emergency Preparedness (PHEP) spell out
- FEMA Pre-Disaster Mitigation Grants
- FEMA Hazard Mitigation Grant Program (HMGP)
- Indian Health Service
- U.S. Dept of Interior Healthy Forests Restoration Act (HFRA)
- U.S. Dept of Agriculture Natural Resources Conservation Service (NRCS)
- U.S. Dept of Agriculture Farm Service Agency
- Community Development Block Grants
- Capital improvement project funding
- Gaming Funds
- Private funds

6.2.3 Historical Mitigation Activities

An updated summary, by jurisdiction, of historical mitigation activities completed over previous planning cycles are included in a database to track all mitigation measures. This database 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 2010 A/Ps), will be migrated into the database. An update on progress from 2010 (A/Ps) is currently included in Section 6.3.1 Previous Mitigation Measures of this Plan.

6.3 Mitigation Measures and Implementation Strategy

Mitigation measures 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.

The implementation strategy addresses the "*how, when, and by whom?*" questions related to implementing an identified measure.

The update process for defining the new list of mitigation measures for the Plan was accomplished in three steps. First, an assessment of the measures and projects specified in Section 6 of the 2010 Plan was performed, wherein each jurisdiction and the Cocopah Tribe reviewed and evaluated their jurisdiction or Tribe specific list. Second, a new list of measures for the Plan was developed by combining the carry forward results from the assessment with new identified measures. Third; an implementation strategy for the combined list of measures was formulated. Details of each step and the results of the process are summarized in the following sections.

6.3.1 Previous Mitigation Measures Assessment

The jurisdictions and Tribe reviewed and assessed the measures identified in the 2010 Plan. The assessment included evaluating and classifying each of the previously identified measures based on the following criteria and the results can be found in the Appendices:

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

6.3.2 New Mitigation Measures and Implementation Strategy

Upon completion of the risk assessment, the jurisdictions and Tribe developed new measures 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 communities/Tribe.

For each measure, the following elements were identified:

- **ID No. –** a unique alpha-numeric identification number for the measure.
- **Mitigation Action / Project Description –** a brief description of the measure including a supporting statement that tells the "what" and "why" reason for the measure.
- **Hazard(s) Mitigated –** a list of the hazard or hazards mitigated by action.
- **Estimated Costs –** cost estimates that may be a dollar amount or estimated as staff time.
- **Priority Ranking –** measures were assigned a ranking of either "High", "Medium", or "Low".
- **Primary Agency / Job Title Responsible for Implementation –** the agency, department, or other entity that has responsibility for the measure and its implementation.
- **Anticipated Completion Date –** best available estimates for implementation
- **Status –** new, in-progress, or on-going

Once the full list of measures was identified, jurisdictions were then asked to help to prioritize each one. During the final Mitigation Strategy Workshop, Planning Team members were presented with ideas and tools relating to measure prioritization. FEMA's STAPLEE method was included in these discussions, as was the need to ensure measure costs versus benefits were considered 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 straightforward process that assessed how well the measures satisfied the following considerations:

- A favorable benefit vs cost evaluation
- A direct beneficial impact on the ability to protect life and/or property from hazards
- A mitigation solution with a long-term effectiveness

The following table lists measures identified by the Planning Team for this 2018 Plan update. The potential funding sources listed in the table below for each measure are in addition to possible FEMA and federal Tribal funding sources, listed below.

- FEMA Hazard Mitigation Grant Program (HMGP): The HMGP supports cost-effective post-disaster projects. The purpose of the HMGP is to help communities implement hazard mitigation measures following a Presidential Major Disaster Declaration in the areas of the State, Tribe, or Territory requested by the Governor or Tribal Executive. The key purpose of this grant program is to enact mitigation measures that reduce the risk of loss of life and property from future disasters.
- FEMA Pre-Disaster Mitigation Grant Program (PDM): The PDM program is designed to assist States, U.S. Territories, Federally-recognized tribes, and local communities in implementing a sustained pre-disaster natural hazard mitigation program. The goal is to reduce overall risk to the population and structures from future hazard events, while also reducing reliance on Federal funding in future disasters.
- FEMA Flood Mitigation Assistance Grant Program (FMA): The FMA is authorized under the NFIP, as amended, with the goal of reducing or eliminating claims under the NFIP. FMA provides funding to States, Territories, federally-recognized tribes and local communities for projects and planning that reduces or eliminates long-term risk of flood damage to structures insured under the NFIP.
- FEMA Emergency Management Performance Grant Program (EMPG): Under the National Preparedness System, the EMPG supports the building, sustainment, and delivery of core capabilities essential to achieving the National Preparedness Goal of a secure and resilient nation.
- FEMA Tribal Homeland Security Grant Program (THSGP): Under the National Preparedness System, the THSGP supports the building, sustainment, and delivery of core capabilities essential to achieving the National Preparedness Goal of a secure and resilient nation.
- EPA Indian Environmental General Assistance Program (GAP): The EPA provides GAP grants to federally recognized tribes and tribal consortia for planning, developing and establishing environmental protection programs in Indian country, and for developing and implementing solid and hazardous waste programs on tribal lands.

Table 6-18. 2018 Mitigation Measures

ID No.	Description	Hazard(s) Mitigated	Estimated Cost & Completion	Potential Funding Source(s)	Priority Ranking	Primary Agency	Status
Cocopah Tribe							
2018.01	Bury canal system that runs through the reservation. (East & West Reservation)	Flooding	$$$ 2023	PDM	H	OEM	New
2018.02	Develop reservation-wide drought plan.	Drought	$ 2021	EPO, GAP grant	M	OEM	New
2018.03	Identification and Mapping of fault lines on reservation through AZGS. Identify areas of seismic risk for future development and existing buildings.	Earthquake	$ 2021	Tribal General Fund	H	OEM	New
2018.04	Annual Heat awareness community meetings. Brochures passed out. If power outage where to seek refuge.	E Heat	$ 2020	Tribal Depts, PHEP	H	OEM	New
2018.05	Tribe will develop outreach/awareness program for protect homes and what to do when a high wind warning is posted. At home and out driving. Deliver reservation wide.	Severe Wind	$ 2020	Existing staff Cocopah Emergency Response Team, EMPG	H	OEM	New`
2018.14	Secure utility sites (water, sewer lift stations).	Multi-hazard	$$ 2023	THSP, Public Works, Tribal General Fund	H	Public Works	New
C-2	Provide Emergency back-up power to critical facility (Cocopah Community Center): Emergency generators, secondary feeds, portable generators with standard camlock connections so power can be maintained in emergency shelters and public safety offices.	Multi-hazard	$$ 2020	THSP, Tribal General Fund	H	OEM, SCFD	On-going
C-3	Maintain Fire Breaks on North Reservation and in riparian area of West Reservation to minimize damage from wildfires. Continue to identify other areas for treatment and maintenance.	Wildfire	$ 2020	BIA, BLM, EPO, GAP, Tribal General Fund	H	BIA / EPO / manpower	On-going
2018.17	Wire critical facilities with transfer switches to ease installations of temporary backup generators	Multi-hazard	$$$ 2023	THSG	H	OEM	New

ID No.	Description	Hazard(s) Mitigated	Estimated Cost & Completion	Potential Funding Source(s)	Priority Ranking	Primary Agency	Status
2018.18	Backup power for Cocopah Hotel Resort to serve as community disaster shelter and cooling	Multi-hazard	$$$ 2023	Hotel/ Casino, Tribal General Fund	H	OEM	New
San Luis							
2018.01	Improve interoperability, technology use, and communications with U.S. and Mexico (radio, 911, video, etc).	Multi-hazard	$$ 2023	SHSGP Grant, Yuma Regional Communication System operating budget; City of San Luis operating budget; Yuma Co OEM operating budget; Mexico	H	Fire / Police / IT	New
2018.02	Coordinate with Federal agencies to mitigate delays of border crossings, improve EM access, enhance commerce, and streamline crossing by expanding facilities/infrastructure.	Multi-hazard	$ 2023	U.S. Dept of Homeland Security; GSA; City of San Luis operating budget; Yuma Co operating budget	M	Public Works / Fire / Police	New
2018.03	Conduct HazMat and police training & coordination exercises.	Multi-hazard	$ 2023	City of San Luis operating budget; SHSGP Grant; HMEP Grant Funding	H	Fire / Police	New
2018.04	Support border 2020 mission & goals.	Multi-hazard	$$ 2023	City of San Luis operating budget; Border 2020 operating budget; Yuma Co operating budget; EMPG Grant	L	Fire / Police	New
2018.05	Coordinate with local/state/Federal/Mexico on improving regional air quality.	Multi-hazard	$ 2023	City of San Luis operating budget; Border 2020 operating budget; ADEQ	M	Development Services / Public Works	New
2018.06	Development of multiple-area cooling stations.	Extreme Heat	$ 2023	City of San Luis operating budget; Yuma Co OEM operating budget; American Red Cross	M	Fire / Yuma County Public Health	New
2018.07	Water system reliability and redundancy improvements.	Extreme Heat	$$$ 2023	City of San Luis operating budget	H	Public Works	New
2018.08	Secure utility sites (water, sewer lift stations).	Multi-hazard	$$ 2023	City of San Luis operating budget	M	Public Works / IT / Police	New

ID No.	Description	Hazard(s) Mitigated	Estimated Cost & Completion	Potential Funding Source(s)	Priority Ranking	Primary Agency	Status
2018.09	Conduct an egress / supply routes assessment.	Multi-hazard	$ 2023	ADOT; City of San Luis operating budget; Yuma Co operating budget; Highway User Funds	M	Public Works / Fire	New
2018.10	Develop community specific emergency plans.	Multi-hazard	$ 2023	City of San Luis operating budget; Yuma Co OEM operating budget	H	Fire / Police / Public Works / City Administration	New
2018.11	Increase public safety response by identifying alternate facilities to ensure continuity.	Multi-hazard	$ 2023	City of San Luis operating budget	M	Police / Fire / IT	New
2018.12	Increase public awareness and community outreach to include multi-hazard planning.	Multi-hazard	$ 2023	City of San Luis operating budget; Yuma Co OEM operating budget	M	Fire / Police	New
2018.13	Work on maximizing local emergency broadcast system participation.	Multi-hazard	$ 2023	City of San Luis operating budget; Yuma OEM operating budget	M	Yuma County EM / City Administration / PIO / Fire / Police	New
SL-1	Update construction codes (NFPA1, UBC, UMC, UPC,UEC, etc) within appropriate cycles to ensure adequate design of new facilities. Enforce updated codes to modifications of existing structures.	Earthquake Severe Wind, Wildfire	- On-going	City of San Luis operating budget	M	Development Services / Fire	On-going
SL-3	Continue to review effects of participation in the National Flood Insurance Program (NFIP), specifically; the costs of insurance and the ability to market/sell property real property within identified area. The anticipated area is among the oldest developed area of the city and may result in the inability of homeowners to sell, refinance or simply occupy residences, based on the costs and availability of flood insurance.	Flooding	- On-going	City of San Luis operating budget; Yuma Co Development Services operating budget	M	Development Services / City Administration	On-going

ID No.	Description	Hazard(s) Mitigated	Estimated Cost & Completion	Potential Funding Source(s)	Priority Ranking	Primary Agency	Status
SL-4	Continue involvement with AZ Department of Transportation and US Customs to maintain awareness of product and goods transported through both ports of entry (POE 1 and 2). Continue training and education of personnel and the purchase of appropriate equipment to support emergency response to any incidents or events within the US POEs or the AZ-DOT Inspection Station.	Multi-hazard	- On-going	ADOT operating budget; City of San Luis operating budget; U.S. Dept of Homeland Security; Government Services Administration	M	Fire	On-going
SL-5	Water Conservation and Public Education: Develop and distribute brochures outlining the advantages of water conservation to City water-users	Drought	- On-going	City of San Luis operating budget	M	Public Works	On-going
SL-6	Water Rights Acquisition: Assurance of water supply through acquisition of senior Colorado River Water Rights with retirement of agricultural lands	Drought	- On-going	City of San Luis operating budget; Yuma Co operating budget	M	Public Works	On-going
SL-7	Transportation Planning Agency Coordination: Continue to coordinate and participate with inter-agency transportation planning groups such as the Yuma Metropolitan Planning Organization, Greater Yuma Port Authority, Yuma Marine Corps Air Station, and Arizona Department of Transportation	Multi-hazard	- On-going	City of San Luis operating budget; Yuma Co Yuma Metropolitan Planning Organization; Greater Yuma Port Authority, Yuma Marine Corps Air Station; ADOT	M	Development Services / Public Works / Fire Department	On-going
SL-8	Seismic Building Code Enforcement: Continue to enforce seismic requirements in current building codes	Earthquake	- On-going	City of San Luis operating budget; Yuma Co Development Services operating budget	M	Development Services / Public Works / Fire Department	On-going
SL-9	Enforcement of Zoning and Building Code Ordinance: Continue to enforce zoning and building codes through current site plan, subdivision, and building permit review processes to reduce the effects of flood, thunderstorm/high wind, earthquake, transportation and other hazards on new buildings and infrastructure	Earthquake Flooding, Severe Wind, Wildfire	- On-going	City of San Luis operating budget; Yuma Co Development Services operating budget	M	Development Services / Public Works / Fire Department	On-going

ID No.	Description	Hazard(s) Mitigated	Estimated Cost & Completion	Potential Funding Source(s)	Priority Ranking	Primary Agency	Status
SL-10	Wildfire Mitigation Cooperation: Coordinate/cooperate with BLM/BOR wildfire mitigation activities along the Colorado River	Wildfire	- On-going	City of San Luis operating budget; Yuma Co operating budget; U.S. Bureau of Land Management; U.S. Dept of Interior- Bureau of Reclamation; AZ Forestry	M	Development Services / Public Works / Fire Department	On-going
Somerton							
2018.01	South drainage tie-in design and implementation	Flooding	$$ 2023	City of Somerton operating budget; Yuma Co operating budget	H	Public Works / Yuma County Flood District	New
2018.02	Develop an education campaign, particularly addressed to vulnerable populations, of the impacts of extreme heat and location of available cooling centers (recreation center) in the case of an extreme heat event.	Extreme Heat	$ 2023	City of Somerton operating budget; Yuma Co OEM operating budget; American Red Cross	M	Parks and Rec	New
2018.03	Installation of air conditioning in recreation center (cooling center & shelter)	Extreme Heat	$$ 2023	City of Somerton operating budget	H	Parks and Rec	New
2018.04	Installation of back-up power for recreation center (cooling center and shelter) and City Hall (continuity of operations)	Multi-hazard	$$ 2023	City of Somerton operating budget	H	Public Works / Community Development	New
2018.05	Install lift station and well generator at municipal water facility	Drought	$$ 2023	City of Somerton operating budget	M	Public Works	New
2018.06	Extend water supply to residential and commercial areas (currently well water)	Drought and extreme heat	$$$ 2023	City of Somerton operating budget	M	Public Works	New
2018.07	Removal of remaining asbestos from municipal water lines	Earthquake and health Issues	$$ 2023	City of Somerton operating budget; U.S. EPA; ADEQ	L	Public Works	New
2018.08	Enhance code enforcement for outdated electrical systems of private residences.	Extreme Heat	$$ 2023	City of Somerton operating budget	L	Community Development	New

ID No.	Description	Hazard(s) Mitigated	Estimated Cost & Completion	Potential Funding Source(s)	Priority Ranking	Primary Agency	Status
2018.09	Coordinate existing private septic systems to hook into City sewer infrastructure	Drought	$$ 2023	City of Somerton operating budget; Yuma Co Development Services operating budget	L	Community Development / Public Works	New
2018.10	Upgrade emergency operations center (technology - phones, computers, network)	Multi-hazard	$$ 2023	City of Somerton operating budget; AZ Dept of Homeland Security	H	Police	New
2018.11	Conduct fire training & coordination exercises.	Wildfire	$ 2023	City of Somerton operating budget; SHSGP Grant; HMEP Grant Funding	L	Fire	New
2018.12	Develop additional fire station on eastern side (in coordination with San Luis)	Wildfire	$$$ 2023	City of Somerton operating budget	M	Fire	New
2018.13	Purchase mobile police command post.	Multi-hazard	$$$ 2023	City of Somerton operating budget; SHSGP Grant Funding	M	Police	New
2018.14	Water Rights Acquisition: Assurance of water supply through acquisition of senior Colorado River Water Rights with retirement of agricultural lands	Drought	$$$ 2023	City of Somerton operating budget; Yuma Co operating budget	L	Community Development	New
2018.15	Secure utility sites (water, sewer lift stations).	Earthquake and flood	$$ 2023	City of Somerton operating budget	H	Public Works	New
2018.16	Expansion of existing radio tower from 80' to 100'	Multi-hazard	$$ 2023	City of Somerton operating budget; SHSGP Grant; Yuma Regional Communication System operating budget	M	Public Works	New
2018.17	Prewire critical facilities with transfer switches to ease installations of temporary backup generators	Earthquake and extreme heat	$$ 2023	City of Somerton operating budget; SHSGP Grant; Yuma Regional Communication System operating budget	M	Community Development	New
2018.18	Update Emergency Operations Plan	Multi-hazard	$ 2023	City of Somerton operating budget; SHSGP Grant;	M	Fire / Police	New

ID No.	Description	Hazard(s) Mitigated	Estimated Cost & Completion	Potential Funding Source(s)	Priority Ranking	Primary Agency	Status
				Yuma Co OEM operating budget			
2018.19	Adopt building Code enforcement to enforce current codes to reduce the effects of earthquake and severe wind hazards on new and remodeled buildings	Earthquake, Severe Winds	- On-going	City of Somerton operating budget; Yuma Co Development Services operating budget	M	Community Development	On-going
2018.20	Enforcement of low water use fixture requirements for new residential/commercial buildings in current plumbing codes to reduce the demand on acquiring additional water resources.	Drought	- On-going	City of Somerton operating budget	M	Community Development	On-going
Wellton							
2018.01	Complete installation/linkage of back-up generator to potable water supply system.	Multi-hazard	$$ 2020	Town of Wellton operating budget	H	Town Administration	New
2018.09	Develop an education campaign of the impacts of extreme heat and available cooling centers within Wellton and Yuma County in the case of an extreme heat event. Ensure the education campaign reaches vulnerable populations to extreme heat, such as the elderly, children, and populations with chronic illness.	Extreme Heat	$ 2023	Yuma County Public Health	L	Town Administration	New
W-2	Continual enforcement of zone and building codes through current site plans, subdivision, and building permit review process to reduce the effects of disasters on new buildings and infrastructure.	Earthquake Flooding, Severe Wind, Wildfire	- On-going	Town of Wellton operating budget	M	Town Code Enforcement Officer	On-going
W-4	Adopt building Code Enforcement for new and existing residential and commercial developments to minimize structural damages due to seismic and wind events.	Earthquake, Sever Wind	- 2020	Town of Wellton operating budget	M	Town Administration / Code Enforcement Officer /Planning & Zoning.	In Process
W-5	Local Area Drainage Study- perform local area drainage studies to determine vulnerability of identified streets to understand and implement drainage needs and improvements.	Flooding	- On-going	Yuma County Flood District; Town of Wellton operating budget	M	Yuma County Flood District / Town Public Works / Highway Dept	On-going

ID No.	Description	Hazard(s) Mitigated	Estimated Cost & Completion	Potential Funding Source(s)	Priority Ranking	Primary Agency	Status
W-6	Enforcement of Nuisance Abatement Ordinance-continual enforcement of current nuisance abatement ordinance for control of weeds, debris and flammable materials within Town limits.	Wildfire	- On-going	Town of Wellton operating budget	M	Police	On-going
W-11	Continued development, design, and compliance of a water conservation plan to reduce and ensure availability of water supply.	Drought	- On-going	Town of Wellton operating budget	M	AZ Dept of Water Resources / Public Works	On-going
Yuma							
2018.01	Acquire mobile rehab (cooling) facility.	Extreme Heat	$$ 2023	City of Yuma operating budget; Emergency Response Funds Grant funding; SHSGP Grant	M	Police	New
2018.02	Acquire backup power sources for fixed City locations that can be used for cooling and shelter.	Extreme Heat	$ 2023	City of Yuma operating budget	H	Fire	New
2018.03	Continued implementation of emergency preparedness public outreach.	Multi-hazard	- On-going	City of Yuma operating budget	M	Fire	On-going
Y-10	Continue to enforce zoning and building codes through current site plan, subdivision, and building permit review processes to reduce the effects of flood, thunderstorm/high wind, earthquake, and other hazards on new and existing buildings and infrastructure	Earthquake Flooding, Severe Wind, Wildfire	- On-going	City of Yuma operating budget	M	Community Development	On-going
Y-11	Clear and remove dense stands of salt-cedar and re-establish native riparian vegetation along the Colorado River to produce a natural park area and mitigate the effects of wildland fires.	Wildfire	- On-going	City of Yuma operating budget	M	Yuma Crossing National Heritage Area - Project Manager	On-going
Y-8	Enforce low water use fixture requirements for new residential/commercial buildings. The city has adopted the IRC and the IPC both of which have provisions for low flow fixtures in both commercial and residential structures. The codes limit the amount of the water that can flow from fixtures such as toilets, sinks, and shower heads.	Drought	- On-going	City of Yuma operating budget	M	Community Development	On-going

ID No.	Description	Hazard(s) Mitigated	Estimated Cost & Completion	Potential Funding Source(s)	Priority Ranking	Primary Agency	Status
Y-9	Continue to enforce current Zone D1 seismic requirements in residential and commercial building codes. Continue to inspect all requirements for seismic to include liquefaction mitigation, seismic construction requirements, and seismic bracing for all equipment and piping in buildings.	Earthquake	- On-going	City of Yuma operating budget	M	Community Development	On-going
Y-13	Encourage the use of xeriscape landscaping in new and existing developments through impact fee incentives and public education through the "The Right Plant in the Right Place" Program.	Drought	- On-going	City of Yuma operating budget	M	Community Development	On-going
Y-7	Stormwater Pumping Structure Conversions to Automated Lift Station: Tierra Kino & Suncrest Estates subdivisions. Telemetry for all storm water pump station locations. There is a need to monitor and control the condition of storm water pump stations.	Flooding	- On-going	City of Yuma Operating budget; Yuma Co Flood District special tax assessment	M	Community Development	On-going
2018.04	Virginia Drive Retention Basin: Construct retention basin at northeast corner of Virginia Drive and 28th Street. Install new curb inlets to intercept on street runoff into retention basin. This project will reduce on street flooding that occurs during periods of heavy rainfall.	Flooding	$$ 2020	City of Yuma Operating budget; Yuma Co Flood District special tax assessment	M	Community Development	New
Y-2	28th Street Storm Drainage – Phase I, II, and III: Storm sewer installation in 28th Street from 8th Avenue to Smucker Park Retention Basin. Construction will consist of 72" diameter pipe to 96" diameter pipe and construction of a storm water collection basin. This project will improve storm water drainage collection and disposal in area from Avenue A to Barbara Avenue and 26th Place.	Flooding	- On-going	City of Yuma Operating budget; Yuma Co Flood District special tax assessment	M	Community Development	On-going

ID No.	Description	Hazard(s) Mitigated	Estimated Cost & Completion	Potential Funding Source(s)	Priority Ranking	Primary Agency	Status
Y-4	Del Oro Estates: Construct underground drainage collection system with surface inlets for Del Oro Estates. Construct outfall drain from Del Oro to Victoria Meadows Detention Basin. Del Oro Estates has no provisions for storm water removal and is virtually flat having been designed for on-site storm water disposal. This project will afford flooding protection for residents and remove storm water from City streets.	Flooding	- On-going	City of Yuma Operating budget; Yuma Co Flood District special tax assessment	M	Community Development	On-going
Y-6	Extend Storm Sewer/Arena Drive, 9th Street, 10th Street. And 10th Street from Arena Drive to 13th Avenue. Include inlet structures. Storm water from 13th Avenue is supposed to be channeled in 10th Street, 9th Place, and Arena Drive then conveyed by surface to the existing inlets at 9th Street and Arena Drive. Such is not the case. Even moderately small storms create overland flow that quickly jumps curbs and creates erosion problems across private property.	Flooding	- On-going	City of Yuma Operating budget; Yuma Co Flood District special tax assessment	M	Community Development	On-going
Y-12	Continue to provide earthquake safety awareness to the community on an annual basis through booths at fairs, brochures, Channel 73 public service announcements, and utility bill inserts.	Earthquake	- On-going	City of Yuma Operating budget	M	Community Development	On-going
Yuma County							
2018.01	Inspect county critical facilities to evaluate vulnerabilities to earthquake, severe winds, and flooding and implement necessary upgrades to key infrastructure	Earthquake, Severe Winds, Flooding	$ 2023	Yuma Co Operating budget	M	Facility Management	New
2018.02	Survey county facilities to evaluate back-up power availability and needs to install in locations that can be used for shelter and cooling	Extreme Heat, Earthquake, Flooding	$ 2023	Yuma Co Operating budget	H	Facility Management	New
2018.03	Install power transfer switches for back-up generators in critical facilities	Extreme Heat,	$$ 2023	Yuma Co Operating budget	H	Facility Management	New

ID No.	Description	Hazard(s) Mitigated	Estimated Cost & Completion	Potential Funding Source(s)	Priority Ranking	Primary Agency	Status
		Earthquake , Flooding					
2018.05	East County low flow crossing construction / improvements (White Wing, Bearagon)	Flooding	$150K 2023	Yuma Co Flood District Special Tax assessment	M	Public Works / Flood District	New
2018.06	Educate community members on how to create defensable spaces around their homes	Wildfire	$ 2023	Yuma Co Operating budget; Rural Metro Fire	M	Development Services / Administration	New
2018.12	Upgrade water infrastructure to residences by improvement districts	Drought	$ 2023	Yuma County Operating budget	L	Public Works / ID	New
2018.13	Water Rights Acquisition: Assurance of water supply through acquisition of senior Colorado River Water Rights with retirement of agricultural lands	Drought	$$$ 2023	Yuma County Operating budget	H	Administration / BOS	New
2018.14	Deliver public education campaign focused on informing the public about the risks posed by dam failure/release flooding	Flooding	$ 2023	Yuma Co OEM operating budget; EMPG	L	Emergency Management / PIO	New
YC-1	Design and construct a new storm water a basin, Smucker Park Detention Basin. New construction of this planned detention basin for the Yuma Mesa area will store the 100-year discharge. This basin is needed to mitigate the damage and reduce uncontrolled runoff that currently flows down the West Mesa Area to the Yuma Valley resulting in flooding of surrounding areas. Design is complete and is in state permitting process. Future phases to extend the storm lines to the basin will be programmed upon completion.	Flooding	$10M 2020	Yuma County Flood District special tax assessment	M	Development Services	On-going
YC-21	Public education campaign to encourage citizens to conserve water	Drought	- On-going	Yuma County operating budget	M	Emergency Management	On-going

ID No.	Description	Hazard(s) Mitigated	Estimated Cost & Completion	Potential Funding Source(s)	Priority Ranking	Primary Agency	Status
YC-25	Continue to enforce zoning and building codes through current site plan, subdivision, and building permit review processes to reduce the effects of flood, thunderstorm/high wind, earthquake, transportation and other hazards on new and existing buildings and infrastructure	Earthquake Flooding, Severe Wind, Wildfire	- On-going	Yuma County Operating budget	M	Development Services	On-going
2018.15	SW Somerton Area Drainage Improvements: Phase I will address the need to provide a discharge system to the existing basins.	Flooding	$3.6M 2021	Yuma Co Flood District special tax assessment	M	Development Services	New / On-going
2018.16	Wellton Area Drainage Improvements: Phase I is the near term priorities, Helen Street Retention Basin, Maybele Street Retention Basin, and Arizona Avenue/San Jose Avenue Storm Drain. Phase II is the Coyote Wash Channelization.	Flooding	$4.4M 2022	Yuma Co Flood District special tax assessment	M	Development Services	New / On-going
2018.17	Far West Drainage System: The Foothills Master Drainage Plan Update addresses the needs of the Foothills area. This phase will construct the storm drain system into the Far West Basin.	Flooding	$4M 2020	Yuma County Flood District special tax assessment	M	Development Services	New / On-going
2018.18	Pump Station installations at Retention basins: Existing retentions are located within the City of Yuma, Somerton and San Luis. This project proposes to install storm sewer pump stations to drain the basin to an outfall line (river or drain)	Flooding	$240K 2020	Yuma Co Flood District special tax assessment; Cities of Yuma, San Luis, and Somerton Operating budgets	M	Development Services	New / On-going
2018.19	San Luis Area Drainage Improvements: The storm drain trunk lines were construction concurrently with ADOT's Main Street reconstruction. Phase II extends the storm lines to the east.	Flooding	$315K 2020	Yuma Co Flood District special tax assessment; ADOT	M	Development Services	New / On-going
2018.20	Gadsden - San Luis Outfall and Basin Discharges: An initial study would look at the cost effectiveness of the Rio Sonora basins and then consider an outfall system for growth between San Luis and Gadsden.	Flooding	$4M 2023	Yuma Co Flood District special tax assessment	M	Development Services	New / On-going

SECTION 7: PLAN MAINTENANCE PROCEDURES

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 Planning Mechanisms

Continued Public Involvement

Yuma County, the Cocopah Tribe, and the 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 2018 Plan update process, the Planning Team recognized the need for improvement to the Plan monitoring and evaluation process. The results of those discussions are outlined in the following sections and the plan maintenance strategy.

7.1 Monitoring and Evaluation

The Planning Team has established the following monitoring and evaluation procedures:

- **Schedule** – The Plan shall be reviewed on at least an annual basis and following a major disaster. The County EM will contact the Tribe and 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:
  - **Hazards**
  - **Goals and objectives**
  - **Mitigation measure implementation progress**

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. The 2010 plan was used to drive the efforts of the council to mitigate many of the identified gaps in the mitigation efforts by the tribe. This allowed for the request of funding both in-house and through tribal grant opportunities. The Cocopah Indian Tribe will continue to utilize the 2018 plan as a guide for future improvements and funding opportunities.

7.2 Plan Update

According to DMA 2000, the Plan requires updating and approval from FEMA every five years. It was recognized that the 2010 Plan was not updated on the five-year schedule. This was mostly due to the staff time and resources needed to continually monitor and update the Plan on schedule. In order to update this Plan within the five-year cycle, the Plan update 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.

Monitoring Progress of Mitigation Measures

The Tribe will discuss the progress made with their respective mitigation measures on at least an annual basis. Representatives of the Planning Team will report on the progress made by their departments. Other departments or programs will be invited, as necessary to report or present data relative to the Plan or mitigation measures implemented by their departments. The implementation of mitigation measures will be monitored by the Office of Emergency Management on an on-going basis until implementation is complete. For the most part, the previous Plan's mitigation measures were implemented as planned. However, we intend to more widely publicize and educate on this Plan increasing understanding and awareness, resulting in a more success in implementing mitigation measures.

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

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

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

7.3 Incorporation into Existing Planning Mechanisms

Incorporation of the 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 jurisdictions/tribe revealed that methods for utilizing and/or incorporating the 2010 Plan elements over the past planning cycle into other planning programs has varied. Ways in which the 2010 Plan has been successfully incorporated or referenced into other planning mechanisms for each jurisdiction are described below:

Yuma County

- The County utilized the Plan as a blueprint when conducting yearly CIP planning activities.

Cocopah Tribe

- The Tribe utilized the Plan as a 'roadmap' for implementing mitigation projects.

City of San Luis

- The risk and vulnerability assessment helped the City focus on mitigating roadway flooding and led to updating the City Fire Code (2012).

City of Somerton

- The City referred to the Plan as part of their annual planning and budgeting processes.

Town of Wellton

- The Town utilized the previous Plan as part of their annual planning exercises, to identify opportunities to align mitigation project implementation into other related efforts.

City of Yuma

- The City referenced the previous Plan as part of their annual CIP efforts, to identify opportunities to implement mitigation projects.

Ways in which the 2018 Plan will be incorporated or referenced into other planning mechanisms for each Plan participant are summarized below:

Yuma County

- The County will continue to utilize the Plan as in input into their yearly CIP planning activities. Additionally, elements will be leveraged as they conduct the pending update to their COOP and any other Emergency Management planning.

Cocopah Tribe

- The Tribe plans to integrate the HIRA as they update their EOP in the near future.
- As mentioned with the past Plan, the Tribe plans to continue to reference the Plan to serve as their mitigation 'roadmap' going forward.

City of San Luis

- The City plans to integrate portions of and content from the 2018 HMP into their updated General Plan. Mitigation Measures will also help the City when prioritizing projects in the General Plan and as they look to update building codes.

City of Somerton

- The City will integrate use of this Plan into their annual CIP process and when evaluating on-going grant and loan applications.

Town of Wellton

- The Town is anticipating Administrative leadership changes and hopes this updated Plan can serve as a blueprint to implementing mitigation projects for future administrations.

City of Yuma

- The City plans to continue Plan integration into future CIP efforts.

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 Plan participants. Whenever possible, Plan participants will endeavor to incorporate

the risk assessment results and mitigation measures 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'/tribe's 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 2010 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. Moving forward, when appropriate, the jurisdictions and Tribe will continue to perform the activities that occurred over the past five years. Additionally, some jurisdictions identified specific mitigation measures relating to public education and outreach efforts. Additional details relating to these on-going and new efforts can be found in Section 6.

This left the question of how best to involve the public going forward with this updated Plan. It was decided that the Plan's annual evaluation 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 measures.

Following the yearly plan evaluation, meeting minutes and/or a summary report of progress on mitigation measures will be produced and posted on the county and tribal websites. Public questions relating to the yearly meeting and ideas for additional mitigation measures will also be solicited.

APPENDIX A: PREVIOUS PLAN'S MITIGATION MEASURES

Jurisdiction	Description	Status	Summary
Cocopah Tribe	Develop Water Management Plan and create Drought Ordinances.	In progress	EPO has been engaging this project and is still ongoing at this time. This project was funded by Tribal General Fund and EPA GAP funding.
Cocopah Tribe	Provide Emergency back-up power to critical facilities (Police Station and Cocopah Community Center): Emergency generators, secondary feeds, portable generators with standard camlock connections so power can be maintained in emergency shelters and public safety offices.	Complete (police)	The police department has emergency backup power and we are in the process of installing a generator at the community center for emergency sheltering. The PD generator installation was funded by a Tribal Homeland Security grant and (Community center generator is this year's THSG) funding.
Cocopah Tribe	Provide Fire Breaks in riparian area of West Reservation/Maintain Fire Breaks on North Reservation to minimize damage from wildfires.	Complete Ongoing	This is an ongoing process that once completed, will grow back to have cleared again. This project was funded by Bureau of Indian Affairs funding.
San Luis	Complete current updating and continue to up-date family of construction codes (NFPA1, UBC, UMC, UPC,UEC, etc) within appropriate cycles to ensure adequate design of new or remodeled facilities	Continuous and on-going	The City of San Luis Fire Dept and the Development Services Division continue to review the 2012 NFPA 1 Uniform Fire Code and other building Codes to insure our codes stay abreast of the current standards and to insure compatibility.
San Luis	Evaluate, review, design and construct infrastructure to minimize effects of run-off damage to right-of-ways, roadways, streets, curb and gutters, sidewalks, retention basins and structures.	Complete	phase 2 downtown drainage plan / updated curb/gutter requirements
San Luis	Continue to review effects of participation in the NFIP, specifically; the costs of insurance and the ability to market/sell property real property within identified area. The anticipated area is among the oldest developed area of the city and may result in the inability of homeowners to sell, refinance or simply occupy residences, based on the costs and availability of flood insurance.	On-going	City building officials will work with neighborhoods identified in the NFIP and coordinate with homeowners to resolve insurance needs.
San Luis	Continue involvement with ADOT and US Customs to maintain awareness of product and goods transported through both ports of entry (POE 1 and 2). Continue training and education of personnel and the purchase of appropriate equipment to support emergency response to any incidents or events within the US POEs or the ADOT Inspection Station.	Continuous and on-going	Continue to review commodities and transportation corridors which are within the City of San Luis Fire Dept response areas. Continue to maintain equipment and training of personnel who will respond to transportation emergencies which may contain hazardous materials.
San Luis	Water Conservation and Public Education: Develop and distribute brochures outlining the advantages of water conservation to City water-users	On Going	Distributed through billing statements.

Jurisdiction	Description	Status	Summary
San Luis	Water Rights Acquisition: Assurance of water supply through acquisition of senior Colorado River Water Rights with retirement of agricultural lands	On Going	This issue is larger than the City. The City will work with local farmers, politicians, and state legislatures to ensure the protection of water rights within Arizona.
San Luis	Transportation Planning Agency Coordination: Continue to coordinate and participate with inter-agency transportation planning groups such as the Yuma Metropolitan Planning Organization, Greater Yuma Port Authority, Yuma Marine Corps Air Station, and ADOT	Continuous and on-going	Coordinated direct access to commercial port of entry, w/ ADOT developed ASH Hwy (U.S. Route 195), implementation of an Area Transit bussing system (transportation district). Continued participation in public meetings and pre-construction meetings of major roadway construction projects which enhance population movement, increase traffic counts or may affect emergency response.
San Luis	Seismic Building Code Enforcement: Continue to enforce seismic requirements in current building codes	Continuous and on-going	Continue to support strong earthquake construction standards which protect lives and minimize damages of minimal to moderate earthquake events to buildings and property.
San Luis	Enforcement of Zoning and Building Code Ordinance: Continue to enforce zoning and building codes through current site plan, subdivision, and building permit review processes to reduce the effects of flood, thunderstorm/high wind, earthquake, transportation and other hazards on new buildings and infrastructure	Continuous and on-going	Currently adopting 2018 building code. The Fire Dept will continue to participate in building plans review, apply currently adopted Fire Codes to insure best standard of life and building safety. Continue to do regular building inspections of existing buildings and structures and initial inspections for to provide Certificate of Occupancy of new buildings upon construction.
San Luis	Wildfire Mitigation Cooperation: Coordinate/cooperate with BLM/BOR wildfire mitigation activities along the Colorado River	Continuous and on-going	The Fire Dept has recently completed transition and modifications to existing vehicle to provide a more appropriate brush fire and off-road response. Vehicle has Compressed Air Foam System capabilities and will eventually achieve Type 6 Engine classification.
Somerton	Seismic Building Code enforcement to enforce current seismic codes to reduce the effects of earthquake hazards on new and remodeled buildings	In progress	With all the seismic activity in our area, there will be new studies and data that when it comes available we will revise our codes to meet new changes. Updated to 2003 and will be updating to 2018.
Somerton	Enforcement of low water use fixture requirements for new residential/commercial buildings in current plumbing codes to reduce the demand on acquiring additional water resources.	In progress	All new construction has low water use fixtures installed verified by building code inspectors. New 2018 code will address.

Jurisdiction	Description	Status	Summary
Wellton	Design and construct overpass over the Union Pacific railroad tracks allowing vehicles, emergency vehicles, and 1st responders to cross at all times. The plan has identified a location and cost estimate. Would assist in evacuation from any type of disaster or hazard.	Cost prohibitive - still on 10 year plan	Appears unlikely that this will ever be possible. Alternative sub-station south of the tracks being explored.
Wellton	Continual enforcement of zone and building codes through current site plans, subdivision, and building permit review process to reduce the effects of disasters (natural or manmade) as well as other hazards on new buildings and infrastructure.	In-progress	Awaiting the Adoption of 2018 Building codes (2009 currently). 3rd review of adopting. Are doing enforcement.
Wellton	Post signage in community on roadways within Town limits once designated as truck routes, hazard material routes, or weight limited roadways.	No longer a priority	To potentially be included in new town traffic ordinance.
Wellton	Adopt Seismic Building Code Enforcement for new and existing residential and commercial developments to minimize structural damages.	In-progress	Awaiting the Adoption 2012 Building codes
Wellton	Local Area Drainage Study- perform a local area drainage study to determine vulnerability of identified streets to understand and implement drainage needs and improvements.	Ongoing	Requested Grant of CBG Drainage Funds. In design study through County FCD.
Wellton	Enforcement of Nuisance Abatement Ordinance-continual enforcement of current nuisance abatement ordinance for control of weeds, debris and flammable materials within Town limits.	Pending	On-going enforcement
Wellton	Traffic Law Enforcement-continue to enforce traffic laws and minimize accidents within Town limits.	Ongoing	Enforcement equip. obtained through GOHS grant
Wellton	Continued enforcement of low water use fixtures in zoning regulations to minimize loss of water resource.	Ongoing	Recently completed another Water Loss Study.
Wellton	Continued interaction between local, state, county, and federal agencies to ensure cooperation and planning for transportation networks.	Ongoing	Wellton active in YCIPTA and works closely with ADOT. Participating with YMPO
Wellton	Continued development, design, and compliance of a water conservation plan to reduce the ensure availability of water supply.	Ongoing	Completed water plant renovation. Current program.

Jurisdiction	Description	Status	Summary
Yuma	Design and construct stormwater basins, USBR East Main Canal siphon and overshoot and stormwater lift station with discharge force main(s) to detain and evacuate 116.8 acre-feet of storm water. Needed to improve storm water drainage collection and disposal in the area from Avenue A to Barbara Avenue and 26th Place	Being lead by County	Study is to be initiated in FY 20.
Yuma	28th Street Storm Drainage – Phase I, II, and III: Storm sewer installation in 28th Street from 8th Avenue to Smucker Park retention Basin. Construction will consist of 72" diameter pipe to 96" diameter pipe and construction of a storm water collection basin. This project will improve storm water drainage collection and disposal in area from Avenue A to Barbara Avenue and 26th Place.	Ongoing	Terminal basin at Smucker Park needs to be constructed first.
Yuma	Stormwater NPDES Permit Activities: Two phase project Phase I completed. Phase II implement action plan and provide documentation to ADEQ	Complete	Revised drainage ordinance in FY14 and identifying Priority Areas with direct connection to river.
Yuma	Del Oro Estates: Construct underground drainage collection system with surface inlets for Del Oro Estates. Construct outfall drain from Del Oro to Victoria Meadows Detention Basin. Del Oro Estates has no provisions for storm water removal and is virtually flat having been designed for on-site storm water disposal. This project will afford flooding protection for residents and remove storm water from City streets.	Ongoing	Engineering study complete.
Yuma	Extend Storm Sewer/Arena Drive, 9th Street, 10th Street. And 10th Street from Arena Drive to 13th Avenue. Include inlet structures. Storm water from 13th Avenue is supposed to be channeled in 10th Street, 9th Place, and Arena Drive then conveyed by surface to the existing inlets at 9th Street and Arena Drive. Such is not the case. Even moderately small storms create overland flow that quickly jumps curbs and creates erosion problems across private property.	Ongoing	Engineering and planning complete. Funding needed.
Yuma	Stormwater Pumping Structure Conversions to Automated Lift Station: Tierra Kino & Suncrest Estates subdivisions. Telemetry for all storm water pump station locations. There is a need to monitor and control the condition of storm water pump stations.	Ongoing	Work may include replacing pumps, controls, and SCADA systems.

Jurisdiction	Description	Status	Summary
Yuma	Enforce low water use fixture requirements for new residential/commercial buildings. The city has adopted the IRC and the IPC both of which have provisions for low flow fixtures in both commercial and residential structures. The codes limit the amount of the water that can flow from fixtures such as toilets, sinks, and shower heads.	Ongoing	Applicable to new construction
Yuma	Continue to enforce current Zone D1 seismic requirements in residential and commercial building codes. Continue to inspect all requirements for seismic to include liquefaction mitigation, seismic construction requirements, and seismic bracing for all equipment and piping in buildings.	Ongoing	2012 Building Code adopted per the International Code Council.
Yuma	Continue to enforce zoning and building codes through current site plan, subdivision, and building permit review processes to reduce the effects of flood, thunderstorm/high wind, earthquake, and other hazards on new buildings and infrastructure	Ongoing	2012 Building Code adopted per the International Code Council
Yuma	Clear and remove dense stands of salt-cedar and re-establish native riparian vegetation along the Colorado River to produce a natural park area and mitigate the effects of wildland fires. Costs reflect vegetation removal and replacement only.	Ongoing	Ongoing maintenance at both East and West Wetlands. Reduction of riverfront fires down 80% since mitigation efforts began in 2002. The majority of the West Wetlands has been eradicated of salt cedar and non-native vegetation and all work at West Wetlands requiring an ACOE 404 permit has been completed. We are currently working on eradicating the last remaining large stand of non-native vegetation from a 28-acre parcel of West Wetlands located between the boat ramp and the 4th Ave Bridge and anticipate this work being completed in 2019. Ongoing maintenance to prevent re-growth of non-native vegetation is ongoing at East Wetlands
Yuma	Continue to provide earthquake safety awareness to the community on an annual basis through booths at fairs, brochures, Channel 73 public service announcements, and utility bill inserts.	Ongoing	Yuma Fire continues to do public Education
Yuma	Encourage the use of xeriscape landscaping in new and existing developments through impact fee incentives and public education through the “Use Water Wisely” Program.	Ongoing	The City adopted an update to the Landscaping Ordinance in 2017 that encourages the right plant in the right place. The Landscaping code requires xeriscape design to minimize water use within the City of Yuma.

Jurisdiction	Description	Status	Summary
Yuma County	Design and construct new storm water a basin, Smucker Park Detention Basin. New construction of this planned detention basin for the Yuma Mesa area will store the 100-year discharge. This basin is needed to mitigate the damage and reduce uncontrolled runoff that currently flows down the West Mesa Area to the Yuma Valley resulting in flooding of surrounding areas. Design is complete and is in state permitting process.	On-going	District and City of Yuma entered into an IGA to complete the project
Yuma County	This project is located in the La Jolla Subdivision. Project will provide drainage improvements, catch basin and storm water pipeline to drain this neighborhood. Storm water presently ponds in the street and requires removal by water trucks.	Complete	Project complete.
Yuma County	Develop and implement a Flood/Waterway Education and Public Outreach campaign to encourage citizen awareness to mitigate the damages of floods via the use of internet, public meetings, brochures, etc.	Ongoing	Letters sent to property owners affected by 2014 Flood Insurance Rate Map Updates.
Yuma County	Attend related technical conferences and relay new information to stakeholders	Ongoing	Staff attended Emergency Management Training, Arid Region Conference, CRS & BW12 training
Yuma County	Fund annual State Floodplain regulations and develop technical and review standards for floodplain related topics	Ongoing	$5,000 annual contribution submitted to State Standards Work Group
Yuma County	Document Flood Damage after flood events to further mitigate ongoing efforts by identification of potential and actual hazard areas; will also be used in public outreach and education campaign as well as provide historical reference for future mitigation efforts	Ongoing	Localized flooding photographed in the Foothills and Yuma Area. Annual Assessment Report is prepared
Yuma County	Design and construct additional Groundwater Wells to mitigate and lower the groundwater levels during sustained flooding of the Colorado River and along the west Yuma Mesa.	Ongoing	Coordination with YCWUA and USBR for operation and maintenance of Yuma Valley facilities
Yuma County	Participate in Community Assistance Program and other state and federal programs when they benefit Yuma County.	Ongoing	District coordinates with ADWR regarding Flood Insurance Regulations and assists Wellton and Somerton with NFIP
Yuma County	Design and construct Business 8 Drainage Improvements are needed to drain ponding along roadway.	On hold	Limited community interest
Yuma County	Virginia Ave/24th Street Storm Drain Improvements is an extension of the 28th Street Storm drain System.	Remove	City does not have plans to extend Smucker Park system for several years (20+)

Jurisdiction	Description	Status	Summary
Yuma County	Design and re-construct Engler Avenue Basin Pump Station to drain this basin to the East Mesa Outfall System mitigating damage to surrounding area and thus reducing detention times below 5 days.	Remove	Project is not cost effective
Yuma County	Phoenix and Mesa St. within the Yuma East area. On site drainage has been filled in by the owners. Design will provide alternatives to address the storm water ponding.	On hold	Study completed. Not in 5 yr CIP.
Yuma County	Design and then renovate the Gadsden Area Drainage to provide storm water facilities, to mitigate the effects of existing storm water ponds occurring within roadway or adjacent properties	Ongoing	Completed system constructed. Land has been purchased for regional basin
Yuma County	Public education campaign to encourage citizens to conserve water	On-going	Yuma County Area Agriculture Council/YCOEM uses public events on a regular basis to pass out flyers and speak to community members about issues to include water preservation.
Yuma County	Continue to ensure that Yuma County residents are safe from flooding by meeting the NFIP requirements for development within a Special Flood Hazard Area through enforcement of the Floodplain Ordinance.	On-going	County maintains compliance with the NFIP.
Yuma County	Continue to coordinate and participate with inter-agency transportation planning groups such as the Yuma Metropolitan Planning Organization, Greater Yuma Port Authority, Yuma Marine Corps Air Station, and Arizona Department of Transportation	On-going	MOU has been completed.
Yuma County	Develop and implement a public education and awareness campaign for county residents to mitigate damages caused by these specified incidents via the use of internet, brochures, website, community presentations and forums and other media	On-going	Participate in Great Arizona Shake-Out annually. YCOEM has monthly community tabletop exercises which include seismic events, and we also use public events on a regular basis to pass out flyers and speak to community members about issues to include earthquake preparedness.
Yuma County	Continue to enforce zoning and building codes through current site plan, subdivision, and building permit review processes to reduce the effects of flood, thunderstorm/high wind, earthquake, transportation and other hazards on new buildings and infrastructure	On-going	Adopted 2012 Building Codes June 2013, include provisions for the mitigation of earthquake, flood and wind events. Currently moving towards 2018 IRC/IBC.

Jurisdiction	Description	Status	Summary
Yuma County	Continue to require county residents to acquire burn permits to mitigate against the potential for wildland fires.	On-going	Continue enforcing provisions of 2003 International Fire Code including permit requirements for open burning The open burn permitting program via ADEQ to the Yuma County Health department and delegated to Yuma Rural/Metro fire department The open burn program has numerous preventions steps built into it and one of these steps is to prevention wild land fires as stated. 2010 adopted Community Wild Fire Protection Plan.
Yuma County	Continue to enforce building code low water use fixture requirements for new residential and commercial buildings.	On-going	2018 code update will address. Adopted 2012 International Building Code June 2013 require low flow fixture installation
Yuma County	Continued enforcement of development restricted areas relative to the MCAS and the MCAS Auxiliary Field II as identified in the Joint Land Use Plan.	On-going	Yuma Regional development plan addresses this. No joint land-use plan anymore. Applications are reviewed for conformance with current Arizona Revised Statutes and Zoning Ordinance. All actions involving land use permits are cleared to uphold proper airspace operations of the military
Yuma County	Develop and implement a public education and awareness campaign for county residents to mitigate damages caused by these specified incidents via the use of internet, brochures, website, community presentations and forums and other media	On-going	Local Fire depts provide preventative and preparedness training. YCOEM has monthly community tabletop exercises which include wildfire, storm related issues, and seismic events, and we also use public events on a regular basis to pass out flyers and speak to community members about issues to include Drought, Earthquake, Wildfire, Transportation, Flooding, Severe Wind, preparedness

APPENDIX B: PLANNING PROCESS DOCUMENTATION