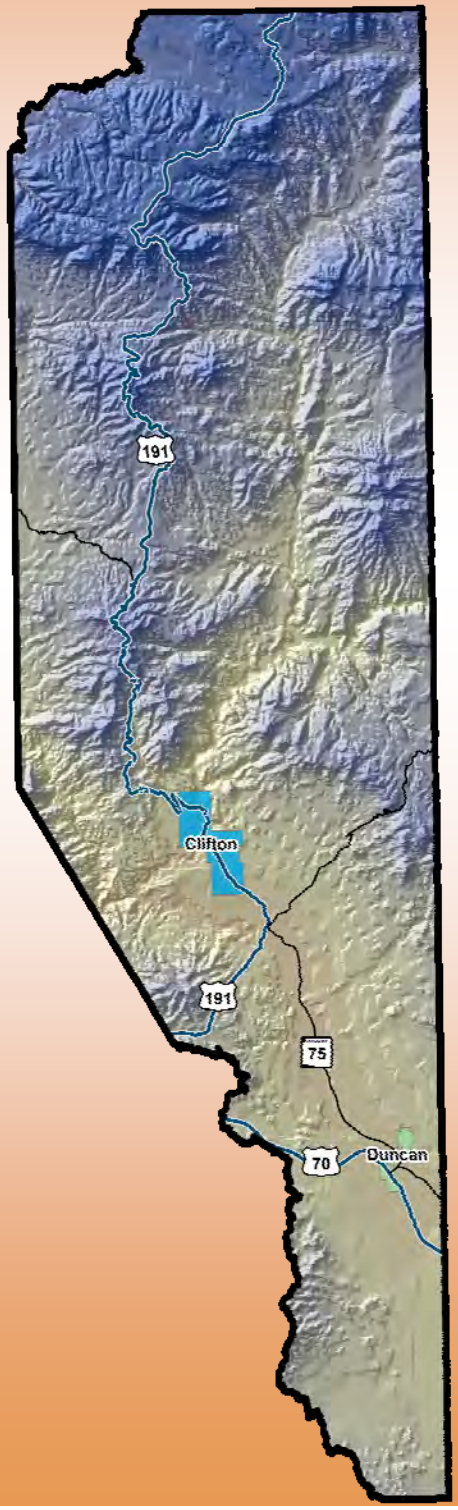
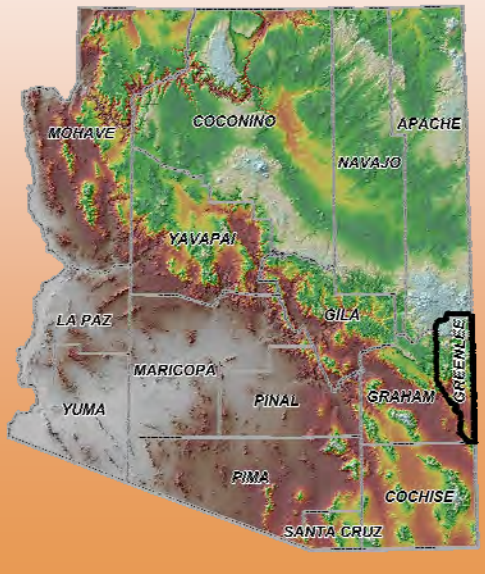
Greenlee County Multi-Jurisdictional Hazard Mitigation Plan 2016





EXECUTIVE SUMMARY

Across the United States, natural and human-caused disasters have led to increasing levels of death, injury, property damage, and interruption of business and government services. The toll on families and individuals can be immense and damaged businesses cannot contribute to the economy. The time, money and effort to respond to and recover from these emergencies or disasters divert public resources and attention from other important programs and problems. With 43 federal or state declarations, 37 other significant events, and a combined total of over 80 disaster events recorded since 1966, the three jurisdictions within Greenlee County, Arizona participating in this planning effort, recognize the consequences of disasters and the need to reduce the impacts of natural and human-caused hazards. The county and jurisdictions also know that with careful selection, mitigation actions in the form of projects and programs can become long-term, cost effective means for reducing the impact of natural and human-caused hazards.

The elected and appointed officials of Greenlee County, Clifton and Duncan demonstrated their commitment to hazard mitigation in 2010-2011 by preparing the first update to the Greenlee County Multi-Jurisdictional Hazard Mitigation Plan (2011 Plan). The 2011 Plan was updated through a multi-jurisdictional planning effort and was approved by FEMA on October 11, 2011. In order for Greenlee County and the Towns of Clifton and Duncan to remain eligible for certain non-emergency FEMA mitigation grants, the 2011 Plan must be fully updated and receive FEMA approval, prior to the five year expiration date of October 11, 2016.

In response, the Greenlee County Department of Emergency Management (GCDEM) was able to secure funding through the FEMA Pre-Disaster Mitigation planning grant program and hired JE Fuller/ Hydrology and Geomorphology, Inc. to assist the county and participating jurisdictions with the update process. GCDEM then reconvened a multi-jurisdictional planning team comprised of veteran and first-time representatives from each participating jurisdiction. The Planning Team met three times during the period of February to May 2016 in a collaborative effort to review, evaluate, and update the 2011 Plan. The Greenlee County Multi-Jurisdictional Hazard Mitigation Plan (Plan) will continue to guide the county and participating jurisdictions toward greater disaster resistance in full harmony with the character and needs of the community and region.

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

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SECTION 1: JURISDICTIONAL ADOPTION AND FEMA APPROVAL

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

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

Requirement §201.7(a)(1): *Indian tribal governments applying to FEMA as a grantee must have an approved Tribal Mitigation Plan meeting the requirements of this section as a condition of receiving non-emergency Stafford Act assistance and FEMA mitigation grants.*

Requirement §201.7(a)(4): *Multi-jurisdictional plans (e.g. county-wide or watershed plans) may be accepted, as appropriate, as long as the Indian tribal government has participated in the process and has officially adopted the plan. Indian tribal governments must address all the elements identified in this section to ensure eligibility as a grantee or as a sub-grantee.*

1.1 DMA 2000 Requirements

1.1.1 General Requirements

This 2016 update of the Greenlee County Multi-Jurisdictional Hazard Mitigation Plan (Plan) has been prepared in compliance with Section 322 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1988 (Stafford Act), 42 U.S.C. 5165, as amended by Section 104 of the Disaster Mitigation Act of 2000 (DMA 2000) Public Law 106-390 enacted October 30, 2000. The regulations governing the mitigation planning requirements for local mitigation plans are published under the Code of Federal Regulations (CFR) Title 44, Section 201.6 (44 CFR §201.6). Minimum requirements for tribal mitigation plans are published under CFR Title 44, Section 201.7 (44 CFR §201.7). Additionally, a DMA 2000 compliant plan that addresses flooding will also meet the minimum planning requirements for the Flood Mitigation Assistance program as provided for under 44 CFR §78.

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

Under 44 CFR §201.6 and §201.7, local and tribal governments must have a Federal Emergency Management Agency (FEMA)-approved local mitigation plan in order to apply for and/or receive project grants as a sub-grantee under the following Hazard Mitigation Assistance (HMA) programs:

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

In addition, Indian Tribal governments applying to FEMA as a grantee must have an approved tribal mitigation plan meeting the requirements of 44 CFR §201.7 as a condition of receiving non-emergency Stafford Act assistance through Public Assistance Categories C through G and the above mentioned HMA program funds.

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

1.1.2 Update Requirements

DMA 2000 requires that existing plans be updated every five years, with each plan cycle requiring a complete review, revision, and re-approval of the plan at both the state and FEMA level. Greenlee County and the incorporated communities of Clifton and Duncan are all currently covered under a FEMA approved multi-jurisdictional hazard mitigation plan. The Plan is the result of an update process performed by the participating jurisdictions to update the current 2011 version of the Greenlee County Multi-Jurisdictional Hazard Mitigation Plan (2011 Plan).

1.2 Official Record of Adoption

Promulgation of the Plan is accomplished through formal adoption of official resolutions by the governing body for each participating jurisdiction in accordance with the authority and powers granted to those jurisdictions by the State of Arizona and/or the federal government. Participating jurisdictions in the Plan include Greenlee County, the Town of Clifton and the Town of Duncan. Each jurisdiction will keep a copy of their official resolution of adoption located in Appendix A of their copy of the Plan.

1.3 FEMA Approval Letter

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

[Insert FEMA Approval Letter Here]

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SECTION 2: INTRODUCTION

2.1 Plan History

In 2005 and 2006, Greenlee County and the incorporated communities of Clifton and Duncan participated in a mitigation planning process that resulted in the development of separate stand-alone plans for each participating jurisdiction. The following is a list of the plans that were produced for the Greenlee County jurisdictions:

- *Greenlee County Multi-Hazard Mitigation Plan*
- *Town of Clifton Multi-Hazard Mitigation Plan*
- *Town of Duncan Multi-Hazard Mitigation Plan*

Collectively and individually, these plans will be referred to herein as the 2006 Plan(s). The 2006 Plans received official FEMA approval ranging from June 15, 2006 to September 12, 2006. In September of 2010, the Greenlee County Department of Emergency Management (GCDEM) initiated and performed an update planning process with Clifton and Duncan resulting in the *2011 Greenlee County Multi-Jurisdictional Hazard Mitigation Plan*, herein referred to as the 2011 Plan, being submitted to FEMA and receiving official approval on October 11, 2011. The 2011 Plan is nearing the end of the 5-year planning cycle and will expire on October 11, 2016.

The Greenlee County Department of Emergency Management successfully obtained a pre-disaster mitigation planning grant from FEMA for FY2015 to fund the required 5-year update. The planning process was officially kicked off in January 2016 with the selection of a consultant to assist with the update process. The first planning team meeting was convened on March 16, 2016.

2.2 Plan Purpose and Authority

The purpose of the Plan is to identify natural hazards that impact the various jurisdictions located within Greenlee 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 2011 Plan.

Greenlee County and both 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). As such, each of these entities are empowered to formally plan and adopt the Plan on behalf of their respective jurisdictions.

Funding for the development of the Plan was provided through a PDM planning grant obtained by the GCDEM from FEMA through ADEMA. JE Fuller/ Hydrology and Geomorphology, Inc. (JE Fuller) was retained by GCDEM to provide consulting services in guiding the plan update 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 Multi-Hazard Mitigation Plan (State Plan) and is comprised of the following major sections:

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

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

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

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

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

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

SECTION 3: PLANNING PROCESS

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

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

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

3.1 Update Process Description

GCDEM applied for and received a PDM planning grant to fund a multi-jurisdictional effort to review and update the 2011 Plan. GCDEM solicited support from Clifton and Duncan to aid in the substantiation of the PDM planning grant application. Once the grant was received, GCDEM then selected JE Fuller to work with the participating jurisdictions and guide the Plan update process. An initial project kick-off meeting between JE Fuller and GCDEM was convened in February 2016 to line up the first meeting date and discuss the agenda for the coming planning efforts, discuss the plan format and potential changes to the Plan outline and content to address recent FEMA guidelines, request initial data, and other administrative tasks. Three planning team meetings were subsequently conducted over the period of March to May 2016, along with all the work required to collect, process, document updated data, and make changes to the Plan. Details regarding updated key contact information and promulgation authorities, the planning team selection, participation, and activities, and public involvement are discussed in the following sections.

3.2 Previous Planning Process Assessment

The first task of preparation for the Plan update, was to evaluate the process used to develop the 2011 Plan. This was initially discussed by GCDEM and JE Fuller in the January 2016 kick-off meeting with the goal of establishing the framework for the planning effort ahead. The 2011 Plan process employed a multi-jurisdictional approach with representation from each participating jurisdiction in larger multi-jurisdictional planning team meetings wherein concepts would be presented and discussed, and work assignments would be made for completion by each jurisdiction. Supplemental follow-up sessions with one or more jurisdictions by both GCDEM and JE Fuller were also employed on an as-needed basis to assist jurisdictions with completing assignments on schedule. GCDEM and JE Fuller agreed to continue with substantially the same approach due to the success of the 2011 Planning effort in getting to an approved plan both in time and budget.

The Plan update process was presented and discussed at the first Multi-Jurisdictional Planning Team (MJPT) meeting for comment and concurrence of the Plan jurisdictions. A slight change was proposed for the Plan update process, wherein the MJPT would meet only once to cover topics that pertain to all jurisdictions jointly, and then the consultant would meet individually with each participating jurisdiction to update jurisdiction specific planning items. Several of the planning team members were familiar with the 2011 Plan development and felt the proposed process would work well and streamline the effort needed to get the work done.

3.3 Planning Team

3.3.1 General

Two levels of planning teams were organized for this Plan update. The first was a Multi-Jurisdictional Planning Team (MJPT) that was comprised of one or more representatives from each participating jurisdiction.

The second level planning team was the Local Planning Team (LPT), which was generally composed of various representatives for departments or agencies specific to a jurisdiction.

The role of the MJPT and LPT was to work with the planning consultant to perform the coordination, research, and planning element activities required to update the 2011 Plan. Attendance by each participating jurisdiction was required for the MJPT meeting. Subsequent LPT workshop meetings were convened by jurisdiction to perform the jurisdiction specific updates.

3.3.2 Primary Point of Contact

Table 3-1 summarizes the primary points of contact (PPOC) identified for each participating local jurisdiction.

3.3.3 Planning Team Assembly

At the beginning of the update planning process, GCDEM organized and identified members for the MJPT by initiating contact with the Clifton and Duncan PPOCs identified in the 2011 Plan or their current equivalent. In February 2016, JE Fuller sent out a project kickoff email to provide initial information and begin the process of scheduling the first MJPT meeting. Two more planning workshop meetings were conducted with each jurisdiction to review and update the majority of planning elements. The participating members of the MJPT and LPTs are summarized in Table 3-2. Returning planning team members from the 2011 Plan are highlighted.

3.3.4 Planning Team Activities

The MJPT met on March 16, 2016 to kick-off the plan update process. Two more LPT workshop meetings were conducted at each jurisdiction on April 6th or 7th, 2016 and May 9th or 10th, 2016. Table 3-3 summarizes the MJPT and LPT workshop dates, times, locations, and a brief list of the agenda items discussed. Detailed meeting notes for the March 16, 2016 MJPT meeting is provided in Appendix B. There are no meeting notes for the LPT workshop meetings.

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Table 3-1: List of jurisdictional primary points of contact

Jurisdiction	Name	Department / Position	Address	Phone	Email
Greenlee County	Steve Rutherford	Health and Emergency Management / Emergency Manager	Greenlee County Government, 253 Fifth St, P.O. Box 908, Clifton, AZ 85533	928-865-2601	srutherford@co.greenlee.az.us
Clifton	Ian McGaughey	Town Manager	Town Manager 510 N. Coronado Blvd. Clifton, AZ 85533	928-865-4146	ian@townofclifton.com
Duncan	John Basteen Jr.	Town Manager	506 SE Old West Hwy Duncan, AZ 85534	928-359-2791	john.basteen@townofduncan.org

Table 3-2: Summary of multi-jurisdictional planning team participants

Name	Jurisdiction / Organization	Department / Position	Planning Team Role
Larry Barela	Town of Clifton	Public Works / Public Works Director	• Clifton LPT Member
John Basteen	Town of Duncan	Administration / Town Manager	• Duncan PPOC and MJPT / LPT Member
Paul Easley	Freeport McMoRan	Emergency Services / Coordinator	• Clifton LPT Member • Morenci Mine Liaison
Ian McGaughey	Town of Clifton	Administration / Town Manager	• Clifton PPOC and MJPT / LPT Membert
Omar Negrete	Town of Clifton	Police / Police Chief	• Clifton LPT Member
Scott Ogden	JE Fuller	Consultant	• Planning Consultant
Peter Ortega	Town of Clifton	Fire / Fire Chief	• Clifton LPT Member
Philip Ronnerud	Greenlee County	Engineering / County Engineer	• Greenlee County PPOC and MJPT / LPT Member • Primary POC for Plan
Steve Rutherford	Greenlee County	Health and Emergency Management / Emergency Manager	• Greenlee County LPT Member
Jeff Walden	Town of Clifton	Building / Inspector	• Clifton LPT Member

Table 3-3: Summary of planning meetings convened as part of the plan update process

Meeting Type, Date, and Location	Meeting Agenda
MJPT Meeting No. 1 March 16, 2016 Greenlee County Government Bldg BOS Conference Room Clifton, AZ 85533 1:00 to 4:00pm	• **Initial Introductions** • **Discussion of Scope And Schedule** • **DMA2K Overview And Update Requirements** o General DMA2K Overview o Update Requirements (New Crosswalk) o Proposed Outline for New Plan • **Planning Process** o Discussion Of Last Planning Process o Planning Team Roles And Responsibilities • **Public Involvement** o Discuss Past Strategy o Formulate New Strategy o Additional Invitations • **Risk Assessment** o Initial Hazard List Identification • **Mitigation Strategy** o Goals and Objectives • **Plan Maintenance Strategy** o Review/Discuss maintenance and monitoring over the last plan cycle o Develop New Monitoring Schedule o Plan Update Schedule • **Promulgation Process Review** • **Next Steps**
LPT Workshop No. 1 April 6, 2016 8:00am to Noon Council Chambers Duncan Town Hall Duncan, AZ April 6, 2016 1:00 to 5:00pm Council Chambers Clifton Town Hall Clifton, AZ April 7, 2016 8:00 am to Noon Greenlee County Government Bldg BOS Conference Room Clifton, AZ 85533	• **General – Community Descriptions** • **Risk Assessment** o Asset Inventory Review/Update o Review hazard profile mapping and data for each hazard o CPRI Analysis o Repetitive Loss Properties o Discuss and Profile Development Trends ▪ Past Plan Cycle ▪ Future Development • **Mitigation Strategy** o Capability Assessment o Legal and Regulatory (Codes / Ordinances) o Administrative and Technical Staff Resources o Fiscal Capabilities • **Plans / Manuals / Guidelines / Studies Integration and Incorporation** o Past Plan Cycle o Future Strategy • **NFIP Statistics and Compliance**

Table 3-3: Summary of planning meetings convened as part of the plan update process

Meeting Type, Date, and Location	Meeting Agenda
LPT Workshop No. 2 May 9, 2016 1:00 to 5:00pm Council Chambers Clifton Town Hall Clifton, AZ May 10, 2016 8:00am to Noon Council Chambers Duncan Town Hall Duncan, AZ May 10, 2016 1:00 to 5:00pm Greenlee County Government Bldg BOS Conference Room Clifton, AZ 85533	• **Risk Assessment** o VA Result Review • **Mitigation Strategy** o Existing Mitigation Action/Project Assessment o Action/Project Identification ▪ Repetitive Loss Structures Recommendations o Implementation Strategy • **Plan Maintenance Strategy** o Continued Public Involvement

3.3.5 Agency/Organization Participation

The planning process used to develop the 2011 Plan included participation from several agencies and organizations which operate within or have jurisdiction over small and large areas of Greenlee County. For this update, a list of known and/or potential stakeholders not already involved in the MJPT was brainstormed and compiled at the MJPT Meeting No. 1. The MJPT started with a list of Local Emergency Planning Committee (LEPC) members since most of those individuals would represent the type of organizations and agencies that would have an interest in Greenlee County hazard mitigation. Invitations were sent to the identified list via emails with an attached document that explained the DMA 2000 planning process and the request for involvement. A copy of the letter attachment is provided in Appendix C. In addition to the personal invitations, a broader invitation to all citizens within and near Greenlee County was indirectly extended via website postings and newspaper articles, which are discussed more thoroughly in Section 3.5.2. This approach was considered the best way to reach interested non-profits and businesses within the County and provide them an opportunity for participation in the planning process. Table 3-4 represents the list of all entities (except the participating jurisdictions) that were either directly invited or that responded to the public invitations:

Table 3-4: List of agencies and organizations invited or participating in the planning process

Agency / Organization	Contact Name and Position
Clifton Police Department	Omar Negrete, Chief of Police
Greenlee County	Kay Gale, County Administrator
Greenlee County	Yvonne Pearson, Clerk of the Board
Greenlee County Sheriff's Office	Larry Avila, Sheriff
Greenlee County Sheriff's Office	Pat Sexton, Undersheriff
Greenlee County Sheriff's Office	Jeromy Vaughn, LT.
Greenlee County Sheriff's Office	Ronnie Manuz, Search & Rescue
Town of Duncan	John Basteen, Duncan Town Manager
Town of Clifton	Ian McGaughey, Clifton Town Manager

Table 3-4: List of agencies and organizations invited or participating in the planning process

Agency / Organization	Contact Name and Position
Greenlee County	Steve Rutherford, Emergency Management
Greenlee County	Phil Ronnerud, County Engineer
Greenlee County	Derek Rapier, County Attorney
Greenlee County	Tony Hines, Road Department Maintenance
Greenlee County	David Manuz, Road Department
Gila Health Resources	Karen Paz, Gila Health Resources
Morenci Fire/ FMI	Paul Easley, Emergency Coordinator
Duncan Valley Electric CO-OP	Steve Lunt, CEO
Greenlee County	Charles Berube, IT
Clifton Fire Department	Peter Ortega, Chief
Graham County	Brian Douglas, Emergency Manager
Graham County	Hank Metzger
Copper Era,	David Bell, Local Media
Duncan Fire	Hayden Boyd, Fire Chief
Apache County	Brannon Eager, Emergency Management
Greenlee County	Matt Bolinger, Deputy Director Health
Department of Transportation	Tyrel Cranford, ADOT Greenlee County
Arizona Department of Public Safety	Dan Long, Greenlee DPS
Duncan School District	Eldon Merrell, Duncan Schools Sup.
Morenci School District	David Woodall, Morenci School Sup.
Hidalgo County New Mexico	Bob Hill, County Manager/Emergency Management
El Paso Natural Gas, Thatcher AZ	El Paso Natural Gas
Catron County New Mexico	Mike Shriver, Emergency Management

An integral part of the planning process also included coordination with agencies and organizations outside of the participating jurisdiction's governance to obtain information and data for inclusion into the Plan, or to provide more public exposure to the planning process. Much of the information and data that is used in the risk assessment is developed by agencies or organizations other than the participating jurisdictions. In some cases, the jurisdictions may be members of a larger organization that has jointly conducted a study or planning effort like the development of a community wildfire protection plan, participation in an area association of governments, or participation in a FEMA RiskMAP Discovery study. Examples of those data sets include the FEMA floodplain mapping, community wildfire protection plans, severe weather statistics, hazard incident reports, and regional comprehensive plans. The resources obtained, reviewed and compiled into the risk assessment are summarized in Section 3.6 and at the end of each subsection of Section 5.3 of this Plan. 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.

3.4 Public Involvement

3.4.1 Previous Plan Assessment

The public involvement strategy for the 2011 Plan development included the publishing of public notices in the primary newspaper that covers the greater Greenlee County area, posting of similar public notices to jurisdiction websites with an included link to the full time website maintained on the Greenlee County servers. Additional notices inviting public participation were published in local and regional newspapers, jurisdictional newsletters, and flyer inserts to utility bills.

The second opportunity for public input was provided through the normal city/town/tribal council and/or county board of supervisors public meeting process associated with each jurisdiction's formal adoption of the 2011 Plan. The details of the meeting process varied from jurisdiction to

jurisdiction, but typically included some form of advertisement of the meeting agenda two to four weeks in advance of the council/board meeting. In most cases, an informal, pre-adoption presentation of the 2011 Plan was made during a working session of the council/board. The final adoption of the resolutions was almost unanimously done as part of a consent agenda at a formal council/board meeting. There are no records of any public comment on the 2011 Plan adoption process. Because the process is required for any formal council/board action and has a built-in public notification and comment opportunity, the MJPT chose to continue using this process as one of the post-draft mechanisms for getting the Plan update before the public.

3.4.2 Plan Update

The opportunity for public involvement and input to the plan update process was accommodated using the same general strategy as the 2011 Plan.

A public notice was published in the Copper Era and an announcement of the mitigation planning process was made at a LEPC meeting. Participating jurisdictions also posted public notices to their respective websites that included a link to the full time website maintained on the Greenlee County servers. A copy of the 2011 Plan was made available on the County website along with contact information for the MJPT PPOCs. No responses from the general public were received from the first round of notices.

A second wave of post-draft public notices was posted to jurisdiction websites and a copy of the draft Plan was posted to the County website for review and comment. Interested citizens were also encouraged to participate in the local community adoption process which, depending upon the jurisdiction, included a formal public hearing and in some cases, a prior informal presentation.

Copies of the public notices, web pages, and newspaper notices are provided in Appendix C. Other than those mentioned, there were no substantive public comments received.

3.5 Reference Documents and Technical Resources

Over the course of the update planning process, numerous other plans, studies, reports, and technical information were obtained and reviewed for incorporation or reference purposes. The majority of sources referenced and researched pertain to the risk assessment and the capabilities assessment. To a lesser extent, the community descriptions and mitigation strategy also included some document or technical information research. Table 3-5 provides a reference listing of the primary documents and technical resources reviewed and used in the Plan. Detailed bibliographic references for the risk assessment are provided at the end of each hazard risk profile in Section 5.3. Other bibliographic references are provided as footnotes throughout the Plan.

Table 3-5: List of resource documents and references reviewed and incorporated in the Plan update process

Referenced Document or Technical Source	Resource Type	Description of Reference and Its Use
Arizona Department of Commerce	Website Data and Community Profiles	Reference for demographic and economic data for the county. Used for community descriptions
Arizona Department of Emergency Management	Data and Planning Resource	Resource for state and federal disaster declaration information for Arizona. Also a resource for hazard mitigation planning guidance and documents.
Arizona Department of Water Resources	Technical Resource	Resource for data on drought conditions and statewide drought management (AzGDTF), and dam safety data. Used in risk assessment.
Arizona Geological Survey	Technical Resource	Resource for earthquake, fissure, landslide/mudslide, subsidence, and other geological hazards.
Arizona Model Local Hazard Mitigation Plan	Hazard Mitigation Plan	Guidance document for preparing and formatting hazard mitigation plans for Arizona.
Arizona State Land Department	Data Source	Source for statewide GIS coverages (ALRIS) and statewide wildfire hazard profile information (Division of Forestry). Used in the risk assessment.
Arizona Wildland Urban Interface Assessment (2004)	Report	Source of wildfire hazard profile data and urban interface at risk communities. Used in the risk assessment.
Arizona Workforce Informer	Website	Source for employment statistics in Arizona.
Bureau Net (2016)	Website Database	Source for NFIP statistics for Arizona.
Greenlee County Comprehensive Plan (2003)	Comprehensive Plan	Source for history, demographic and development trend data for the unincorporated county.
Greenlee County Multi-Hazard Mitigation Plan (2011)	Hazard Mitigation Plan	FEMA approved hazard mitigation plan that together with the other Greenlee County jurisdiction's MHMPs, formed the starting point for the update process. See Section 2.4 for further discussion
Greenlee County Community Wildfire Protection Plan (LSD, 2005)	Community Wildfire Protection Plan	Source of wildfire hazard profile data for hazard mapping and risk assessment
Environmental Working Group's Farm Subsidy Database (2016)	Website Database	Source of disaster related agricultural subsidies. Used in the risk assessment.
Federal Emergency Management Agency	Technical and Planning Resource	Resource for HMP guidance (How-To series), floodplain and flooding related NFIP data (mapping, repetitive loss, NFIP statistics), and historic hazard incidents. Used in the risk assessment and mitigation strategy.
HAZUS-MH	Technical Resource	Based data sets within the program were used in the vulnerability analysis.
National Climatic Data Center	Technical Resource	Online resource for weather related data and historic hazard event data. Used in the risk assessment.
National Integrated Drought Information System (2016)	Technical Resource	Source for drought related projections and conditions. Used in the risk assessment.

Table 3-5: List of resource documents and references reviewed and incorporated in the Plan update process

Referenced Document or Technical Source	Resource Type	Description of Reference and Its Use
National Response Center	Technical Resource	Source of traffic related HAZMAT incidents and rail accidents. Used in the risk assessment.
National Weather Service	Technical Resource	Source for hazard information, data sets, and historic event records. Used in the risk assessment.
National Wildfire Coordination Group (2015)	Technical Resource	Source for historic wildfire hazard information. Used in the risk assessment.
Office of the State Climatologist for Arizona	Website Reference	Reference for weather characteristics for the county. Used for community description.
Standard on Disaster/Emergency Management and Business Continuity Programs (2000)	Standards Document	Used to establish the classification and definitions for the asset inventory. Used in the risk assessment.
State of Arizona MHMP (2013)	Hazard Mitigation Plan	The state plan was used a source of hazard information and the state identified hazards were used as a starting point in the development of the risk assessment.
Town of Clifton MHMP (2006)	Hazard Mitigation Plan	FEMA approved hazard mitigation plan that together with the other Greenlee County jurisdiction's MHMPs, formed the starting point for the update process. See Section 2.4 for further discussion
Town of Duncan MHMP (2006)	Hazard Mitigation Plan	FEMA approved hazard mitigation plan that together with the other Greenlee County jurisdiction's MHMPs, formed the starting point for the update process. See Section 2.4 for further discussion
USACE Flood Damage Report (1978)	Technical Data	Source of historic flood damages for 1978 flood. Used in the risk assessment.
USACE Flood Damage Report (1994)	Technical Data	Source of historic flood damages for 1993 flood. Used in the risk assessment.
U.S. Census Bureau	Technical Data and Website Data	Source of demographic and building permit data.
U.S. Forest Service	Technical Data	Source for local wildfire data. Used in the risk assessment.
U.S. Geological Survey	Technical Data	Source for geological hazard data and incident data. Used in the risk assessment.

3.6 Plan Integration Into Other Planning Mechanisms

Incorporation and/or integration of the Plan into other planning mechanisms, either by content or reference, enhances a community's ability to perform hazard mitigation by expanding the scope of the Plan's influence. It also helps a community to capitalize on all available mechanisms at their disposal to accomplish hazard mitigation and reduce risk.

3.6.1 Past Plan Incorporation/Integration Assessment

A poll of the participating jurisdictions revealed that success of incorporating the 2011 Plan elements into other planning programs has varied over the past planning cycle. Ways in which the 2011 Plan has been successfully incorporated or referenced into other planning mechanisms by each jurisdiction are summarized in Tables 3-6 through 3-8.

Table 3-6: Plan integration history and future strategy for Clifton

Plan Integration Over the Past Plan Cycle:

- MJHMP references the Levee maintenance plan as a part of the latest recertification process (2010)
- Not that many active plans to integrate with.

Plan Integration Strategy for Next Five Years:

Planning Mechanism	Description of Planning Mechanism Opportunity
Town of Clifton General Plan	The Town will be updating the General Plan within the next couple of years and will incorporate and reference the MJHMP as appropriate. Hazard mapping will also be used to inform the development of new zoning maps.
Town of Clifton Emergency Operations Plan	Future updates to the EOP will include a review of the MJHMP risk assessment as appropriate.
Levee Plan	Any significant repair and rehabilitation will be coordinated with MJHMP and incorporated into the next MJHMP update as appropriate.
CIP	The Town is considering developing a formal capital improvements plan. If developed, the Town will reference and include the mitigation A/Ps as appropriate.

Table 3-7: Plan integration history and future strategy for Duncan

Plan Integration Over the Past Plan Cycle:

- The MJHMP has and will continue to be referenced as a part of the current General Plan update process to ensure that the mitigation goals and activities are congruent with General Plan.

Plan Integration Strategy for Next Five Years:

Planning Mechanism	Description of Planning Mechanism Opportunity
Town of Duncan General Plan	The MJHMP will be reviewed and incorporated/referenced in the final update of the Town's General Plan, which is anticipated to be completed in the Summer of 2016.
Town of Duncan Emergency Operations Plan and Procedures	The Town will use the MJHMP to assist with any future updates of the EOP, including the risk profiles and vulnerability assessments.
Town of Duncan 5-Year Capital Improvements Program	The Town will review the MJHMP mitigation actions/projects to determine if any are eligible for inclusion in the 5-year CIP

Table 3-8: Plan integration history and future strategy for Greenlee County

Plan Integration Over the Past Plan Cycle:

- Referenced and reviewed with EOP annual plan updates.
- Risk assessment information in MJHMP is reviewed referenced as a part of the quarterly LEPC meetings.
- MJHMP is referenced during application for FEMA mitigation grants and LEPC plans.
- The MJHMP is referenced and integrated into the Southern Greenlee County Small Area Transportation Plan.

Plan Integration Strategy for Next Five Years:

Planning Mechanism	Description of Planning Mechanism Opportunity
Greenlee County Comprehensive Plan	During updates, the MJHMP will be referenced and elements incorporated to provide a connection between the two planning documents.

Table 3-8: Plan integration history and future strategy for Greenlee County	
Greenlee County Emergency Operations Plan	The County will use the MJHMP to assist with any future updates of the EOP, including the risk profiles and vulnerability assessments.
Greenlee County LEPC Plan	As the lead agency for the LEPC, the County will integrate the MJHMP with the LEPC Plan and vice-versa by keeping PPOCs current and correlating potential hazards.
Greenlee County CIP	The County will continue to keep the MJHMP mitigation actions/projects and CIP projects current with each other.

3.6.2 Five Year Plan Integration/Incorporation Strategy

With the efficacy of integrating the 2011 Plan during the last cycle in view, the MJPT identified typical ways to use and incorporate the Plan over the next five-year planning cycle, as follows:

- Use of, or reference to, Plan elements in updates/revisions to codes, ordinances, general and/or comprehensive planning documents, and other long-term strategic plans.
- Integration of defined mitigation A/Ps into capital improvement plans and programming.
- Reference to Plan risk assessments during updates or revisions to land use planning and zoning maps.
- Resource for developing and/or updating emergency operations plans, community wildfire protection plans, emergency response plans, etc.
- Reference during grant application processes.
- Use of the Plan as a resource during LEPC meetings.

Specific opportunities for integrating and/or referencing the Plan into other planning mechanisms over the next five years are summarized by jurisdiction in Tables 3-6 to 3-8. In all cases, the jurisdiction's PPOC will take responsibility to ensure that the Plan, risk assessment, goals and mitigation strategies are integrated and/or incorporated into the listed planning mechanism by participating in those efforts as they occur.

3.6.3 Plan Incorporation Process

Each jurisdiction has particular processes that are followed for officially incorporating and adopting planning documents and tools. Many of the processes and procedures are similar for jurisdictions with comparable government structures.

In general, planning documents prepared by the various departments or divisions of a particular jurisdiction are developed using an appropriate planning process that is overseen and carried out by staff, and often with the aid of consultants. Each planning process is unique to the plan being developed, but all usually involve the formation of a planning or steering committee, and have some level of interagency/stakeholder coordination within the plan's effective area. Public involvement may also be incorporated when appropriate and depending on the type of plan. New or updated plans are usually developed to a draft stage wherein they are presented to the respective governing body for initial review and comment. Upon resolution and address of all comments, which may take several iterations, the plans are then presented to the governing body for final approval and official adoption.

Integration or reference to the Plan into these various processes will be accomplished by the active participation of the MJPT PPOC representative(s) from each jurisdiction, in the other planning teams or committees to ensure that the Plan risk assessment, goals, and mitigation A/Ps are integrated and/or incorporated into the planning mechanism as appropriate.

Table 3-9 provides a summary of standard operating procedures that each of the participating jurisdictions follow when considering and incorporating official planning mechanisms, and how they apply to integration of the Plan.

Table 3-9: Jurisdictional standard operating procedures for integration of planning mechanisms

Jurisdiction	Description of Plan Integration Standard Operating Procedures
Clifton	The development or update of planning related documents and mechanisms in the Town will generally be accomplished using the following steps: • At Council direction, conduct initial planning using internal resources to discern feasibility. • Staff would then work with a consultant to develop the plan to draft stage. • The draft plan would be presented to council in work session(s) and public outreach would be performed as needed. • The plan would be finalized and formally adopted by the Council during an open public meeting.
Duncan	Preparation of new or updated plans or planning mechanisms generally are initiated with the Town Manager and Council convening a work session to discuss the plans and procedures of the proposed planning document. Direction will be given to the Town Manager by the Council in developing the planning document. The draft document is then presented and reviewed by the Council and any corrections are made. The planning document is then officially adopted by the Council through a normal public hearing process. When developing the planning document, the Town Manager will review and reference the MJHMP as appropriate.
Greenlee County	In general, the development of planning documents and tools within the County follow a basic process outlined by the bullets below: • Initiation of plan development can be from staff or as a directive from BOS • Plan is written by staff and/or consultants • Plan goes through a legal review • Plan goes out for public comment • Work-study session(s) are convened with BOS • Edited plan is presented to BOS for adoption Whenever possible and appropriate, the PPOC for the County will endeavor to make sure the Greenlee County Multi-Jurisdictional Hazard Mitigation Plan is reviewed and as appropriate, incorporated into future planning documents and mechanisms by active participation in the development or update of those plans and mechanisms.

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SECTION 4: COMMUNITY DESCRIPTIONS

4.1 General

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

4.2 County Overview

4.2.1 History

In 1872, a group of soldiers from Silver City, New Mexico, lead by Captain Chase were seeking renegade Apaches, in the group were Jim and Bob Metcalf. While passing through the canyon the Metcalfs noticed rich copper deposits in the walls close to the present day town of Clifton and Morenci. The troops never found the Apaches and returned to Silver City. The Metcalf brothers later returned to prospect and staked a claim where they located rich copper deposits. The remoteness of the area and the ever present threat of Indian attacks meant that developing these resources would require large sums of money. Henry Lesinsky, a successful Jewish merchant of Las Cruces and Silver City, New Mexico, decided to invest as a partner of Robert Metcalf, one of the original prospectors of the Longfellow claim. Lesinsky recruited miners from Mexico to do the smelting of copper ore in this new enterprise. Thus, was born the Longfellow Copper Mining Company. After several rather unsuccessful attempts, a crude, but workable smelter (three mud and rock furnaces fired by mesquite charcoal and hand bellows) was built between the confluence of Chase Creek and the San Francisco River. A small settlement of miners developed near the city (a state census record for 1874 shows a population of 132). From that day to the present, the vast majority of people from Clifton, Morenci and Duncan have depended on the mining industry for their livelihood.

Three large copper mining companies, Arizona Copper Mining Company, Detroit Copper Mining Company (Phelps Dodge) and Shannon Copper Mining Companies were all operating at once. James Colquhoun, an engineer and General Manager of the Arizona Copper Company (the A.C. Company had bought Lesinsky's property in 1882). Mr. Colquhoun pioneered a plan for concentrating low grade copper and developed the principles of leaching that led to the profitable use of low grade ores.

Clifton has been under the jurisdiction of several counties. In 1872 they were recorded in Prescott, the county seat of Yavapai County. Later the territory was placed under the jurisdiction of Apache County. In 1881 Graham County was created from parts of Apache and Pima counties. Clifton was in the part of Apache County that was ceded to Graham County. The people were glad because now their county seat was only 45 miles away at Solomonville. Being a wild mining town, Clifton was not interested in government or they would have fought for the county seat, because Clifton had far more population than Solomonville. By the turn of the century the people of Clifton began to fight for the establishment of a new county. Clifton and Morenci had a combined population of 10,000 while Safford and Solomonville had about half that number. The people of Clifton-Morenci felt that it was the old story of taxation without representation since most of the county officers were chosen by the political machine at Safford. The Clifton and Morenci mines were paying most of the county's taxes.

In the early 1900's the fight for county division was renewed. The managers of the three mining companies had taken up the fight. The Arizona Copper Company wished to name the county after Mr. Colquhoun, who was the head of the company. The leaders in Morenci wanted the name to be Douglas in honor of Dr. James Douglas, superintendent of the Detroit Copper Company of Morenci. This proposal caused the Clifton leaders to give up their proposed name of Colquhoun and substitute Lincoln instead. They sent John R. Hampton a young, able lawyer who worked for the Shannon Copper Company, to the state legislature. He organized the fight at the territorial capital, which led to the establishment of Greenlee County. The mining companies decided to send a large delegation of local men to Phoenix to lobby for division. In Safford and Solomonville a fight was led by Charles Solomon, a banker, against the county division. When the bill was introduced before the legislature, many farmers and townspeople

from Graham County made the trip to Phoenix to lobby against it. The bill was introduced on February 25, 1909 as council bill 94. It passed by a majority of 10 to 1. The bill went to the house where it was passed with an amendment to change the name from Lincoln to Greenlee. This was done to delay the final passage of the bill, the amendment lost by a vote of 5 to 4. Mr. Mills, General Manager of the Detroit Copper Company made a trade with the Safford opponents where the final division would be delayed for two years. This agreement and the assumption of all Graham county debts, which were $146,000, by the new county appeased the Safford delegation. Nearly all opposition ceased and the bill passed the next day by a vote of seven to two in the Council. The bill to create a new county was approved March 10, 1909 by Governor Joseph H. Kibbey. It was one of the smaller counties, being only 120 miles long and 20 miles wide containing 1,037,713 acres. With only four populated towns the new county had a population of about 12,000 to 13,000 people.

Both Clifton and Duncan fought to become the county seat. The citizens of Duncan argued that since Duncan was the county's outlet to the rest of the world, and more accessible to the rest of the world, it should become the County's seat. Clifton argued that it was nearer the geographical center of the county and nearer to the population centers of Morenci and Metcalf. Clifton won the fight and the seat was located there.

Besides the Copper Mines of the Clifton-Morenci-Metcalf area, there are mines in the Duncan District of the Gila Valley. Precious metals have been produced at Ash Peak and from the mines in the mountains east of Duncan. Duncan is considered a farming and ranching area. Ranching on Blue River, Eagle Creek, and the "Frisco" River has added to the County economy since the 1870's. One of the three largest cattle company to operate in Arizona was the Double Circle with ranch headquarters on Eagle Creek.

The first mineral discoveries in the Clifton-Morenci District were made around 1856 when a group of California volunteers pursuing renegade Apache Indians came through the area and wrote about the colorful mineral outcrops. In 1872 a group of soldiers from New Mexico were seeking renegade Indians, among the group were Joe Yankie, Robert and James Metcalf. They later returned to the area searching for placer gold. Although very little gold was found, they located the Longfellow, Arizona Central and Metcalf claims which later become the mines around the town of Metcalf and Morenci.

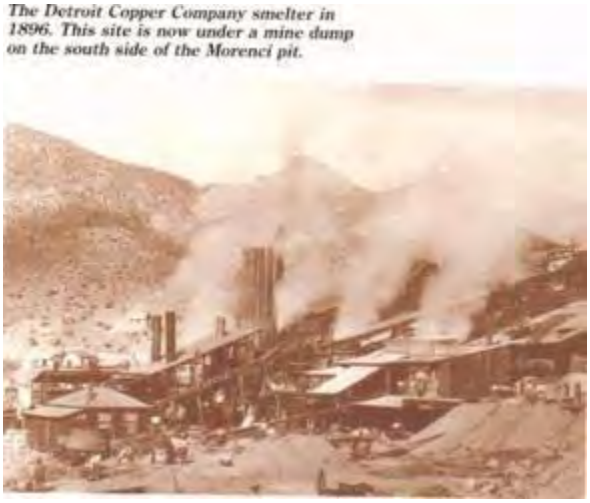
Source: Phelps Dodge/Greenlee County Historical Society

Two mining companies were organized in the Clifton-Morenci District in the early 1870's; the Longfellow Copper Company (which later became the Arizona Copper Company) and the Detroit Copper Company (later became Phelps Dodge, Morenci Branch). The first ore mined from the Longfellow mine assayed as high as 80% copper, and averaged 20% copper over the first 10 years of mining. The first copper furnace was built in Chase Creek, about 800 feet below the Longfellow Mine so the ore had to be lowered by cable in ore cars. Horse and mule-drawn wagons transported ore before the coming of the railroad in 1879. They hauled in all supplies and carried out the limited amount of copper from the crude smelters. The wagons then hauled the copper to the railroads that carried them to markets as far away as San Francisco and Kansas City or Kit Carson, Colorado, which was the nearest railroad.

Although the ore contained very high copper grades, the early mining in the district had three major problems. The early smelters lasted only a few weeks (sometimes only days) before they had to be rebuilt. The transportation costs of the ore from the mine to the smelters, to the railhead for delivery and then to the market were expensive and often unreliable. The constant threat of Indian raids often caused temporary production losses.

Early mining by the Detroit Copper Company ceased after a short time because of the dangers of Indian raids and the remoteness of the mines. It was reactivated a few years later with the arrival of William Church. In 1880, Church decided to build a smelter to handle the ore from his mines. He didn't have the required capital, so he went to New York to seek a loan. On a historic day in 1881, Church entered the office of Phelps Dodge and Company in New York City and asked for a loan. Phelps Dodge at this time was not in the mining business, but rather involved in exporting commodities such as cotton, and importing metals, primarily tin, copper, brass, and zinc. Phelps Dodge did not immediately extend the loan, but asked Dr. James Douglas, a renowned metallurgist to examine Church's claims. Douglas reported favorably and recommended that Phelps Dodge invest in mining properties in Bisbee, Arizona that same year. Because of Douglas favorable report, Phelps Dodge and Company advanced $50,000 to Church and became part owners of the Detroit Mining Company. The year 1881 thus became the year Phelps Dodge entered Morenci and began mining copper.

In 1882, the Detroit Copper Company smelter was shut down because an Apache Indian raid killed several workers, stole the supplies and left the smelter riddled with bullet holes. Because of the difficulties with the Indians, the high cost of ore transportation to the smelter in Clifton, the smelter was relocated in 1883 closer to the mining in Copper Mountain. As part of the move the name "Morenci" was given to this new area, replacing the old name of "Joy's Camp".


The Detroit Copper Company smelter in 1896. This site is now under a mine dump on the south side of the Morenci pit.

Source: Phelps Dodge/Greenlee County Historical Society

In 1892, the Detroit Copper Company was forced to shut down because the price of copper dropped to six cents per pound. An attempt to start back by building a concentrator to handle lower grade sulfide copper ore was unsuccessful. In 1897, Church sold the remainder of the Detroit Copper Company to Phelps Dodge and Company for $1,600,000. Underground mining was renewed, a new concentrator was built and the Company again prospered.

The three major operators in the early 1900's were the Detroit, the Arizona, and the Shannon Copper Companies. In the towns of Metcalf were the Arizona and Shannon Copper Company mines; Morenci had the Arizona Copper Company mines and concentrator, and the Detroit Copper Company mines, concentrator and smelter. Clifton with the Arizona Copper Company and the Shannon Copper Company concentrators and smelters were all thriving.

In 1921, Phelps Dodge became sole owner of the entire mining District through its purchase of the Arizona Copper Company which had been the largest copper operation in the Clifton-Morenci District since 1882. Most of the ore mined by the underground methods after 1921 was sulfide copper ore from the Humboldt Mine and assayed 2% to 4% copper. By 1928 and 56 years of operation, the Morenci district had produced almost two billion pounds of copper.

Between 1928 and 1930, Phelps Dodge drilled many test holes in the "Clay" deposits. Although huge tonnages of ore were indicated, the grade of the ore was too low to be mined profitably by underground methods. In 1932, all underground mining ended in Morenci because the depression had dropped copper prices to less than six cents per pound.

In 1937 mining was again started in Morenci, not by underground methods, but rather by open pit methods. Stripping of waste from the top of the ore body lasted until 1942 when the first ore was delivered to the new Morenci concentrator and a new era of mining in the Morenci district began.

4.2.2 Geography

Greenlee County is located in eastern Arizona on the state line with New Mexico. According to the Greenlee County Comprehensive Plan [2], the County was created by an Act of the 25th Territorial Assembly in 1909, by a division of Graham County. The County is currently comprised of 1,838 square miles, with the Town of Clifton serving as the County seat since inception. The location of Greenlee County, relative to other counties within the State of Arizona is depicted in Figure 4-1.

The County limits generally extend from longitude 109.05 to 109.50 degrees west and latitude 32.42 to 33.80 degrees north. Major roadway transportation routes through the County include U.S. Highways 70 and 191, and State Routes 75 and 78. Railways through the County include the Southern Pacific Railway and the Phelps Dodge Industrial Railroad, which services the Phelps Dodge Morenci Copper Mine. Figure 4-2 shows all the major roadway and railway transportation routes and the airports within Greenlee County.

The Gila River, San Francisco River, Blue River, Black River and Eagle Creek are the primary perennial watercourses located within the County. The Black River also forms a portion of the northwest boundary of the County. The remaining watercourses are primarily ephemeral washes.

The geographical characteristics of Greenlee County have been mapped into three terrestrial ecoregions[3], which are depicted in Figure 4-3 and described below:

- **Arizona Mountain Forests** – this ecoregion contains a mountainous landscape, with moderate to steep slopes. Elevations in this zone range from approximately 4,000 to 13,000 feet, resulting in comparatively cool summers and cold winters. Vegetation in these areas are largely high altitude grasses, shrubs, brush, and conifer forests.
- **Chihuahuan Desert** – this ecoregion is typical of the high altitude deserts and foothills and is found in much of the southeastern portion of Arizona. Elevations in this zone vary between 3,000 to 4,500 feet. The average temperatures for the Chihuahuan Desert tend to be cooler than the Sonoran Desert (see below) due to the elevation differences. However, like its lower elevation cousin, the summers are hot and dry with mild to cool winters.
- **Sierra Madre Occidental Pine-Oak Forest** – this ecoregion is predominant to mountainous regions in southeast Arizona with elevations generally above 5,000 feet. The average temperatures tend to be cool during the summer and cold in winter.

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

[3] World Wildlife Fund, 2010, GIS database.

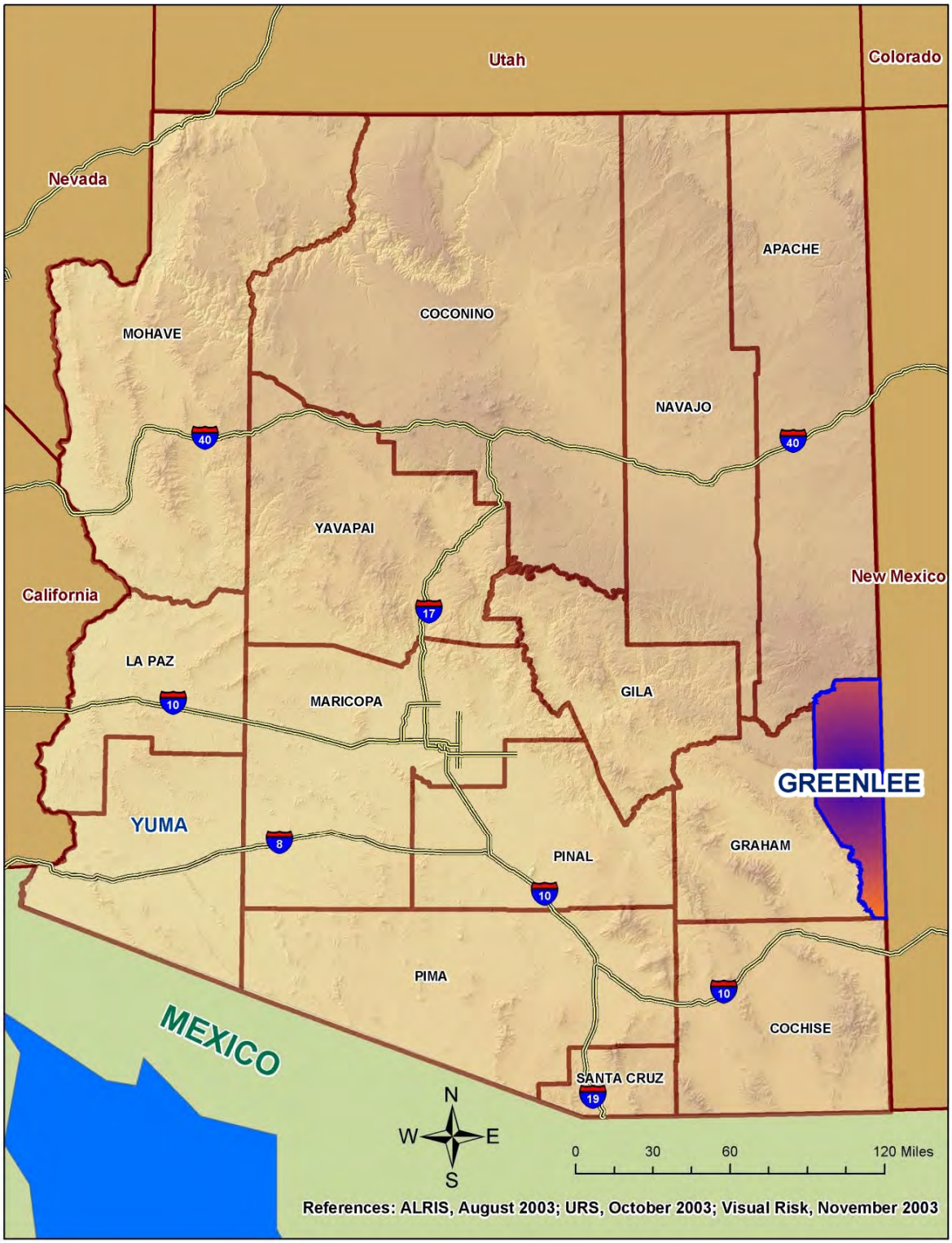


Figure 4-1
Vicinity Map

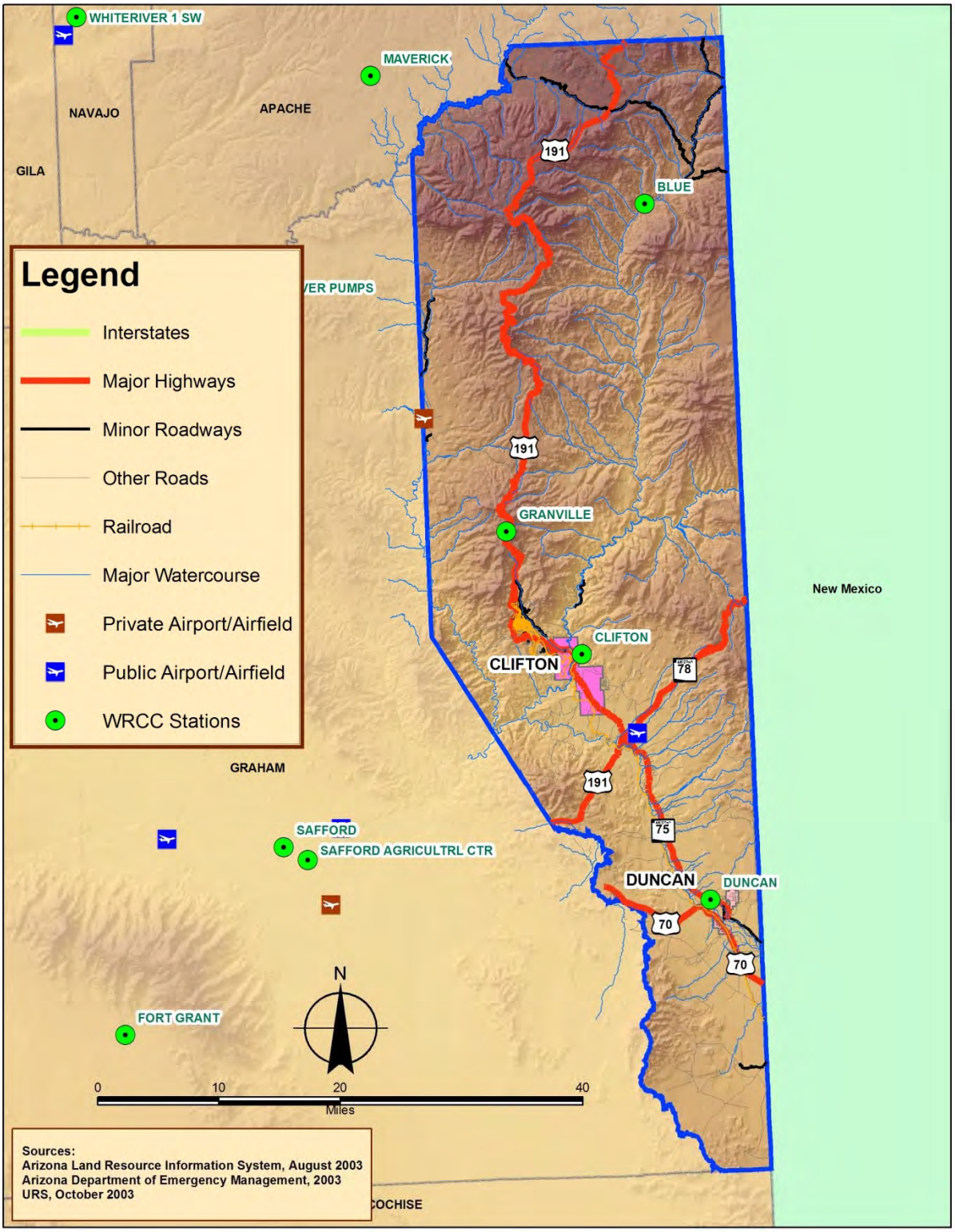


Figure 4-2
Transportation Routes Map

Figure 4-3
Terrestrial Ecoregions Map

4.2.3 Climate

For the majority of Greenlee County, the climate when compared to other regions in the State of Arizona, is relatively moderate. Climatic statistics for weather stations within Greenlee County are produced by the Western Region Climate Center[4] and span records dating back to the early 1900's. Locations of reporting stations within or near Greenlee County are shown on Figure 4-2.

Average temperatures within Greenlee County range from below freezing during the winter months to over 100 degrees Fahrenheit during the hot summer months. The severity of temperatures in either extreme is highly dependent upon the location, and more importantly the altitude, within the County. Below are figures taken from three climate stations found in geographically different areas of Greenlee County. Figures 4-4, 4-5, and 4-6 present graphical depictions of temperature variability and extremes throughout the year for the Blue, Clifton, and Duncan Stations respectively. The Blue Station would be representative of typical Arizona Mountain Forest ecoregions. The Clifton Station would represent the transitional zone from Arizona Mountain Forest to Chihuahuan Desert. The Duncan Station represents values typical of the Chihuahuan Desert ecoregion. In general, there is an approximate ten degree reduction in temperature between the lower Chihuahuan Desert and upper Arizona Mountain Forest elevation stations.

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

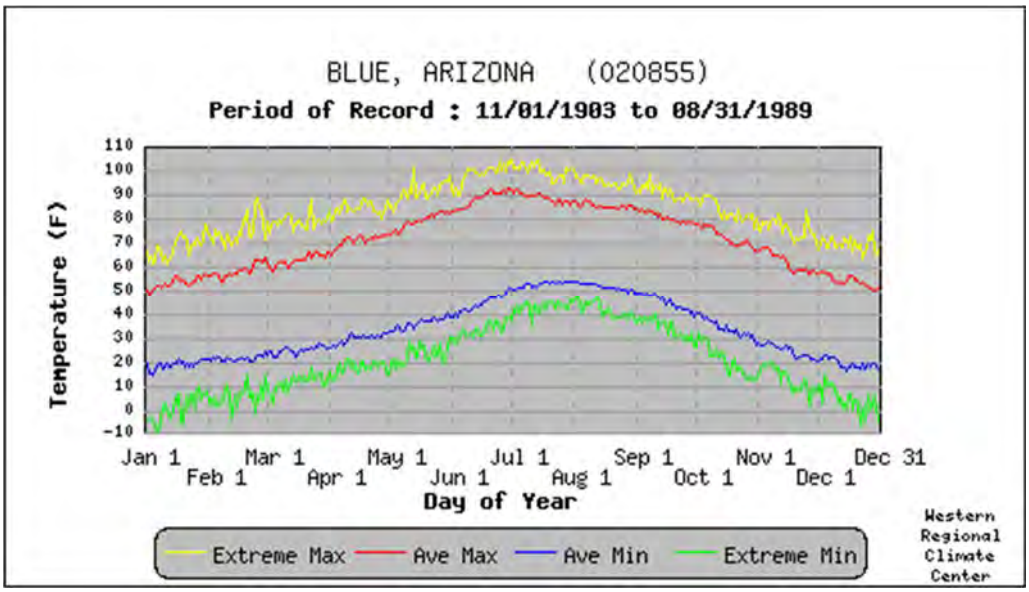


Figure 4-4
Daily Temperatures and Extremes for Blue Station, Arizona

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

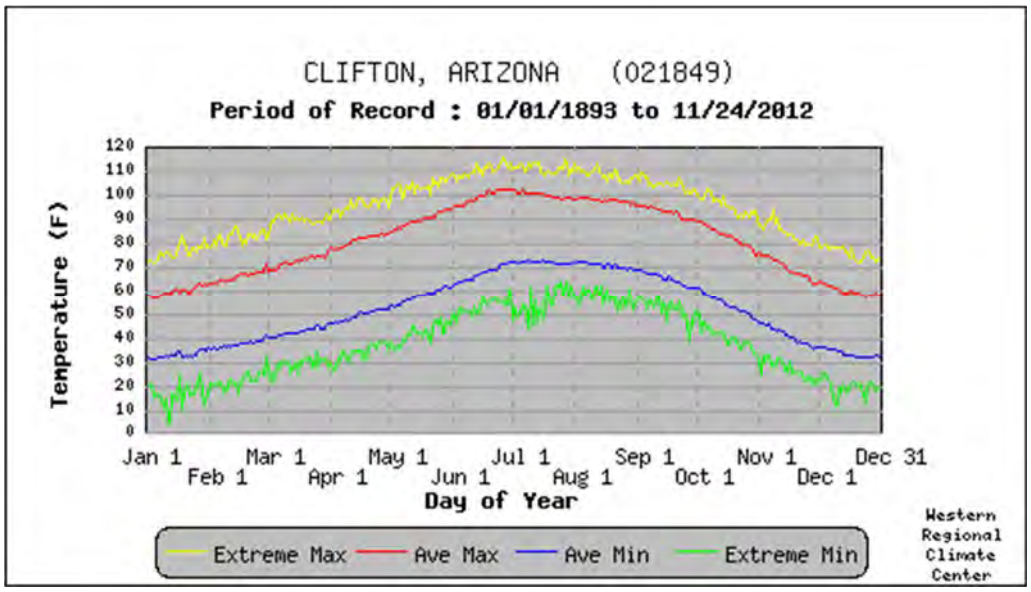


Figure 4-5
Daily Temperatures and Extremes for Clifton Station, Arizona

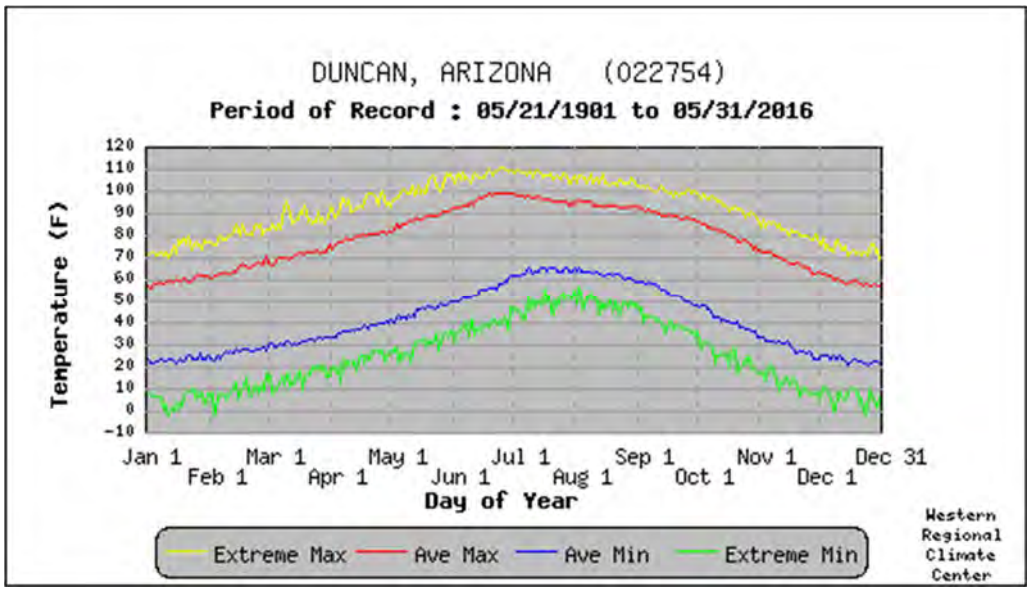


Figure 4-6
Daily Temperatures and Extremes for Duncan Station, Arizona

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

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

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

BLUE, ARIZONA (020855)

Period of Record Monthly Climate Summary

Period of Record : 11/01/1903 to 08/31/1989

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	53.5	58.1	62.6	70.6	78.9	88.3	88.9	85.7	80.8	72.4	61.8	54.3	71.3
Average Min. Temperature (F)	18.6	21.1	24.5	29.4	36.0	44.3	52.5	51.4	45.2	34.3	24.6	19.1	33.4
Average Total Precipitation (in.)	1.35	1.30	1.27	0.70	0.50	0.68	3.90	3.69	2.27	2.13	1.14	1.79	20.73
Average Total SnowFall (in.)	5.3	5.9	2.8	1.0	0.0	0.0	0.0	0.0	0.0	0.3	1.7	7.6	24.6
Average Snow Depth (in.)	0	0	0	0	0	0	0	0	0	0	0	1	0

Percent of possible observations for period of record.
Max. Temp.: 37% Min. Temp.: 36.8% Precipitation: 63.6% Snowfall: 63.6% Snow Depth: 59.8%
Check Station Metadata or Metadata graphics for more detail about data completeness.

Western Regional Climate Center, wrcc@dri.edu

Figure 4-7
Monthly Climate Summary for Blue Station, Arizona

CLIFTON, ARIZONA (021849)

Period of Record Monthly Climate Summary

Period of Record : 01/01/1893 to 11/24/2012

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	59.7	65.8	72.5	80.9	89.7	99.2	100.1	97.7	93.2	82.9	69.3	59.7	80.9
Average Min. Temperature (F)	32.8	37.2	42.6	49.3	57.6	67.1	71.5	70.6	65.1	54.0	40.8	33.4	51.8
Average Total Precipitation (in.)	1.02	1.01	0.82	0.39	0.35	0.42	2.22	2.43	1.64	1.10	0.79	1.19	13.36
Average Total SnowFall (in.)	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.5	1.1
Average Snow Depth (in.)	0	0	0	0	0	0	0	0	0	0	0	0	0

Percent of possible observations for period of record.
Max. Temp.: 81.9% Min. Temp.: 81.1% Precipitation: 96.4% Snowfall: 96.2% Snow Depth: 96.1%
Check Station Metadata or Metadata graphics for more detail about data completeness.

Western Regional Climate Center, wrcc@dri.edu

Figure 4-8
Monthly Climate Summary for Clifton Station, Arizona

DUNCAN, ARIZONA (022754)

Period of Record Monthly Climate Summary

Period of Record : 05/21/1901 to 05/31/2016

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	59.5	64.3	70.6	79.0	87.2	96.1	96.4	93.8	89.6	80.3	68.1	59.3	78.7
Average Min. Temperature (F)	23.5	26.5	31.4	37.2	45.1	54.3	63.7	62.4	54.2	41.2	29.2	23.2	41.0
Average Total Precipitation (in.)	0.83	0.77	0.56	0.23	0.25	0.32	1.88	2.04	1.13	0.95	0.60	1.00	10.57
Average Total SnowFall (in.)	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.7
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.: 57.7% Min. Temp.: 57.8% Precipitation: 65.2% Snowfall: 64.3% Snow Depth: 63.9%
Check Station Metadata or Metadata graphics for more detail about data completeness.

Western Regional Climate Center, wrcc@dri.edu

Figure 4-9
Monthly Climate Summary for Duncan Station, Arizona

4.2.4 Population

Greenlee County is home to 8,440 residents, with the majority of the population living in the two communities of Clifton and Duncan which are geographically located in the southern half of the County. The largest community is the Town of Clifton. Other smaller, unincorporated places are located throughout the county, with most situated along major highways and primarily comprised of only a few structures or landmark. Table 4-1 summarizes jurisdictional population statistics for Greenlee County incorporated communities and the County as a whole.

Table 4-1: Summary of jurisdictional population estimates for Greenlee County

Jurisdiction	1990	2000	2010	2015	2020
Greenlee County (total)	8,000	8,547	8,437	9,529	10,694
Towns					
Clifton	2,840	2,596	3,311	3,685	n.a.
Duncan	660	812	696	799	n.a.
Unincorporated	n/a	5,139	4,431	5,045	n.a.

Note:
- *n.a. – not available at this time. Will be published in September 2016*
- *Figures for 1990, 2000, and 2010 from AZ Dept of Admin. Employment and Population Statistics, as accessed at: https://population.az.gov/population-estimates*
- *Figures for 2015 from US Census Bureau as accessed at: http://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml*
- *Figures for 2020 from AZ Dept of Admin. Employment and Population Statistics, as accessed at: https://population.az.gov/population-projections*

4.2.5 Economy

Greenlee County, Arizona's 14th county, was created from the eastern part of Graham County by an act of the 25th territorial assembly on March 10, 1909. There was great resistance to the formation of this new county because Graham County would lose considerable copper mining revenue. However, the citizens in the Morenci mining district of eastern Graham County wanted a more localized governing area. As a compromise, Greenlee County assumed $146,000 of Graham County's debt and Greenlee County was made smaller than originally proposed. The County was named after Mason Greenlee, an early day mining man. In 1921, Phelps Dodge became sole owner of the entire mining district through its purchase of the Arizona Copper Company which had been the largest copper operation in the Clifton-Morenci District since 1882. Most of the ore mined by the underground methods after 1921 was sulfide

copper ore from the Humboldt Mine and assayed 2% to 4% copper. By 1928 and after 56 years of operation, the Morenci district had produced almost two billion pounds of copper. Between 1928 and 1930, Phelps Dodge drilled many test holes in the "clay" deposits. Although huge tonnages of ore were indicated, the grade of the ore was too low to be mined profitably by underground methods. In 1932, all underground mining ended in Morenci because the depression had dropped copper prices to less than six cents per pound. In 1937, mining was again started in Morenci, but not by underground methods. This era of mining saw the introduction of open pit methods. Stripping of waste from the top of the ore body lasted until 1942 when the first ore was delivered to the new Morenci concentrator and a new era of mining in the Morenci district began [6].

Duncan was originally established as a shipping point for cattle. Around Duncan, substantial agriculture has developed in the rich soils of the well-watered Gila River Valley. Farming and ranching continue to be the primary industries for the small community.

As indicated by Table 4-1, growth in Greenlee County has been very slow and is closely tied to the copper mining industry. During the period of 1990 to 2000, census data housing unit counts indicate an average annual growth rate of less than 0.8 percent. During 2000-2010, the County essentially experienced a net of zero growth.

Greenlee County covers 1,837 square miles. The vast majority of land is government-owned. The U.S. Forest Service controls 63.5 percent; the U.S. Bureau of Land Management, 13.6 percent; and individual or corporate ownership, only 8.1 percent. Figure 4-10 provides a visual depiction of the land ownership and town or community locations within the County.

[6] Excerpts taken from the Greenlee County website at the following URLs:
http://www.co.greenlee.az.us/History/MorenciMining.aspx and
http://www.co.greenlee.az.us/History/HistoryHomePage.aspx

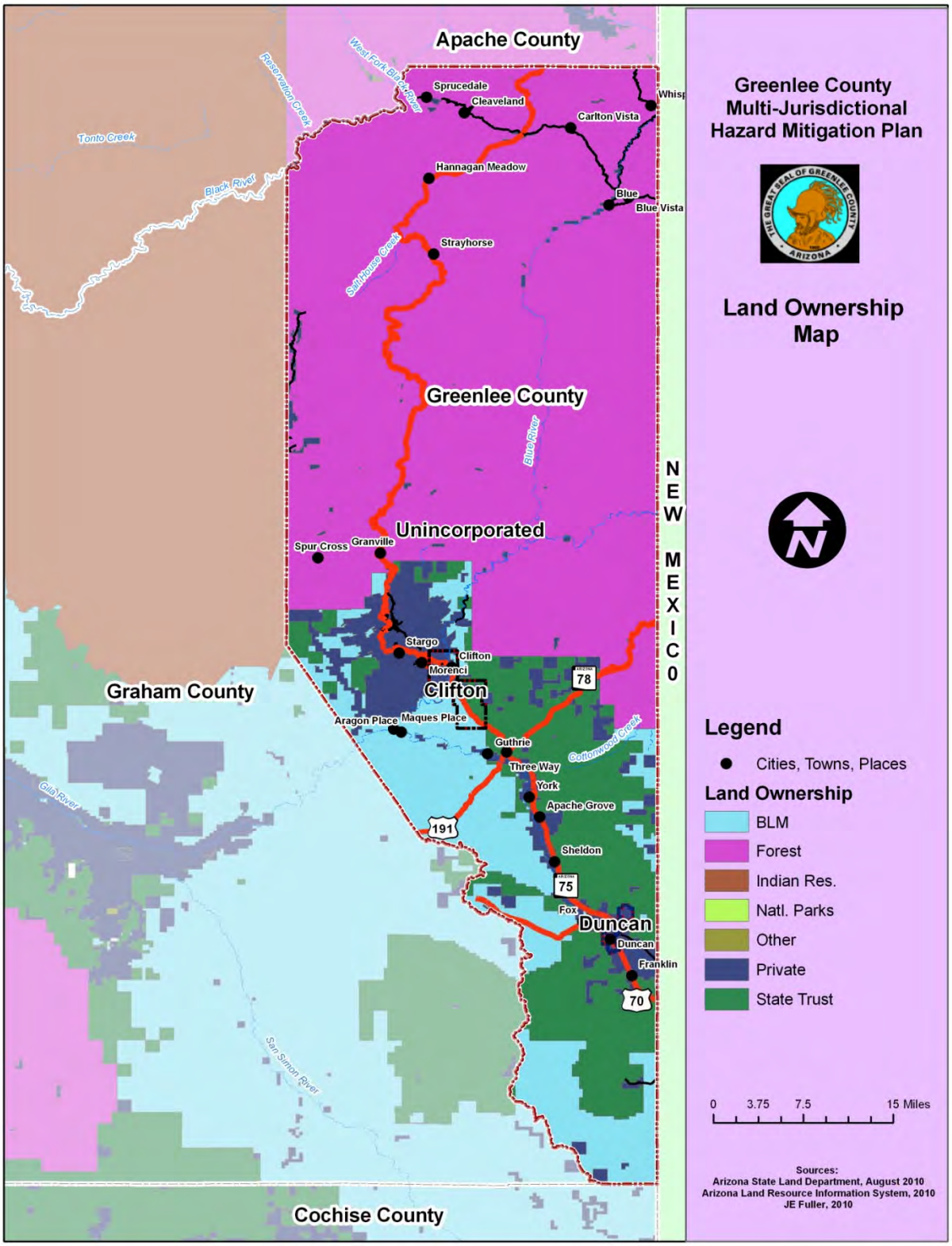


Figure 4-10: Land Ownership and Community Location Map for Greenlee County

4.3 Incorporated Jurisdictional Overviews

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

4.3.1 Clifton

The Town of Clifton is located in the central portion of Greenlee County in southeastern Arizona. Clifton is one of two incorporated communities in Greenlee County and serves as the County seat. The Town is enclosed by steep canyon walls with the San Francisco River and Chase Creek running through the middle. The Town is sometimes referred to as the "Gateway to the Coronado Trail," which follows U.S. Highway 191 from Clifton north to the town of Springerville, Arizona and is noted as one of the most scenic drives in Arizona. The present incorporated Town limits occupy 14.86 square miles, with approximately half encompassing the main portion of Town and the other half extending south the main Town. The location of Clifton, relative to Greenlee County is depicted in Figure 4-11.

The centroid of the Town is generally located at longitude 109.29 degrees west and latitude 33.02 degrees north and the average elevation is 3,464 feet. The major roadway through the Town is U.S. Highway 191 or otherwise known as the Coronado Trail. State Routes 75 and 78 junction with U.S. Highway 191 south the Town boundaries. The Southern Pacific Railway passes through Clifton and is primarily used to service the Phelps Dodge Corporation's Morenci Mining District. Greenlee County operates an airport south of Town off of State Route 78. Figure 4-2 shows all the major roadway and railway transportation routes within the vicinity of Clifton.

The San Francisco River is the primary perennial watercourse located within the Town. Other major watercourses include Chase Creek, Wards Canyon Wash, and Owl Canyon Wash. The remaining watercourses are primarily small ephemeral washes.

As shown on Figure 4-3, the Town of Clifton is located at the transitional zone from Chihuahuan Desert to Arizona Mountain Forests. The corridor along the San Francisco River upstream and downstream of Clifton provides an example of a desert riparian community where scattered cottonwood, willow, sycamore, box elder, ash, and walnut trees grow along the riverbank.

Clifton is one of two (2) incorporated communities within Greenlee County. There are an additional thirteen (13) unincorporated communities scattered across the County, with Morenci and Guthrie being the closest to Clifton. Approximately half of the land is privately owned with the other half divided between Bureau of Land Management holdings and State Land. Figure 4-11 provides a visual depiction of the land ownership within the Town.

The total 2015 population for Clifton was 3,685. Town officials believe the current population is close to 4,500. Table 4-1 summarizes population estimates for Clifton and other Greenlee County communities in 10-year cycles beginning in 1990 and projecting through 2020.

Manufacturing/Mining: According to the community profile for Clifton[7], the average labor force in 2008, was 1,331 with an unemployment rate of 6.8 percent. The major industries significant to the economy of Clifton include: Copper Mining and Processing, Retail Trade and Services, and Tourism.

According to the Greenlee County website [8], Henry Clifton, Recorder of the Hassayampa Mining District, and for whom the city of Clifton is thought to be named, learned of placer mining in the area and journeyed overland in 1864. There, among the cliffs and canyons where Chase Creek joins the San Francisco, he found signs of copper, but gold and silver were still the metals sought, and the copper went undeveloped. In 1870, the growing demand for copper brought a renewal of exploration. Soon the town of Metcalf arose upon Chase Creek, five miles to the north. A smelter large enough to accommodate the surrounding mining needs was built at Clifton, where waterpower was available. Once established as a smelter site and as a trans-shipment point for copper, Clifton's future was assured.

[7] Arizona Department of Commerce, 2009, *Community Profile for Duncan, Arizona*

[8] Greenlee County Website, 2005, URL at: *http://www.co.greenlee.az.us/History/Clifton.aspx*

Very early in 1879, Clifton claimed the distinction of possessing the first steam-powered railroad in Arizona-making runs between the Longfellow Mine and the Clifton smelter. In the early eighties, the railhead of the Arizona and New Mexico Railroad was extended from Lordsburg with Clifton becoming the terminus. Along with the boost to civic pride and economic well-being, this development ended the difficult and dangerous haulage by mule and wagon, which were often attacked by Apache ambush.

Indian attacks, floods, mine fires, and a coarse standard for the mining camps of that day were easily taken in stride by the people of Clifton. At one point during its years of lusty, roaring growth, it was known as being the second toughest town in the west. The community standing first in this honor was not specified. In time, the high-grade copper ore was depleted and the direct-smelting process for low-grade ore became uneconomical. During the Depression years the flotation process, now in use by Freeport McMoRan, Incorporated, was developed to exploit the very-low grade ores of the Morenci Pit, which then was in the planning stage. A vast complex of tailings ponds and basins was erected along the hilltops of Morenci, and the role of Clifton in the copper mining industry changed.

Tourism: No longer directly involved in the physical mining processes, the Town, with characteristic enterprise, has evolved into a trading center for the ranching and farming regions lying southward, and as a tourism stop along the famous Coronado Trail.

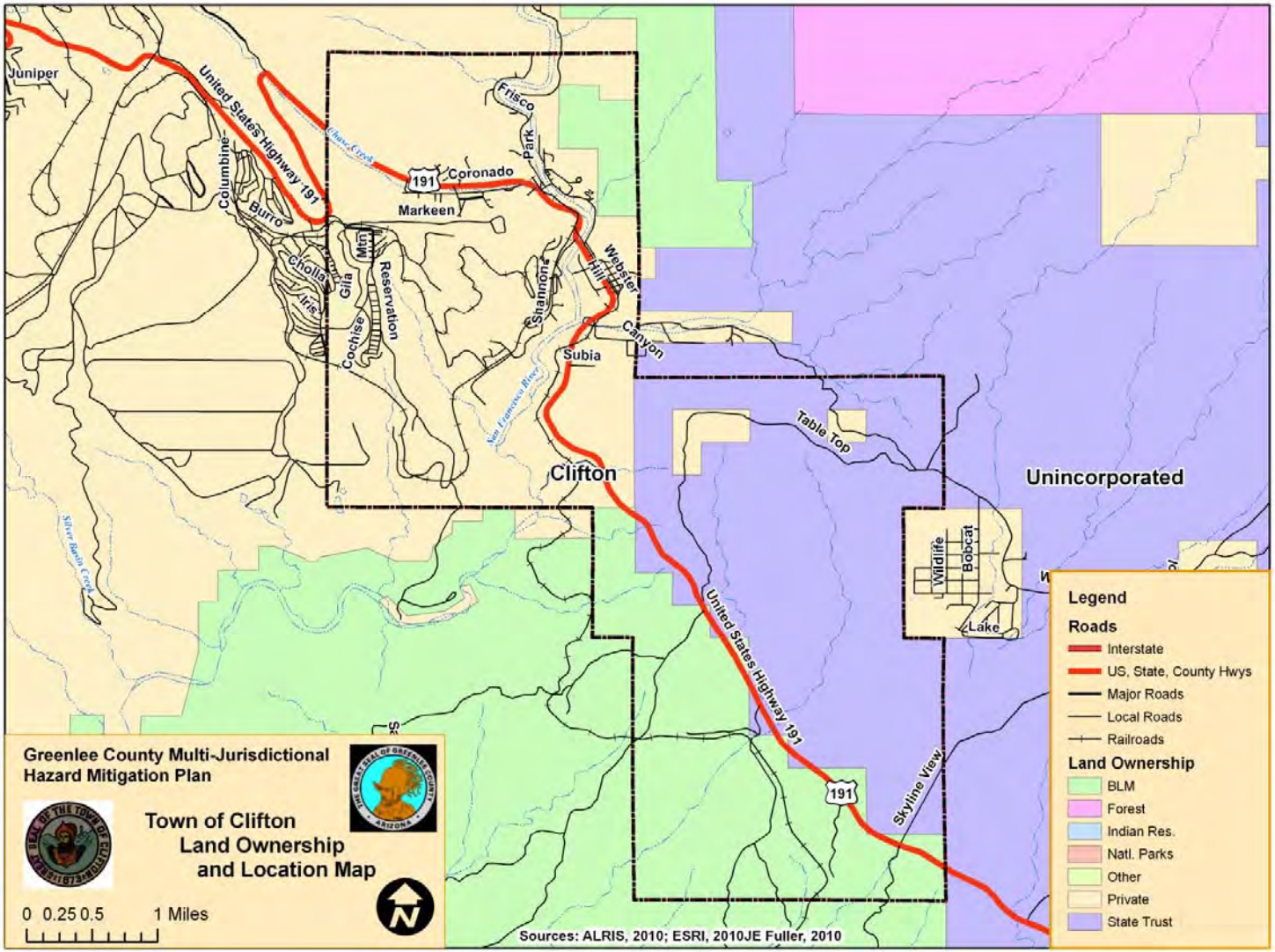


Figure 4-11: Town of Clifton location map

4.3.2 Duncan

The Town of Duncan is located in southeastern Arizona and is within six miles of the Arizona/New Mexico state border. Duncan is one of two incorporated communities in Greenlee County, and is situated along the Gila River in the southern portion of the county. The Town lies in the central portion of a long, narrow valley extending from east of Virden, New Mexico to the Gila River confluence with the San Francisco River. The present incorporated Town limits occupy 2.38 square miles, with approximately half situated north of the Gila River (locally referred to as Hunter Flat) and the other half on the south (Main Town). The location of Duncan, relative to Greenlee County is depicted in Figure 4-1.

The centroid of the Town is generally located at longitude 109.10 degrees west and latitude 32.74 degrees north and the average elevation is 3,535 feet. Major roadway transportation routes through the Town include U.S. Highway 70 and State Route 75. The Southern Pacific Railway passes through Duncan and is primarily used to service the Freeport McMoRan Corporation's Morenci Mining District. In the past, Duncan has operated its own airport (O'Connor Airfield), which is located approximately 1.5 miles southwest of Town. Increased insurance costs forced the closure of the airport for a period of time; however, the Town has begun construction again with an expected operational date targeted for late 2016. Figure 4-12 shows all the major roadway and railway transportation routes within the vicinity of Duncan.

The Gila River is the primary, and only perennial, watercourse located within the Town. The remaining watercourses are primarily ephemeral washes, with Blackfield Canyon Wash and Packer Wash being the largest.

As shown on Figure 4-3, the Town of Duncan lies entirely within the Chihuahuan Desert. The corridor along the Gila River provides an excellent example of a healthy desert riparian community where scattered cottonwood, willow, sycamore, and mesquite trees grow in dense thickets of water motie and arrow weed.

Duncan is one of two (2) incorporated communities within Greenlee County. There are an additional thirteen (13) unincorporated communities scattered across the County, with Franklin and Sheldon being the closest to Duncan. The majority of land within Duncan is privately held with the rest being State Land. Figure 4-12 provides a visual depiction of the land ownership within the Town.

The total 2015 population for Duncan was 799. Table 4-1 summarizes population estimates for Duncan and other Greenlee County communities in 10-year cycles beginning in 1990 and projecting through 2020.

Agriculture: Irrigation and farming were well established when the Duncan Post Office was created in 1883. Approximately, 10,000 acres is under irrigation which produces around 5,000 bales of cotton annually. Some of the other crops include: alfalfa, grains, potatoes, melons and chilies. The Duncan Valley became the heart of the cattle and farming area and exported meat and milk products, vegetables and wheat throughout the copper mining area of southeastern Arizona.

Mining/Manufacturing: According to the community profile for Duncan[9], the average labor force in 2008 was 353 with an unemployment rate of 6.2 percent. The major industries significant to the economy of Duncan include: Crop and Ranching Agriculture, Copper Mining, Retail Trade and Services, and Public Administration.

According to the 2004 update to the Town of Duncan Comprehensive Plan[10], the first permanent communities in the Duncan area were established after the Civil War. The settlement of the Western U.S. and the opening of the copper mines in Clifton/Morenci pulled many people into the southeastern Arizona area.

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[9] Arizona Department of Commerce, 2009, *Community Profile for Duncan, Arizona*

[10] Town of Duncan, 2004, *Town of Duncan Comprehensive Plan – 2004 Update.*

A narrow-gauge railroad, the Arizona and New Mexico, was completed from Lordsburg in 1883 as well. The rail line was changed to standard gauge in the early 1900's and still serves the copper mine in Clifton/Morenci. Stage routes and freight hauling roads gradually developed into the current highway system of well-maintained two lane roads between Duncan, Virden, Clifton/Morenci, and Safford.

Tourism:

The Town was most likely named after Sheriff James Duncan Smith, a director of the Arizona Copper Company, headquartered in Scotland. Duncan was officially incorporated on July 5, 1938. The first major expansion of the Town boundaries was the annexation of the Hunter Estates area, north of the Gila River, in 1974. The Babbitt Heights area was subdivided in 1980 and the Duncan Heights were annexed in 1983. The LDS Church area was also annexed in 1983. In 2010 the town started its own farmers market located at Centennial Park. Along with the historical buildings already in Duncan, ADOT will be relocated some historical markers to Duncan in 2011. The Sandra Day O'Conner walkway is a new addition to Duncan and was completed in May 2011.

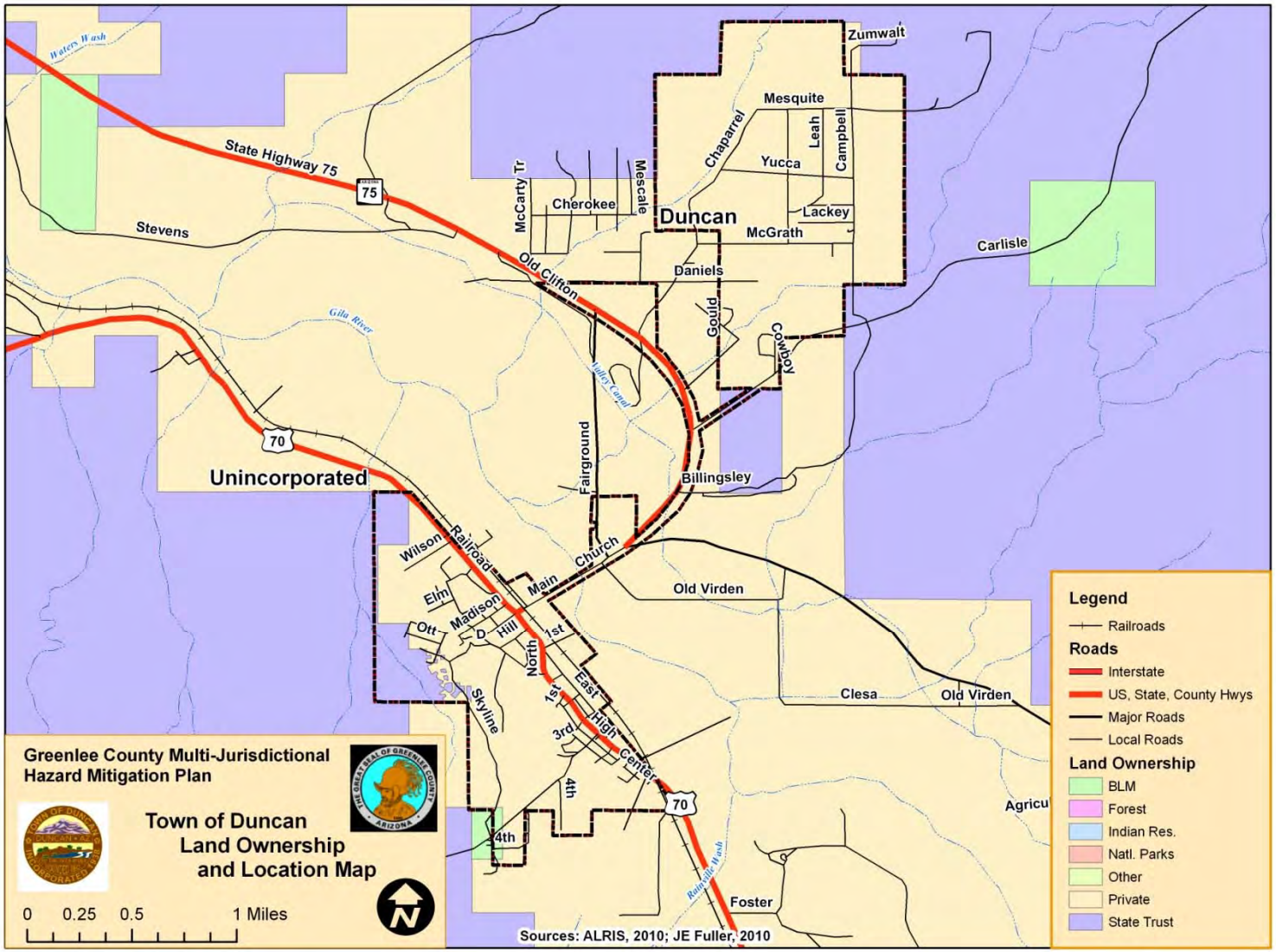

Figure 4-12: Town of Duncan Landownership and Location Map

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SECTION 5: RISK ASSESSMENT

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

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

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

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

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

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

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

One of the key elements to the hazard mitigation planning process is the risk assessment. In performing a risk assessment, a community determines "what" can occur, "when" (how often) it is likely to occur, and "how bad" the effects could be[11]. According to DMA 2000, the primary components of a risk assessment that answer these questions are generally categorized into the following measures:

Hazard Identification and Screening

Hazard Profiling

Assessing Vulnerability to Hazards

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

5.1 Hazard Identification and Screening

Hazard identification is the process of answering the question; *"What hazards can and do occur in my community or jurisdiction?"* For this Plan, the list of hazards identified in the 2011 Plan were reviewed by the Planning Team with the goal of refining the list to reflect the hazards that pose the greatest risk to the jurisdictions represented by this Plan. The Planning Team also compared and contrasted the 2011 Plan list to the comprehensive hazard list summarized in the 2013 State Plan[12] to ensure compatibility with the State Plan. Table 5-1 summarizes the 2011 Plan and 2010 State Plan hazard lists.

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

[12] ADEM, 2013, *State of Arizona Multi-Hazard Mitigation Plan*

Table 5-1: Summary of initial hazard identification lists	
2011 Greenlee County Plan Hazard List	**2013 State Plan Hazard List**
• Drought • Flooding/Flash Flood • Levee Failure • Wildfires	• Dam Failure • Disease • Drought • Earthquake • Extreme Heat • Fissure • Flooding/Flash Flood • HAZMAT • Landslides/Mudslides • Levee Failure • Severe Wind • Subsidence • Terrorism • Wildfires • Winter Storms

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

One tool used in the initial screening process was the historic hazard database referenced in 2011 Plan. With this update, the 2011 Plan database was reviewed and revised to separately summarize declared disaster events versus non-declared events. Declared event sources included Greenlee County Department of Emergency Management (GCDEM), Arizona Division of Emergency Management (ADEM), Federal Emergency Management Agency (FEMA), and United States Department of Agriculture (USDA). Non-declared sources included Arizona State Land Department (ASLD), National Weather Service (NWS), National Oceanic and Atmospheric Administration (NOAA), National Climatic Data Center (NCDC), United States Geological Survey (USGS), and United States Forest Service (USFS). Both data sets were updated with additional hazard events that have occurred over the last plan cycle. The declared events represent the period of February 1966 to August 2010. The undeclared events were decided by the Planning Team to represent the past 25 years. Three tables are used in this update to summarize the historic hazard events. Tables 5-2 and 5-3 summarize federal and state disaster declarations that included Greenlee County, with Table 5-2 showing only state and federal disaster expenditure data provided by the ADEM Recovery Section, and Table 5-3 summarizing fatality, injury, and property damage estimates obtained from many of the sources previously mentioned. Table 5-4 summarizes all non-declared hazard events specific to Greenlee County, that were considered to be a significant event to the jurisdiction(s) using the following selection criteria:

- 1 or more fatalities
- 1 or more injuries
- Any dollar amount in property or crop damages
- For wildfires, all the following must be met:
    - 100 acres or larger, and
    - Any reported amount for firefight costs, and
    - Any reported damages to structures
- A significant event to a community regardless of the above criteria

The following should be noted when reviewing Tables 5-2, 5-3 and 5-4: 1) Hazard categories in all tables follow the updated hazard categories discussed in the following paragraphs; 2) Events in Tables 5-2 and 5-3 are generally not duplicated as events in Table 5-4; 3) If a hazard is not listed, that means there were no events reported for that hazard that fit the criteria above.

Table 5-2: Total Disaster Expenditures for State and Federally Declared Natural Hazard Events That Included Greenlee County – February 1966 to September 2014

Hazard Categories	Arizona Declared Events That Included Greenlee County January 1966 to September 2014		
	No. of Events	Total Expenditures	
		State	Federal
Drought	10	$211,499	$0
Flooding / Flash Flooding	16	$44.3 million	$227.9 million
Wildfire	16	$5.7 million	$0
Winter Storm	1	$4.5 million	$14.2 million

Notes:
- Damage Costs are reported as is and no attempt has been made to adjust costs to current dollar values.
- Only a portion of the reported expenditures were spent in the subject county.

Source: ADEM - Recovery Section, October 2015

Table 5-3: Human and Property Loss Estimates for State and Federally Declared Events That Included Greenlee County January 1966 to September 2014

Hazard	No. of Declarations	Recorded Losses		
		Fatalities	Injuries	Damage Costs ($)
Drought	10	0	0	$303 million
Flooding / Flash Flooding	16	48	1,187	$903 million
Wildfire	16	0	0	$0
Winter Storm	1	0	0	$0

Notes:
- Damage Costs are reported as is and no attempt has been made to adjust costs to current dollar values. Sources: ADEM, FEMA, USDA, NCDC, AFMA

Table 5-4: Undeclared Historic Hazard Events for Greenlee County – December 1985 to January 2016

Hazard	No. of Records	Recorded Losses		
		Fatalities	Injuries	Damage Costs ($)
Flooding / Flash Flooding	14	3	0	$362,000
Severe Wind	7	0	0	$93,500
Wildfire	15	0	16	$10.1 million

Notes:
- Damage costs include property and crop/livestock losses and are reported as is with no attempt to adjust costs to current dollar values. Furthermore, wildfire damage cost do not include the cost of suppression which can be quite substantial. Sources: ADEM, NCDC, NWCG, NWS, USFS
- No damages for drought reported.

Detailed historic hazard records are provided in Appendix D.

The culmination of the review and screening process by the Planning Team concluded that no changes will be made to the hazard list for this updated mitigation plan. Accordingly, the Planning Team has selected the following list of hazards for profiling and updating based on the above explanations and screening process. Revised and updated definitions for each hazard are provided in Section 5.3 and in Section 8.2:

- **Drought**
- **Flooding / Flash Flooding**
- **Levee Failure**
- **Wildfire**

5.2 Vulnerability Analysis Methodology

5.2.1 General

The following sections summarize the methodologies used to perform the vulnerability analysis portion of the risk assessment. For this Plan, the entire vulnerability analysis was either revised or updated to reflect the new hazard categories, the availability of new data, or differing loss estimation methodology. Specific changes are noted below and/or in Section 5.3. Comparisons between the 2011 Plan and this Plan are made whenever appropriate.

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

Unless otherwise specified in this Plan, the general cutoff date for new hazard profile data and jurisdictional corporate limits is the end of December 2010.

5.2.2 Climate Change

In recent years, FEMA and others have begun to take a harder look at the impacts of climate change on natural hazards and the mitigation planning process. In March 2016, FEMA released new state mitigation planning guidance that will require all state hazard mitigation plans to address climate change beginning with all updates submitted after March 2016 [13]. FEMA's National Advisory Council noted that the effects of climate change could manifest as a "threat multiplier". When considering probabilities of hazard events, it is typical to make the implicit assumption that the past is a prologue for the future; however, trending changes to climate related variables may require broader thinking and projections to develop mitigation actions and projects that account for those changes.

The scope and severity of cause and impacts relating to climate change are still difficult to predict and highly debated. There is, however, a growing body of science and research that indicates a few noticeable trends that should be considered when evaluating natural hazard vulnerability and risk. In 1989, the U.S. Global Change Research Program (USGCRP) was established by Presidential Initiative and later mandated by Congress in the Global Change Research Act of 1990 with the stated purpose of assisting "the Nation and the world to understand, assess, predict, and respond to human-induced and natural processes of global change." In May 2014, the USGCRP released the 3rd National Climate Assessment (NCA), which is a comprehensive compilation of the latest body of work and science on the topic of climate change. The NCA results and discussion are divided into regions to focus the discussions and conclusions to a regional perspective. The Southwest region includes the states of Arizona, California, Colorado, Nevada, New Mexico, and Utah. According to Chapter 20 of the NCA[14], the

[13] FEMA, 2016, *State Mitigation Plan Review Guide*, released March 2016, effective March 2016, FP 302-094-2

[14] Garfin, G., G. Franco, H. Blanco, A. Comrie, P. Gonzalez, T. Piechota, R. Smyth, and R. Waskom, 2014, *Ch. 20: Southwest. Climate Change Impacts in the United States: The Third National Climate Assessment*, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds., U.S. Global Change Research Program, 462-486. doi:10.7930/J08G8HMN

Southwest regional climate change impacts noted in the recent research include increased heat, drought, and insect outbreaks that result in more wildfires, declining water supplies, reduced agricultural yields, health impacts in cities due to heat, and flooding and erosion in coastal areas. In its 2014 report, the NCA released the following "Key Messages" for the Southwest Region:

1. Snowpack and streamflow amounts are projected to decline in parts of the Southwest, decreasing surface water supply reliability for cities, agriculture, and ecosystems. The Southwest produces more than half of the nation's high-value specialty crops, which are irrigation-dependent and particularly vulnerable to extremes of moisture, cold, and heat. Reduced yields from increasing temperatures and increasing competition for scarce water supplies will displace jobs in some rural communities.
2. Increased warming, drought, and insect outbreaks, all caused by or linked to climate change, have increased wildfires and impacts to people and ecosystems in the Southwest. Fire models project more wildfire and increased risks to communities across extensive areas.
3. Flooding and erosion in coastal areas are already occurring even at existing sea levels and damaging some California coastal areas during storms and extreme high tides. Sea level rise is projected to increase as Earth continues to warm, resulting in major damage as wind-driven waves ride upon higher seas and reach farther inland.
4. Projected regional temperature increases, combined with the way cities amplify heat, will pose increased threats and costs to public health in southwestern cities, which are home to more than 90% of the region's population. Disruptions to urban electricity and water supplies will exacerbate these health problems.

FEMA has established that future changes in probabilities and severity of hazard events influenced by climate change should be addressed during mitigation planning. Accordingly, a brief assessment of the potential effects that current climate change understanding may have on the Plan hazards is provided where appropriate in Section 5.3.

5.2.3 Calculated Priority Risk Index (CPRI) Evaluation

The first step in the vulnerability analysis (VA) is to assess the perceived overall risk for each of the plan hazards using a tool developed by the State of Arizona called the Calculated Priority Risk Index[15] (CPRI). The CPRI value is obtained by assigning varying degrees of risk to four (4) categories for each hazard, and then calculating an index value based on a weighting scheme. Table 5-5 summarizes the CPRI risk categories and provides guidance regarding the assignment of values and weighting factors for each category.

As an example, assume that the project team is assessing the hazard of flooding, and has decided that the following assignments best describe the flooding hazard for their community:

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

The CPRI for the flooding hazard would then be:

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

CPRI = 2.65

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

5.2.4 Asset Inventory

A detailed asset inventory was performed for the 2011 Plan to establish a fairly accurate baseline data-set for assessing the vulnerability of each jurisdiction's assets to the hazards previously identified. The asset inventory from the 2011 Plan was reviewed and updated by the Planning Team to reflect the facilities and infrastructure most important to the participating jurisdictions.

The 2010 State Plan defines assets as:

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

The 2011 Plan asset inventory database was generally categorized into critical and non-critical categories. The working definition for ***Critical facilities and infrastructure,*** adopted for the 2011 Plan and continuing with this Plan is as follows:

> *Systems, structures and infrastructure within a community whose incapacity or destruction would:*

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

Following the criteria set forth by the Critical Infrastructure Assurance Office (CIAO), the State of Arizona has adopted eight general categories[16] that define critical facilities and infrastructure:

1. **Communications Infrastructure:** Telephone, cell phone, data services, radio towers, and internet communications, which have become essential to continuity of business, industry, government, and military operations.
2. **Electrical Power Systems:** Generation stations and transmission and distribution networks that create and supply electricity to end-users. **Gas and Oil Facilities:** Production and holding facilities for natural gas, crude and refined petroleum, and petroleum-derived fuels, as well as the refining and processing facilities for these fuels.
3. **Banking and Finance Institutions:** Banks, financial service companies, payment systems, investment companies, and securities/commodities exchanges.

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

Table 5-5: Summary of Calculated Priority Risk Index (CPRI) categories and risk levels

CPRI Category	Degree of Risk			Assigned Weighting Factor
	Level ID	Description	Index Value	
Probability	Unlikely	▪ Extremely rare with no documented history of occurrences or events. ▪ Annual probability of less than 0.001.	1	45%
	Possible	▪ Rare occurrences with at least one documented or anecdotal historic event. ▪ Annual probability that is between 0.01 and 0.001.	2	
	Likely	▪ Occasional occurrences with at least two or more documented historic events. ▪ Annual probability that is between 0.1 and 0.01.	3	
	Highly Likely	▪ Frequent events with a well documented history of occurrence. ▪ Annual probability that is greater than 0.1.	4	
Magnitude/ Severity	Negligible	▪ Negligible property damages (less than 5% of critical and non-critical facilities and infrastructure). ▪ Injuries or illnesses are treatable with first aid and there are no deaths. ▪ Negligible quality of life lost. ▪ Shut down of critical facilities for less than 24 hours.	1	30%
	Limited	▪ Slight property damages (greater than 5% and less than 25% of critical and non-critical facilities and infrastructure). ▪ Injuries or illnesses do not result in permanent disability and there are no deaths. ▪ Moderate quality of life lost. ▪ Shut down of critical facilities for more than 1 day and less than 1 week.	2	
	Critical	▪ Moderate property damages (greater than 25% and less than 50% of critical and non-critical facilities and infrastructure). ▪ Injuries or illnesses result in permanent disability and at least one death. ▪ Shut down of critical facilities for more than 1 week and less than 1 month.	3	
	Catastrophic	▪ Severe property damages (greater than 50% of critical and non-critical facilities and infrastructure). ▪ Injuries or illnesses result in permanent disability and multiple deaths. ▪ Shut down of critical facilities for more than 1 month.	4	
Warning Time	Less than 6 hours	Self explanatory.	4	15%
	6 to 12 hours	Self explanatory.	3	
	12 to 24 hours	Self explanatory.	2	
	More than 24 hours	Self explanatory.	1	
Duration	Less than 6 hours	Self explanatory.	1	10%
	Less than 24 hours	Self explanatory.	2	
	Less than one week	Self explanatory.	3	
	More than one week	Self explanatory.	4	

4. **Transportation Networks:** Highways, railroads, ports and inland waterways, pipelines, and airports and airways that facilitate the efficient movement of goods and people.
5. **Water Supply Systems:** Sources of water; reservoirs and holding facilities; aqueducts and other transport systems; filtration, cleaning, and treatment systems; pipelines; cooling systems; and other delivery mechanisms that provide for domestic and industrial applications, including systems for dealing with water runoff, wastewater, and firefighting.
6. **Government Services:** Capabilities at the federal, state, and local levels of government required to meet the needs for essential services to the public.
7. **Emergency Services:** Medical, police, fire, and rescue systems.

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

The 2011 Plan used a combination of the Asset Inventory and HAZUS®-MH[17] data to represent the critical facilities and general building stock and population for Greenlee County jurisdictions. Tools used by the Local Planning Team for the update included GIS data sets, on-line mapping utilities, insurance pool information, county assessors data, and manual data acquisition. Table 5-6 summarizes the facility counts provided by each of the participating jurisdictions in this Plan.

It should be noted that the facility counts summarized in Table 5-6 do not represent a comprehensive inventory of all the category facilities that exist within the county. They do represent the facilities inventoried to-date by each jurisdiction and are considered to be a work-in-progress that is to be expanded and augmented with each Plan cycle.

[17] U.S. Department of Homeland Security, Federal Emergency Management Agency, HAZUS®-MH.

Table 5-6: Asset inventory structure counts by category and jurisdiction as of December 2010

	Communications Infrastructure	Electrical Power Systems	Gas and Oil Facilities	Banking and Finance Institutions	Transportation Networks	Water Supply Systems	Government Services	Emergency Services	Educational [a]	Cultural [a]	Business [a]	Flood Control [a]	Residential [a]	Recreational [a]
County-Wide Totals	13	6	1	2	36	23	8	12	10	23	19	1	0	2
Clifton	5	2	1	0	14	11	1	5	1	10	8	1	0	1
Duncan	2	2	0	1	2	7	2	3	5	12	7	0	0	1
Unincorporated Greenlee County	6	2	0	1	20	5	5	4	4	1	4	0	0	0

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

5.2.5 Loss Estimations

In the 2011 Plan, losses were estimated by either quantitative or qualitative methods. Quantitative methods consisted of intersecting hazard map layers with the asset inventory map layer and the HAZUS®-MH map layer. The loss estimates for this Plan represent the current hazard map layers and asset databases using the procedures discussed below.

Economic loss and/or human and structural exposure estimates for each of the final hazards identified in Section 5.1 begins with an assessment of the potential exposure of asset inventory structures and human populations to those hazards. Exposure estimates of asset inventory structures identified by each jurisdiction is accomplished by intersecting the asset inventory with the hazard profiles in Section 5.3. Human or population exposures are estimated by intersecting the same hazards with the 2010 block level Census Data population statistics that have been re-organized into GIS compatible databases and distributed with HAZUS®-MH (HAZUS).

Additional exposure estimates for general residential, commercial, and industrial building stock not specifically identified with the asset inventory, are also accomplished using the HAZUS general building stock database, wherein the developers of the HAZUS database have made attempts to correlate building/structure counts to census block data. *It is duly noted that the HAZUS data population statistics may not exactly equate to the current population statistics provided in Section 4.2 due to actual changes in population counts associated with a particular census block, GIS positioning anomalies and the way HAZUS depicts certain census block data. It is also noted that the residential, commercial and industrial building stock estimates for each census block may severely under-predict the actual buildings present due to the substantial growth in the last decade, the general lack of commercial and industrial data for some of the more rural communities and counties, and the disparity of the HAZUS replacement cost estimates for these categories when compared to current market rates. However, without a detailed, site specific structure inventory of these types of buildings, the HAZUS database is still the best available and the results are representative of a general magnitude of population and residential, commercial and industrial facility exposures to the various hazards discussed.* Combining the exposure results from the asset inventory and the HAZUS database provides a fairly comprehensive depiction of the overall exposure of building stock and the two datasets are considered complimentary and not redundant.

Economic losses to structures and facilities are estimated by multiplying the exposed facility replacement cost estimates by an assumed loss to exposure ratio for the hazard. The loss to exposure ratios used in this plan update are summarized by hazard in Section 5.3. It is important to note that the loss to exposure ratios are subjective and the estimates are solely intended to provide an understanding of relative risk from the hazards and potential losses. Real uncertainties are inherent in any loss estimation methodology due to:

- Incomplete scientific knowledge concerning hazards and our ability to predict their effects on the built environment;
- Approximations and simplifications that are necessary for a comprehensive analysis; and,
- Lack of detailed data necessary to implement a viable statistical approach to loss estimations.

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

5.2.6 Development Trend Analysis

The 2011 Plan development trend analysis will require updating to reflect growth and changes in Greenlee County and jurisdiction boundaries over the last planning cycle. The updated analysis will focus on the potential risk associated with projected growth patterns and their intersection with the Plan identified hazards.

5.3 Hazard Risk Profiles

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

- **Description**
- **History**
- **Probability and Magnitude**
- **Climate Change Impacts**
- **Vulnerability**
  - **CPRI Results**
  - **Loss/Exposure Estimations**
  - **Development Trend Analysis**
- **Sources**
- **Profile Maps (if applicable)**

Much of the 2011 Plan data has been updated, incorporated and/or revised to reflect current conditions and planning team changes, as well as few small changes to the plan format. County-wide and jurisdiction specific profile maps are provided at the end of the section (if applicable) and the maps are not included in the page count.

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

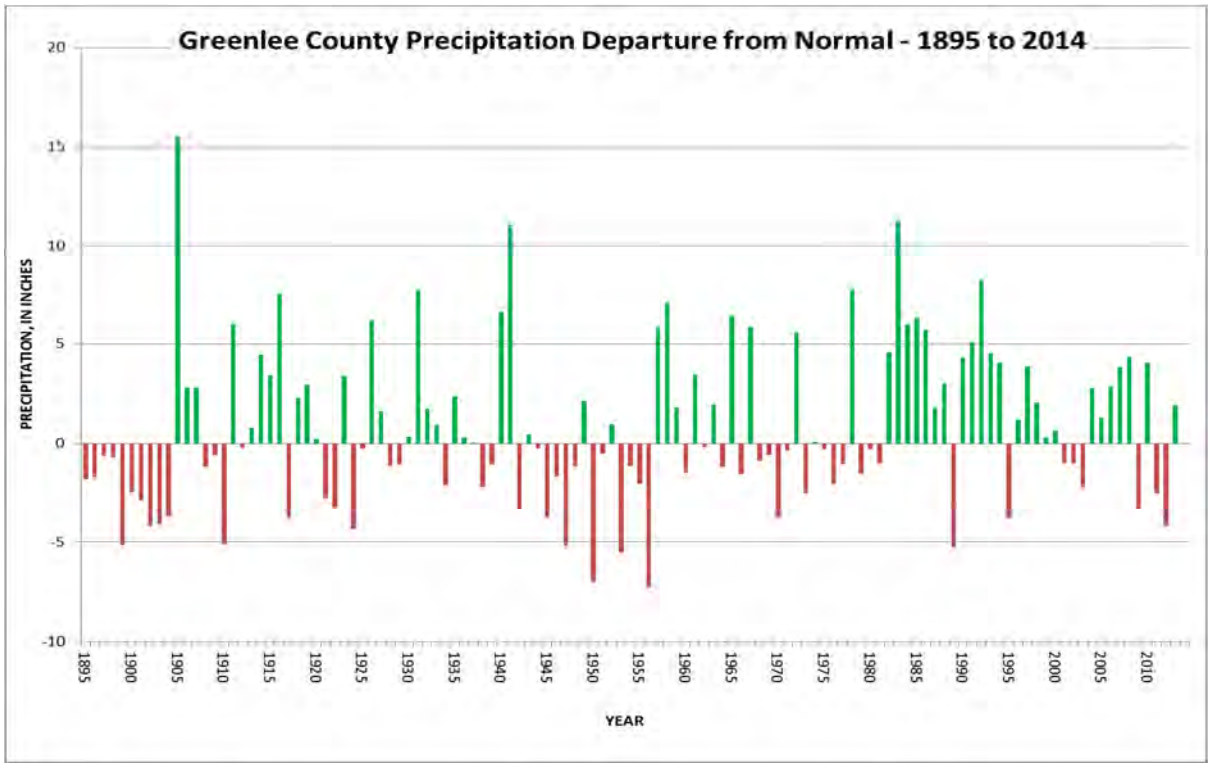
Arizona has experienced 22 droughts declared as drought disasters/emergencies and 93 drought events (droughts affecting multiple years are recorded as a distinct event for each year affected) since records have been kept. Figures 5-1 and 5-2 depict recent precipitation data from NCDC regarding average statewide precipitation variances from normal. Between 1849 and 1905, the most prolonged period of drought conditions in 300 years occurred in Arizona (Jacobs, 2003). Another prolonged drought occurred during the period of 1941 to 1965. The period from 1978-1997 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 2009 and 2014, there have been more months with below normal precipitation than months with above normal precipitation.

Probability and Magnitude

There is no commonly accepted return period or non-exceedance probability for defining the risk from drought (such as the 100-year or 1% annual chance of flood). The magnitude of drought is

usually measured in time and the severity of the hydrologic deficit. There are several resources available to evaluate drought status and even project expected conditions for the very near future.

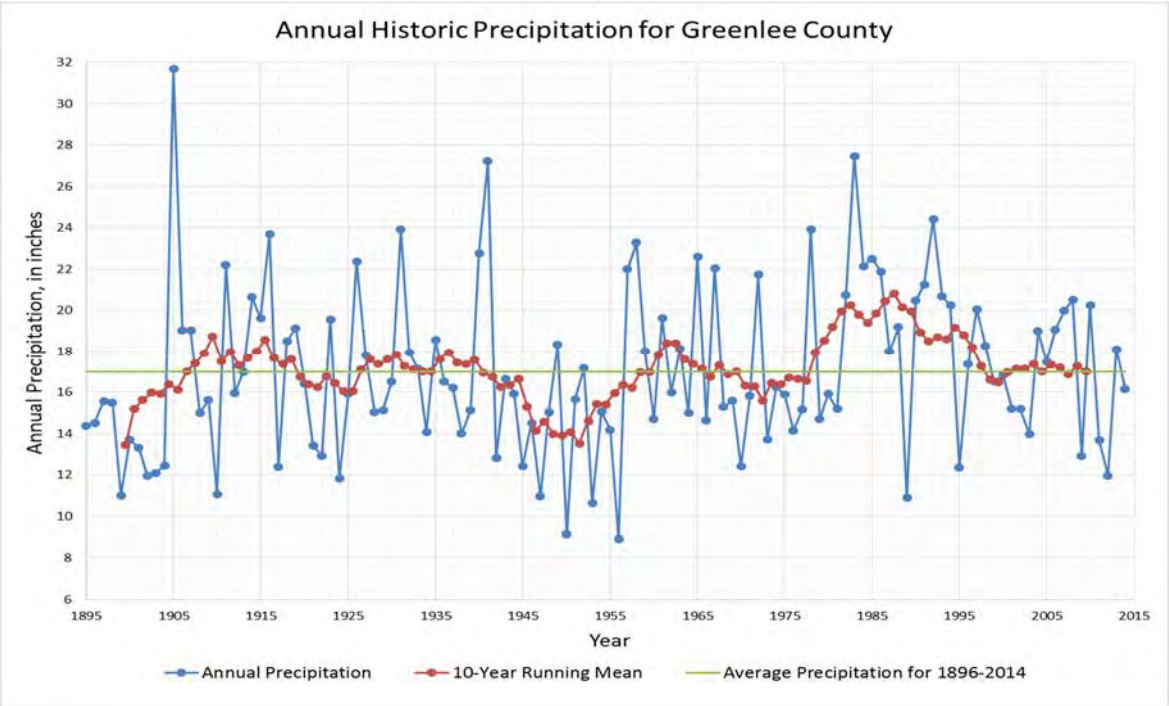
The National Integrated Drought Information System (NIDIS) Act of 2006 (Public Law 109-430) prescribes an interagency approach for drought monitoring, forecasting, and early warning (NIDIS, 2007). The NIDIS maintains the U.S. Drought Portal[18] which is a centralized, web-based access point to several drought related resources including the U.S. Drought Monitor (USDM) and the U.S. Seasonal Drought Outlook (USSDO). The USDM, shown in Figure 5-3, 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 5-4, is a six month projection of potential drought conditions developed by the National Weather Service's Climate Prediction Center. The primary indicators for these maps for the Western U.S. are the Palmer Hydrologic Drought Index and the 60-month Palmer Z-index. The Palmer Drought Severity Index (PSDI) is a commonly used index that measures the severity of drought for agriculture and water resource management. It is calculated from observed temperature and precipitation values and estimates soil moisture. However, the Palmer Index is not considered to be consistent enough to characterize the risk of drought on a nationwide basis (FEMA, 1997) and neither of the Palmer indices are well suited to the dry, mountainous western United States.



Source: http://cefa.dri.edu/Westmap/westmappass.php

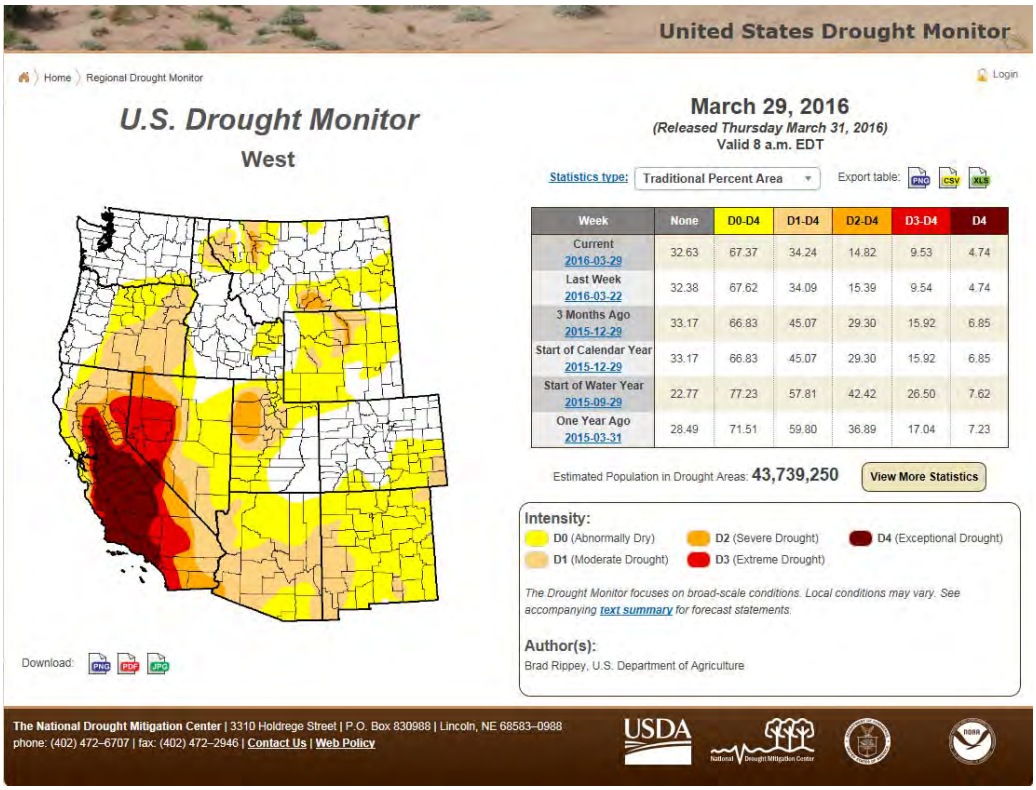
Figure 5-1: Average annual precipitation variances from a normal based on 1895-2014 period for Greenlee County

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



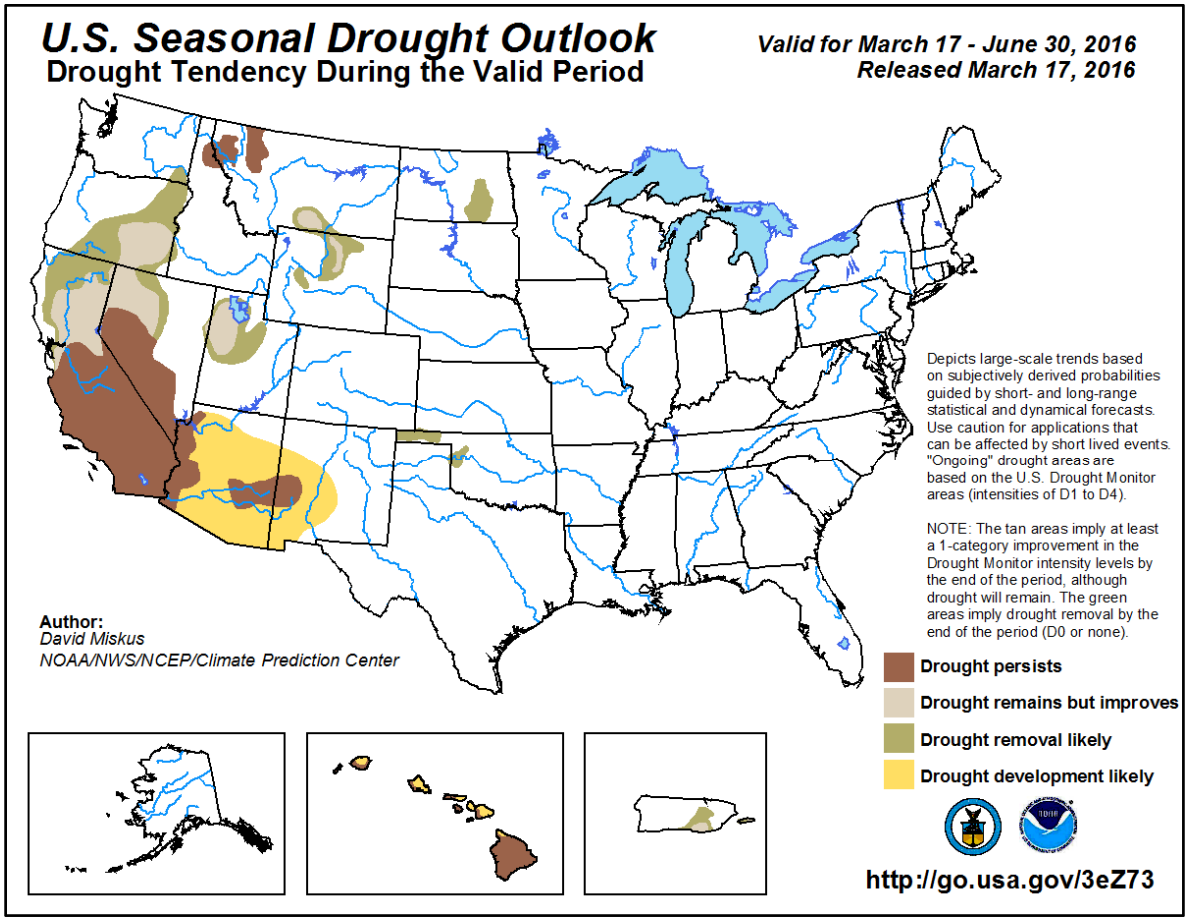
Source: http://cefa.dri.edu/Westmap/westmappass.php

Figure 5-2: Annual historic precipitation for Greenlee County from 1895 to 2014



Source: http://droughtmonitor.unl.edu/Home/RegionalDroughtMonitor.aspx?west

Figure 5-3: U.S. Drought Monitor Map for March 29, 2016

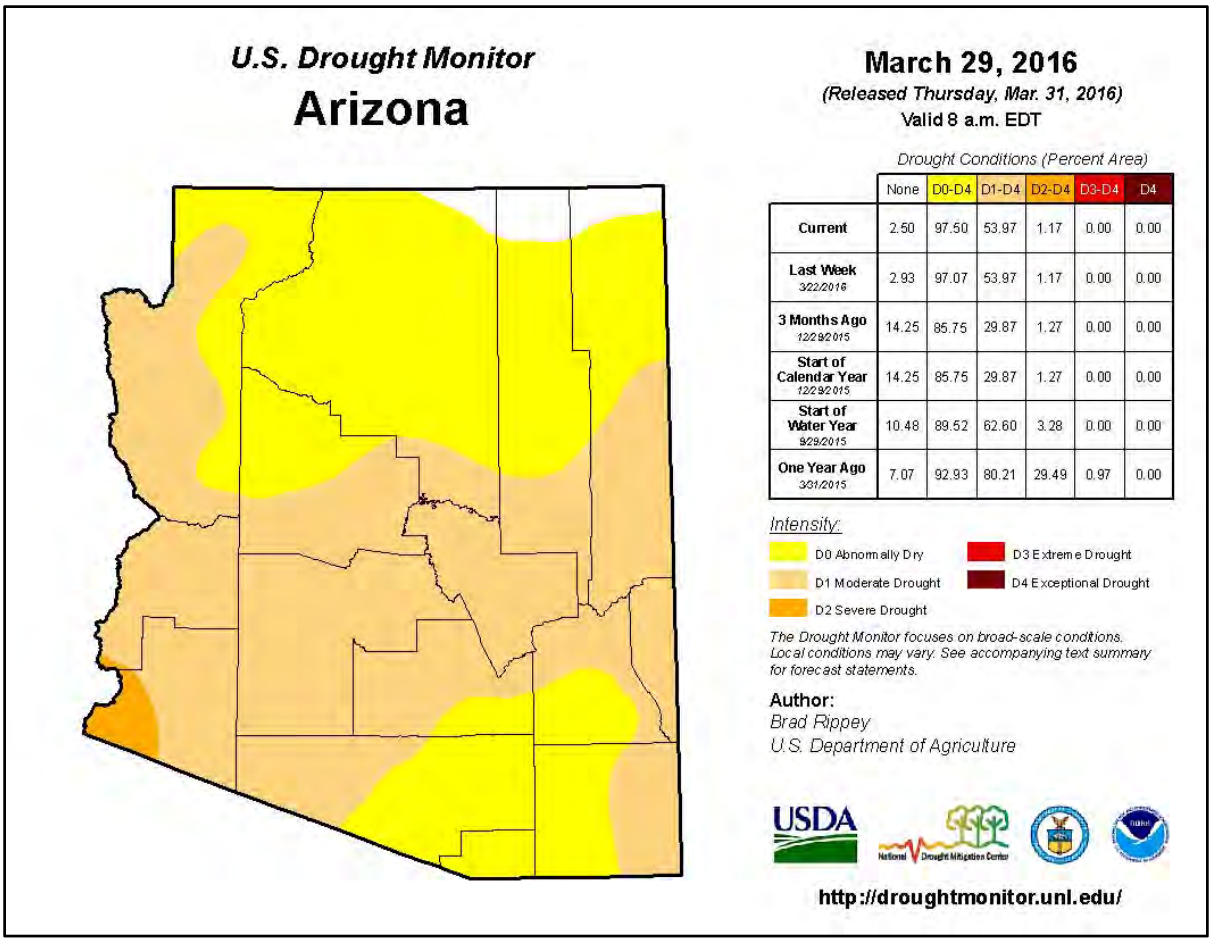


Source: http://www.cpc.ncep.noaa.gov/products/expert_assessment/sdo_summary.php

Figure 5-4: U.S. Seasonal Drought Outlook, March to May, 2011

In 2003, Governor Janet Napolitano created the Arizona Drought Task Force (ADTF), led by ADWR, which developed a statewide drought plan. The plan includes criteria for determining both short and long-term drought status for each of the 15 major watersheds in the state using assessments that are based on precipitation and stream flow. The plan also provides the framework for an interagency group which reports to the governor on drought status, in addition to local drought impact groups in each county and the State Drought Monitoring Technical Committee. Twice a year this interagency group reports to the governor on the drought status and the potential need for drought declarations. The counties use the monthly drought status reports to implement drought actions within their drought plans. The State Drought Monitoring Technical Committee defers to the USDM for the short-term drought status and uses a combination of the Standardized Precipitation Index (SPI), evaporation and streamflow for the long-term drought status. Figures 5-5 and 5-6, present the most current short and long term maps available for Arizona as of the writing of this plan.

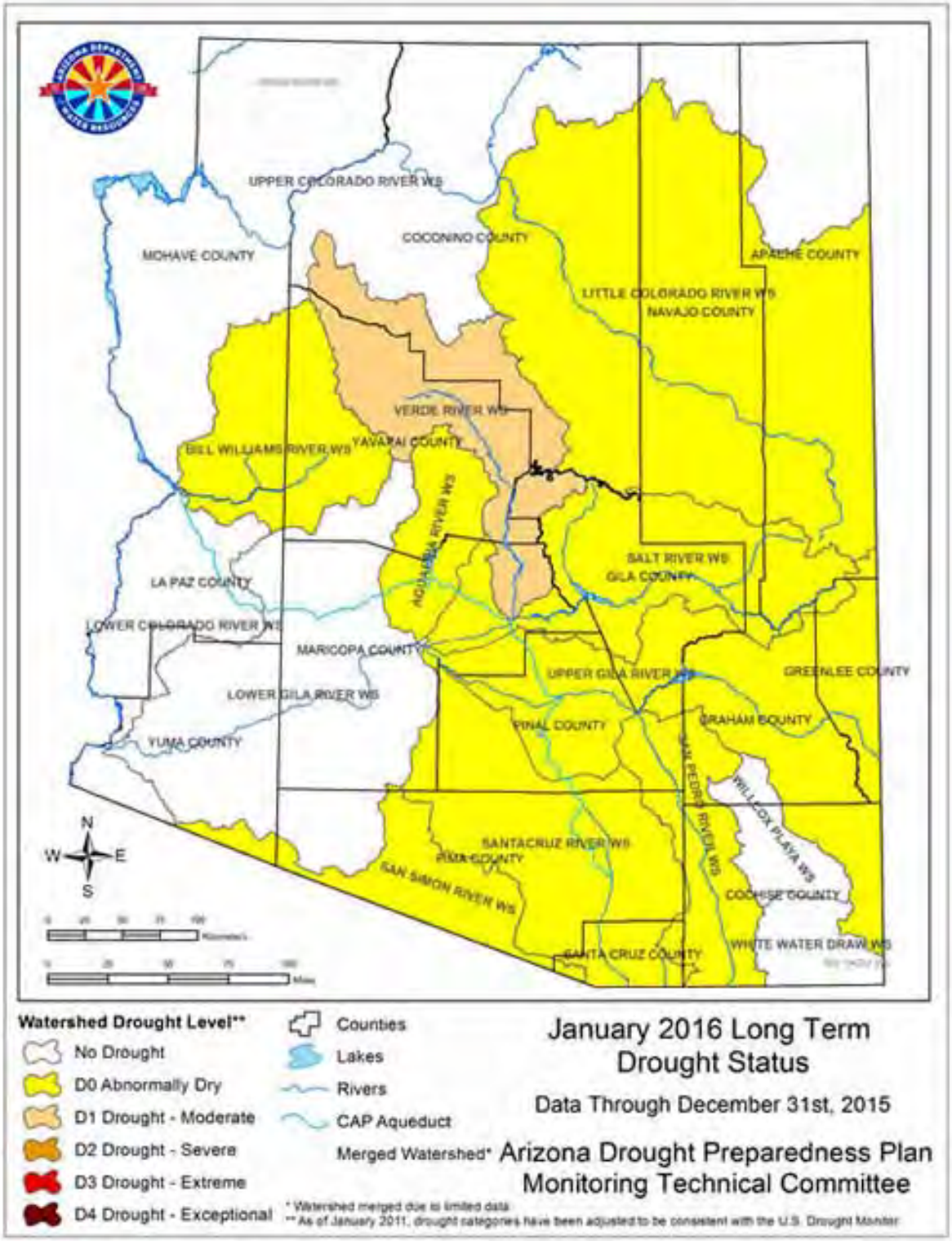
The current drought maps are in general agreement that Greenlee County is currently experiencing a moderate to severe drought condition for the short term and in a moderate drought condition for the long term. Figure 5-4 indicates that the drought conditions are likely to persist or even intensify for Greenlee County over the next few months.



	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	2.50	97.50	53.97	1.17	0.00	0.00
Last Week 3/22/2016	2.93	97.07	53.97	1.17	0.00	0.00
3 Months Ago 12/29/2015	14.25	85.75	29.87	1.27	0.00	0.00
Start of Calendar Year 12/29/2015	14.25	85.75	29.87	1.27	0.00	0.00
Start of Water Year 9/29/2015	10.48	89.52	62.60	3.28	0.00	0.00
One Year Ago 3/31/2015	7.07	92.93	80.21	29.49	0.97	0.00

Source: http://droughtmonitor.unl.edu/data/pngs/current/current_az_trd.png

Figure 5-5: Arizona short term drought status map as of March 29, 2016



Source: ADWR, 2011 as accessed at: http://www.azwater.gov/azdwr/StatewidePlanning/Drought/DroughtStatus2.htm

Figure 5-6: Arizona long term drought status map for January 2016

Vulnerability – CPRI Results

Drought CPRI results for each community are summarized in Table 5-7 below.

Table 5-7: CPRI results by jurisdiction for drought

Participating Jurisdiction	Probability	Magnitude/ Severity	Warning Time	Duration	CPRI Score
Clifton	Highly Likely	Limited	> 24 hours	> 1 week	2.95
Duncan	Highly Likely	Limited	> 24 hours	> 1 week	2.95
Unincorporated Greenlee County	Highly Likely	Limited	> 24 hours	> 1 week	2.95
				County-wide average CPRI =	**2.95**

Vulnerability – Loss Estimations

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

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

The Greenlee County farming and ranching industries are directly affected by extended drought conditions. The primary sources of water for irrigated farming are the San Francisco and Gila Rivers, including groundwater that is sustained by these watercourses along the valley floor. Rangeland ranching is dependent upon groundwater and captured rainfall runoff via stock tanks and rain catchments. Extended drought conditions reduce rangeland grasses and other fodder. Stock tank water levels and replenishment are also significantly reduced. This forces ranchers to feed more hay and to truck in water to sustain their rangeland herds. The expense of these activities forces ranchers to drastically reduce herd sizes, flooding the markets with excess animals and tumbling livestock prices. Then supplies in following years are drastically reduced due to lack of rangeland and water and prices soar. These expenses are translated into the Greenlee County economy as a two-fold hardship. First, as an economic hardship for merchants and retailers that provide goods and services to the ranching community. Second, as increased costs due to a reduced supply in ranching commodities.

From 1995 to 2014, Greenlee County farmers and ranchers received approximately $2.7 million in disaster related assistance funding from the U.S Department of Agriculture (USDA) (EWG, 2016), with nearly half of that amount ($1.2 million) being received in 2014 which was primarily due to the impacts of the Wallow Fire. The majority of those funds were received during the time period of 2000 to 2014 and are associated with livestock assistance and aid. The 2000-2014 time period also corresponds to the most severe period of the recent drought cycle for Greenlee County. Other direct impacts associated with increased pumping costs due to lowering of groundwater levels and costs to expand water infrastructure to compensate for reduced yields or to develop alternative water sources, are significant but very difficult to estimate due to a lack of documentation. There are also the intangible costs associated with lost tourism revenues, and impacts to wildlife habitat and animals. Typically, these impacts are translated into the general economy in the form of higher food and agricultural goods prices and increased utility costs.

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

Vulnerability – Development Trends

Growth in Greenlee County over the past five years has been very small and is not anticipated to increase significantly over the next five years. Requirements for additional surface and ground water supplies is therefore expected to be minimal. It is also 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. However, 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 Greenlee County will recognize drought as a potential constraint.

Sources

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NOAA, NWS, Climate Prediction Center, 2010, website located at: http://www.cpc.ncep.noaa.gov/products/expert_assessment/sdo_summary.php

Profile Maps - No profile maps are provided.

5.3.2 Flood / Flash Flood

Description

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

- *Tropical Storm Remnants*: Some of the worst flooding tends to occur when the remnants of a hurricane that has been downgraded to a tropical storm or tropical depression enter the State. These events occur infrequently and mostly in the early autumn, and usually bring heavy and intense precipitation over large regions causing severe flooding.
- *Winter Rains*: Winter brings the threat of low intensity; but long duration rains covering large areas that cause extensive flooding and erosion, particularly when combined with snowmelt.
- *Summer Monsoons*: A third 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 include riverine, sheet, alluvial fan, and local area flooding. Riverine flooding occurs along established watercourses when the bankfull capacity of a watercourse is exceeded by storm runoff or snowmelt and the overbank areas become inundated. Sheet flooding occurs in regionally low areas with little topographic relief that generate floodplains over a mile wide, Alluvial fan flooding is generally located on piedmont areas near the base of the local mountains and are characterized by multiple, highly unstable flowpaths that can rapidly change during flooding events. Local area flooding is often the result of poorly designed or planned development wherein natural flowpaths are altered, blocked or obliterated, and localized ponding and conveyance problems result. Erosion is also often associated with damages due to flooding.

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

History

Flooding is clearly a major hazard in Greenlee County as shown in Tables 5-2 and 5-3. Greenlee County has been part of 16 disaster declarations for flooding, with three of those declarations occurring in the past five years. There have been at least five other non-declared events of reported flooding incidents that met the thresholds outlined in Section 5.1, two of which occurred in the last five years. The following incidents represent examples of major flooding that has impacted the County:

- In October 1972, severe flooding occurred in Graham and Greenlee County with Clifton, Safford and Duncan being hit the hardest. Tropical moisture caused heavy rain over most of

the state. The ground was already saturated from tropical storm Joanne earlier in the month. The heaviest flooding occurred along the San Francisco and Gila Rivers, with the Towns of Clifton and Duncan suffering extremely heavy losses due to flooding. Nearly $8 million in property damage occurred, with most of this in Graham and Greenlee counties. Agricultural losses in Greenlee County totaled $2 million and some deaths were caused by drowning (NWS, 2011).

- In March 1978, heavy spring rains coupled with snowmelt caused significant flooding on the Gila River in Duncan and farmlands all along the river. Statewide damages were estimated to exceed $60,000,000, with thousands of homes damaged and over 100 homes destroyed. More than 7,000 people had to be sheltered and four people lost their lives (ADEM, 2010).
- In December 1978, widespread heavy rainfall from December 16-20 caused some of the costliest and widespread flooding in Arizona history. Waters from the Gila River rose to seven feet deep in the town of Duncan, and 75 homes were destroyed when a dike broke. Along the San Francisco River near Clifton, 1,000 people were evacuated from homes. Statewide damage estimates exceeded $450 million and at least 10 deaths were reported (ADEM, 2010).
- In early October 1983, tropical storm remains, including those from Hurricane Octave, caused heavy rain over Arizona during a 10-hour period. Southeast Arizona, Yavapai and Mohave Counties were particularly hard hit with severe flooding occurring in Tucson, Clifton and Safford. Fourteen fatalities and 975 injuries were attributed to the flooding. At least 1,000 Arizonans were left temporarily homeless. Damages were estimated at $370 million in 2001 currency. Record water levels in the Santa Cruz, Gila, San Pedro and San Francisco Rivers contributed to heavy flooding statewide. Greenlee County was hit hard. Damages in Clifton alone were over $20 million where approximately 41 businesses were destroyed and over 231 homes and 57 businesses suffered major damages. The U. S. Army Corps of Engineers constructed an emergency dike in the Winkelman Flats area to try and protect 112 homes. There were flood-fight activities at Florence to protect a sewage treatment plant and at Safford to protect critical arterial bridge embankment from severe damage (ADEM, 2010; NWS Tucson, 2016).
- In late December 1992 - early January 1993, a series of winter storms produced record breaking precipitation amounts and severe weather across much of Arizona. Heavy rains combined with melting snowpack caused heavy flooding of both local washes and regional rivers within Greenlee County. Nearly every community and city within the county was impacted by the storms at some level. Most of the heavy damage was associated with the Gila, San Pedro, and Santa Cruz Rivers. According to the USACE Flood Damages Report, the total public and private damages from the 1993 floods were estimated to exceed $55.5 million in Greenlee County alone, with the majority of damages occurring at the Phelps Dodge mine.[19] The flooding prompted a federal disaster declaration (FEMA-977-DR-AZ) for almost the entire state. Greenlee County received approximately $1.1 million dollars in federal aid to restore or repair flood damages at 86 locations across the county (USACE, 1994; ADEM, 2010).
- In February 2005, heavy winter rains caused extensive flooding throughout much of the state and Greenlee County. The precipitation event began the night of February 10th and lasted through the early hours February 14th. Rainfall totals of 2 to 3 inches were common in many locations. Many roadways and utilities within the County were impacted. The U.S. Army Corps of Engineers was mobilized to Duncan to provide flood fight measures to protect the Town. Estimated damages within the County were at least $1.2 million. The flooding prompted a federal disaster declaration (FEMA-1586-DR-AZ) for Gila, Graham, Greenlee, Greenlee,

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

Yavapai, Maricopa, and Mohave Counties. Total disaster expenditures exceeded $9.5 million. (ADEM, 2005, JEF, 2006).

- In August 2005, a flash flood along Ward's Canyon near Clifton caused damage to existing utilities and bridges. A three to four foot wall of water was reported to travel down the canyon creating a sizable scour hole just downstream of the U.S. 191 bridge. The Town of Clifton's sewer main and lift station were completely destroyed (The Copper Era, 2005).
- In late July and early August 2006, several areas of the state were struck by severe storms and flooding during the period of July 25 to August 4, 2006. Tropical moisture poured into Southeast Arizona, saturating the ground at most locations. As rainfall continued, additional runoff quickly filled rivers and washes, exceeding bank full capacities and flooding homes and businesses as well as nearby roads. Some roadways were washed away due to the strong flood waters. The flooding prompted a federal disaster declaration (FEMA-1660-DR-AZ) for Gila, Graham, Greenlee, Pima, and Greenlee Counties. Total disaster expenditures exceeded $13.6 million (ADEM, 2010).
- On July 19, 2010 through July 29, 2010, a series of potent monsoon thunderstorms causing high winds and flash floods damaged many locations in southeastern Arizona. The heavy rains resulted in unusually strong flooding events and caused extreme peril to public health and safety in Wards Canyon. On July 29, 2010 both the Town of Clifton and Greenlee County declared a state of emergency for this event. Flooding within Wards Canyon caused extensive damages to roads and sewer lines (ADEM, 2010).
- On September 22, 2010, An upper level disturbance as well as tropical moisture from remnants of Tropical Storm Georgette caused thunderstorms to develop over Clifton around 4:30 pm and intense rainfall resulted. According to Clifton officials, 2.25 inches fell in about 45 minutes on already saturated soil. The storm resulted in tons of mud and rock piled on city streets. Two unoccupied vehicles parked on Turner Avenue were washed down Ward's Canyon and into the San Francisco River. A third vehicle was tossed onto its side in the canyon about 100 yards from the canyon's confluence with the river. Flash flooding also resulted in damage to a main water line feeding Clifton. Total damages were estimated to exceed $50,000 (NCDC, 2011)
- On September 14, 2013, heavy rain occurred along the Campbell Blue Creek near the headwaters of the Blue River in Arizona, which was an area that was affected by the 2011 Wallow Fire. Heavy rain also fell along Turkey Creek in Arizona and the Dry Blue Creek in New Mexico. Runoff continued downstream to the confluence of the Campbell Blue and Dry Blue Creeks, which forms the Blue River. Multiple crests of two to four feet above flood stage resulted, washing out sections of Blue River Road and isolating residents of the community. A Campbell Blue Ridge 30 foot concrete bridge just across the state line in New Mexico, was completely washed out. Electrical and telephone lines were damaged by the flooding. A utility company truck rolled into Turkey Creek after the adjacent flood-compromised road gave way. The driver was able to escape the six foot deep flowing water without injury. Total Arizona damages were estimated to exceed $50,000 (NCDC, 2016).
- On August 1, 2014, three inches of rain in less than an hour caused flash flooding in Duncan. One home was flooded with water up to 3 feet deep and damage was sustained to a car wash structure. Two to three feet of water covered part of Highway 70 on the northwest edge of Duncan. Total damages were estimated to exceed $20,000 (NCDC, 2016).

Numerous other flood related incidents are summarized in the historic hazard database provided in Appendix D.

Probability and Magnitude

For the purposes of this Plan, the probability and magnitude of flood hazards in Greenlee County jurisdictions are primarily based on the 1% (100-year) and 0.2% (500-year) probability floodplains delineated on FEMA Flood Insurance Rate Maps (FIRMs), plus any provisional floodplain delineations used for in-house purposes by participating jurisdictions or Planning Team delineated areas.

FEMA has recently completed a map modification program to update the FIRMs for the County into a digital FIRM (DFIRM) format. The effective date for the new DFIRM maps is September 28, 2007. DFIRM floodplain GIS base files were obtained from FEMA and are the basis for the flood hazard depictions in this Plan. Therefore, the vulnerability analysis results in this plan are likely conservative.

Two designations of flood hazard are used. Any "A" zone is designated as a high hazard area. Medium flood hazard areas are all "Shaded X" zones. All "A" zones (e.g. – A, A1-99, AE, AH, AO, etc.) represent areas with a 1% probability of being flooded at a depth of one-foot or greater in any given year. All "Shaded X" zones represent areas with a 0.2% probability of being flooded at a depth of one-foot or greater in any given year. These two storms are often referred to as the 100-year and 500-year storm, respectively. High and medium hazard designations were also assigned to the non-FEMA areas by the Planning Team based on the anticipated level of flood hazard posed.

Maps 1A and 1B show the flood hazard areas for the entire county. Maps 1C and 1D show the flood hazard areas for Clifton and Duncan, respectively.

Vulnerability – CPRI Results

Flooding CPRI results for each community are summarized in Table 5-8 below.

Table 5-8: CPRI results by jurisdiction for flooding

Participating Jurisdiction	Probability	Magnitude/ Severity	Warning Time	Duration	CPRI Score
Clifton	Highly Likely	Critical	6-12 hours	< 24 hours	3.35
Duncan	Highly Likely	Catastrophic	6-12 hours	< 1 week	3.75
Unincorporated Greenlee County	Highly Likely	Catastrophic	< 6 hours	< 1 week	3.90
				County-wide average CPRI =	**3.67**

Vulnerability – Loss Estimations

The estimation of potential exposure to high and medium flood hazards was accomplished by intersecting the human and critical facility assets with the flood hazard limits depicted on Maps 1A, 1B, 1C and 1D. Loss estimates to all facilities located within the high and medium flood hazard areas were made based on loss estimation tables published by FEMA (FEMA, 2001). Most of the assets located within high hazard flood areas will be subject to less than three feet of flooding. Using the FEMA tables, it is assumed that all structural assets located within the high hazard areas will have a loss-to-exposure ratio of 0.20 (or 20%). No losses were estimated for assets located in the medium hazard areas. Table 5-9 summarizes the Planning Team identified critical facilities potentially exposed to high and medium flood hazards, and the corresponding estimates of losses. Table 5-10 summarizes population sectors exposed to the high and medium flood hazards. HAZUS residential, commercial and industrial exposures and loss estimates to high and medium flood hazards are summarized in Tables 5-11 through 5-14.

In summary, $11.9 million in asset related losses are estimated for high flood hazards, for all the participating jurisdictions in Greenlee County. An additional $22.5 in high flood hazard losses to HAZUS defined residential, commercial, and industrial facilities is estimated for all participating Greenlee County jurisdictions. Regarding human vulnerability, a total population of 1,017 people, or 12.1% of the total population, is potentially exposed to a high hazard flood event. Based on the historic record, multiple deaths and injuries are plausible and a substantial portion of the exposed population is subject to displacement depending on the event magnitude.

It is duly noted that the loss and exposure numbers presented above represent a comprehensive evaluation of the County as a whole. It is unlikely that a storm event would occur that would flood all of the delineated high and medium flood hazard areas at the same time. Accordingly, actual event based losses and exposure are likely to be only a fraction of those summarized above. Furthermore, it should be noted that any flood event that exposes assets or population to a medium hazard will also expose assets and populations to the high hazard flood zone. That is, the 100-year floodplain would be entirely inundated during a 500-year flood.

Table 5-9: Asset inventory exposure to high and medium hazard flooding and corresponding loss estimates

Community	Total Facilities Reported by Community	Impacted Facilities	Percentage of Total Community Facilities Impacted	Estimated Replacement Cost (x $1000)	Estimated Structure Loss (x $1000)
HIGH					
County-Wide Totals	**156**	**55**	**35.26%**	**$59,680**	**$11,936**
Clifton	60	23	38.33%	$23,720	$4,744
Duncan	44	15	34.09%	$13,860	$2,772
Unincorporated Greenlee County	52	17	32.69%	$22,100	$4,420
MEDIUM					
County-Wide Totals	**156**	**9**	**5.77%**	**$12,900**	**$0**
Clifton	60	7	11.67%	$12,200	$0
Duncan	44	0	0.00%	$0	$0
Unincorporated Greenlee County	52	2	3.85%	$700	$0

Table 5-10: Population sectors exposed to high and medium hazard flooding

Community	Total Population	Population Exposed	Percent of Population Exposed	Total Population Over 65	Population Over 65 Exposed	Percent of Population Over 65 Exposed
HIGH						
County-Wide Totals	**8,438**	**1,017**	**12.06%**	**1,016**	**183**	**18.03%**
Clifton	3,300	242	7.34%	308	31	10.21%
Duncan	718	146	20.38%	114	28	24.64%
Unincorporated Greenlee County	4,420	629	14.22%	593	123	20.81%
MEDIUM						
County-Wide Totals	**8,438**	**479**	**5.68%**	**1,016**	**78**	**7.66%**
Clifton	3,300	291	8.83%	308	40	13.10%
Duncan	718	0	0.00%	114	0	0.00%
Unincorporated Greenlee County	4,420	188	4.25%	593	37	6.31%

Table 5-11: Greenlee County HAZUS building exposure to flooding

	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SUMMARY		
Greenlee County HAZUS Summary	**Building Count**	**Potential Economic Impact (x$1000)**	**Building Count**	**Potential Economic Impact (x$1000)**	**Building Count**	**Potential Economic Impact (x$1000)**	**Total of All Potential Economic Impact (x$1000)**	**Loss-to-Exposure Ratio**	**Total Estimated Loss (x$1000)**
County-Wide Totals	**4,151**	**$971,262**	**63**	**$72,037**	**15**	**$20,142**	**$1,063,441**		
High Hazard Exposure	552	$103,563	11	$8,070	3	$1,080	$112,713	20%	$22,543
Medium Hazard Exposure	254	$48,324	2	$975	1	$233	$49,532		
Greenlee County HAZUS Summary	**% Building Count**	**% Potential Economic Impact**	**% Building Count**	**% Potential Economic Impact**	**% Building Count**	**% Potential Economic Impact**			
High Hazard Exposure	13.30%	10.66%	17.55%	11.20%	18.89%	05.36%			
Medium Hazard Exposure	06.11%	04.98%	02.57%	01.35%	06.67%	01.16%			

Table 5-12: Clifton HAZUS building exposure to flooding

	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SUMMARY		
Clifton HAZUS Summary	**Building Count**	**Potential Economic Impact (x$1000)**	**Building Count**	**Potential Economic Impact (x$1000)**	**Building Count**	**Potential Economic Impact (x$1000)**	**Total of All Potential Economic Impact (x$1000)**	**Loss-to-Exposure Ratio**	**Total Estimated Loss (x$1000)**
Community-Wide Totals	**1,517**	**$391,736**	**21**	**$33,731**	**4**	**$5,505**	**$430,973**		
High Hazard Exposure	139	$29,418	6	$4,290	1	$301	$34,009	20%	$6,802
Medium Hazard Exposure	172	$35,786	2	$975	1	$233	$36,995		
Clifton HAZUS Summary	**% Building Count**	**% Potential Economic Impact**	**% Building Count**	**% Potential Economic Impact**	**% Building Count**	**% Potential Economic Impact**			
High Hazard Exposure	09.17%	07.51%	28.35%	12.72%	24.67%	05.47%			
Medium Hazard Exposure	11.36%	09.14%	07.67%	02.89%	24.67%	04.23%			

Table 5-13: Duncan HAZUS building exposure to flooding

	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SUMMARY		
Duncan HAZUS Summary	**Building Count**	**Potential Economic Impact (x$1000)**	**Building Count**	**Potential Economic Impact (x$1000)**	**Building Count**	**Potential Economic Impact (x$1000)**	**Total of All Potential Economic Impact (x$1000)**	**Loss-to-Exposure Ratio**	**Total Estimated Loss (x$1000)**
Community-Wide Totals	**395**	**$80,590**	**20**	**$17,671**	**4**	**$2,095**	**$100,356**		
High Hazard Exposure	90	$18,011	5	$3,362	2	$713	$22,086	20%	$4,417
Medium Hazard Exposure	0	$0	0	$0	0	$0	$0		
Duncan HAZUS Summary	**% Building Count**	**% Potential Economic Impact**	**% Building Count**	**% Potential Economic Impact**	**% Building Count**	**% Potential Economic Impact**			
High Hazard Exposure	22.80%	22.35%	22.73%	19.02%	42.04%	34.01%			
Medium Hazard Exposure	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			

Table 5-14: Unincorporated Greenlee County HAZUS building exposure to flooding

	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SUMMARY		
Unincorporated Greenlee County HAZUS Summary	**Building Count**	**Potential Economic Impact (x$1000)**	**Building Count**	**Potential Economic Impact (x$1000)**	**Building Count**	**Potential Economic Impact (x$1000)**	**Total of All Potential Economic Impact (x$1000)**	**Loss-to-Exposure Ratio**	**Total Estimated Loss (x$1000)**
Community-Wide Totals	**2,240**	**$498,935**	**22**	**$20,634**	**7**	**$12,542**	**$532,111**		
High Hazard Exposure	323	$56,134	0	$418	0	$66	$56,618	20%	$11,324
Medium Hazard Exposure	81	$12,538	0	$0	0	$0	$12,538		
Unincorporated Greenlee County HAZUS Summary	**% Building Count**	**% Potential Economic Impact**	**% Building Count**	**% Potential Economic Impact**	**% Building Count**	**% Potential Economic Impact**			
High Hazard Exposure	14.43%	11.25%	02.29%	02.03%	02.18%	0.53%			
Medium Hazard Exposure	03.64%	02.51%	0.0%	0.0%	0.0%	0.0%			

A summary comparison of the 2011 Plan county-wide flooding vulnerability analysis results to the current plan is shown in Table 5-15. Changes shown in Table 5-15 are a result of revisions to the Planning Team asset inventory (several of the 2011 Plan assets did not have estimated replacement costs), a different flood hazard layer (DFIRM), a refinement of the GIS algorithms used to determine the HAZUS exposure, and a different loss to exposure ratio applied to the HAZUS exposure numbers.

Table 5-15: 2011 Plan county-wide flooding vulnerability analysis comparison to the 2016 Plan estimates

Exposure	2011 Plan	2016 Plan
Assets: High Hazard	$12.6 Million	$11.9 Million
Assets: Medium Hazard	$0.5 Million	None Estimated
HAZUS Facilities: High Hazard	$11.3 Million	$22.5 Million
HAZUS Facilities: Medium Hazard	$1.8 Million	None Estimated
Human: High Hazard	1,077	1,017
Human: Medium Hazard	594	479

Vulnerability – Repetitive Loss Properties

Repetitive Loss (RL) properties are those NFIP-insured properties that since 1978, have experienced multiple flood losses. FEMA tracks RL property statistics, and in particular to identify Severe RL (SRL) properties. RL properties demonstrate a track record of repeated flooding for a certain location and are one element of the vulnerability analysis. RL properties are also important to the NFIP, since structures that flood frequently put a strain on the National Flood Insurance Fund. FEMA records dated February 2016 (provided by ADWR) indicate that there are 6 identified RL properties in Greenlee County, with a total of over $284,510 in associated building and contents value payments. None of the payments have occurred within the last five years and none of the properties are currently carrying NFIP insurance. Table 5-16 summarizes the RL property characteristics by jurisdiction.

Table 5-16: Repetitive Loss property statistics for Greenlee County jurisdictions

Jurisdiction	No. of Properties	No. of Properties Mitigated	Total Payments
Clifton	4	0	$139,311
Duncan	1	1[a]	$46,160
Unincorporated Greenlee County	1	0	$99,039

Source: FEMA NFIPSTAT web query provided by ADWR, 2016 (data as of February 29, 2016)
Notes:
a – FEMA database does not show property to be mitigated, but Town officials believe it is.

Vulnerability – Development Trends

Most floodprone properties in Greenlee County pre-date the planning jurisdictions' entry into the NFIP and were constructed prior to current floodplain management practices. The development of new properties or substantial re-development of existing structures is now subject to regulatory review procedures implemented by each jurisdiction. New development, adequate planning and regulatory tools are in place to regulate future development. For many areas within the county, challenges for the management of new growth include the need for master drainage planning and additional detailed floodplain delineations to identify and map the flood hazards within the growth areas where no mapping currently exists, or where approximate zones lack accuracy and detail.

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FEMA National Flood Hazard Layer database downloaded January 2016.

Profile Maps

Maps 1A and 1B – County-Wide Flood Hazard Maps

Maps 1C and 1D – Clifton and Duncan Flood Hazard Maps

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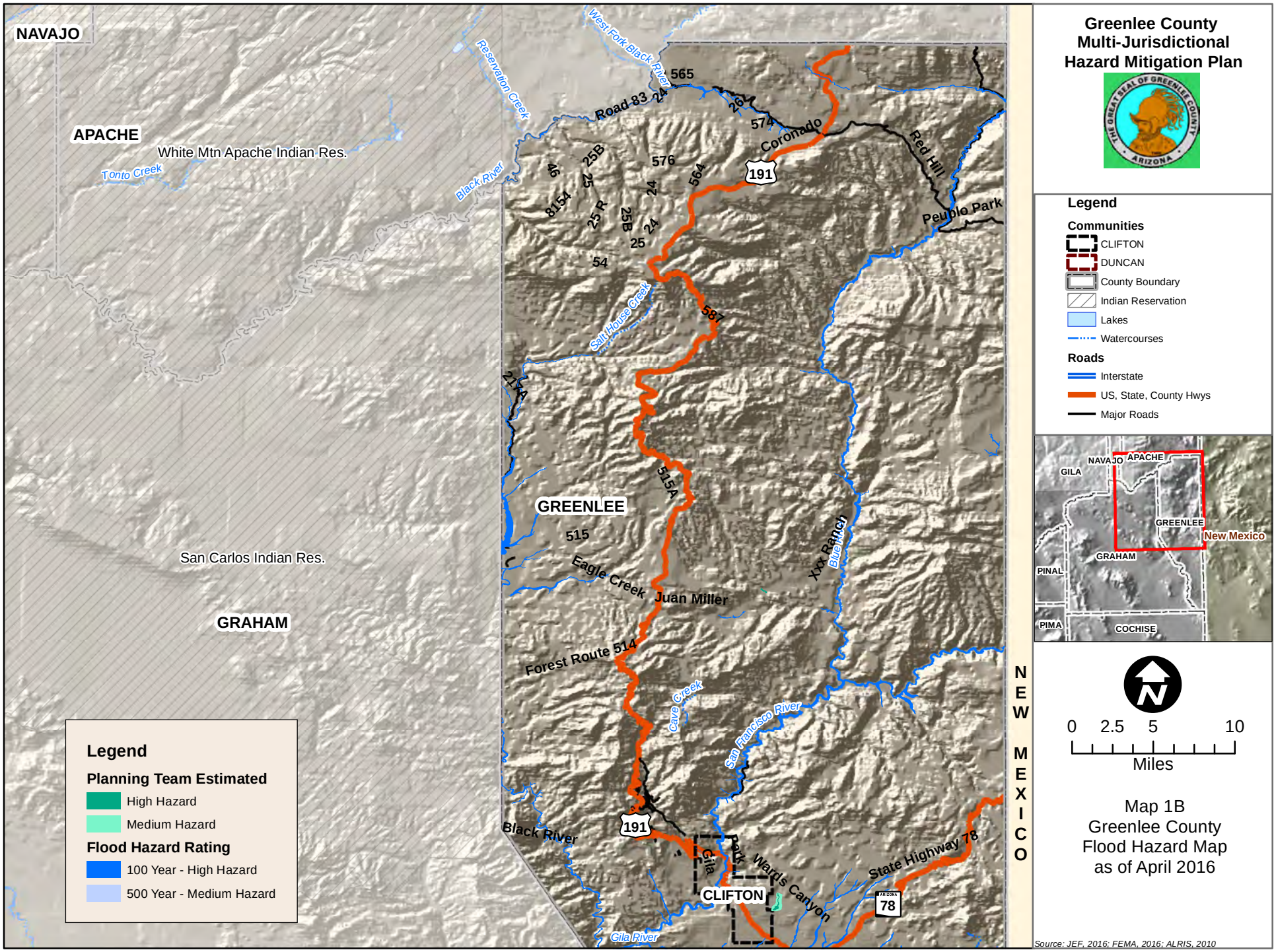
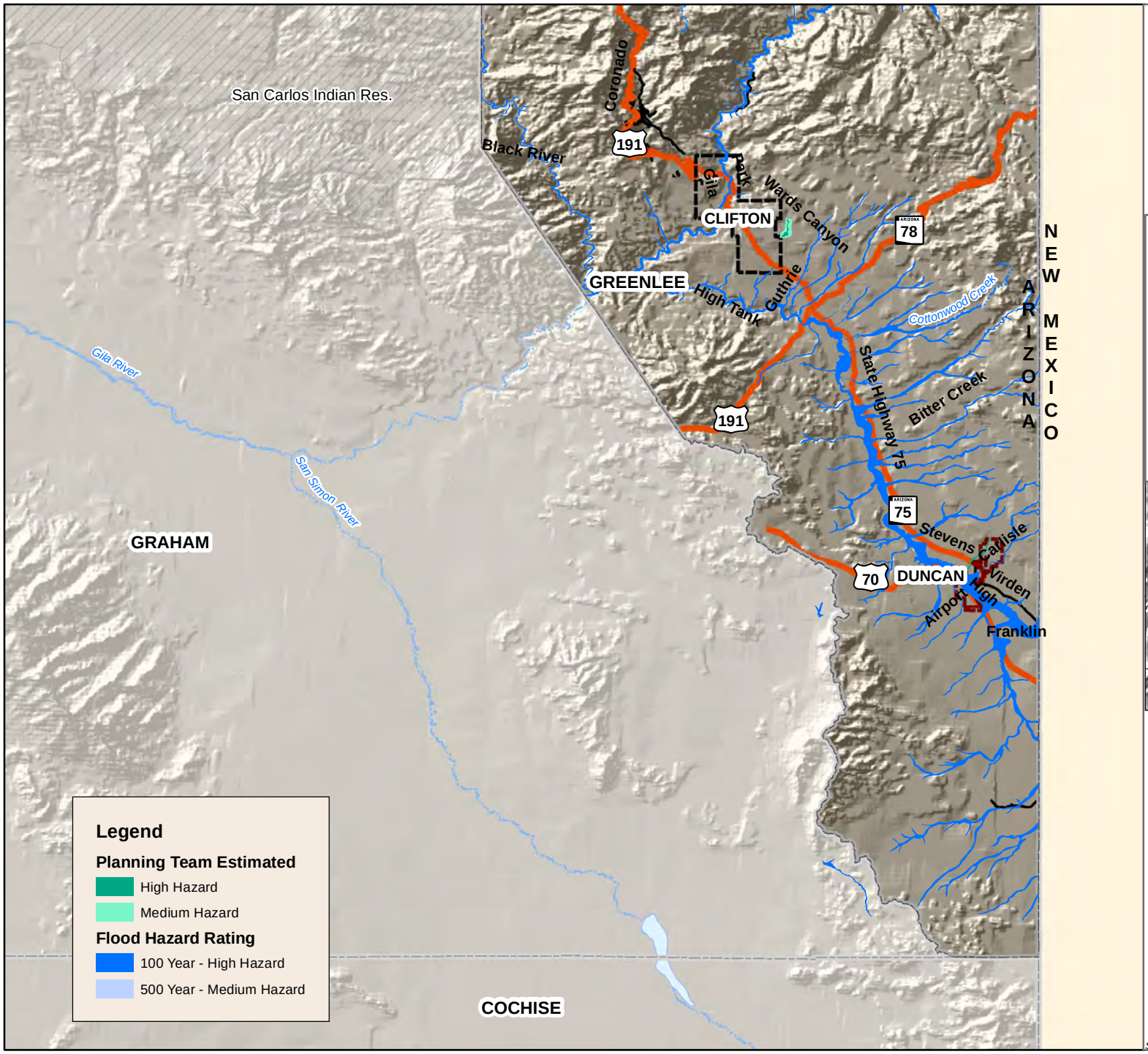

Greenlee County
Multi-Jurisdictional
Hazard Mitigation Plan
NAVAJO
APACHE
White Mtn Apache Indian Res.
Tonto Creek
Black River
Reservation Creek
West Fork Black River
Road 83
565
24
26
574
Coronado
191
Red Hill
Peublo Park
576
564
25B
25
46
8154
25 R
24
25B
24
25
54
Salt House Creek
587
217A
515A
GREENLEE
515
Eagle Creek
Juan Miller
Xxx Ranch
Blue Ranch
San Carlos Indian Res.
GRAHAM
Forest Route 514
Cave Creek
San Francisco River
Black River
191
Gila
Park
Wards Canyon
CLIFTON
State Highway 78
78
Gila River
NEW MEXICO
Legend
Planning Team Estimated
High Hazard
Medium Hazard
Flood Hazard Rating
100 Year - High Hazard
500 Year - Medium Hazard
Legend
Communities
CLIFTON
DUNCAN
County Boundary
Indian Reservation
Lakes
Watercourses
Roads
Interstate
US, State, County Hwys
Major Roads
NAVAJO
APACHE
GILA
GREENLEE
New Mexico
GRAHAM
PINAL
PIMA
COCHISE
0 2.5 5 10
Miles
Map 1B
Greenlee County
Flood Hazard Map
as of April 2016
Source: JEF, 2016; FEMA, 2016; ALRIS, 2010



Greenlee County Multi-Jurisdictional Hazard Mitigation Plan

Legend

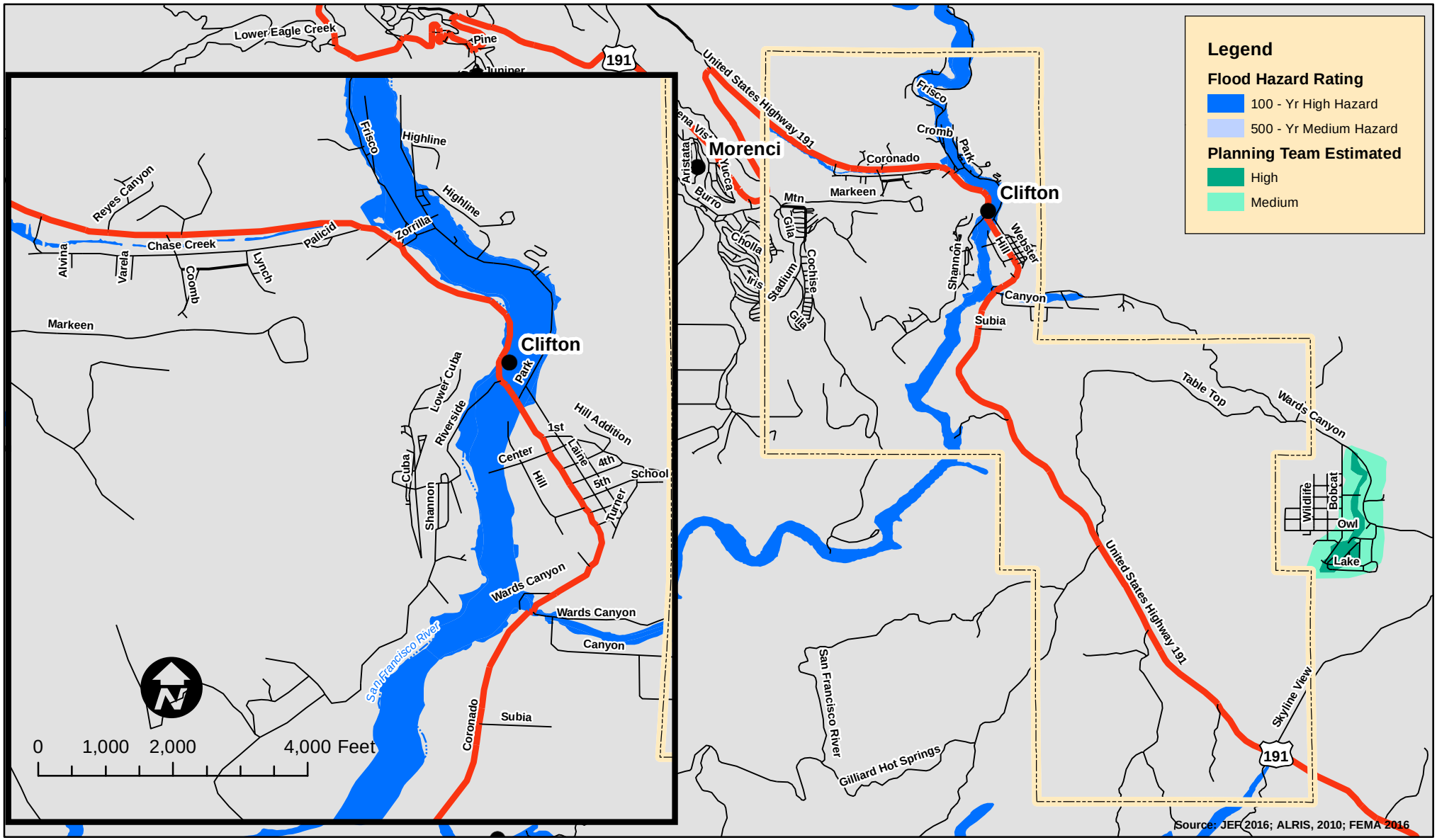
Communities
- CLIFTON
- DUNCAN
- County Boundary
- Indian Reservation
- Lakes
- Watercourses

Roads
- Interstate
- US, State, County Hwys
- Major Roads

0 2.5 5 10
Miles

Map 1A
Greenlee County
Flood Hazard Map
as of April 2016

Source: JEF, 2016; FEMA, 2016; ALRIS, 2010



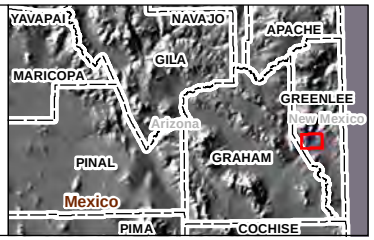
Legend

- County Boundary
- CLIFTON
- Lakes
- Cities, Towns, Places

Roads

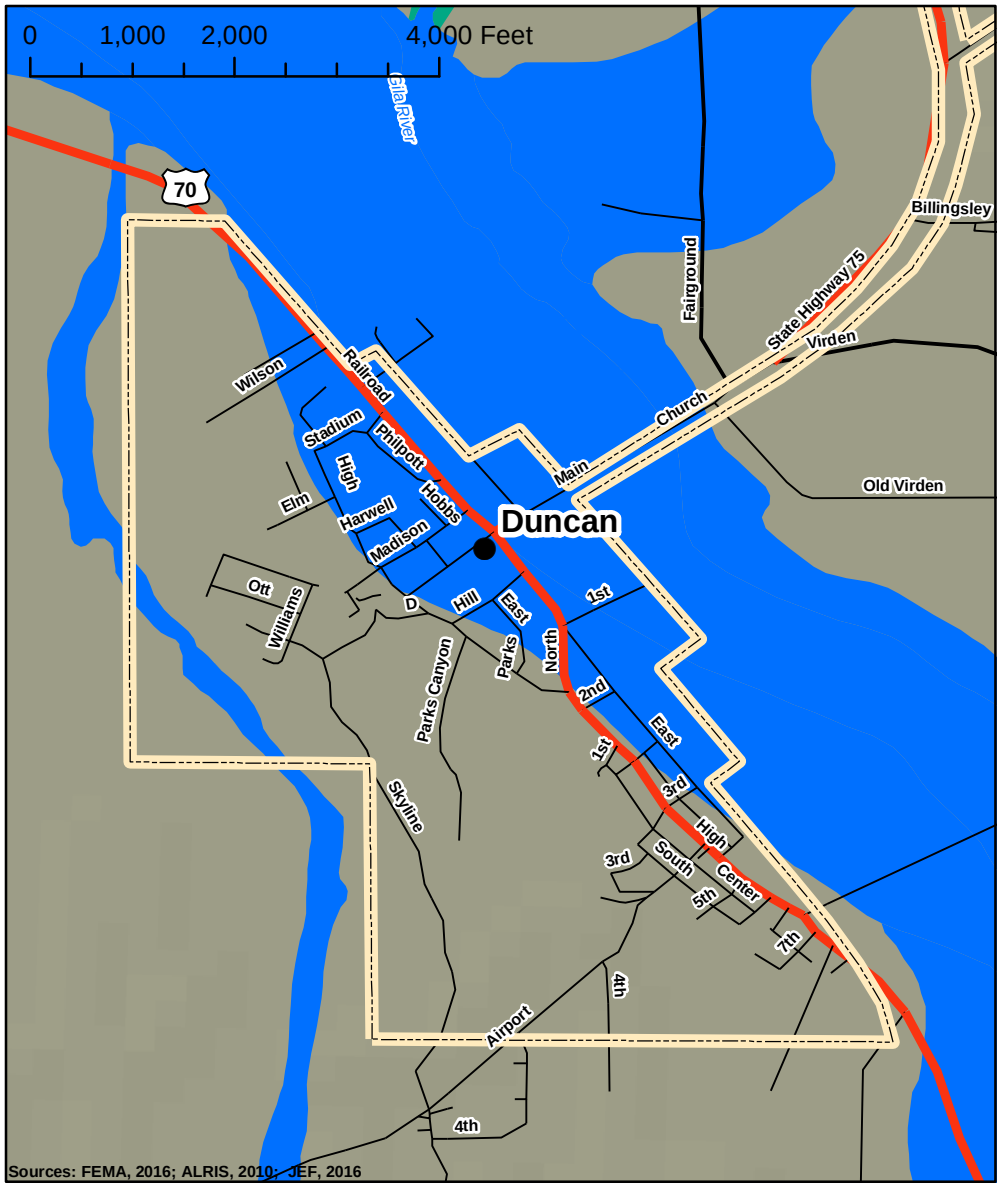
- Interstate
- US, State, County Hwys
- Major Roads
- Local Streets
- major

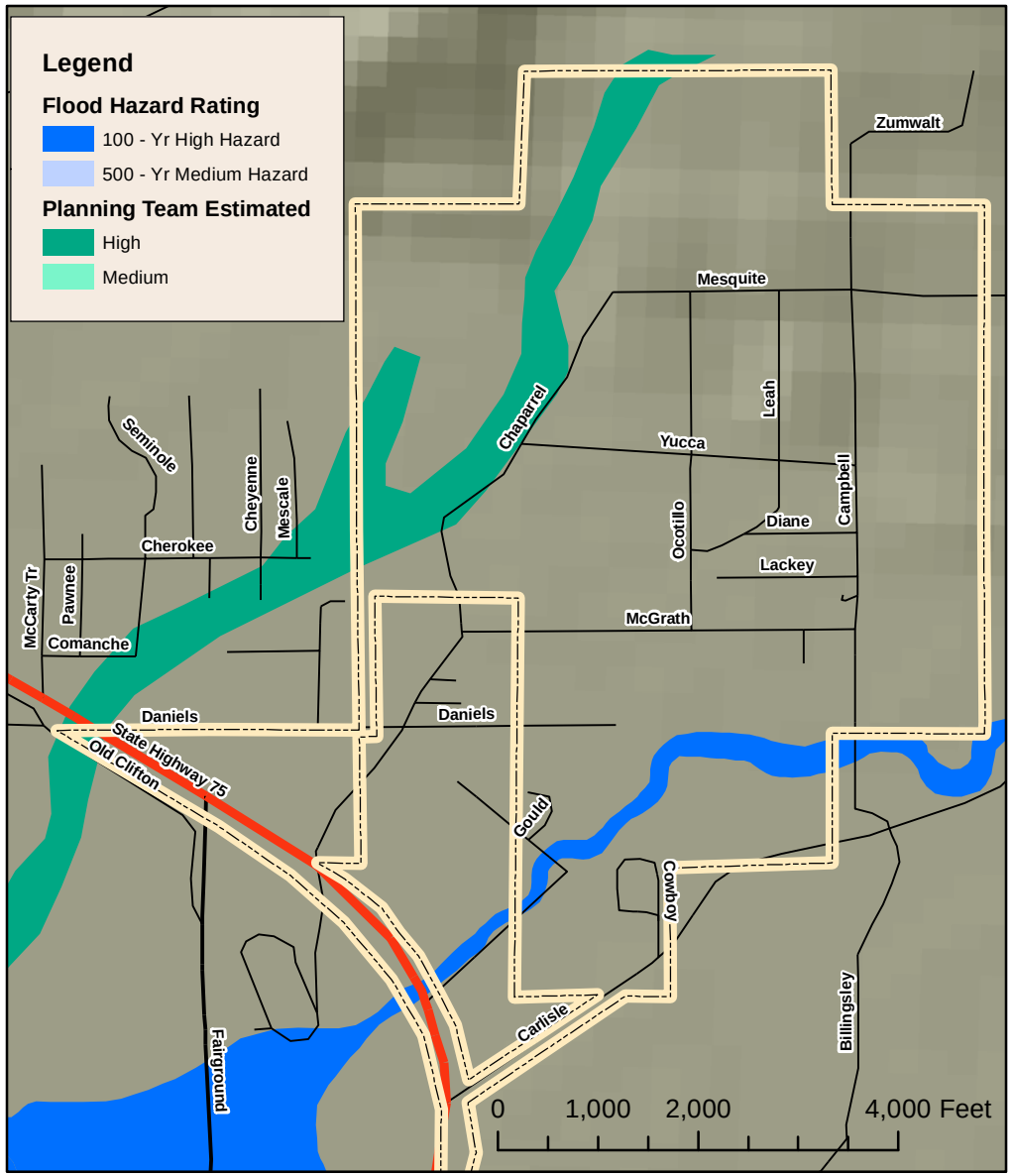
0 0.25 0.5 1 Miles



Greenlee County Multi-Jurisdictional Hazard Mitigation Plan

Map 1C
Town of Clifton
Flood Hazard Map
as of April 2016



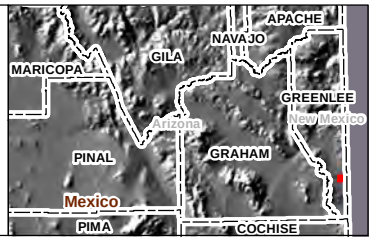


Legend

- DUNCAN
- Lakes
- County Boundary
- Cities, Towns, Places
- Watercourses

Roads

- Interstate
- US, State, County Hwys
- Major Roads
- Local Streets



Greenlee County Multi-Jurisdictional Hazard Mitigation Plan

Map 1D
Town of Duncan
Flood Hazard Map
as of April 2016

5.3.3 Levee Failure

Description

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 or certain federal agencies. FEMA has classified all other structures that impound, divert, and/or otherwise impede the flow of runoff as "non-levee embankments". In Greenlee County, these "non-levee embankments" might be comprised of features such as non-certified levees, roadway and railway embankments, canals, irrigation ditches and drains, and agricultural dikes. Currently there is no State or Federal Levee Safety Program and no official state or federal levee inventory. It is anticipated that FEMA will institute a National Levee Safety Program in the near future.

By design, a levee and many non-levee embankments increase the conveyance capacity of a watercourse by artificially creating a deeper channel through embankments that extend above the natural overbank elevation. Upon failure, floodwaters will return to the natural overbank areas. FEMA urges communities to recognize that all areas downstream of levees and embankments are at some risk of flooding and that 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

Levees (certified or not) have been used in Greenlee County for many years to protect communities and agricultural assets from flooding, as well as to facilitate the delivery and removal of irrigation water. These levees range from simple earthen embankments pushed up by small equipment to large engineered embankments lining one or both sides of a watercourse. The structural integrity of levees with regard to flood protection and policy has been discussed at a national level since the early 1980s but was elevated to a high priority after the collapse and breach of New Orleans' levees after Hurricane Katrina in 2005. In 2009, a draft report was issued to Congress by the National Committee on Levee Safety (NCLS, 2009) summarized recommendations and a strategic plan for implementation of a National Levee Safety Program.

There are no documented failures of certified levees within Greenlee County. Non-levee embankment failures, however, occur on a regular basis and the risk posed by the many uncertified embankments in the county is great. This is especially true in the Duncan area. The following are a few of the documented flooding events in which a breached dike or levee was involved:

- In December 1978, widespread heavy rainfall from December 16-20 caused some of the costliest and widespread flooding in Arizona history. Waters from the Gila River rose to seven feet deep in the town of Duncan, and 75 homes were destroyed when a dike broke (ADEM, 2010).
- In late December 1992 - early January 1993, a series of winter storms produced record breaking precipitation amounts and severe weather across much of Arizona. Heavy rains combined with melting snowpack caused heavy flooding of both local washes and regional rivers within Greenlee County. A 400 foot breach in a protective dike caused five businesses and six residences to be inundated by water up to two feet deep (USACE, 1994; ADEM, 2010).

- In February 2005, a rain on snow event produced moderate flooding along the Gila River at Duncan where a section in the town's dike system broke flooding one occupied structure and the state highway near the Duncan high school (NWSTucson, 2011).

Probability and Magnitude

There are varied probability or magnitude criteria regarding levee failure due to variability in levee design, ownership and maintenance. For flood protection credit under the NFIP, FEMA has established certain deterministic design criteria that are based on the 1 percent (100-year) storm event and corresponding minimum freeboard requirements. Federally constructed levees are usually designed for larger, more infrequent events such as the 0.04% and 0.02% probability (250 to 500 year) events plus freeboard. Recent recertification procedures proposed by U.S. Army Corps of Engineers, require that a certifiable levee have at least a 90% assurance of providing protection from overtopping by the 1% chance exceedance flood for all reaches of a levee system with a design freeboard height of at least three feet. For levees with more than three feet of design freeboard, the assurance is increased to 95%, and no certification will be made for levees with less than two feet of freeboard unless approved via a waver process. This assurance is only for containment (overtopping failure) and does not include probability of failure by other modes such as piping (USACE, 2007).

As of the writing of this Plan, the only FEMA certified levee within Greenlee County is the Clifton Levee. The landside of the levee is delineated as a Shaded Zone X with an "Area Protected by Levee" description. This area was chosen by the Planning Team to represent the High hazard levee failure limits. Risk associated with other non-certified dikes and levees are represented in Flooding profile of Section 5.3.2 and will not be duplicated here. The currently identified High hazard levee failure zone in Clifton is indicated on Map 2.

Vulnerability – CPRI Results

Levee Failure CPRI results for each community are summarized in Table 5-17 below.

Table 5-17: CPRI results by jurisdiction for levee failure

Participating Jurisdiction	Probability	Magnitude/ Severity	Warning Time	Duration	CPRI Score
Clifton	Possible	Catastrophic	< 6 hours	< one week	3.00
Duncan	Highly Likely	Catastrophic	< 6 hours	< one week	3.90
Unincorporated Greenlee County	Possible	Catastrophic	< 6 hours	< 24 hours	2.90
				County-wide average CPRI =	**3.27**

Vulnerability – Loss Estimations

There are no commonly accepted methods for estimating potential levee related losses. Many variables including storm size and duration, as well as size, speed, and timing at which a levee breach forms, all contribute to the potential for human and economic losses. Accordingly, no estimates of loss are made in this Plan. Potential exposure of human and facility assets to the high hazard levee failure areas will be estimated instead. Table 5-18 summarizes the Planning Team defined critical facilities potentially exposed to a high hazard levee failure zone. Table 5-19 summarizes population sectors exposed to the high hazard levee failure zones. HAZUS residential, commercial and industrial exposures to high hazard levee failure zones are summarized in Tables 5-20 through 5-23.

In summary, $1.0 million in county-wide assets are exposed to a high hazard levee failure. An additional $32.0 million in county-wide high hazard levee failure exposure of HAZUS defined residential, commercial, and industrial facilities is estimated. Regarding human vulnerability, a total population of 247 people, or 2.9% of the total county-wide population, is potentially exposed to a high hazard levee failure event. Should a significant levee structure fail suddenly, it is plausible that death and injury might occur. It can also be expected that a substantial portion of the exposed population is subject to displacement depending on the event magnitude.

Table 5-18: Asset inventory exposure to levee failure

Community	Total Facilities Reported by Community	Impacted Facilities	Percentage of Total Community Facilities Impacted	Estimated Replacement Cost (x $1000)	Estimated Structure Loss (x $1000)
HIGH					
County-Wide Totals	**156**	**4**	**2.56%**	**$1,000**	**$200**
Clifton	60	4	6.67%	$1,000	$200
Duncan	44	0	0.00%	$0	$0
Unincorporated Greenlee County	52	0	0.00%	$0	$0

Table 5-19: Population sectors exposed to levee failure

Community	Total Population	Population Exposed	Percent of Population Exposed	Total Population Over 65	Population Over 65 Exposed	Percent of Population Over 65 Exposed
HIGH						
County-Wide Totals	**8,438**	**247**	**2.93%**	**1,016**	**29**	**2.84%**
Clifton	3,300	247	7.49%	308	29	9.37%
Duncan	718	0	0.00%	114	0	0.00%
Unincorporated Greenlee County	4,420	0	0.00%	593	0	0.00%

Table 5-20: Greenlee County HAZUS building exposure to levee failure

	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SUMMARY		
Greenlee County HAZUS Summary	**Building Count**	**Potential Economic Impact (x$1000)**	**Building Count**	**Potential Economic Impact (x$1000)**	**Building Count**	**Potential Economic Impact (x$1000)**	**Total of All Potential Economic Impact (x$1000)**	**Loss-to-Exposure Ratio**	**Total Estimated Loss (x$1000)**
County-Wide Totals	**4,151**	**$971,262**	**63**	**$72,037**	**15**	**$20,142**	**$1,063,441**		
High Hazard Exposure	148	$30,787	2	$975	1	$233	$31,995	20%	$6,399
Greenlee County HAZUS Summary	**% Building Count**	**% Potential Economic Impact**	**% Building Count**	**% Potential Economic Impact**	**% Building Count**	**% Potential Economic Impact**			
High Hazard Exposure	03.57%	03.17%	02.57%	01.35%	06.67%	01.16%			

Table 5-21: Clifton HAZUS building exposure to levee failure

	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SUMMARY		
Clifton HAZUS Summary	**Building Count**	**Potential Economic Impact (x$1000)**	**Building Count**	**Potential Economic Impact (x$1000)**	**Building Count**	**Potential Economic Impact (x$1000)**	**Total of All Potential Economic Impact (x$1000)**	**Loss-to-Exposure Ratio**	**Total Estimated Loss (x$1000)**
Community-Wide Totals	**1,517**	**$391,736**	**21**	**$33,731**	**4**	**$5,505**	**$430,973**		
High Hazard Exposure	148	$30,787	2	$975	1	$233	$31,995	20%	$6,399
Clifton HAZUS Summary	**% Building Count**	**% Potential Economic Impact**	**% Building Count**	**% Potential Economic Impact**	**% Building Count**	**% Potential Economic Impact**			
High Hazard Exposure	09.76%	07.86%	07.67%	02.89%	24.67%	04.23%			

Table 5-22: Duncan HAZUS building exposure to levee failure

	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SUMMARY		
Duncan HAZUS Summary	Building Count	Potential Economic Impact (x$1000)	Building Count	Potential Economic Impact (x$1000)	Building Count	Potential Economic Impact (x$1000)	Total of All Potential Economic Impact (x$1000)	Loss-to-Exposure Ratio	Total Estimated Loss (x$1000)
Community-Wide Totals	**395**	**$80,590**	**20**	**$17,671**	**4**	**$2,095**	**$100,356**		
High Hazard Exposure	0	$0	0	$0	0	$0	$0	20%	$0
Duncan HAZUS Summary	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact			
High Hazard Exposure	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			

Table 5-23: Unincorporated Greenlee County HAZUS building exposure to levee failure

	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SUMMARY		
Unincorporated Greenlee County HAZUS Summary	Building Count	Potential Economic Impact (x$1000)	Building Count	Potential Economic Impact (x$1000)	Building Count	Potential Economic Impact (x$1000)	Total of All Potential Economic Impact (x$1000)	Loss-to-Exposure Ratio	Total Estimated Loss (x$1000)
Community-Wide Totals	**2,240**	**$498,935**	**22**	**$20,634**	**7**	**$12,542**	**$532,111**		
High Hazard Exposure	0	$0	0	$0	0	$0	$0	20%	$0
Unincorporated Greenlee County HAZUS Summary	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact			
High Hazard Exposure	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			

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

Vulnerability – Development Trend Analysis

With the new focus on residual downstream risk for the land-side of levees and a general refocusing of national levee regulation and policy, it is likely that new and old developments in these areas will need to be revisited to determine if additional measures are necessary for adequate flood protection. Many structures located downstream of non-certified levee embankments are being re-mapped into Special Flood Hazard Zones. New developments should be evaluated to determine if sufficient protection is proposed to mitigate damages should the levee protecting them fail.

New development and redevelopment of the areas protected by the Clifton levee has been and will continue to be limited. The best mitigation for this area is for structure owners to be thoroughly made aware of the residual risks and to carry flood insurance. For the Town of Clifton, continued performance of routine maintenance and inspection of the existing levee facilities is critical to mitigating failures.

Sources

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

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

FEMA, 2009, Web page at URL: http://www.fema.gov/plan/prevent/fhm/lv_intro.shtm#3

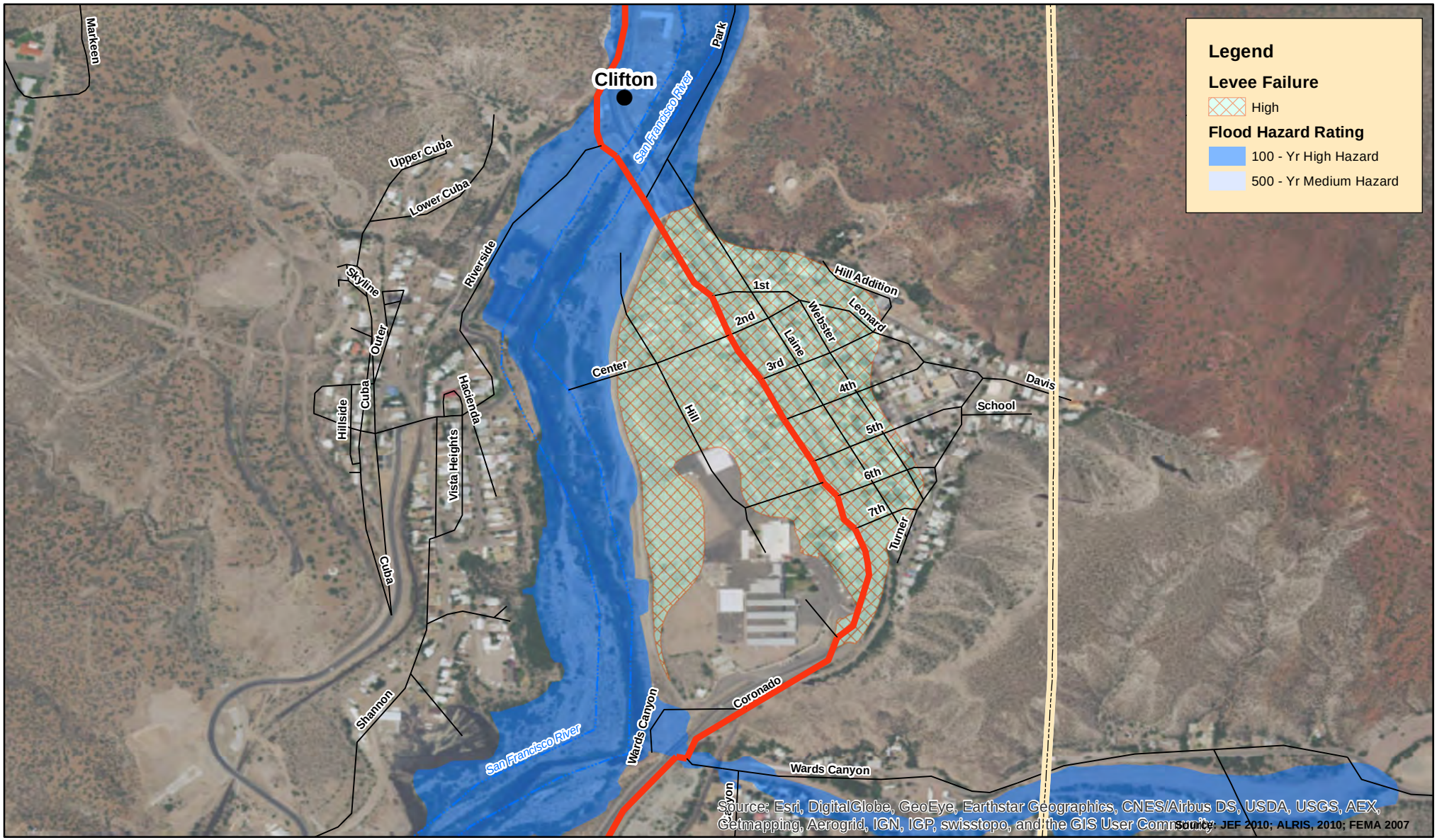
National Committee on Levee Safety, 2009, *Draft Recommendation For A National Levee Safety Program.*

National Weather Service – Tucson FO, web page at URL: http://www.wrh.noaa.gov/twc/hydro/floodhis.php

USACE, 2007, *Certification of Levee Systems for the National Flood Insurance Program (NFIP) – DRAFT*, ETL 1110-2-570.

Profile Maps

Map 2 – Potential Levee Failure Hazard Map



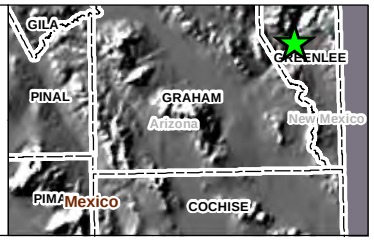
Legend

- County Boundary
- CLIFTON
- Cities, Towns, Places
- Lakes
- Watercourses

Roads

- Interstate
- US, State, County Hwys
- Major Roads
- Local Streets

0 250 500 1000 Feet



Greenlee County Multi-Jurisdictional Hazard Mitigation Plan

Map 2
Clifton Area
Levee Failure Hazard Map
as of April 2016

5.3.4 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 usually signaled by dense 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 grow into an emergency or disaster. 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, waterways and the land itself. 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.

History

For the period of 1980 to 2008, data compiled by the Arizona State Forestry Division for the 2010 State Plan update indicates that at least 63 wildfires greater than 100 acres in size, have occurred in all of Greenlee County. According to the National Wildfire Coordination Group (NWCG, 2010), there have been four fires larger than 10,000 acres, that have burned within Greenlee County during the period of 2002 to 2009, as described below in chronological order:

- In June of 2003, the Thomas Fire was started by lightning and burned an area 16 miles south of Alpine, Arizona. The fire started June 6, 2003 and burned a total of 10,618 acres with over $3,500,000 in fire suppression costs..
- In July of 2003, the Blue River Fire Complex was started by lightning and burned an area south of Alpine, Arizona. The fire started July 12, 2003 and burned a total of 18,600 acres with over $6,233,034 in fire suppression costs..
- In May of 2004, the KP Fire was started by human causes and burned an area 20 miles south of Alpine, Arizona. The fire started May 17, 2004 and was controlled August 19, 2004, burning a total of 16,625 acres with $2,024,202 in fire suppression costs. There were also six firefight related injuries.
- In June of 2007, the Chitty Fire was started by lightning and burned an area 6 miles south-southwest of Hannagan Meadow, Arizona. The fire started June 30, 2007 and was controlled July 16, 2007, bunring a total of 14,200 acres with one reported injury.
- In May-July of 2011, the Wallow Fire - the largest fire in the history of Arizona - burned a significant portion of the White Mountains near Springerville and Alpine, Arizona. The fire started May 29, 2011 and was controlled July 12, 2011, burning a total of 538,049 acres with over $109 million in fire suppression costs. Five residences and one outbuilding were damaged, and 32 residences, 36 outbuildings and 4 commercial structures were completely destroyed. Total damages are estimated to exceed $10 million and 8 firefight related injuries were reported.

There have been 10 wildfires impacting Greenlee County in excess of 100 acres for the period of 2009 to 2014. Maps 3A and 3B provide a graphical depiction of the 100 acre plus wildfires.

The Planning Team recognized that the declared disaster and historic hazard data collected and summarized in Section 5.1 does not adequately reflect the true cost of a wildfire. Particularly, the cost of wildfire suppression efforts to prevent structure and human loss. For example, the KP Fire did not result in any structure losses, however, the suppression costs exceeded $6.2 million. Furthermore, the County, State, Forest Service, and other agencies spend millions of dollars every year in wildfire mitigation in fuel treatment projects.

Probability and Magnitude

The probability and magnitude of wildfire incidents for Greenlee 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. Two sources were used to map the wildfire risk for Greenlee County. The first is the data developed for the Greenlee County Community Wildfire Protection Plan (LSD, 2005). The second is a statewide coverage developed by the State of Arizona as a part of the 2003/04 Arizona Wildland Urban Interface Assessment (AWUIA) project (Fisher, 2004).

Greenlee County and various cooperating stakeholders collaborated to prepare the Greenlee County Community Wildfire Protection Plan (GCCWPP). The GCCWPP established the Wildland Urban Interface (WUI) areas for the County, and mapped various wildfire risk elements such as vegetative fuels and densities, topographical slope and aspect, previous burn areas and ignition points, and prior treatment areas. Using these elements, a comprehensive fuels hazard risk map[20] was developed for the WUI and are shown in Figures 5-7 and 5-8. The High, Medium and Low hazard classifications are used for the Wildfire profile of this Plan in the WUI.

In 2004, the State of Arizona prepared the AWUIA to analyze wildfire risk at a statewide basis, using a common spatial model. The model results were used for validation of those communities listed in the federal register as WUI, and for further identification other communities possibly at risk. The AWUIA approach used four main data layers:

- TOPO – aspect and slope derived from 30 meter Digital Elevation Model data from USGS.
- RISK – historical fire density using point data from fire record years 1986–1996 from all wildland agencies.
- HAZARD – fuels, natural fire regimes and condition class.
- HOUSE – houses and/or structures

A value rating in the range of 1-15 was assigned for all layers to represent the level of risk.

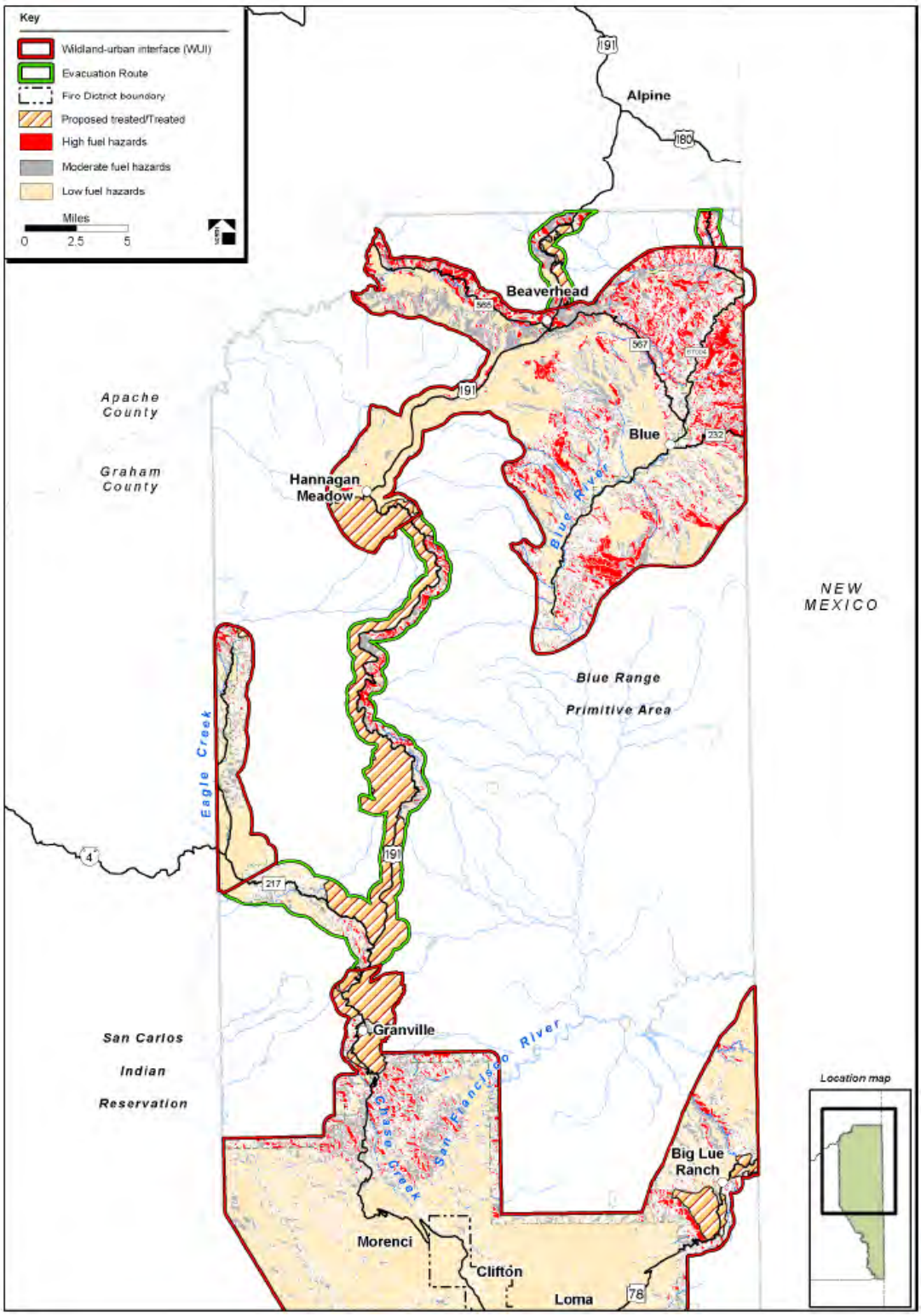
Two separate results were developed. The first coverage used an applied weighting scheme that combined each of the four data layers to develop a ranking model for identifying WUI communities at greatest risk. The second coverage, referred to as the "Land Hazard", also applied a weighting scheme that combined only the TOPO, RISK, and HAZARD layers, as follows:

LAND HAZARD = (HAZARD*70%)+(RISK*20%)+(TOPO*10%)

Weighing percentages were determined through discussion with the Arizona Interagency Coordinating Group. The "Land Hazard" layer produced from this model is based on a 250-meter raster grid (some data originated at 1,000-meter). The resultant raster values range from 1-15 and were classified into three groups to depict wildfire hazard without the influence of structures: HIGH (values of 10-15), MEDIUM (values of 7-9), and LOW (values of 1-6).

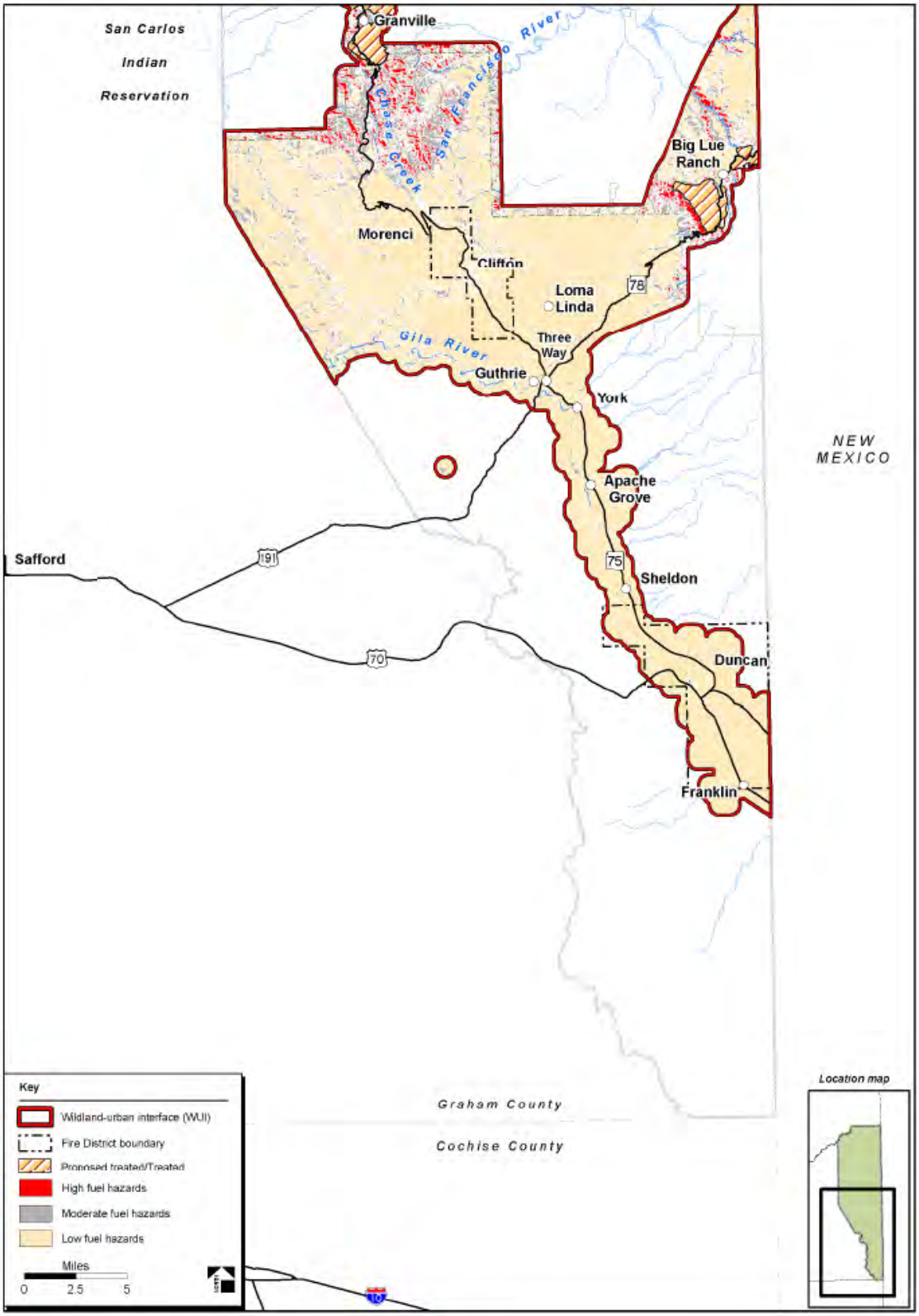
The final wildfire hazard profile map for this Plan depicts a mosaic of the High, Medium and Low risk areas identified in the GCCWPP and the AWUIA. The GCCWPP risk areas are assigned to the WUI and the wildfire risk for the rest of the county, outside of the WUI, is assigned based on the statewide AWUIA "Land Hazard" layer. Maps 3A through 3D indicates the various wildfire hazard areas for Greenlee County and the incorporated boundaries of Clifton and Duncan.

[20] Figures 3.6 in the GCCWPP



Source: Greenlee County CWPP, 2005

Figure 5-7: Greenlee County CWPP Fuel Hazards Map – North Half



Source: Greenlee County CWPP, 2005

Figure 5-8: Greenlee County CWPP Fuel Hazards Map – South Half

The following table is an excerpt from the GCCWPP that summarizes the WUI risk for community areas within Greenlee County.

Table 3.6. Cumulative risk levels, by percentage of WUI area

GCWPP communities	High risk (%)	acres	Moderate risk (%)	acres	Low risk (%)	acres	Total Acres
Blue Area	50	70,042	37	51,831	13	18,211	140,084
Eagle Creek Area	8	1,107	53	7,336	39	5,398	13,841
Clifton Area	4	3,500	33	28,879	63	55,133	87,512
Morenci Area	10	9,098	61	55,503	29	26,387	90,988
Duncan Area	0	0	47	23,001	53	25,937	48,938
Evacuation Routes	100	37,813	0	0	0	0	37,813
Total Acres		121,560		166,550		131,066	419,176

Source: Logan Simpson Design Inc.

Vulnerability – CPRI Results

Wildfire CPRI results for each community are summarized in Table 5-24 below.

Table 5-24: CPRI results by jurisdiction for wildfire

Participating Jurisdiction	Probability	Magnitude/ Severity	Warning Time	Duration	CPRI Score
Clifton	Likely	Limited	12 to 24 hours	< 1 week	2.55
Duncan	Possible	Negligible	< 6 hours	< 24 hours	2.00
Unincorporated Greenlee County	Highly Likely	Critical	< 6 hours	> 1 week	3.70
				County-wide average CPRI =	**2.75**

Vulnerability – Loss Estimations

The estimation of potential exposure to high and medium wildfire hazards was accomplished by intersecting the human and facility assets with the wildfire hazard limits depicted on Maps 3A – 3D. No wildfire related losses were estimated with this update. Table 5-25 summarizes the Planning Team identified critical and non-critical facilities potentially exposed to high and medium wildfire hazards. Table 5-26 summarizes population sectors exposed to the high and medium wildfire hazards. HAZUS residential, commercial and industrial exposures to high and medium wildfire hazards are summarized in Tables 5-27 through 5-30.

In summary, $0 and $2.75 million in asset related exposure to high and medium wildfire hazards, for all the participating jurisdictions in Greenlee County. An additional $16.3 and $45.0 million in high and medium hazard wildfire exposure to HAZUS defined residential, commercial, and industrial facilities, is estimated for all participating Greenlee County jurisdictions. It should be noted that typical damage estimates do not include the cost of wildfire suppression which can be substantial. For example, a Type 1 wildfire fighter crew costs about $1 million per day.

Regarding human vulnerability, a county-wide population of 95 and 327 people, or 1.2% and 3.9% of the total, are potentially exposed to a high and medium hazard wildfire event, respectively. Typically, deaths and injuries not related to firefighting activities are rare. However, it is feasible to assume that at least one death and/or injury may be plausible. There is also a high probability of population displacement during a wildfire event, and especially in the urban wildland interface areas.

Table 5-25: Asset inventory exposure to high and medium hazard wildfire and corresponding loss estimates

Community	Total Facilities Reported by Community	Impacted Facilities	Percentage of Total Community Facilities Impacted	Estimated Replacement Cost (x $1000)	Estimated Structure Loss (x $1000)
HIGH					
County-Wide Totals	**156**	**0**	**0.00%**	**$0**	**$0**
Clifton	60	0	0.00%	$0	$0
Duncan	44	0	0.00%	$0	$0
Unincorporated Greenlee County	52	0	0.00%	$0	$0
MEDIUM					
County-Wide Totals	**156**	**4**	**2.56%**	**$2,750**	**$0**
Clifton	60	1	1.67%	$750	$0
Duncan	44	0	0.00%	$0	$0
Unincorporated Greenlee County	52	3	5.77%	$2,000	$0

Table 5-26: Population sectors exposed to high and medium hazard wildfire

Community	Total Population	Population Exposed	Percent of Population Exposed	Total Population Over 65	Population Over 65 Exposed	Percent of Population Over 65 Exposed
HIGH						
County-Wide Totals	**8,438**	**95**	**1.12%**	**1,016**	**18**	**1.82%**
Clifton	3,300	0	0.00%	308	0	0.00%
Duncan	718	0	0.00%	114	0	0.00%
Unincorporated Greenlee County	4,420	95	2.15%	593	18	3.11%
MEDIUM						
County-Wide Totals	**8,438**	**327**	**3.87%**	**1,016**	**69**	**6.76%**
Clifton	3,300	102	3.09%	308	20	6.57%
Duncan	718	31	4.27%	114	8	6.84%
Unincorporated Greenlee County	4,420	194	4.39%	593	41	6.85%

Table 5-27: Greenlee County HAZUS building exposure to wildfire

	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SUMMARY		
Greenlee County HAZUS Summary	**Building Count**	**Potential Economic Impact (x$1000)**	**Building Count**	**Potential Economic Impact (x$1000)**	**Building Count**	**Potential Economic Impact (x$1000)**	**Total of All Potential Economic Impact (x$1000)**	**Loss-to-Exposure Ratio**	**Total Estimated Loss (x$1000)**
County-Wide Totals	**4,151**	**$971,262**	**63**	**$72,037**	**15**	**$20,142**	**$1,063,441**		
High Hazard Exposure	76	$12,330	4	$3,589	0	$379	$16,298		
Medium Hazard Exposure	201	$38,448	5	$5,839	1	$705	$44,993		
Greenlee County HAZUS Summary	**% Building Count**	**% Potential Economic Impact**	**% Building Count**	**% Potential Economic Impact**	**% Building Count**	**% Potential Economic Impact**			
High Hazard Exposure	01.84%	01.27%	05.56%	04.98%	03.26%	01.88%			
Medium Hazard Exposure	04.85%	03.96%	08.37%	08.11%	06.16%	03.50%			

Table 5-28: Clifton HAZUS building exposure to wildfire

	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SUMMARY		
Clifton HAZUS Summary	**Building Count**	**Potential Economic Impact (x$1000)**	**Building Count**	**Potential Economic Impact (x$1000)**	**Building Count**	**Potential Economic Impact (x$1000)**	**Total of All Potential Economic Impact (x$1000)**	**Loss-to-Exposure Ratio**	**Total Estimated Loss (x$1000)**
Community-Wide Totals	**1,517**	**$391,736**	**21**	**$33,731**	**4**	**$5,505**	**$430,973**		
High Hazard Exposure	0	$0	0	$0	0	$0	$0		
Medium Hazard Exposure	59	$13,107	0	$55	0	$0	$13,162		
Clifton HAZUS Summary	**% Building Count**	**% Potential Economic Impact**	**% Building Count**	**% Potential Economic Impact**	**% Building Count**	**% Potential Economic Impact**			
High Hazard Exposure	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
Medium Hazard Exposure	03.87%	03.35%	0.08%	0.16%	0.0%	0.0%			

Table 5-29: Duncan HAZUS building exposure to wildfire

	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SUMMARY		
Duncan HAZUS Summary	**Building Count**	**Potential Economic Impact (x$1000)**	**Building Count**	**Potential Economic Impact (x$1000)**	**Building Count**	**Potential Economic Impact (x$1000)**	**Total of All Potential Economic Impact (x$1000)**	**Loss-to-Exposure Ratio**	**Total Estimated Loss (x$1000)**
Community-Wide Totals	**395**	**$80,590**	**20**	**$17,671**	**4**	**$2,095**	**$100,356**		
High Hazard Exposure	0	$0	0	$0	0	$0	$0		
Medium Hazard Exposure	15	$3,123	0	$192	0	$0	$3,314		
Duncan HAZUS Summary	**% Building Count**	**% Potential Economic Impact**	**% Building Count**	**% Potential Economic Impact**	**% Building Count**	**% Potential Economic Impact**			
High Hazard Exposure	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
Medium Hazard Exposure	03.77%	03.87%	01.34%	01.08%	0.0%	0.0%			

Table 5-30: Unincorporated Greenlee County HAZUS building exposure to wildfire

	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SUMMARY		
Unincorporated Greenlee County HAZUS Summary	**Building Count**	**Potential Economic Impact (x$1000)**	**Building Count**	**Potential Economic Impact (x$1000)**	**Building Count**	**Potential Economic Impact (x$1000)**	**Total of All Potential Economic Impact (x$1000)**	**Loss-to-Exposure Ratio**	**Total Estimated Loss (x$1000)**
Community-Wide Totals	**2,240**	**$498,935**	**22**	**$20,634**	**7**	**$12,542**	**$532,111**		
High Hazard Exposure	76	$12,330	4	$3,589	0	$379	$16,298		
Medium Hazard Exposure	128	$22,219	5	$5,593	1	$705	$28,517		
Unincorporated Greenlee County HAZUS Summary	**% Building Count**	**% Potential Economic Impact**	**% Building Count**	**% Potential Economic Impact**	**% Building Count**	**% Potential Economic Impact**			
High Hazard Exposure	03.41%	02.47%	16.08%	17.40%	07.04%	03.02%			
Medium Hazard Exposure	05.70%	04.45%	22.89%	27.10%	13.31%	05.62%			

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

Vulnerability – Development Trend Analysis

By its very definition, the WUI represents the fringe of urban development as it intersects with the natural environment. As previously discussed, wildfire risks are significant for a sizeable portion of the county. Any future development will only increase the WUI areas and expand the potential exposure of structures to wildfire hazards. The GCCWPP addresses mitigation opportunities for expanding WUI areas and provides recommended guidelines for safe building and land-use practices in wildfire hazard areas.

Sources

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

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Logan Simpson Design, Inc., 2005, *Greenlee County Community Wildfire Protection Plan*

National Wildfire Coordination Group, 2014, Historical ICS 209 reports at: http://fam.nwcg.gov/fam-web/hist_209/report_list_209

USFS, Southwestern Region 3, data at: http://www.fs.usda.gov/main/r3/landmanagement/gis

White, Seth, 2004, *Bridging the Worlds of Fire Managers and Researchers: Lessons and Opportunities From the Wildland Fire Workshops*, USDA Forest Service, General Technical Report PNW-GTR-599, March 2004

Profile Maps

Maps 3A and 3B – County-Wide Wildfire Hazard Maps

Maps 3C and 3D – Clifton and Duncan Wildfire Hazard Maps

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 5-31 summarizes the hazards selected for mitigation by each jurisdiction and will be the basis for each jurisdictions mitigation strategy.

Table 5-31: Summary of hazards to be mitigated by each participating jurisdiction

Jurisdiction	Drought	Flooding	Levee Failure	Wildfire
Unincorporated Greenlee County	M	M	NH	M
Clifton	M	M	M	NH
Duncan	M	M	M	NH

M – Mitigation A/Ps will be identified
NH – Nuisance hazard - no mitigation is warranted
NV – Jurisdiction is not vulnerable to hazard – no mitigation is warranted

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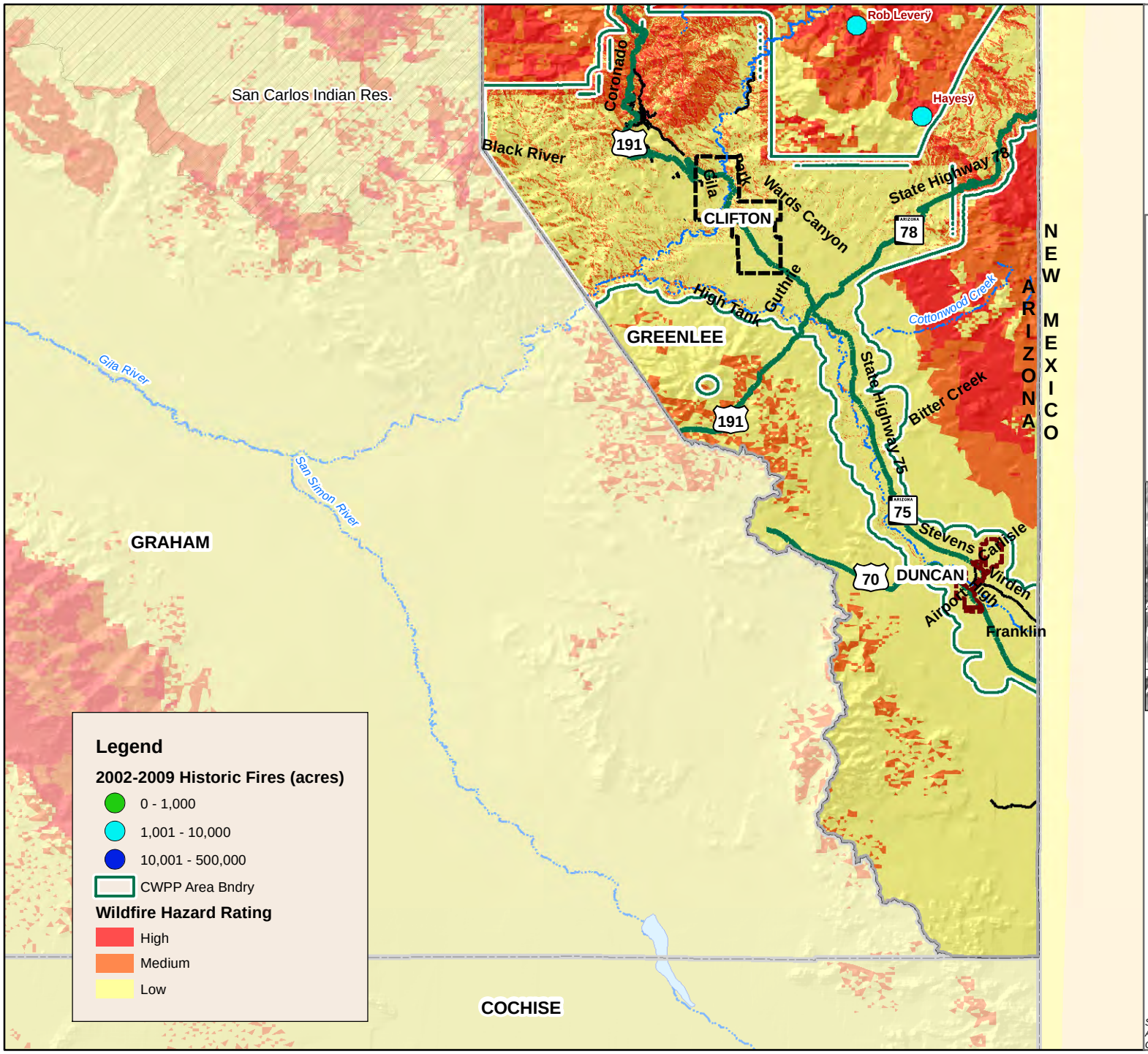
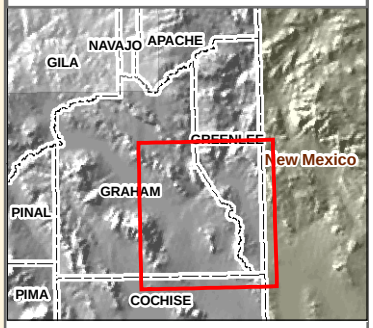


Greenlee County Multi-Jurisdictional Hazard Mitigation Plan

Legend

Communities
- CLIFTON
- DUNCAN
- County Boundary
- Lakes

Roads
- Interstate
- US, State, County Hwys
- Major Roads
- Watercourses
- Indian Reservation

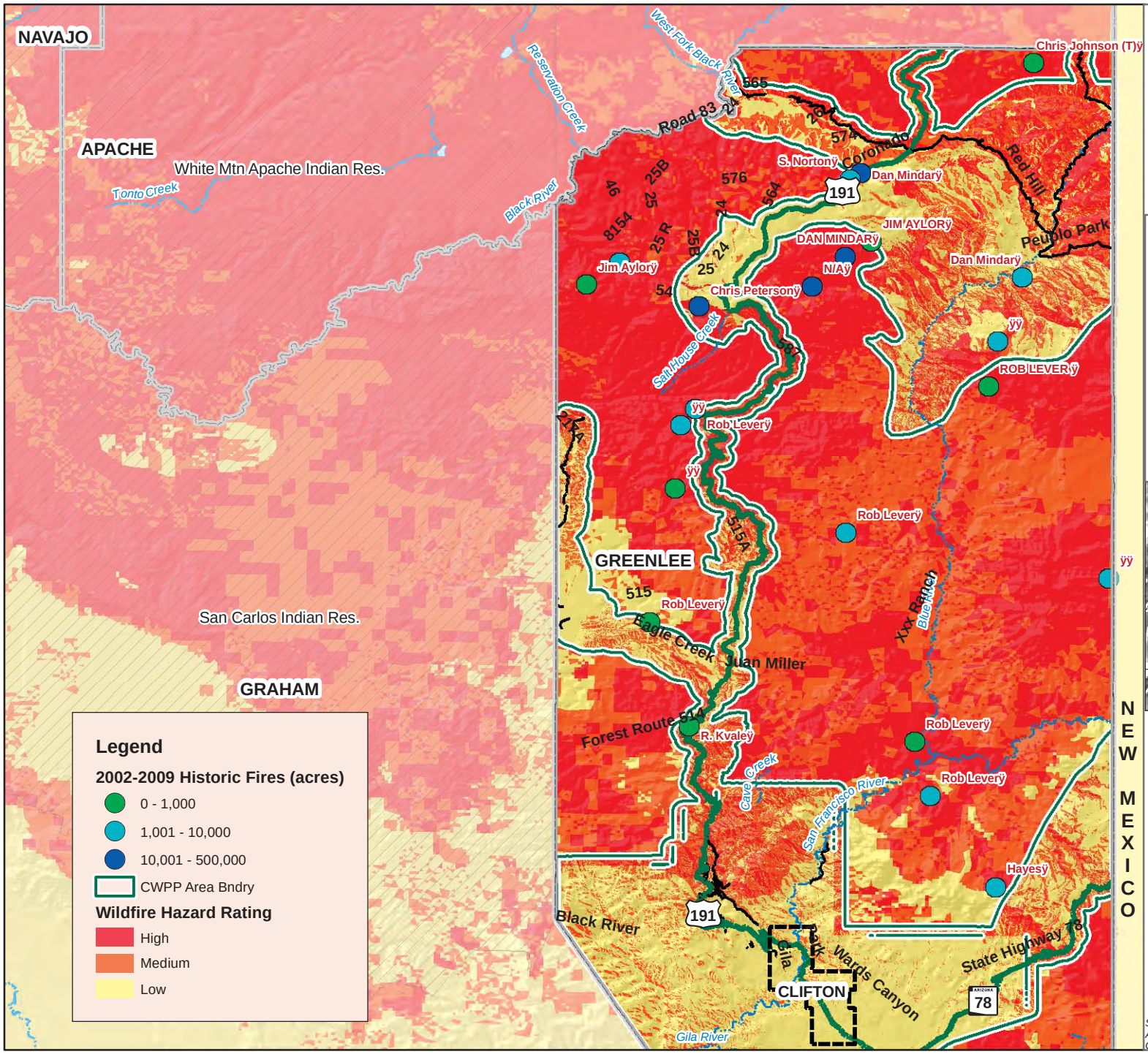


0 2.5 5 10
Miles

Map 3A
Greenlee County
Wildfire Hazard Map
as of April 2016

Source: JEF 2016; ALRIS, 2010; GACC, 2010; Arizona Interagency Coordination Group, 2004; GCCWPP, 2005

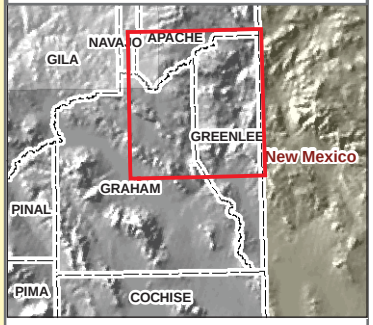
Greenlee County Multi-Jurisdictional Hazard Mitigation Plan



Legend

Communities
- CLIFTON
- DUNCAN
- County Boundary
- Lakes

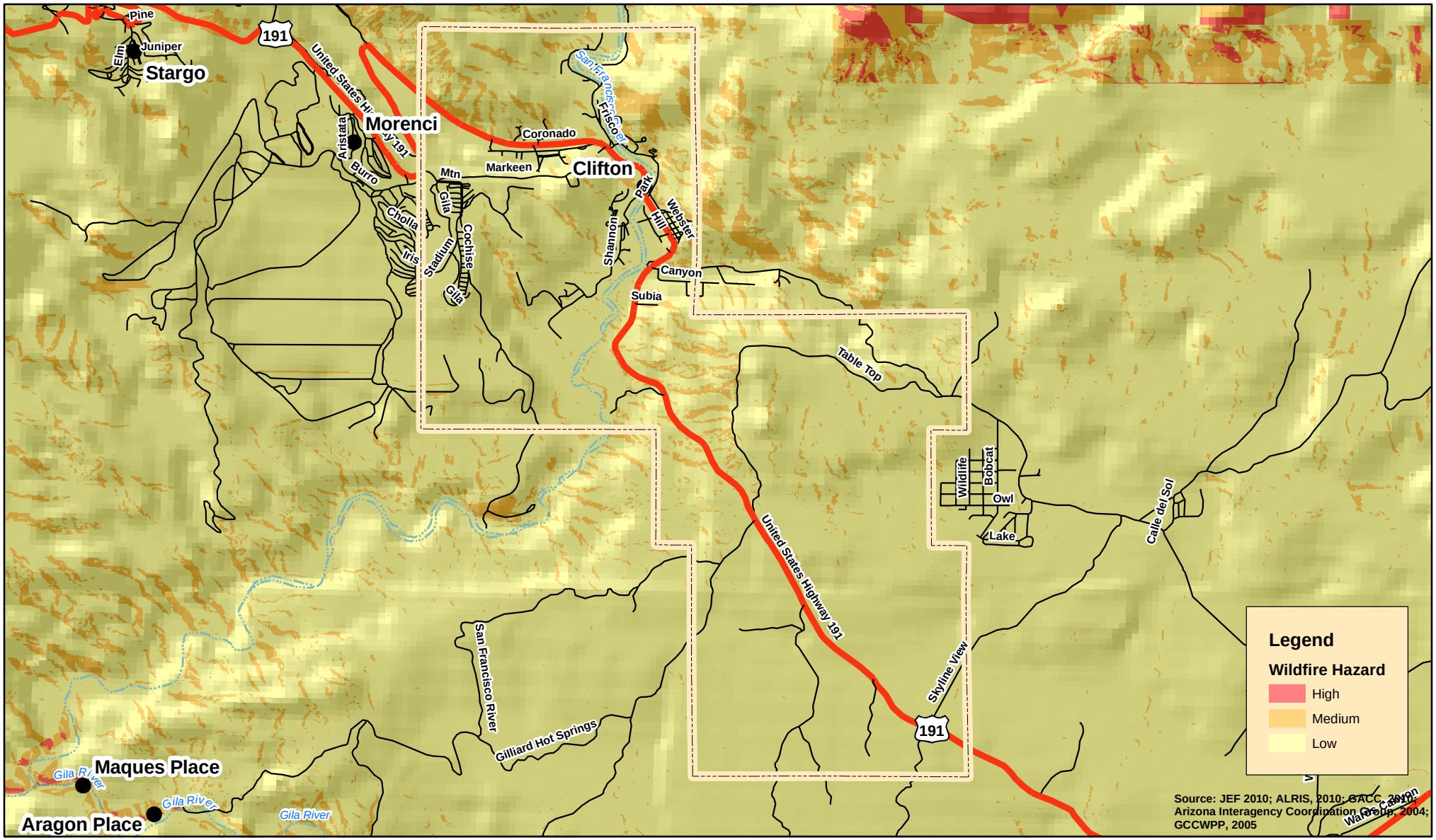
Roads
- Interstate
- US, State, County Hwys
- Major Roads
- Watercourses
- Indian Reservation



0 2.5 5 10
Miles

Map 3B
Greenlee County
Wildfire Hazard Map
as of April 2016

Source: JEF 2010; ALRIS, 2010; GACC, 2010; Arizona Interagency Coordination Group, 2004; GCCWPP, 2005



Legend

County Boundary
CLIFTON
Cities, Towns, Places

Roads

Interstate
US, State, County Hwys
Major Roads
Local Streets
Lakes
Watercourses
Indian Reservation

0 0.25 0.5 1 Miles

Greenlee County Multi-Jurisdictional Hazard Mitigation Plan

Map 3C
Town of Clifton
Wildfire Hazard Map
as of April 2016

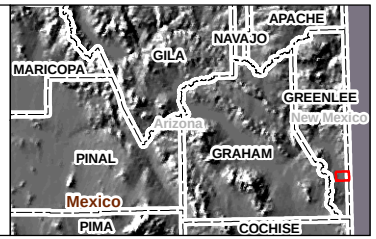
Legend

- DUNCAN
- Lakes
- County Boundary
- Cities, Towns, Places

Roads

- Interstate
- US, State, County Hwys
- Major Roads
- Local Streets
- Watercourses

0 0.25 0.5 1 Miles



Greenlee County Multi-Jurisdictional Hazard Mitigation Plan

Map 3D
Town of Duncan
Wildfire
Hazard Map
as of April 2016

SECTION 6: MITIGATION STRATEGY

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

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

- ☑ **Goals and Objectives**
- ☑ **Capability Assessment**
- ☑ **Mitigation Actions/Projects and Implementation Strategy**

The entire 2011 Plan mitigation strategy was reviewed and updated by the MJPT, including the addition or augmentation of the section describing National Flood Insurance Program (NFIP) compliance. Specifics of the changes and updates are discussed in the subsections below.

6.1 Hazard Mitigation Goals and Objectives

The 2011 Plan goals and objectives were developed using the 2010 State Plan[21] goals and objectives as a starting point. Each jurisdiction then edited and modified those goals and objectives to fit the mitigation planning vision for their community. An assessment of those goals and objectives by the Planning Team and the Local Planning Team for each jurisdiction was made with consideration of the following[22]:

- Do the goals and objectives identified in the 2011 Plan reflect the updated risk assessment?
- Did the goals and objectives identified in the 2011 Plan lead to mitigation projects and/or changes to policy that helped the jurisdiction(s) to reduce vulnerability?
- Do the goals and objectives identified in the 2011 Plan support any changes in mitigation priorities?
- Are the goals and objectives identified in the 2011 Plan reflective of current State goals?

After discussion and comparison of the 2011 Plan goals and objectives to the 2013 State Plan, the Planning Team chose to keep the 2011 Plan goal and objectives as-is and without change, as documented below:

- ➢ **GOAL:** Reduce or eliminate the risk to people and property from natural hazards.
  - ♦ **Objective 1:** Reduce or eliminate risks that threaten life and property in the incorporated and unincorporated jurisdictions within Greenlee County.
  - ♦ **Objective 2:** Reduce risk to critical facilities and infrastructure from natural hazards.

[21] State of Arizona, 2010, *State of Arizona All Hazard Mitigation Plan*

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

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

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

6.2 Capability Assessment

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

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

For this update, the MJPT reviewed the information provided in Section 6.2 of the 2011 Plan and updated data in the tables of Section 6.2.1 as appropriate. The MJPT chose to remove and not update Section 6.2.2 and Tables 6.4 and 6.5 for this Plan. The 2011 Plan Section 6.2.3 is renamed to Section 6.2.2 herein and has been augmented to summarize more detail of each jurisdiction's participation in the NFIP program.

6.2.1 Jurisdictional Capabilities

Tables 6-1-1 through 6-1-3 summarize the legal and regulatory mitigation capability for each participating jurisdiction. Information provided includes a brief listing of current codes, mitigation relevant ordinances, plans, and studies/reports. Tables 6-2-1 through 6-2-3 summarize the staff and personnel resources employed by each jurisdiction that serve as a resource for hazard mitigation. Tables 6-3-1 through 6-3-3 summarize the fiscal capability and budgetary tools available to each participating jurisdiction. Each of these three tables are listed below by jurisdiction.

Table 6-1-1: Legal and regulatory capabilities for Greenlee County

Regulatory Tools for Hazard Mitigation	Description	Responsible Department/Agency
CODES	• To be added within next 5 years	• A position of Building Inspector to be added in the next 5 years
ORDINANCES	• Zoning Ordinance (2/1985) • Subdivision Ordinance (1/1978) • Hazard Abatement Ordinance (11/2005)	• County Engineer

Table 6-1-1: Legal and regulatory capabilities for Greenlee County

Regulatory Tools for Hazard Mitigation	Description	Responsible Department/Agency
PLANS, MANUALS, and/or GUIDELINES	• Comprehensive Plan (3/2003) - Includes sections related to Land Use, Transportation, Water Resources, Open Space. • Airport Master Plan (4/2008) - Master plan developed to address issues regarding the airport and future expansion. • Loma Linda Landfill C&D Landfill Facility Plan (1998) - Municipal Solid Waste • Loma Linda Landfill APP (1/2002) - Construction and Demolition • HAZMAT Response Plan (2015) • Greenlee County Community Wildfire Protection Plan (9/2005) - A plan to identify and guide wildfire hazards and potential mitigation measure for the wildland urban interface areas. • Greenlee County Multi-Hazard Mitigation Plan (2011). • Greenlee County Emergency Operations Plan (2015)	• County Administrator • County Engineer • Board of Supervisors • Public Works Director
STUDIES	• FEMA Flood Insurance Study for Greenlee County (2007). • Southern Greenlee County Small Area Transportation Study – Final Report (2008)	• County Engineer

Table 6-2-1: Technical staff and personnel capabilities for Greenlee County

Staff/Personnel Resources	☑	Department/Agency - Position
Planner(s) or engineer(s) with knowledge of land development and land management practices	☑	Public Works Department – County Engineer
Engineer(s) or professional(s) trained in construction practices related to buildings and/or infrastructure	☑	Public Works Department – County Engineer
Planner(s) or engineer(s) with and understanding of natural and/or human-caused hazards	☑	Public Works Department – County Engineer Emergency Management – Emergency Manager
Floodplain Manager	☑	Public Works Department – County Engineer
Surveyors		None
Staff with education or expertise to assess the community's vulnerability to hazards	☑	Public Works Department – County Engineer Emergency Management – Emergency Manager
Personnel skilled in GIS and/or HAZUS	☑	Information Systems – Information Systems Manager
Scientists familiar with the hazards of the community		None
Emergency Manager	☑	Administration – County Administrator Emergency Management – Emergency Manager Public Works Department – County Engineer
Grant writer(s)	☑	Economic Developer

Table 6-3-1: Fiscal capabilities for Greenlee County

Financial Resources	Accessible or Eligible to Use (Yes, No, Don't Know)	Comments
Community Development Block Grants	No	None
Capital Improvements Project funding	Yes	General Funds – 5-year
Authority to levee taxes for specific purposes	Yes	By vote
Fees for water, sewer, gas, or electric service	No	None
Impact fees for homebuyers or new developments/homes	Yes	No development
Incur debt through general obligation bonds	Yes	None
Incur debt through special tax bonds	Yes	By vote only
Other		

Table 6-1-2: Legal and regulatory capabilities for Clifton		
Regulatory Tools for Hazard Mitigation	**Description**	**Responsible Department/Agency**
CODES	• 2009 International Building Codes	• Town Manager • Building Official
ORDINANCES	• Flood Damage Prevention (2007)	• Town Manager/ Flood Plain Manager
PLANS, MANUALS, and/or GUIDELINES	• Town of Clifton General Plan (1986) (update anticipated) - A plan that provides an inventory of existing conditions for key planning elements and future economic development and zoning. • Greenlee County Community Wildfire Protection Plan (9/2005) - A plan to identify and guide wildfire hazards and potential mitigation measure for the wildland urban interface areas. • Town of Clifton Emergency Operations Plan (1995) • Town of Clifton Multi-Hazard Mitigation Plan (2005). • Operation, Maintenance, Repair, Replacement, and Rehabilitation Manual – Clifton Flood Control Project (1996)	• Town Manager • Town Council • Police Chief • Fire Chief
STUDIES	• South Clifton Drainage Study (2000) • FEMA Flood Insurance Study 2007 • FEMA Flood Insurance Study 1983	• Town Manager • Public Works • Consulting Engineers

Table 6-2-2: Technical staff and personnel capabilities for Clifton		
Staff/Personnel Resources	☑	**Department/Agency - Position**
Planner(s) or engineer(s) with knowledge of land development and land management practices	☑	• Town Manager • Building Inspector
Engineer(s) or professional(s) trained in construction practices related to buildings and/or infrastructure	☑	• Building Inspector
Planner(s) or engineer(s) with and understanding of natural and/or human-caused hazards	☑	• Building Inspector • Police Chief • Fire Chief
Floodplain Manager	☑	• Town Manager
Surveyors		None
Staff with education or expertise to assess the community's vulnerability to hazards	☑	• Town Manager • Public Works Director • Building Inspector
Personnel skilled in GIS and/or HAZUS		None
Scientists familiar with the hazards of the community		None
Emergency Manager	☑	• Town Manager • Chief of Police • Greenlee County Emergency Manager
Grant writer(s)	☑	• Town Manager • Town Clerk

Table 6-3-2: Fiscal capabilities for Clifton		
Financial Resources	**Accessible or Eligible to Use (Yes, No, Don't Know)**	**Comments**
Community Development Block Grants	Yes	
Capital Improvements Project funding	No	
Authority to levee taxes for specific purposes	Yes	Vote of Residents
Fees for water, sewer, gas, or electric service	Yes	Sewer only
Impact fees for homebuyers or new developments/homes	No	
Incur debt through general obligation bonds	Yes	Vote of Residents
Incur debt through special tax bonds	Yes	Vote of Residents
Other		

Table 6-1-3: Legal and regulatory capabilities for Duncan		
Regulatory Tools for Hazard Mitigation	**Description**	**Responsible Department/Agency**
CODES	• Uniform Building Code 1997	• Town Manager/ Building Inspector
ORDINANCES	• Zoning Ordinance - Town of Duncan Codebook, Chapter 15 • Subdivision Ordinance - Town of Duncan Codebook, Chapter 15 • Special Purpose Ordinance - Town of Duncan Codebook, Chapter 15 and 17 • Greenlee County Floodplain Ordinance • Growth Management Ordinance - Town of Duncan Codebook, Chapter 15 • Site Plan Review Requirements Ordinance - Town of Duncan Codebook, Chapter 15	• Town Manager/Planning and Zoning
PLANS, MANUALS, and/or GUIDELINES	• Town of Duncan General Plan (12/2004) - A plan that provides an inventory of existing conditions for key planning elements and future economic development and zoning. • Town of Duncan Multi-Hazard Mitigation Plan (2005). • Town of Duncan Emergency Operations Plan and Procedures (2007)	• Town Manager/ Town Council
STUDIES	• FEMA Flood Insurance Study (2007)	• Town Manager/ Town Council

Table 6-2-3: Technical staff and personnel capabilities for Duncan		
Staff/Personnel Resources	☑	**Department/Agency - Position**
Planner(s) or engineer(s) with knowledge of land development and land management practices		None (use contract engineer -Bowman Engineering, 305 East 4th Street, Safford, AZ, 85546, Phone: 928-428-3898)
Engineer(s) or professional(s) trained in construction practices related to buildings and/or infrastructure		None
Planner(s) or engineer(s) with and understanding of natural and/or human-caused hazards	☑	• Volunteers (P&Z Commission)
Floodplain Manager	☑	• Town Manager • Greenlee County Public Works Department – County Engineer
Surveyors		None
Staff with education or expertise to assess the community's vulnerability to hazards	☑	• NO FULL TIME STAFF • Volunteers (P&Z Commission)
Personnel skilled in GIS and/or HAZUS		None
Scientists familiar with the hazards of the community		None
Emergency Manager	☑	• Town Manager
Grant writer(s)	☑	• Grant Coordinator

Table 6-3-3: Fiscal capabilities for Duncan		
Financial Resources	**Accessible or Eligible to Use (Yes, No, Don't Know)**	**Comments**
Community Development Block Grants	Yes	
Capital Improvements Project funding	Yes	5-Year
Authority to levee taxes for specific purposes	Yes	Through Voters
Fees for water, sewer, gas, or electric service	Yes	Town of Duncan and Duncan Valley Electric Coop
Impact fees for homebuyers or new developments/homes	Yes	Chapter 15-13 Impact Fees
Incur debt through general obligation bonds	Yes	Currently have bonds for water and sewer
Incur debt through special tax bonds	No	
Other		

6.2.4 National Flood Insurance Program Participation

Participation in the NFIP is a key element of any community's local floodplain management and flood mitigation strategy. Greenlee County, Clifton and Duncan all participate in the NFIP at varying levels.

Joining the NFIP requires the adoption of a floodplain management ordinance that requires jurisdictions to follow established minimum standards set forth by FEMA and the State of Arizona when developing in the floodplain. These standards require that all new buildings and substantial improvements to existing buildings will be protected from damage by the 100-year flood, and that new floodplain development will not aggravate existing flood problems or increase damage to other properties. Greenlee 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 6-4 summarizes the NFIP status and statistics for each of the jurisdictions participating in this Plan.

Table 6-4: NFIP status and statistics for Greenlee County and participating jurisdictions

Jurisdiction	Community ID	NFIP Entry Date	Current Effective Map Date	Number of Policies	Amount of Coverage (x $1,000)	Floodplain Management Role
Greenlee County (Unincorporated)	040110	7/18/1985	9/28/2007	9	$3,181.5	County manages floodplains for unincorporated areas of the County and provides assistance to Clifton and Duncan
Clifton	040035	3/1/1984	9/28/2007	18	$2,053.6	Town manages floodplains within Town limits with assistance from the County
Duncan	040036	8/2/1982	9/28/2007	26	$1,841.6	Town manages floodplains within Town limits with assistance from the County

Sources: Policy Statistics - http://bsa.nfipstat.fema.gov/reports/1011.htm (2/29/16) ; NFIP Status - http://bsa.nfipstat.fema.gov/comm_status/index.html (2/29/16)

Each of the participating jurisdictions performed an overall assessment of their participation in the NFIP program by responding to the following questions:

Question 1: Describe your jurisdiction's current floodplain management / regulation process for construction of new or substantially improved development within your jurisdiction.

Question 2: Describe the status and/or validity of the current floodplain hazard mapping for your jurisdiction.

Question 3: Describe any community assistance activities (e.g. – help with obtaining Elevation Certificates, flood hazard identification assistance, flood insurance acquisition guidance, public involvement activities, etc.)

Question 4: Describe identified needs in your floodplain management program. This could include things like updating the floodplain management code/regulation, establishing written review procedures, modifying or adding flood hazard area mapping, etc.

Responses were provided by all jurisdictions regardless of their participation status in the NFIP program. Table 6-5 summarizes the responses provided by each of the currently participating jurisdictions

Table 6-5: NFIP program assessment for Greenlee County and participating jurisdictions

Participating Jurisdiction	Responses to Questions 1-4	
Clifton	Q1	• Building permit process identifies floodplain (FP) status • Properties identified to be in a FP trigger an administrative review by the FP manager • Depending on the complexity, will require a study or analyses to determine base flood elevation and/or other compliance with NFIP • Require that an elevation certificate be produced for all new or substantially improved structures in a special flood hazard area
	Q2	• None are known at this time • Maps are good
	Q3	• Coordinate with ADWR to get information to pass along to citizens • Assist the public with determining flood hazards • Public outreach on flood sirens
	Q4	• None identified at this time
Duncan	Q1	• Residential/Commercial/Industrial: Check BFE to determine FF elevation. Provide a minimum FF per ordinance • RV Parks: All must have quick connects to allow for moving the RVs in case of flood • Town does not allow building of permanent structures within the areas where FEMA acquired flood properties and dedicated back to Town • Where Elevation Certificates are required, citizens are directed to get with an engineer/surveyor to get those • Staff regularly attends NFIP related training events
	Q2	• There is a need to map additional floodplains within the Town boundary, and particularly along an unnamed wash corridor within the Hunter Flat (northeast quadrant) area. See Map 1D in Section 5.3.2 for the approximate limits of the Town identified limits
	Q3	• Provide assistance in determining the BFE and proper FF elevations • Provide FEMA developed NFIP brochures to interested residents • Make copies of DFIRMs and floodplain workmaps as needed

Table 6-5: NFIP program assessment for Greenlee County and participating jurisdictions

Participating Jurisdiction	Responses to Questions 1-4	
	Q4	• Adding the new flood hazard area discussed above • Converting the Zone As to Zone AEs
Greenlee County	Q1	When a permit for a property or building comes in: • Property is reviewed to determine if it lies within a special flood hazard area • Permittee is provided with information regarding FEMA DFIRM Panel • For Zone As, information is provided regarding resources for determining base flood elevations
	Q2	• All of the Zone A's are not very good and need to be re-studied an re-mapped. • Zone AE's are pretty good
	Q3	• NFIP brochures regarding floodplain management and flood insurance requirements are kept on-hand for distribution to the public as needed / warranted
	Q4	• There is definitely a need for better mapping (both topographic and SFHA) • The County needs to update the floodplain management code to be consistent with the current State Code (process is currently underway)

6.3 Mitigation Actions/Projects and Implementation Strategy

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

The update process for defining the new list of mitigation A/Ps for the Plan was accomplished in three steps. First, an assessment of the actions and projects specified in Section 6 of the 2011 Plan was performed, wherein each jurisdiction reviewed and evaluated their jurisdiction specific list. Second, a new list of A/Ps for the Plan was developed by combining the carry forward results from the assessment with new A/Ps. Third, an implementation strategy for the combined list of A/Ps was formulated. Details of each step and the results of the process are summarized in the following sections.

6.3.1 Previous Mitigation Actions/Projects Assessment

The MJPT and LPT for each jurisdiction reviewed and assessed their jurisdiction's actions and projects listed in Tables 6-8-1 through 6-8-28 of the 2011 Plan. The assessment included evaluating and classifying each of the previously identified A/Ps based on the following criteria:

STATUS		***DISPOSITION***	
Classification	Explanation Requirement:	Classification	Explanation Requirement:
"***No Action***"	Reason for no progress	***"Keep"***	None required
"***In Progress***"	What progress has been made	***"Revise"***	Revised components
"***Complete***"	Date of completion and final cost of project (if applicable)	***"Delete"***	Reason(s) for exclusion.

Any A/P with a disposition classification of "Keep" or "Revise" was carried forward to become part of the new A/P list for the Plan. All A/Ps identified for deletion were removed and are not included in this updated plan. The results of the assessment for each of the 2011 Plan A/Ps are summarized by jurisdiction in Tables 6-7-1 through 6-7-28.

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Any A/P with a disposition classification of "Keep" or "Revise" was carried forward to become part of the A/P list for the Plan. All A/Ps identified for deletion were removed and are not included in this Plan. The results of the assessment for each of the 2011 Plan A/Ps is summarized by jurisdiction in Tables 6-6-1 through 6-6-3.

Table 6-6-1
Greenlee County assessment of previous plan cycle mitigation actions/projects

ID	Description	• Lead Agency • Proposed Cost • Proposed Comp Date	Status	Disposition	Explanation
1	Flood Alert System for Town of Duncan. Design, install and maintain a flood alert system for the Gila River through the Town of Duncan.	• Emergency Mgmt • $108,000 • Jan 2014	Complete	Revise	Installed by end of 2015. Revise text to address maintenance only.
2	Duncan Backflow Gate. Design, construct and maintain a backflow prevention gate at the ADOT drainage channel east of Whitefield Wash.	• Emergency Mgmt • $30,000 • Feb 2012	No Action	Revise	Change name of wash to Blackfield Wash. Refinement of scope.
3	Filleman Crossing. Design and construct hardened crossing at the Filleman Crossing of Eagle Creek.	• County Engineer • $80,000 • Mar 2012	No Action	Delete	Discontinued due to environmental restrictions.
4	Ward Canyon Watercourse Master Plan. Develop and implement a floodplain management and land-use plan for Ward Canyon, for the reach extending one-mile upstream of the San Francisco River confluence. The management plan will consider socio-economic factors as well as standard floodplain and erosion hazard management elements.	• Emergency Mgmt • $100,000 • Apr 2012	No Action	Keep	
5	Public Wildfire Outreach and Education. Perform public outreach activities, including fliers, town hall meetings, safety fairs, and others to educate the public on wildfire protection activities and best management practices.	• Emergency Mgmt • $10,000 • Ongoing	Ongoing	Keep	Provide educational material during public health fair events. Also provided onsite one-on-one education during wildfire mitigation activities.
6	Update Zoning Ordinance. Update zoning ordinance to provide more stringent floodplain management policy and ordinance.	• County Engineer • $20,000 • May 2012	Complete	Delete	Completed via a change to the floodplain ordinance. Zoning changes were not needed.
7	Continue participation in the Governors Drought Interagency Coordinating Group along with ADWR	• Emergency Mgmt • $5,000 • Ongoing	No Action	Delete	

Table 6-6-2
Clifton assessment of previous plan cycle mitigation actions/projects

ID	Description	• Lead Agency • Proposed Cost • Proposed Comp Date	Status	Disposition	Explanation
1	Enforcement of Zoning and Building Code Ordinances. Continue to enforce zoning and building codes through current site plan, subdivision, and building permit review processes to reduce the effects of drought, flood, severe wind, and other hazards on new buildings and infrastructure.	• Town Manager; Clifton Police • $50,000 Annually • Ongoing	In Progress	Revise	-added a code enforcement officer in 2012 - revise the budget to $88K
2	Flood Alert System for Town of Clifton. Reconfigure, update, and maintain the flood alert system for the San Francisco River through the Town of Clifton.	• Town Manager; Clifton Police • $10,000 Annually • Ongoing	In Progress	Revise	- brought 3 up to working status - performed maintenance - revise to make it only maintenance
4	Riley's Bridge Repairs. Repair the bridge shackles, pedestrian path, and bridge deck that were damaged during the 1983 flood.	• Public Works • $100,000 • Aug 2012	No Action	Keep	- in receipt of funding to begin work in Aug 2017
5	Ward Canyon Wash Rip Rap Protection. Design and construct rip rap protection to mitigate bank erosion in Ward Canyon.	• Public Works • $200,000 • Jan 2015	Completed	Delete	Completed in 2013
6	San Francisco River Salt Cedar Removal. Remove salt cedar from floodplain areas upstream and downstream of the bridges through town to mitigate debris accumulation and improve the hydraulic conveyance..	• Town Manager; Public Works • $15,000 Annually • Ongoing	Ongoing	Keep	Performed some removal over last 5 years. Still need more done
7	Ward Canyon Watercourse Master Plan. Develop and implement a floodplain management and land-use plan for Ward Canyon, for the reach extending one-mile upstream of the San Francisco River confluence. The management plan will consider socio-economic factors as well as standard floodplain and erosion hazard management elements.	• Town Manager; Public Works • $100,000 • 2016	No Action	Delete	Not likely to happen within the next five years.

Table 6-6-2
Clifton assessment of previous plan cycle mitigation actions/projects

ID	Description	• Lead Agency • Proposed Cost • Proposed Comp Date	Status	Disposition	Explanation
8	Coronado/5th Street Drainage Project. Construct a detention basin with force main bleed-off system to augment existing drainage system passing flows under the railroad and Coronado Blvd westerly to the San Francisco River.	• Town Manager; Public Works; Town Engineer • $500,000 • 2018	No Action	Revise	Project will now be done by ADOT as part of their Coronado/South Clifton project
9	The Town will continue to enforce Flood Plain Standards that are NFIP compliant per the current floodplain ordinance.	• Floodplain Mgr • $10,000 Annually • Ongoing	Ongoing	Keep	

Table 6-6-3
Duncan assessment of previous plan cycle mitigation actions/projects

ID	Description	• Lead Agency • Proposed Cost • Proposed Comp Date	Status	Disposition	Explanation
1	Enforcement of Zoning and Building Code Ordinances. Continue to enforce zoning and building codes through current site plan, subdivision, and building permit review processes to reduce the effects of drought, flood, severe wind, and other hazards on new buildings and infrastructure	• Town of Duncan • $10,000 • Jul 2011	Ongoing	Keep	N/A
2	Duncan Backflow Gate. Design, construct and maintain a backflow prevention gate at the ADOT drainage channel east of Whitefield Wash.	• Town of Duncan; Greenlee County; ADOT • $30,000 • FY 2012	No Action	Delete	No longer a priority for the Town.
3	Update zoning ordinance to provide more stringent floodplain management policy and ordinance.	• Town of Duncan • $10,000 • Jul 2011	Ongoing	Keep	N/A
4	Establish written floodplain management procedures and compliance criteria for the NFIP program.	• Town of Duncan • $10,000 • Jul 2011	Ongoing	Keep	N/A
5	Highway 70 Drainage Evaluation. Work with ADOT to analyze and evaluate the existing Highway 70 drainage system to identify hazard areas and identify alternative drainage solutions.	• Town of Duncan; ADOT • $75,000 • FY 2012	No Action	Keep	Some conversations have been conducted. Still a priority for the Town.
6	Roadside Drainage Ditch Maintenance. Perform regular maintenance of roadside drainage ditches and cross culverts with the Town. Cost reported is an annual cost.	• Town of Duncan • $50,000 Annually • Ongoing	Ongoing	Keep	Regular part of the Town's work plan.
7	Drainage Master Plan for Duncan. Analyze and evaluate drainage conditions within the Town of Duncan to identify drainage problem areas and develop alternative solutions and mitigation actions.	• Town of Duncan • $50,000 • Jul 2011	Ongoing	Keep	Worked with ADOT to improve drainages.

Table 6-6-3
Duncan assessment of previous plan cycle mitigation actions/projects

ID	Description	• Lead Agency • Proposed Cost • Proposed Comp Date	Status	Disposition	Explanation
8	Flood Alert System for Town of Duncan. Design, install and maintain a flood alert system for the Gila River through the Town of Duncan.	• Town of Duncan; Greenlee County • $200,000 • FY 2011	Complete	Revise	System is in place but will require ongoing maintenance and testing.
9	Duncan Floodplain Levee. Design, construct and maintain a 100-year floodplain levee to protect the Town of Duncan.	• Town of Duncan; Greenlee County • $1,000,000 • FY 2015	No Action	Keep	N/A
10	Gila River Sewer Line. Relocate the existing sewer line under the Gila River to protect it from Gila River flooding and erosion	• Water Works Department • $300,000 • FY 2015	No Action	Keep	N/A
11	Gila River Sediment. Remove over growth of weeds and sediment deposits to increase the conveyance capacity of the river through Town limits as well as reduce wildfire potential.	• Public Works • $200,000 • Jul 2011	Ongoing	Keep	Worked with USACE and various groups to clean out vegetation.
12	Well Sources. Conduct hydrogeological investigations to identify 3 new well locations that are located outside of the 100-year floodplain	• Water Works Department • $300,000 • FY 2012	Ongoing	Keep	Working with FMI to purchase land to install a well that is outside the floodzone.

6.3.2 New Mitigation Actions / Projects and Implementation Strategy

The first step in developing new mitigation actions/projects for each participating jurisdiction was to conduct a brainstorming session at the Planning Team Meeting No. 4. Using the goals, results of the vulnerability analysis and capability assessment, and the Planning Team's institutional knowledge of hazard mitigation needs in the county and jurisdictions, the MJPT brainstormed to develop a comprehensive list of potential mitigation A/Ps that address the various hazards identified. The results of that brainstorming effort are summarized as follows:

GENERAL MULTI-HAZARD:
Install/maintain early warning sirens in select strategic locations as a part of a comprehensive emergency notification system to inform citizens of impending hazards such as flooding, levee failure, severe weather conditions, and severe wind events. ****Addresses: Levee Failure, Flood, Wildfire ***
Use newsletters, flyers, utility bill inserts, website notices, radio and television announcements, social media and newspaper articles to educate the public about hazards impacting the county and how to be prepared in the case of a disaster event. ****Addresses: Levee Failure, Drought, Flood, Wildfire ***
Provide links on the community's website to sources of hazard mitigation educational materials (e.g. – www.fema.gov) encouraging private citizens to be prepared for hazard emergencies. ****Addresses: Levee Failure, Drought, Flood, Wildfire ***
Review and assess building and residential codes currently in use to determine if newer, more up-to-date codes are available or required ****Addresses: Levee Failure, Drought, Flood, Wildfire ***
Promote the use of weather radios, especially in schools, hospitals and other locations where people congregate to inform them of the approach of severe weather events. ****Addresses: Levee Failure, Drought, Flood, Wildfire ***
DROUGHT:
Public education of water conservation best practices through newsletter, flyers, social media and website notices.
Develop and/or update an ordinance requiring strategic watering times and volumes during times of drought.
Mandate/Encourage/Incentivize the use of drought resistant landscaping through ordinance development and/or enforcement.
Coordinate with State Drought Task Force to perform drought management at the local/tribal level.
Develop/Update a local Drought Management Plan to define various levels of conservation requirements that are based on drought severity triggers and enforced through utility billing structures and ordinance.
Implement a water harvesting program through the location, design and construction of dual functioning stormwater retention facilities with enhanced recharge elements designed into the basin. ****Addresses both Drought and Flood****
FLOOD:
Implement a water harvesting program through the location, design and construction of dual functioning stormwater retention facilities with enhanced recharge elements designed into the basin. ****Addresses both Drought and Flood****
Develop a community-wide, stormwater management plan that will analyze and identify problem flooding areas and propose long-term mitigation alternatives designed to reduce or eliminate the flood problems.
Review, update and/or augment flood control ordinances to provide a greater level of protection than the minimum required by the NFIP.
Identify and map flood hazards in areas expected to grow or develop in the foreseeable future.
Develop/augment a county/city/town wide GIS program that is integrated into Public Works, Development Services, Police, Fire/Rescue and Emergency Management to help prevent development in flood prone regions.
Install automated flood barriers at low water crossings to discourage motorists from entering flooded road crossings.
Install stream depth indicators at low water crossings to communicate the risk of entering flooded roadway crossings and provide a visual warning to motorists of flood conditions at the crossing location.
LEVEE FAILURE: (look for nexus with Dam Failure)

Perform regular inspection and maintenance of existing levees to mitigate potential failure.
Perform public outreach to citizens located within levee failure flood risk areas to provide awareness of potential increase in flood elevations with a levee failure.
WILDFIRE:
Develop and/or enforce a weed abatement ordinance.
Educate public on proper fuels thinning, setbacks, and water storage for wildfire mitigation using Firewise type of programs and guidance documents.
Conduct Fire Safety education programs in local public schools.
Enact and enforce burn and fireworks bans as needed during extraordinarily dry and extreme wildfire conditions / seasons to mitigate possible, unintended wildfire starts.
Perform, or encourage the performance of, routine roadside vegetation control to mitigate wildfire starts within the right-of-way areas along roadways and highways.
Clear vegetation and wildfire fuels to create a defensible space around critical or key structures within the community and along perimeter areas of the wildland urban interface.

Upon completion of the assessment summarized in Section 6.3.1, each jurisdiction's LPT met and developed a new list of A/Ps using the goals and objectives, results of the vulnerability analysis and capability assessment, the above list of seed ideas, and the planning team's institutional knowledge of hazard mitigation needs in their community. The A/Ps can be generally classified as either structural or non-structural. Structural A/Ps typify a traditional "bricks and mortar" approach where physical improvements are provided to affect the mitigation goals. Examples may include channels, culverts, bridges, detention basins, dams, emergency structures, and structural augmentations of existing facilities. Non-structural A/Ps deal more with policy, ordinance, regulation and administrative actions or changes, buy-out programs, and legislative actions. For each A/P, the following elements were identified:

- **ID No.** – a unique alpha-numeric identification number for the A/P.
- **Description** – a brief description of the A/P including a supporting statement that tells the "what" and "why" reason for the A/P.
- **Hazard(s) Mitigated** – a list of the hazard or hazards mitigated by action.
- **Community Assets Mitigated** – a brief descriptor to qualify the type of assets (existing, new, or both) that the proposed mitigation A/P addresses.
- **Estimated Costs** – concept level cost estimates that may be a dollar amount or estimated staff time.

Once the full list of A/Ps was completed to the satisfaction of the LPT, the team then set to work developing the implementation strategy for those A/Ps. The implementation strategy addresses the *"priority, how, when, and by whom?"* questions related to the execution and completion of an identified A/P. Specific elements identified as part of the implementation strategy included:

- **Priority Ranking** – each A/P was assigned a priority ranking of either "High", "Medium", or "Low". The assignments were subjectively made using a simple process that assessed how well the A/P satisfied the following considerations:
  - A favorable benefit versus cost evaluation, wherein the perceived direct and indirect benefits outweighed the project cost.
  - A direct beneficial impact on the ability to protect life and/or property from natural hazards.
  - A mitigation solution with a long-term effectiveness.
- **Planning Mechanism(s) for Implementation** – where applicable, a list of current planning mechanisms or processes under which the A/P will be implemented. Examples could include CIPs, General Plans, Area Drainage Master Plans, etc.

- **Anticipated Completion Date –** a realistic and general timeframe for completing the A/P. Examples may include a specific target date, a timeframe contingent upon other processes, or recurring timeframes.
- **Primary Agency and Job Title Responsible for Implementation** – this would be the agency, department, office, or other entity and corresponding job title that will have responsibility for the A/P and its implementation.
- **Funding Source –** the source or sources of anticipated funding for the A/P.

Tables 6-7-1 through 6-7-3 summarize the updated mitigation A/P and implementation strategy for each participating Plan jurisdiction. Projects listed in *italics font* are recognized as being more response and recovery oriented, but are considered to be a significant part of the overall hazard management goals of the community.

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Table 6-7-1: Mitigation actions and projects and implementation strategy for Clifton

Mitigation Action/Project					Implementation Strategy				
ID No.	**Description**	**Hazard(s) Mitigated**	**Community Assets Mitigated (Ex/New)**	**Estimated Cost**	**Priority Ranking**	**Planning Mechanism(s) for Implementation**	**Anticipated Completion Date**	**Primary Agency / Job Title Responsible for Implementation**	**Funding Source(s)**
1	Enforcement of Zoning and Building Code Ordinances. Continue to enforce zoning and building codes through current site plan, subdivision, and building permit review processes to reduce the effects of drought, flood, severe wind, and other hazards on new buildings and infrastructure.	Drought, Flood	New	$80,000 annually	High		Ongoing	Code Enforcement/ Code Enforcement Officer	General Fund
2	Flood Alert System for Town of Clifton. Continue to update and maintain the flood alert system for the San Francisco River through the Town of Clifton.	Flood	Both	$10,000 annually	High	Clifton Highwater Event Plan	Ongoing (monthly testing with annual maintenance)	Town Admin/ Town Manager Public Works/ Director Police/ Chief	General Fund
3	San Francisco River Salt Cedar Removal. Remove salt cedar from floodplain areas upstream and downstream of the bridges through town to mitigate debris accumulation and improve the hydraulic conveyance.	Flood, Wildfire	Both	$15,000 annually	Medium	Clifton Highwater Event Plan	Annually	Public Works/ Director	General Fund
4	Coronado/5th Street Drainage Project. Coordinate with ADOT to construct drainage facilities to augment existing drainage system passing flows under the railroad and Coronado Blvd westerly to the San Francisco River.	Flood	Existing	Staff Time	Medium	ADOT H8590-US 191	Spring 2017	Town Admin/ Town Manager	General Fund
5	The Town will continue to enforce floodplain standards that are NFIP compliant per the current floodplain ordinance.	Flood	Both	$5,000 annual plus Staff Time	High	Floodplain Ordinance	Ongoing as needed	Town Admin/ Town Manager	General Fund
6	Perform regular inspection and maintenance of existing levee facilities on at least an annual basis.	Levee Failure	Existing	$30,000 annually	High	Clifton Highwater Plan USACE Inspection Rotation	Monthly	Town Admin/ Town Manager Public Works/ Director	General Fund, RV Park Enterprise Fund

Table 6-7-1: Mitigation actions and projects and implementation strategy for Clifton

Mitigation Action/Project					Implementation Strategy				
ID No.	Description	Hazard(s) Mitigated	Community Assets Mitigated (Ex/New)	Estimated Cost	Priority Ranking	Planning Mechanism(s) for Implementation	Anticipated Completion Date	Primary Agency / Job Title Responsible for Implementation	Funding Source(s)
7	Perform public outreach to citizens located within the levee failure flood risk areas to provide awareness of potential exposure during a levee failure event. Methods could be social media, website, and possibly brochures.	Levee Failure	Existing	Staff Time plus $5,000 for brochures	Low		Fall 2016	Town Admin/ Town Manager	General Fund
8	Coordinate with local public utilities to perform public education of water conservation best practices through social media, newsletters, flyers, and website notices.	Drought	Both	Staff Time	Low		Bi-annually	Town Admin/ Town Manager	General Fund
9	Research developing an ordinance requiring strategic watering times and volumes during times of drought.	Drought	Both	Staff Time	Low		Bi-annually	Town Admin/ Town Manager	General Fund

Table 6-7-2: Mitigation actions and projects and implementation strategy for Duncan

Mitigation Action/Project					Implementation Strategy				
ID No.	Description	Hazard(s) Mitigated	Community Assets Mitigated (Ex/New)	Estimated Cost	Priority Ranking	Planning Mechanism(s) for Implementation	Anticipated Completion Date	Primary Agency / Job Title Responsible for Implementation	Funding Source(s)
1	Enforcement of Zoning and Building Code Ordinances. Continue to enforce zoning and building codes through current site plan, subdivision, and building permit review processes to reduce the effects of drought, flood, severe wind, and other hazards on new buildings and infrastructure	Drought, Flood	New	Staff Time	High	Building Codes (IBC)	Ongoing As-Needed	Town Administration/ Town Manager	General Fund, Permit Fees
2	Review and update as needed, zoning ordinance to provide more stringent floodplain management policy and ordinance.	Flood	Both	Staff Time	Medium	Current Floodplain Ordinance	Annually	Town Administration/ Town Manager	General Fund

Table 6-7-2: Mitigation actions and projects and implementation strategy for Duncan

Mitigation Action/Project					Implementation Strategy				
ID No.	Description	Hazard(s) Mitigated	Community Assets Mitigated (Ex/New)	Estimated Cost	Priority Ranking	Planning Mechanism(s) for Implementation	Anticipated Completion Date	Primary Agency / Job Title Responsible for Implementation	Funding Source(s)
3	Establish written floodplain management procedures and compliance criteria for the NFIP program.	Flood	Both	Staff Time	Medium	5-year CIP for storm drainage	Aug 2016	Town Administration/ Town Manager	General Fund
4	Highway 70 Drainage Evaluation. Work with ADOT to analyze and evaluate the existing Highway 70 drainage system to identify hazard areas and identify alternative drainage solutions.	Flood	Both	Staff Time	Low	N/A	Ongoing	Town Administration/ Town Manager	General Fund
5	Roadside Drainage Ditch Maintenance. Perform regular maintenance of roadside drainage ditches and cross culverts with the Town. Cost reported is an annual cost.	Flood, Wildfire	Both	Staff Time plus $40K per year	High	N/A	Ongoing	Town Administration/ Town Manager Public Works/ Director	General Fund, USDA Grant
6	Drainage Master Plan for Duncan. Analyze and evaluate drainage conditions within the Town of Duncan to identify drainage problem areas and develop alternative solutions and mitigation actions.	Flood	Both	Staff Time plus $100K	High		Aug 2016	Town Administration/ Town Manager	General Fund, USACE PAS or FPMS
7	Flood Alert System for Town of Duncan. Test and maintain flood alert system for the Gila River through the Town of Duncan.	Flood, Levee Failure	Both	Staff Time	Low		Annually	Town Administration/ Town Manager	General Fund
8	Duncan Floodplain Levee. Design, construct and maintain a 100-year floodplain levee to protect the Town of Duncan.	Flood, Levee Failure	Both	$1.5 million	High		2019	Town Administration/ Town Manager	USACE CAP, General Fund
9	Gila River Sewer Line. Relocate the existing sewer line under the Gila River to protect it from Gila River flooding and erosion	Flood	Existing	$300K	Low	5-year CIP	Jan 2017	Town Administration/ Town Manager	WIFA, FMI Grant, USDA Grant, Fees
10	Gila River Sediment. Remove over growth of weeds and sediment deposits to increase the conveyance capacity of the river through Town limits as well as reduce wildfire potential.	Flood, Wildfire	Existing	$30K per year	Medium		Annual Ongoing	Public Works/ Crew	General Fund

Table 6-7-2: Mitigation actions and projects and implementation strategy for Duncan

Mitigation Action/Project					Implementation Strategy				
ID No.	Description	Hazard(s) Mitigated	Community Assets Mitigated (Ex/New)	Estimated Cost	Priority Ranking	Planning Mechanism(s) for Implementation	Anticipated Completion Date	Primary Agency / Job Title Responsible for Implementation	Funding Source(s)
11	Well Sources. Conduct hydrogeological investigations to identify 3 new well locations that are located outside of the 100-year floodplain	Drought	Existing	Staff Time	Medium	5-year CIP	2018	Town Administration/ Town Manager	WIFA, FMI Grant, USDA Grant, Fees

Table 6-7-3: Mitigation actions and projects and implementation strategy for Greenlee County

Mitigation Action/Project					Implementation Strategy				
ID No.	Description	Hazard(s) Mitigated	Community Assets Mitigated (Ex/New)	Estimated Cost	Priority Ranking	Planning Mechanism(s) for Implementation	Anticipated Completion Date	Primary Agency / Job Title Responsible for Implementation	Funding Source(s)
1	Flood Alert System for Town of Duncan. Maintain a flood alert system for the Gila River through the Town of Duncan.	Flood	Both	$35K per year	High	ALERT System Maintenance Plan	Annual	Emergency Management/ Emergency Manager	Flood Control District Funds, EMPG
2	Duncan West Drainage Project. Design and install a backflow gate and pertinent drainage improvements to prevent drainage from the Gila River from backing up into Duncan. The County has some right of way and ADOT holds other portions of the right of way for drainage purposes. Work on Blackfield Wash is included in this project to provide positive drainage. An off-line detention basin may also be incorporated into the project, subject to the design	Flood	Both	$500K	Low		Within 3-years of receipt of grant funding	Engineering/ County Engineer	HMA Grants, NRCS Grants, Az Water Protection Fund, 319 Grant through ADEQ
3	Ward Canyon Watercourse Master Plan. Develop a floodplain management and land-use plan for Ward Canyon, for the reach extending one-mile upstream of the San Francisco River confluence. The management plan will consider socio-economic factors as well as standard floodplain and erosion hazard management elements.	Flood	Both	$400K	Low		Within 3-years of receipt of grant	Engineering/ County Engineer	USACE PAS, FPMS, NRCS EWP, FEMA HMA Grants

Table 6-7-3: Mitigation actions and projects and implementation strategy for Greenlee County

Mitigation Action/Project					Implementation Strategy				
ID No.	**Description**	**Hazard(s) Mitigated**	**Community Assets Mitigated (Ex/New)**	**Estimated Cost**	**Priority Ranking**	**Planning Mechanism(s) for Implementation**	**Anticipated Completion Date**	**Primary Agency / Job Title Responsible for Implementation**	**Funding Source(s)**
4	Public Drought and Wildfire Outreach and Education. Perform public outreach activities, including fliers, town hall meetings, safety fairs, and others to educate the public on drought related conservation measures and wildfire protection activities and best management practices.	Drought, Wildfire	Both	Staff Time plus $10K for materials	Medium		Seasonal	Emergency Management/ Emergency Manager	ADEMA, NRCS, ADHS, USFS
5	Claridge Repetitive Loss Structure Mitigation. Work with homeowner to mitigate this RL structure, by raising home 7 to 10 feet to avoid flooding. The structure has had 4 flood claims.	Flood	Existing	$70K	Medium		Within 2-years of receipt of grant funds	Engineering/ County Engineer	FEMA HMA Grants
7	Duncan Flood Protection Plan. Develop a working plan to provide flood protection for the Town of Duncan and the local landowners. The plan will also address the sewer siphon and lift station at the old treatment plant.	Flood	Both	$200K	Medium		Within 2-years of receipt of grant	Engineering/ County Engineer	WIFA (sewer), USACE PAS and FPMS
8	Educate public on proper fuels thinning, setbacks, and water storage for wildfire mitigation.	Wildfire	Existing	Staff Time plus $10K for materials	Medium		Seasonal	Emergency Management/ Emergency Manager	ADEMA, NRCS, USFS
9	Remove non-native vegetation from watercourses within the County to improve conveyance capacity and reduce fuels for wildfire potential. Replace with native species to sustain erosion and sediment control.	Flood, Wildfire	Both	$300K	Low		Within 1-year of receipt of grant funds	Engineering/ County Engineer	FEMA HMA, Private River Restoration, State Forestry
10	Research and adopt current building codes for use in the unincorporated areas of the County.	Drought, Flood, Wildfire	New	Staff Time plus $5K	Medium		2018	Engineering/ County Engineer	General Fund

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SECTION 7: PLAN MAINTENANCE PROCEDURES

> ***§201.6(c)(4):*** *[The plan shall include…] (4) A* ***plan maintenance process*** *that includes:*
> *(i) A section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.*
> *(ii) A process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.*
> *(iii) Discussion on how the community will continue public participation in the plan maintenance process.*
>
> ***§201.6(d)(3):*** *Plans must be reviewed, revised if appropriate, and resubmitted for approval within five years in order to continue to be eligible for HMGP project grant funding.*

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

- ☑ **Monitoring and Evaluating the Plan**
- ☑ **Updating the Plan**
- ☑ **Continued Public Participation**

The following sections provide a description of the past plan maintenance procedures and activities, and documents the proposed procedures and schedule for the next planning cycle.

7.1 Monitoring and Evaluation

7.1.1 Past Plan Cycle

Greenlee County, Clifton and Duncan recognize that this hazard mitigation plan is intended to be a "living" document with regularly scheduled monitoring, evaluation, and updating. Section 7.1 of the 2011 Plan outlined a schedule of specific activities for annual evaluations of the 2011 Plan. A poll of the MJPT regarding the past execution of the plan maintenance strategy was taken and the following tasks were accomplished:

- Letter and evaluation of mitigation A/Ps was provided by Greenlee County to ADEMA in 2014
- Plan has been reviewed by county engineering when considering applications for mitigation grants.

MJPT discussed ways to improve on the Plan review and maintenance process over the next five years. The results of those discussions are outlined in the following sections.

7.1.2 Proposed Schedule and Scope

Having a multi-jurisdictional plan can aid in the plan monitoring and evaluation through the consolidation of information for all participating jurisdictions into one document. The MJPT reviewed the current DMA 2000 rules and October 2011 FEMA guidance document and discussed a strategy for performing the required monitoring and evaluation of the Plan over the next 5-year cycle. The MJPT has established the following monitoring and evaluation procedures:

- **Schedule** – The Plan shall be reviewed on at least an annual basis as an agenda item on the Local Emergency Planning Committee (LEPC). The LEPC includes representation from Clifton, Duncan and Greenlee County. In addition, Greenlee County Emergency Management will take the lead to send out an email to each jurisdiction via the jurisdiction's PPOC on or around the month of January, requesting a review of the Plan.
- **Review Content** – Within the email request distributed by Greenlee County Emergency Management, each of the jurisdictions will be asked to provide responses to the following questions:

- ***Hazard Identification:*** *Have the risks and hazards changed?*
- ***Goals and Objectives:*** *Are the goals and objectives still able to address current and expected conditions?*
- ***Mitigation Projects and Actions:*** *For each mitigation action/project summarized in Section 6.3.2:*
  - *Has there been activity on the project – Yes or No?*
  - *If Yes, briefly describe what has been done and the current status of the action/project.*

- **Documentation** – Each jurisdiction will review and evaluate the Plan as it relates to their community and document responses to the above questions in the form of an email. Greenlee County Emergency Management will archive email responses by printing and filing with the Plan for incorporation during the next Plan update. Any hard copies will be included in Appendix E.

7.2 Plan Update

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

- ✓ One year prior to the plan expiration date, the MJPT will re-convene to review and assess the materials accumulated in Appendix E.
- ✓ The MJPT will update and/or 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 ADEM and FEMA for review, comment and approval.

7.3 Continued Public Involvement

Greenlee County, Clifton and Duncan are committed to keeping the public informed about hazard mitigation planning efforts, actions and projects. Continued public involvement activities pursued by the Plan jurisdictions over the 2011 Plan cycle are summarized in Table 7-1.

Table 7-1: Continued public involvement activities performed by jurisdictions during the 2011 Plan cycle

Jurisdiction	Public Involvement Activity or Opportunity
Clifton	• Provided mitigation oriented brochures in a rack at Town Hall offices • Provided information at a booth during the annual health fairs at FMI and schools • Provide information to insurance companies on floodplain properties
Duncan	• Public hearing for input on development of the Town's 5-year CIP • Provide information to insurance companies on floodplain properties • Published the Plan on the Town's website • Performed public surveys regarding Gila River flood management regarding maintenance of vegetation and sedimentation
Greenlee County	• Published the Plan to the County website • Provided public education materials at the Greenlee County Fair and the annual FMI health fair • Performed one-on-one education of wildfire mitigation practices with residents • Provided comment opportunity for all mitigation actions that require board approval

Table 7-2 summarizes activities for public involvement and dissemination of information that shall be pursued whenever possible and appropriate by the Plan jurisdictions.

Table 7-2: Continued public involvement activities or opportunities identified by each participating jurisdiction

Jurisdiction	Public Involvement Activity or Opportunity
Clifton	• Provided mitigation oriented brochures in a rack at Town Hall offices • Provided information at a booth during the annual health fairs at FMI and schools • Provide information to insurance companies on floodplain properties • Do seasonal informational postings on social media regarding hazards impacting the communities
Duncan	• Public hearings for input on development of the Town's 5-year CIP • Provide information to insurance companies on floodplain properties • Published the updated Plan on the Town's website. Considering expanding to other social media outlets • Performed public surveys regarding Gila River flood management regarding maintenance of vegetation and sedimentation
Greenlee County	• Publish the Plan to the County website • Provide public education materials at the Greenlee County Fair and the annual FMI health fair • Perform one-on-one education of wildfire mitigation practices with residents • Provide comment opportunity for all mitigation actions that require board approval • Perform public involvement and comment opportunity on LOMRs and other NFIP flood map changes

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SECTION 8: PLAN TOOLS

8.1 Acronyms

A/P.....Mitigation Action/Project
ADEM .....Arizona Division of Emergency Management
ADEQ .....Arizona Department of Environmental Quality
ADWR .....Arizona Department of Water Resources
AGFD .....Arizona Game and Fish Department
ARS .....Arizona Revised Statutes
ASCE .....American Society of Civil Engineers
ASERC .....Arizona State Emergency Response Commission
ASLD .....Arizona State Land Department
ASU .....Arizona State University
AZDEQ .....Arizona Department of Environmental Quality
AZGS .....Arizona Geological Survey
BLM .....Bureau of Land Management
CAP .....Central Arizona Project
CAP .....Community Assistance Program
CFR .....Code of Federal Regulations
CRS .....Community Rating System
CWPP .....Community Wildfire Protection Plan
DEMA .....Arizona Department of Emergency and Military Affairs
DFIRM .....Digital Flood Insurance Rate Map
DMA 2000 .....Disaster Mitigation Act of 2000
DOT .....Department of Transportation
EHS .....Extremely Hazardous Substance
EPA .....Environmental Protection Agency
EPCRA .....Emergency Planning and Community Right to Know Act
FEMA .....Federal Emergency Management Agency
FIS.....Flood Insurance Study
FMA .....Flood Mitigation Assistance Grant Program
GIS .....Geographic Information System
GCDEM .....Greenlee County Department of Emergency Management
HAZMAT .....Hazardous Material
HAZUS-MH .....Hazards United States Multi-Hazard
HMA.....Hazard Mitigation Assistance
IFCI .....International Fire Code Institute
LEPC .....Local Emergency Planning Committee
MJHMP .....Multi-Jurisdictional Hazard Mitigation Plan
MMI .....Modified Mercalli Intensity
NCA .....National Climate Assessment
NCDC .....National Climate Data Center
NDMC .....National Drought Mitigation Center
NESDIS .....National Environmental Satellite, Data and Information Service
NFHL .....National Flood Hazard Layer
NFIP .....National Flood Insurance Program
NFPA .....National Fire Protection Association
NHC .....National Hurricane Center
NIBS .....National Institute of Building Services
NID .....National Inventory of Dams
NIST .....National Institute of Standards and Technology
NSF .....National Science Foundation
NOAA .....National Oceanic and Atmospheric Administration
NRC .....National Response Center

NWS .....National Weather Service
PDSI .....Palmer Drought Severity Index
RL .....Repetitive Loss
SARA .....Superfund Amendments and Reauthorization Act
SFHA.....Special Flood Hazard Area
SRLP .....Severe Repetitive Loss Properties
SRL .....Severe Repetitive Loss
SRP .....Salt River Project
UBC .....Uniform Building Code
USACE .....United States Army Corps of Engineers
USDA .....United States Department of Agriculture
USFS .....United States Forest Service
USGCRP.....U.S. Global Change Research Program
USGS .....United States Geological Survey
VA .....Vulnerability Analysis
WUI .....Wildland Urban Interface

8.2 Definitions

The following terms and definitions are provided for reference and are taken from the 2013 State Plan with a few minor modifications.

ARIZONA HAZARDS

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

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

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

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

Flooding

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

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

Landslide / Mudslide

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

Levee Failure / Breach

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

Severe Wind

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

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

Tropical Storms are storms in which the maximum sustained surface wind ranges from 39-73 mph. Tropical storms are associated with heavy rain and high winds. High intensity rainfall in short periods is typical. A tropical storm is classified as a hurricane when its sustained winds reach or exceed 74 mph. These storms are medium to large in size and are capable of producing dangerous winds, torrential rains, and flooding, all of which may result in tremendous property damage and loss of life, primarily in coastal populated areas. The effects are typically most dangerous before a hurricane makes landfall, when most damage occurs. However, Arizona has experienced a number of tropical storms that caused extensive flooding and wind damage.

Subsidence

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

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

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

GENERAL PLAN TERMS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Hazard Identification

The process of identifying hazards that threaten an area.

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

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

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

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

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

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

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

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

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

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

Promulgation
To make public and put into action the Hazard Mitigation Plan via formal adoption and/or approval by the governing body of the respective community or jurisdiction (i.e. – town or city council, county board of directors, etc.).

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

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

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

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

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

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

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

GENERAL HAZARD TERMS

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

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

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

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

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

Appendix A

Official Resolution of Adoption

Appendix B

Planning Process Documentation

Scott Ogden

From: Scott Ogden
Sent: Tuesday, February 16, 2016 6:29 PM
To: Steve Rutherford (srutherford@co.greenlee.az.us); Phil Ronnerud; John Basteen (john.basteen@townofduncan.org); Ian McGaughey (ian@townofclifton.com)
Subject: Greenlee County Multi-Jurisdictional Hazard Mitigation Plan - 2016 Update

Greetings,

The Greenlee County has secured grant funding to begin the process of updating the 2011 Greenlee County Multi-Jurisdictional Hazard Mitigation Plan (2011 Plan), which covers Unincorporated Greenlee County and the incorporated Towns of Clifton and Duncan. This 5-year plan update is required to maintain compliance with federal regulations set forth by the Disaster Mitigation Act of 2000 (DMA 2000), including continued eligibility for certain non-emergency hazard mitigation grant funds administered by FEMA. As the lead agency for the 2011 Plan, Greenlee County has retained JE Fuller to assist the county and towns with the update process. JE Fuller developed the 2011 Plan, which was officially approved by FEMA on October 11, 2011 and will expire October 11, 2016. Our goal is to be through this update process and approved at FEMA prior to that expiration. The current 2011 Plan can be downloaded using the following link:

Click here to download attachments.

Each of you have been identified as the primary points of contact and/or key planning team members to represent your community. We (JE Fuller) will be working with each community both in a multi-jurisdictional context and as individual communities, to prepare and develop the necessary update elements required for a FEMA approvable plan.

To kick things off, I would like to schedule our first planning team meeting to discuss the overall project scope and schedule, and cover some of the more general planning elements that will be better addressed through discussions as a multi-jurisdictional planning team. This meeting is mandatory and I anticipate the meeting to last for a maximum of 3 hours (either a full morning or afternoon). We will start with trying to get something put together for the 1st part of March. Accordingly, please respond to this email with your availability for the following slots:

March 2nd PM
March 3rd AM or PM
March 4th AM or PM
March 7th AM or PM
March 8th AM or PM
March 9th AM

If you have questions regarding this plan update process, please do not hesitate to contact me or Steve Rutherford at Greenlee County.

Thanks,

W. Scott Ogden, P.E., CFM
JE Fuller/ Hydrology & Geomorphology, Inc.
8400 South Kyrene Road, Suite 201
Tempe, AZ 85284
Phone: 480-222-5717
Cell: 480-299-3394

GREENLEE COUNTY
MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN
2016 UPDATE

MEETING DATE: March 16, 2016

MEETING TIME: 1:00 TO 4:00PM

MEETING LOCATION: Greenlee County BOS Conference Room
253 Fifth Street
Clifton, AZ 85533

DISTRIBUTION: Meeting Attendees

FROM: W. Scott Ogden, P.E. – JE Fuller

RE: **Greenlee County Multi-Jurisdictional Hazard Mitigation Plan 2016 Update**

ATTENDEES:

John Basteen	Duncan Town Manager
Ian McGaughey	Clifton Town Manager
Phil Ronnerud	Greenlee County Engineer
Steve Rutherford	Greenlee County Emergency Manager

AGENDA

1. **INITIAL INTRODUCTIONS**
2. **DISCUSSION OF SCOPE AND SCHEDULE**
3. **DMA2K OVERVIEW AND UPDATE REQUIREMENTS**
    a. **General DMA2K Overview**
    b. **Update Requirements (New Crosswalk)**
    c. **Proposed Outline for New Plan**
4. **PLANNING PROCESS**
    a. **Discussion of Last Planning Process**
    b. **Planning Team Roles and Responsibilities**
5. **PUBLIC INVOLVEMENT**
    a. **Discuss Past Strategy**
    b. **Formulate New Strategy**
    c. **Agency Coordination - Additional Invitations**
6. **RISK ASSESSMENT**
    a. **Hazard List Identification**
7. **MITIGATION STRATEGY**
    a. **Goals and Objectives**

8. **PLAN MAINTENANCE STRATEGY**
    a. **Review/Discuss maintenance and monitoring over the last plan cycle**
    b. **Develop New Monitoring Schedule**
    c. **Plan Update Schedule**
9. **PROMULGATION PROCESS**
10. **NEXT STEPS**

DISCUSSION

Agenda Item 1:

- Steve Rutherford opened the meeting and made a few introductory remarks regarding the plan update process. He then introduced Scott Ogden and turned the rest of the meeting over to him.
- Introductions were made by all, with each person noting whether or not they were a returning multi-jurisdictional planning team (MJPT) member from the last planning cycle.

Agenda Item 2:

- S. Ogden presented an overview of the scope and schedule for the project. Three formal meetings will be planned (including today's meeting). The remainder of the meetings will be conducted individually with each jurisdiction. Supplemental meetings will be convened using WebEx to keep costs down.
- It was noted that the current Plan expires on October 11, 2016, and that the update process will need to be prioritized to complete the process prior to the plan expiring.

Agenda Item 3:

- S. Ogden outlined a brief summary of the DMA 2000 process and FEMA grant programs that are eligibility impacted.
- S. Ogden briefly discussed the FEMA 2011 plan review guidance document and noted the major areas in the plan that will require extra attention or detail to meet some of the requirements outlined in the guidance document. The differences will be discussed in greater detail in later meetings as each topic is covered.
- S. Ogden presented a draft outline for the updated Plan to indicate the areas that are either proposed to be added or will require significant revisions. Each jurisdiction was assigned the task of reading through the descriptions provided in Section 4 of the 2011 Plan and provide any recommended redlines to JE Fuller at the next meeting.

Agenda Item 4a:

- Four of the five meeting attendees were involved in the prior plan update. In general, the returning members expressed satisfaction with the process used during the last cycle and felt that the effort was effective and efficient.

Agenda Item 4b:

- S. Ogden presented a discussion on the various levels of communication and planning team roles and responsibilities. The overall planning process will be accomplished using three levels of contact.

- Steve Rutherford of Greenlee County function as the primary point of contact for the plan update effort and will have the responsibility of overall administration for the planning effort. Primary duties will include scheduling meeting facilities, general contact with the planning team, consultant contract management, and liaison between the planning team and ADEM/FEMA.
- The town managers for Clifton and Duncan will serve as the jurisdictional point of contact. The JPOC will be responsible for attendance at the planning meetings, ensuring task assignments are completed, and coordination with the local planning team in their own jurisdiction.
- The local planning team is comprised staff and others that meet at the jurisdictional level to discuss and complete assignments given at the MJPT meetings. This is where the primary work of updating the various Plan elements will occur.

Agenda Item 5:

- S. Ogden presented an overview of the past plan cycle public involvement strategy and led the MJPT in a discussion evaluating the effectiveness of the effort. There were no comments or feedback received from the public at large during the last plan cycle. The MJPT was satisfied with the effort and felt the process would work well again. Accordingly, the public involvement strategy for the 2016 Plan update will employ websites, newspaper notices, bulletins and flyers in community newsletters and utility bills. The planning team will also develop a short message suitable for social media outlets.
- S. Ogden will provide template documents and language suitable for use by each jurisdiction in their individual efforts. Greenlee County will take responsibility for updating the county website that hosts the current plan and for placing the public notices in the regional newspapers. Each jurisdiction will provide website notices that direct the public to the county website, as well as develop notices to post in municipal buildings, in local newspapers, bulletins and utility bill inserts.
- S. Ogden noted that additional effort was needed regarding extending invitations to other agencies and/or organizations that may have interest and/or authority in the mitigation planning for the county. The MJPT spent some time brainstorming a list of contacts at agencies/organizations to send a personal invitation to. Much of the list will be similar to the LEPC contact list currently used by the county. JE Fuller will work with the team to get the invitation sent out before the next meetings.

Agenda Item 6:

- The MJPT discussed the current list of hazards assessed in the Plan and compared/contrasted that list with the list of hazards discussed in the 2013 State of Arizona Hazard Mitigation Plan. There was some discussion of recent seismic activity in Duncan and potential risks due to severe wind events, but in general, the hazards were perceived to not pose much of a risk to the majority of the county. The MJPT chose to continue with the hazards of the current plan.

Agenda Item 7:

- The MJPT reviewed the 2011 Plan goals and objectives and also compared them to the 2013 Arizona State HMP goals. The MJPT determined that the 2011 Plan goals and objectives were still valid and represented the desires for the 2016 Plan.

Agenda Item 8:

- The MJPT reviewed Section 7.2 of the 2011 Plan and discussed the efficacy of accomplishing the plan monitoring and review. Some activity was accomplished but not in complete adherence to the planned strategy.
- The MJPT discussed ways to improve upon the past performance and lined out a strategy for the 2016 Plan. An effort to tie the reviews to the LEPC process was discussed and agreed upon. The discussed changes will be reflected in the updated plan.

Agenda Item 9:

- S. Ogden provided a quick overview of the promulgation process and what each jurisdiction can expect to do to get the plan approved finally at FEMA.

Agenda Item 10:

- S. Ogden reviewed the action items and assignments for the MJPT.
- Next Meetings were scheduled as follows:

Jurisdiction: Clifton
Dates: April 6, 2016 and May 9, 2016
Time: 1pm to 5pm
Place: Clifton Town Hall

Jurisdiction: Duncan
Dates: April 6, 2016 and May 10, 2016
Time: 8am to Noon
Place: Duncan Town Hall

Jurisdiction: Greenlee County (Unincorporated)
Dates: April 7, 2016 and May 10, 2016
Time: (4/7) 8am to Noon and (5/10) 1pm to 5pm
Place: Greenlee County BOS Conference Room

ACTION ITEM SUMMARY:

ITEM NO.	DESCRIPTION	RESPONSIBILITY [DUE DATE]
1-1	Review and become familiar with the 2011 Greenlee County MJHMP	All Jurisdictions [4/6/16]
1-2	Review pertinent Community Description (Section 4) of the 2011 Plan and provide any edits to JE Fuller at April meeting	All Jurisdictions [4/6/16]
1-3	JEF to provide template website text, newspaper notice, and agency/organization invite letter for use by the MJPT.	JE Fuller [3/23/16]
1-4	Coordinate the publication of newspaper notices in the major newspaper regionally covering Greenlee County	Greenlee County (S. Rutherford) [4/6/16]
1-5	Use the public involvement template documents provided by JE Fuller to develop and post website notices and develop newsletters, fliers, utility inserts, and public notices for publishing in local newspapers.	All Jurisdictions [4/6/16]
1-6	JE Fuller to provide memorandum for use to distribute to agencies and organizations selected.	JE Fuller [3/23/16]
1-7	Research and provide contact information for additional agency/organization contacts to JE Fuller	All Jurisdictions [4/6/16]

Appendix C

Public Involvement Records

Scott Ogden

From:	Steve Rutherford <srutherford@co.greenlee.az.us>
Sent:	Sunday, March 20, 2016 11:17 AM
To:	'Kay Gale'; 'Yvonne Pearson'; 'Larry Avila'; 'Pat Sexton'; jvaughn@co.greenlee.az.us; 'Ronnie Manuz'; john.basteen@townofduncan.org; ian@townofclifton.com; Steve Rutherford; 'Phil Ronnerud'; 'Derek Rapier'; thines@co.greenlee.az.us; dmanuz@co.greenlee.az.us; kpaz@gilahealth.com; cliftonpolice@townofclifton.com; Easley, Paul D.; stevel@dvec.org; 'Charles Berube'; peter_ortega@FMI.com; 'Brian Douglas'; hmetzger@graham.az.gov; 'David Bell'; Scott Ogden; 'Hayden Boyd'; beagar@co.apache.az.us; 'Matt Bolinger'; tcranford@azdot.gov; DLong@azdps.gov; emerrell@duncanschools.org; dwoodall@morenci.k12.az.us; countymanager@hidalgocounty.org; webmaster@epenergy.com
Subject:	Greenlee County Hazard Mitigation Planning Meetings
Attachments:	GCMJHMP 2016_Agency-Organization Invitation.pdf

Overview

Mitigation is the effort to reduce loss of life and property by lessening the impact of disasters. State, tribal, and local governments engage in hazard mitigation planning to identify natural hazards that impact them, identify strategies and activities to reduce any losses from those hazards, and establish a coordinated approach to implementing the plan, taking advantage of a wide range of resources. Mitigation plans are key to state, tribal, and local governments' efforts to break the cycle of disaster damage, reconstruction, and repeated damage.

Developing hazard mitigation plans enables state, tribal, and local governments to:

- Increase education and awareness around threats, hazards, and vulnerabilities;
- Build partnerships for risk reduction involving government, organizations, businesses, and the public;
- Identify long-term strategies for risk reduction that are agreed upon by stakeholders and the public;
- Identify cost effective mitigation actions, focusing resources on the greatest risks and vulnerabilities;
- Align risk reduction with other state, tribal, or community objectives; and
- Communicate priorities to potential sources of funding.

Ultimately, hazard mitigation planning enables action to reduce loss of life and property, lessening the impact of disasters.

Respectfully,

Steve Rutherford
Greenlee County
Emergency Management
Phone 928-865-2601
Cell 928-965-4525
Fax 928-865-1929

GREENLEE COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN - 2016 UPDATE

DATE: March 16, 2016

TO: Interested Agencies and Organizations Within or Near Greenlee County

FROM: The Greenlee County Multi-Jurisdictional Hazard Mitigation Plan – Multi-Jurisdictional Planning Team

RE: Invitation for Participation

In 2005, and again in 2011, Greenlee County and the Towns of Clifton and Duncan developed and/or updated a multi-jurisdictional hazard mitigation in compliance with federal regulations set forth by the Disaster Mitigation Act of 2000 (DMA 2000). The DMA 2000 legislation requires local, county, tribal and state governments to develop a multi-hazard mitigation plan for their respective jurisdiction in order to be eligible to receive certain hazard mitigation and public assistance funds. The original 2005 Plan was submitted to the Federal Emergency Management Agency (FEMA) and approved in June 2006. The 2005 Plan expired five years later and was fully updated by the participating jurisdictions and re-approved by FEMA in October 2011. That plan is set to expire in October 2016 and will require a full update and re-approval with the Arizona Division of Emergency Management and FEMA to maintain compliance with the DMA 2000 legislation.

The goal of mitigation planning is to reduce or eliminate long-term risk to life and property from natural hazard events. Mitigation is not how we respond to natural disasters like floods and wildfires, but rather how we as a community can lessen or prevent the impact of such things in the first place. The mitigation planning process involves identifying and profiling the natural hazards most likely to occur in a community, assessing vulnerability to these hazards, and establishing goals, actions, and projects that mitigate the associated risks. The development of this mitigation plan will also ensure continued eligibility on the part of the county and towns for non-emergency, federal hazard mitigation grants. Each participating jurisdiction is a stakeholder in the Plan and the updated document will ultimately be resubmitted to ADEM and FEMA for review and approval, and formally adopted by each jurisdiction.

Greenlee County, Clifton and Duncan have organized a multi-jurisdictional planning team and have begun an effort to review and update the 2011 Plan. As a prominent agency and/or organization in or near Greenlee County, you are invited to attend the upcoming planning team meetings as a representative of the community at large. Public and agency/organization input on the mitigation planning process is important to the planning team. Residents and interested agencies/organizations are encouraged to educate themselves about the existing plan and offer comments on the update and draft of the plan. The planning team anticipates having a plan draft by July 2016, at which time the public will be provided the opportunity to review the plan and comment.

If you are interested in attending the planning team meetings as a participant or just as an observer, please contact the following for additional information and schedules:

Jurisdiction	Contact Name and Position	Phone Number	Email Address
Greenlee County	Steve Rutherford County Emergency Manager	928-865-2601	srutherford@co.greenlee.az.us
Town of Clifton	Ian McGaughey Town Manager	928-865-4146	ian@townofclifton.com
Town of Duncan	John Basteen Town Manager	928-359-2791	john.basteen@townofduncan.org

New Tab | Greenlee County Emerge

www.co.greenlee.az.us/emergency/

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GREENLEE COUNTY

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Emergency Management

Emergency Management Home

Greenlee County Emergency Management

An Update to the Greenlee County Multi Juristictional Hazard Mitigation Plan
Fire Restriction Resolution May 03, 2013
Greenlee County Fire Ordinance
Stateline Road Repairs - Oct 2007
Stateline Road - Jan 2007
Stateline Road - May 2007
Stateline Road - Oct 2007

Greenlee County Government
253 Fifth St
P.O. Box 908
Clifton, AZ 85533

Normal Business Hours:
Monday - Friday,
8:00 a.m. - 5:00 p.m.

County Seal Use

Comment or Question about the Web site

Greenlee County Department of Emergency Management has joined forces with other local jurisdictions within Greenlee County to review and update the existing Greenlee County Multi-Jurisdictional Hazard Mitigation Plan. The goal of mitigation planning is to reduce or eliminate long-term risk to life and property from all natural hazard events. Mitigation is not how we respond to emergencies like floods and wildfires, but rather how we as a community prevent the impact of such things in the first place.

The mitigation planning process involves identifying and profiling the natural hazards most likely to occur in a community, assessing the vulnerability to these hazards, and establishing goals, actions, and projects that mitigate the associated risks. The update of the current mitigation plan will also ensure continued eligibility for non-emergency, federal and state hazard mitigation grants.

Public input on the mitigation planning process is important and residents are encouraged to educate themselves about the existing hazard mitigation plan and offer comments on the update. For more information, please visit the Maricopa County website at:

http://www.co.greenlee.az.us/emergency

or contact:

Jurisdiction	Contact Name and Position	Phone Number	Email Address
Greenlee County	Steve Rutherford County Emergency Manager	928-865-2601	srutherford@co.greenlee.az.us
Town of Clifton	Ian McGaughey Town Manager	928-865-4146	ian@townofclifton.com
Town of Duncan	John Basteen Town Manager	928-359-2791	john.basteen@townofduncan.org

Town of Clifton, Arizona

www.cliftonaz.com

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TOWN OF CLIFTON
ARIZONA

Where the Trail Begins

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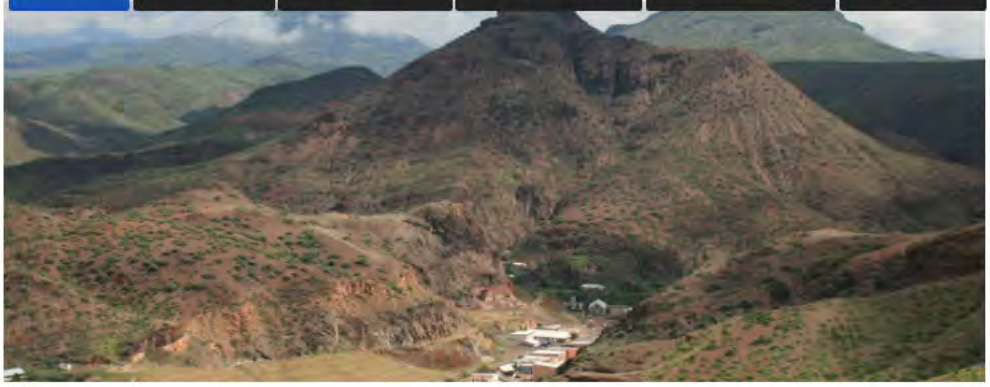


Photos courtesy of Don Lunt

WELCOME

Welcome to the Town of Clifton's website. We invite you to explore our town's services, historical background and to see the uniqueness of Clifton and its surrounding beauty.
- Mayor Felix Callicotte

VISIT CLIFTON

Clifton, Arizona is often called one of the most beautiful places in Arizona. Set in a canyon, the town boasts a rich history, from Geronimo to Coronado and one the finest copper deposits in the world.

DEPARTMENTS

The Town of Clifton is here to serve you. We take pride in providing the services you need with efficiency, respect—and a smile!

I WANT TO...

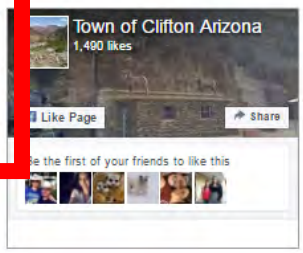
- A — Find Town Meetings
- B — Stay at the RV Park
- C — Visit the Library
- D — Contact Elected Officials

Public Notice of Proposed Wastewater/Sewer Rates and Fees Increases

Notice of Proposed New or Increased Tax or Fee

CLICK HERE FOR IMPORTANT
TOWN OF CLIFTON ANNOUNCEMENTS

CLICK HERE FOR TOWN OF CLIFTON
JOB OPENINGS



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TOWN OF CLIFTON
ARIZONA

Where the Trail Begins

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ANNOUNCEMENTS

Your input is needed for the update to the
Greenlee County Multi Juristictional Hazard Mitigation Plan.
Click to learn more.

Click here for JOB OPENINGS

Appendix D

Detailed Historic Hazard Records

State and Federally Declared Events That Included Greenlee County January 1966 to Current				
Hazard	**No. of Declarations**	**Recorded Losses**		
		Fatalities	**Injuries**	**Damage Costs ($)**
Dam Failure	0	0	0	$0
Drought	10	0	0	$303,000,000
Earthquake	0	0	0	$0
Fissure	0	0	0	$0
Flooding / Flash Flooding	16	48	1187	$902,666,000
Landslide / Mudslide	0	0	0	$0
Levee Failure	0	0	0	$0
Severe Wind	0	0	0	$0
Subsidence	0	0	0	$0
Tropical Storm	0	0	0	$0
Wildfire	16	0	0	$0
Winter Storm	1	0	0	$0

Notes:
- Damage Costs are reported as is and no attempt has been made to adjust costs to current dollar values. Sources: ADEM, FEMA, USDA, NCDC, AFMA

State of Arizona Declaration				Federal Presidential Declaration				
Date	**Hazard**	**State PCA No.**	**Expenditures**	**Date**	**ID**	**Expenditures**	**Counties Affected**	**Description**
5/18/2002	Disease						Statewide	the Arizona Game and Fish Department placed an emergency ban on the importation of live hoofed animals (e.g., deer and elk) into Arizona due to a fear of Chronic Wasting Disease (CWD). CWD is a disease closely related to "mad cow disease" in cattle and scrapie in domestic sheep and goats but affects dear and elk.
6/7/1996	Drought	96005	$211,499				Statewide	
6/23/1999	Drought	99006					Statewide	PCA 99006; Statewide Drought Emergency, Declared June 23, 1999: Lack of precipitation had significantly reduced surface and ground water supplies and stream flows. The drought continues to endanger crops, property and livestock of the citizens of Arizona. This proclamation has been extended to June 23, 2003, as this is still a threatening situation. USDA Programs offer Arizona Ranchers Drought Relief, (Phoenix) - Federal officials this week announced three programs designed to ease the impact of Arizona's drought on the state's ranching industry and the state's natural resources. Gov. Jane Dee Hull in June issued a drought declaration for the state, initiating a federal review process that culminated in the U.S. Department of Agriculture's determination that Arizona agriculture could qualify for drought assistance. The following are brief descriptions of the three assistance packages for which Arizona ranchers may qualify: Those ranching operations that earlier this year reduced herd sizes in response to poor pasture conditions and lack of water due to the drought can receive capital gains tax deferment if those herds are replaced within two years, according to the Internal Revenue Service. It is recommended that businesses consult their tax specialist or the IRS for further details. For more information, contact Joe Lane, Associate Director of Animal Services Division, at (602) 542-3629. The USDA Natural Resource Conservation Service has received an initial $6 million through its Emergency Watershed Program (EWP) to treat short- and long-term damage to rangeland and cropland due to drought. Ranchers and farmers can receive
8/13/1999	Drought			08/13/99	USDA		Apache, Cochise, Coconino, Gila, Graham, Greenlee, Maricopa, Mohave, Navajo, Pima, Pinal, Santa Cruz, Yavapai	GLICKMAN DECLARES PENNSYLVANIA, 13 ARIZONA COUNTIES AS DISASTER AREAS AND ANNOUNCES ADDITIONAL DROUGHT ASSISTANCE Release No. 0334.99, WASHINGTON, August 13, 1999 Agriculture Secretary Dan Glickman today declared all of Pennsylvania and 13 counties in Arizona as agricultural disaster areas due to drought. The declaration makes farmers in those areas and all contiguous counties eligible for emergency low-interest loans and other assistance to help cover losses from the drought. In Arizona, today's disaster declaration applies to Apache, Cochise, Coconino, Gila, Graham, Greenlee, Maricopa, Mohave, Navajo, Pima, Pinal, Santa Cruz, and Yuvapai Counties. Also eligible, because they are contiguous, are La Paz and Yuma Counties. Glickman
6/23/2000	Drought						Statewide	Annual extension of PCA 99006; Statewide Drought Emergency, Declared June 23, 1999: Lack of precipitation had significantly reduced surface and ground water supplies and stream flows. The drought continues to endanger crops, property and livestock of the citizens of Arizona. This proclamation has been extended until further notice, as this is still a threatening situation.
7/21/2000	Drought			07/21/00	USDA		Apache, Cochise, Graham, Greenlee, Pima, Pinal, Santa Cruz, Gila, Maricopa, Navajo, Yuma	GLICKMAN DECLARES 7 ARIZONA COUNTIES AGRICULTURAL DISASTER AREAS: Washington, July 17, 2000 - Agriculture Secretary Dan Glickman today declared seven of Arizona's 15 counties as agricultural disaster areas due to drought, making farmers in those areas and 12 neighboring counties, including counties in Utah, New Mexico and Colorado, eligible for emergency low-interest loans. "Farmers and ranchers in Arizona are experiencing real difficulties this year due to drought," said Glickman. "USDA emergency low-interest loans are available to help producers to cover some of their losses."
6/23/2001	Drought						Statewide	Annual extension of PCA 99006; Statewide Drought Emergency, Declared June 23, 1999: Lack of precipitation had significantly reduced surface and ground water supplies and stream flows. The drought continues to endanger crops, property and livestock of the citizens of Arizona. This proclamation has been extended until further notice, as this is still a threatening situation.
5/17/2002	Drought			05/17/02	USDA		Statewide	VENEMAN DESIGNATES ARIZONA AS DROUGHT DISASTER AREA, Governor Hull and Veneman Tour Fire Areas and Assess Damage in Prescott National Forest Areas: PHOENIX, Ariz., May 17, 2002-- Agriculture Secretary Ann M. Veneman today designated the entire state of Arizona as a drought disaster area. This designation makes Arizona farmers and ranchers immediately eligible for USDA emergency farm loans due to losses caused by drought this year.
6/23/2002	Drought						Statewide	Annual extension of PCA 99006; Statewide Drought Emergency, Declared June 23, 1999: Lack of precipitation had significantly reduced surface and ground water supplies and stream flows. The drought continues to endanger crops, property and livestock of the citizens of Arizona. This proclamation has been extended until further notice, as this is still a threatening situation.
7/11/2002	Drought			07/11/02	USDA		Statewide	VENEMAN ANNOUNCES EXPANSION OF CRP EMERGENCY HAYING AND GRAZING PROGRAM FOR WEATHER-STRICKEN STATES, WASHINGTON, July 11, 2002 - Agriculture Secretary Ann M. Veneman today approved 18 states for Conservation Reserve Program emergency haying and grazing statewide, making all CRP participants in these states basically eligible for this emergency measure. Veneman also said USDA will waive rental reduction fees to encourage donation of hay to farmers and ranchers in immediate need. "Drought and severe weather conditions have depleted hay stocks and grazing lands across the country," said Veneman. "This approval provides immediate relief to livestock producers and encourages donations of hay to producers who need immediate assistance." The 18 approved states are: Arizona, Colorado, Georgia, Idaho, Kansas, Minnesota, Montana, Nebraska, New Mexico, North Carolina, North Dakota, Oklahoma, South Carolina, South Dakota, Texas, Utah, Virginia and Wyoming.ARIZONA FARMERS FACING CATASTROPHE ... Arizona officials are saying that the losses from the livestock industry alone last year will be upward of $300 million. …
6/23/2003	Drought						Statewide	Annual extension of PCA 99006; Statewide Drought Emergency, Declared June 23, 1999: Lack of precipitation had significantly reduced surface and ground water supplies and stream flows. The drought continues to endanger crops, property and livestock of the citizens of Arizona. This proclamation has been extended until further notice, as this is still a threatening situation.
2/24/1966	Flooding		$43,673	04/30/66	217-DR	$3,256,224	Graham, Greenlee, Maricopa, Pima, Pinal	Floods; state/federal disaster declared. A cold winter storm put up to 1.26 inches of rain in many areas of Tucson. Eleven accidents from slick roads and flooding produced most of the damage in the Tucson area.
10/19/1972	Flooding	26591	$58,177	10/25/1972	360-DR	$16,819,609	Graham, Greenlee	Heavy precipitation associated with moist tropical air advected from tropical storm Joanne fell in much of the state in October. It is believed that this was the first time in the climatological history of the state that a tropical storm entered Arizona with its cyclonic (counter-clockwise) air circulation intact. On the 18th and 19th, rainfall measurements of three to five inches were not uncommon along the Mogollon Rim and in the White Mountains. In addition, heavy amounts of rainfall were also reported from western New Mexico. Flooding was reported on the Verde River, the Little Colorado River, and on streams under and on the Mogollon Rim above Payson. However, by far the heaviest flooding occurred along the San Francisco and Gila Rivers. The Towns of Safford, Clifton, and Duncan suffered extremely heavy losses due to flooding. Nearly $8 million in property damage was caused, with most of this damage occurring in Graham and Greenlee Counties. In addition, agricultural losses were heavy, preliminary estimates totaling $8 million in Graham and $2 million in GreenleeCounty. Some deaths were caused by drowning. Levee protecting Holbrook needed emergency resoration; dikes around Winslow overtopped.
9/19/1975	Flooding	27656	$91,500				Graham, Greenlee	Heavy rains over southeastern Arizona and southwestern New Mexico on the 6th, 7th, and 8th of September caused flooding of the Gila, San Francisco, and Blue Rivers. Hardest hit was Clifton where the San Francisco rose to 2.5 feet above floodstage. Three hundred people were evacuated from their homes on the night of the 8th. Water rose to a depth of 3.0 feet in streets on the north and east sides of town. All vehicles were removed, however, from the affected areas before the flood crested. Estimated damages were: public:$91,000;private:$275,000.
3/2/1978	Flooding		$485,718	03/04/78	550-DR	$67,122,627	Statewide	Warm temeratures accompanied by heavy rain filled reservoirs behind all of the dams on the Salt and Verde Rivers and forced large volumes of runoff to be released. This was the largest flow of water down the Salt since 1891. The released water overflowed the channel and flooded residential areas and farmlands. During the same period storm fronts passing over the state caused flash flooding and destruction. 9.53 inches of rainfall occurred on Mt Lemmon. Overflows of the Gila River flooded Duncan and 1000-2000 acres of farmland in Safford Valley. The Rillito Creek, Pantano and Tanque Verde Creeks in Tucson were near bankfull. Total damage was approximately $65.9 million, of which $37 million was attributed to Maricopa County alone. Thousands of homes were damaged and 116 homes were destroyed. More than 7,000 people had to be sheltered and four people lost their lives. For Maricopa County - the storm centered over the mountains north and east of Phoenix, 35 miles north at Rock Springs. Extrapolation of intensity-probability data: 5.73 in./ 24 hr. equates to a 400 yr. storm. Main source of flooding due to Verde River with runoff volume exceeding reservoir storage capacity above Bartlett Dam. Flooding also occurred along irrigation canals on north side of metro area, and along tributaries of the Gila River and Queen Creek. 1 death-countywide. Total damage costs: $37 million: $3.1 million-residential, $16 million-public, $4 million-agriculture, $7.8 million-industrial, $0.75 million-commercial. "Flood Damage Report, 28 February-6 March 1978 on the storm and floods in Maricopa County, Arizona", U.S. Army Corps of Engineers, Los Angles District, FCDMC Library #802.024.

State of Arizona Declaration				Damage Estimates			
Date	**Hazard**	**Fatalities**	**Injuries**	**Property**	**Crop/Livestock**	**Total**	**Sources**
5/18/2002	Disease					$0	ADEM, 2008
6/7/1996	Drought					$0	ADEM, 2008
6/23/1999	Drought					$0	ADEM, 2008
8/13/1999	Drought					$0	ADEM, 2008
6/23/2000	Drought			$2,000,000	$1,000,000	$3,000,000	ADEM, 2008
7/21/2000	Drought					$0	ADEM, 2008
6/23/2001	Drought					$0	ADEM, 2008
5/17/2002	Drought					$0	ADEM, 2008
6/23/2002	Drought					$0	ADEM, 2008
7/11/2002	Drought				$300,000,000	$300,000,000	ADEM, 2008
6/23/2003	Drought					$0	ADEM, 2008
2/24/1966	Flooding					$0	ADEM, 2008; Tucson NWS, 2008 at http://www.wrh.noaa.gov/twc/hydro/floodhis.php ;
10/19/1972	Flooding	12	100	$8,000,000	$10,000,000	$18,000,000	ADEM, 2008; AFMA Floods Happen, Spring 2003.
9/19/1975	Flooding			$366,000		$366,000	ADEM, 2008; AFMA Floods Happen, Spring 2003.
3/2/1978	Flooding	4		$65,900,000		$65,900,000	ADEM, 2008; Tucson NWS, 2008 at http://www.wrh.noaa.gov/twc/hydro/floodhis.php; AFMA Flood Happens, Fall 2003

State of Arizona Declaration				Federal Presidential Declaration				
Date	**Hazard**	**State PCA No.**	**Expenditures**	**Date**	**ID**	**Expenditures**	**Counties Affected**	**Description**
11/28/1978	Flooding	28822	$70,119				Graham, Greenlee	Flooding caused by heavy rains.
12/16/1978	Flooding		$1,909,498	12/21/78	570-DR	$113,561,122	Statewide	Following the spring flooding, Arizona was hit hard again in December 16th-20th. Total precipitation ranged from less than 1 inch in the northeastern and far southwestern portions of Arizona to nearly 10 inches in the Mazatzal Mountains northeast of Phoenix. A large area of the central mountains received over 5 inches. The main stems of the Gila, Salt, Verde, Agua Fria, Bill Williams, and Little Colorado Rivers, as well as a number of major tributaries, experienced especially large discharges. The flooding areas with the most significant damages included the Little Hollywood District near Safford and major portions of Duncan, Clifton, Winslow, and Williams. Damages were estimated at $39,850,000. 10 people die and thousands are left homeless. Severe damage to roads and bridges. For Maricopa County, 4 deaths, $16.3 million-public and $5 million-agriculture losses estimated. ["Flood Damage Report, Phoenix Metropolitan Area, December 1978 Flood", November 1979, U.S. Army Corps of Engineers, FCDMC Library #802.027]
12/30/1984	Flooding	31046	$426,679				Graham, Greenlee	
1/8/1993	Flooding	93003	$30,072,157	01/19/93	977-DR	$104,069,362	Statewide	During January and February 1993, winter rain flooding damage occurred from winter storms associated with the El Nino phenomenon. These storms flooded watersheds throughout Arizona by dumping excessive rainfall amounts that saturated soils and increased runoff. Warm temperature snowmelt exacerbated the situation over large areas. Erosion caused tremendous damage and some communities along normally dry washes were devastated. Stream flow velocities and runoff volumes exceeded historic highs. Many flood prevention channels and retention reservoirs were filled to capacity and so water was diverted to the emergency spillways or the reservoirs were breached, causing extensive damage in some cases (e.g., Painted Rock Reservoir spillway). Ultimately, the President declared a major federal disaster that freed federal funds for both public and private property losses for all of Arizona's fifteen counties. Damages were widespread and significant, impacting over 100 communities. Total public and private damages exceeded $400 million and eight deaths and 112 injuries were reported to the Red Cross (FEMA, April 1, 1993; ADEM, March, 1998). Many roads closed in both counties due to flooding. Duncan was the hardest hit. Half of the town was under water when a dike broke and later left at least 150 people homeless. The San Francisco River and Gila River flooded some farmland near Safford. Gila and Pinal County,07,1900MST,,,0,0,6,0,Flood Winkelman,20,1900MST,,,0,0,6,0,Flood |Major damage to homes and businesses in Winkelman. Gila River reached peak stage on the 20th. The Santa Cruz River in the Avra Valley area was running extremely high in Marana. Water forced the closure of the Trico Road bridge.
11/28/1994	Flooding	95005	$627,378				Greenlee	
1/10/1995	Flooding	95006	$510,789				Apache, Gila, Graham, Greenlee, and Navajo	Heavy rains fell over much of central and southeastern Arizona. Some reports included Magma, 3.50 inches; Payson, 2.23 inches; Pinetop, 2.08 inches; Globe, 2.01 inches; and Sedona, 1.83 inches. Some unbridged road crossings in the Safford area were damaged. Total damages were estimated at $2,000,000.
2/15/1995	Flooding	95007	$1,525,663				Coconino, Gila, Graham, Geenlee, La Paz, Maricopa, Navajo, Pinal, Yavapai, Yuma	On February 15, 1995, the Governor proclaimed an emergency due to flooding in Coconino, Gila, Maricopa, Yavapai, and Yuma Counties. The proclamation included an allocation of $100,000 for emergency measures and recovery costs. The proclamation was amended to include Graham, Greenlee, LaPaz, navajo, and Pinal Counties.
2/16/2005	Flooding	25005	$4,669,352	3/14/2005	1586-DR	$9,536,276	Gila, Graham, Greenlee, Pinal, Yavapai, Maricopa, Mohave	A strong storm system drew moist subtropical air from the Pacific to give northern Arizona widespread moderate to heavy rains. This precipitation event began Thursday night (02/10) and lasted through the early hours on Sunday (02/13). Rainfall totals of 2 to 3 inches were common in many locations...with locally heavier amounts found in portions of Yavapai and Northern Gila counties. Flooding caused road closures in Black Canyon City, Walker, Pinedale, and Globe. Paper Mill Road in Snowflake was washed out by the flood waters. Highway 377 was closed due to flooding between Heber and Holbrook. A trailer park in Black Canyon City was evacuated before the water rose into the parking lot. No trailers were damaged. Minor pasture flooding was reported in Cornville. A trailer park in the community of Tonto Creek was evacuated. Flood waters entered homes in Porter Creek Estates (near Show Low). The Gila River at the Town of Duncan had moderate flooding and the smaller dikes broke allowing water to backup into the town. Damage occurred to a residence near Duncan High School, and a trailer downstream of the high school. Also, U.S. Highway 70 near the high school was covered with four feet of water and the approach ramps to the highway were overtopped with flowing water. East Avenue and low lying areas in the west end of the Town of Duncan were evacuated on the evening of Saturday February 12, 2005. The railroad tracks also on the west end of Duncan were covered with water and power went out in the west side of the town. The San Francisco River at the Town of Clifton had minor flooding reported. There was no damage reported in the Town of Clifton. However, there was water to the bottom of the Railroad Bridge which stopped railroad traffic from the Morenci Mine and minor overflow of the river in the northern end of Clifton. Also, the town gates, designed to divert water away from the Town of Clifton were closed, isolating the town from road and railroad access from the north. The Town of Solomon at the Gila River reported minor flooding. The Solomon Road, Pima Road, and Thatcher Road bridge approaches were all flooded and closed. U.S. Highway 70 Bridge near Bylas was also flooded and closed.
8/26/2005	Flooding	26002	$41,964				Greenlee	Clifton Flash Flood Emergency. A flash flood along Ward's Canyon near Clifton caused damage to existing utilities and bridges. A three to four foot wall of water was reported to travel down the canyon creating a sizable scour hole just downstream of the U.S. 191 bridge. The Town of Clifton's sewer main and lift station were completely destroyed (The Copper Era, 2005).
8/8/2006	Flooding	27001	$2,726,940	9/7/2006	1660-DR	$13,634,698	Gila, Graham, Greenlee, Pima, Pinal	Several areas of the state were struck by severe storms and flooding during the period of July 25 to August 4, 2006. Several rivers running through the Tucson Metro Area flooded on July 31, 2006. The Rillito River flooded with water over the cement banks near Dodge Boulevard. Additionally, the Rillito River was over bankfull just east of the Swan Road Bridge. River Road near La Cholla Road was flooding from the Rillito River. Sabino Creek was out of its banks and houses were flooded near Sabino Canyon and Bear Canyon. Below is a listing of some of the damage, but not all, caused by the flooding and an estimate for the cost of repairs: Sabino Canyon Recreation area road and facility damaged, $100,000 Forty homes and businesses flooded, $1,200,000 One home destroyed due to flooding, $150,000 Water main broke near the Mt. Lemmon highway, $20,000 Catalina Highway road washed away, $50,000 Agricultural irrigation system damaged, $500,000 Cement plant flooded, $400,000 Gravel pit flooded, $30,000 General infrastructure damage, $500,000 With tropical moisture pouring into Southeast Arizona, several days of rainfall preceded the July 31st event. With grounds saturated at most locations, the additional rainfall that fell on the 31st had a hard time soaking into the ground and mainly stayed as runoff. Rivers and washes quickly filled to and over bankfull, flooding homes and businesses as well as nearby roads. Some roadw were washed away due to the strong flood waters.
8/4/2010	Flooding	11003					Greenlee, Santa Cruz	**Monsoon 2010 Flooding Emergency:** On July 19, 2010, through July 29, 2010, a series of potent monsoon thunderstorms causing high winds and flash floods damaged many locations in southeastern Arizona. The heavy rains resulted in unusually strong flooding events and caused extreme peril to public health and safety in two primary areas: Wards Canyon in Greenlee County and the Nogales Wash in Santa Cruz County. On July 29, 2010 both the Town of Clifton and Greenlee County declared a state of emergency for this event, followed on July 30, 2010 by Santa Cruz County, stating that this monsoon event has created a situation above and beyond their capabilities and they are requesting assistance from the State. These water flows caused extensive damages to public infrastructure and threatened resources that provide essential life services to Greenlee and Santa Cruz residents, primarily roads and sewer lines.
9/28/1983	Tropical Storm		$863,283	10/05/83		$13,446,148	Mohave, Apache, Yavapai, Gila, Graham, Greenlee, Pinal, Pima, Santa Cruz, Cochise, Navajo	The autumn floods of 1983. Tropical storm remains, including those from Hurricane Octave, caused heavy rain over Arizona during a 10-hour period. Southeast Arizona and Yavapai and Mohave Counties are particularly hard hit. Severe flooding occurred in Tucson, Clifton and Safford. Fourteen fatalities and 975 injuries were attributed to the flooding. At least 1000 Arizonans were left temporarily homeless. Dam estimated at $370 million in today's value (2001). Record water levels in the Santa Cruz, Gila, San Pedro and San Francisco Rivers contributed to heavy flooding statewide. Greenlee County was hit hard. Damages in Clifton alone were over $20 million where approximately 41 businesses were destroyed and over 231 homes and 57 businesses suffered major damages. The Corps constructed an emergency dike in the Winkelman Flats area to try and protect 112 homes. There were floodfight activities at Florence to protect a sewage treatment pland and at Safford to protect critical arterial bridge embankment from severe damage.

State of Arizona Declaration				Damage Estimates			
Date	**Hazard**	**Fatalities**	**Injuries**	**Property**	**Crop/Livestock**	**Total**	**Sources**
11/28/1978	Flooding					$0	ADEM, 2008
12/16/1978	Flooding	10		$39,850,000		$39,850,000	ADEM, 2008; Tucson NWS, 2008 at http://www.wrh.noaa.gov/twc/hydro/floodhis.php; AFMA Flood Happens, Fall 2003
12/30/1984	Flooding					$0	ADEM, 2008
1/8/1993	Flooding	8	112	$330,000,000	$70,000,000	$400,000,000	ADEM, 2008; NCDC, 2010
11/28/1994	Flooding					$0	ADEM, 2008
1/10/1995	Flooding			$2,000,000		$2,000,000	ADEM, 2008; NCDC, 2010
2/15/1995	Flooding					$0	ADEM, 2008
2/16/2005	Flooding			$1,500,000		$1,500,000	ADEM, 2008 NCDC, 2008
8/26/2005	Flooding			$50,000		$50,000	The Copper Era, 2005; ADEM, 2008
8/8/2006	Flooding			$5,000,000		$5,000,000	ADEM, 2008 NCDC, 2008
8/4/2010	Flooding					$0	ADEM, 2010;
9/28/1983	Tropical Storm	14	975	$370,000,000		$370,000,000	ADEM, 2008; NCDC, 2010

State of Arizona Declaration				Federal Presidential Declaration				
Date	**Hazard**	**State PCA No.**	**Expenditures**	**Date**	**ID**	**Expenditures**	**Counties Affected**	**Description**
4/28/1973	Wildfire		$36,718				Statewide	
4/22/1975	Wildfire		$8,923				Statewide	
4/21/1978	Wildfire		$11,528				Statewide	
4/16/1979	Wildfire		$204,207				Statewide	
6/2/1980	Wildfire		$298,845				Statewide	
6/16/1980	Wildfire						Statewide	AZ Executive Order 81-5: [Terminating the Declaration of a State of Emergency of June 16, 1980 (caused by a severe forest and grassland fire contingency) and returning all unexpended funds authorized by A.R.S. º 35-192 to the General Fund.
6/26/1981	Wildfire						Statewide	Fire suppression assitance
6/30/1981	Wildfire		$256,904				Statewide	
6/30/1982	Wildfire		$492,635				Statewide	
09/09/1993	Wildfire	94002	$200,000				Statewide	Statewide wildfire suppression - State Land Department
6/30/1994	Wildfire						Statewide	AZ Executive Order 94-9: In Accordance with Established Emergency Procedures declare a state of emergency in Apache, Cochise, Coconino, Gila, Graham, Greenlee, LaPaz, Maricopa, Mohave, Navajo, Pima, Pinal, Santa Cruz, Yavapai and Yuma counties due to wildfire conditions pursuant to A.R.S. º 37-623.02 effective June 30, 1994.
10/14/1994	Wildfire	95003	$600,000				Statewide	Statewide wildfire suppression - State Land Department
05/16/1996	Wildfire	96004	$1,000,729				Statewide	Statewide wildfire suppression - State Land Department
05/06/1999	Wildfire	99004	$4,894				Statewide	Statewide wildland fire emergency
5/2/2003	Wildfire	23003	$2,378,020				Statewide	Forest Health Emergency - As a result of the on-going drought conditions the forests within our state have been infested with the Pine Bark Beetle. This proclamation will expedite the clearing of dead, dying and diseased trees and other vegetation that interfere with emergency response and evacuation needs.
2/22/2006	Wildfire	26006	$192,390				Statewide	On February 22, 2006, the Governor declared an emergency due to the driest winter in recorded history coupled with above average temperatures and the earliest recorded start to a wildfire season. The entire state was threatened by extreme wildfire hazards. The 2006 state wildfire presuppression resources strategy required additional financial support. The declaration provided $200,000 for pre-suppression resources to the Arizona State Land Department, Office of State Forester and the Arizona Division of Emergency Management.
1/18/2010	Winter Storm	20102		3/18/2010	EM-3307 DR-1888	$14,210,904	Apache, Coconino, Gila, Greenlee, La Paz, Maricopa, Mohave, Navajo, Yavapai, Hopi Tibe, Navajo Nation	January 18-22, 2010. Severe winter weather hit the northern part of the state and heavy rains fell in the lower elevations causing significant flooding. In February, the Governor declared a State of Emergency and in March, the President declared a major disaster for Arizona. Preliminary damage assessment reports indicated that 51 residences were destroyed, 64 sustained major damage and 474 more were affected or received minor damage. The total individual assistance cost was estimated at $3.6 million. Public assistance damages were primarily related to roads and bridges throughout the impacted areas with over $11.4 million in damages estimated

State of Arizona Declaration				Damage Estimates			
Date	**Hazard**	**Fatalities**	**Injuries**	**Property**	**Crop/Livestock**	**Total**	**Sources**
4/28/1973	Wildfire					$0	ADEM, 2008
4/22/1975	Wildfire					$0	ADEM, 2008
4/21/1978	Wildfire					$0	ADEM, 2008
4/16/1979	Wildfire					$0	ADEM, 2008
6/2/1980	Wildfire					$0	ADEM, 2008
6/16/1980	Wildfire					$0	ADEM, 2008
6/26/1981	Wildfire					$0	ADEM, 2008
6/30/1981	Wildfire					$0	ADEM, 2008
6/30/1982	Wildfire					$0	ADEM, 2008
09/09/1993	Wildfire					$0	ADEM, 2008
6/30/1994	Wildfire					$0	ADEM, 2008
10/14/1994	Wildfire					$0	ADEM, 2008
05/16/1996	Wildfire					$0	ADEM, 2008
05/06/1999	Wildfire					$0	ADEM, 2008
5/2/2003	Wildfire					$0	ADEM, 2008
2/22/2006	Wildfire					$0	ADEM, 2008
1/18/2010	Winter Storm					$0	ADEM, 2010

Greenlee County Undeclared Events September 1960 to December 2015				
Hazard	**No. of Records**	**Recorded Losses**		
		Fatalities	**Injuries**	**Damage Costs ($)**
Dam Failure	**0**	**0**	**0**	**$0**
Drought	**0**	**0**	**0**	**$0**
Earthquake	**0**	**0**	**0**	**$0**
Fissure	**0**	**0**	**0**	**$0**
Flooding	**14**	**3**	**0**	**$362,000**
Landslide/Mudslide	**0**	**0**	**0**	**$0**
Levee Failure	**0**	**0**	**0**	**$0**
Severe Wind	**7**	**0**	**0**	**$93,500**
Subsidence	**0**	**0**	**0**	**$0**
Wildfire	**15**	**0**	**16**	**$10,050,000**
Winter Storm	**0**	**0**	**0**	**$0**

Notes: Damage Costs include property and crop/livestock losses and are reported as is with no attempt to adjust costs to current dollar values. Furthermore, wildfire damage cost do not include the cost of suppression which can be quite substantial. Sources: ADEM, NCDC, NWCG, NWS, USFS

						Damage Estimates			
Date	Hazard	Description	Location	Fatalities	Injuries	Property	Crop/Livestock	Total	Data Source
8/1/1934	Flooding	One of the worst floods in thirty years occurred on the Gila River. The flood drove many residents from Duncan, Greenlee county, swept livestock away, and stopped railroad and highway traffic. Damage was estimated at $15,000 (Ingram 19).	DUNCAN			$15,000		$15,000	Tucson NWS Web Page, 2005
9/9/1980	Flooding	An infant girl and her 2-year-old brother drowned after they were swept from their mother's arms by the raging water of Railroad Wash, near Franklin. A 3-year-old sister also drowned as they were trying to reach the highway on higher ground a short distance from their mobile home. They were caught in a very sudden surge of water that had built up as a result of 4 inches of rain upstream in New Mexico during the afternoon and evening (Sellers et al. 72).	Franklin	3		$0		$0	Tucson NWS Web Page, 2005
9/5/1991	Flooding	Rainfall was locally heavy around many areas of the state this afternoon. A very moist and unstable air mass set the stage for strong thunderstorms that developed by late afternoon. A motorist near Clifton escaped her car just before raging flood waters along Ward's Canyon Road swept it away. Attempts to save the car and the motorist's belongings failed (Storm Data).	Clifton			$20,000		$20,000	Tucson NWS Web Page, 2005
7/12/2002	Severe Wind	A severe thunderstorm developed and moved over the town of Duncan. At 5:25 pm MST, spotters reported shingles being blown off roofs and roofs being blown off of two houses.	DUNCAN			$40,000		$40,000	NCDC, August 2004
8/6/2002	Flooding	Over a four day period, thunderstorms developed over the Duncan causing two washes to overflow on the evening of the 7th. More than four inches of rain was recorded from a rain gage a few miles north of Duncan over the four day period. Officials reported that rainfall from the four day period caused Railro wash to overflow a bridge on Highway 70 which closed the road for a couple of hours. The Packer was in the Hunter Estates area was also washed out but was repaired and passable. A particular area of flash flooding near Lordsburg Flats caused a house to be flooded with 3 inches of mud. No injuries were reported.	DUNCAN			$100,000		$100,000	NCDC, August 2004
6/6/2003	Wildfire	Thomas Fire -a lightning caused fire that burned an area 16 miles south of Alpine, Arizona. The fire started June 6, 2003, was controlled July 18, 2003, and burned a total of 10,618 acres with over $3,500,000 in fire suppression costs.						$0	GACC, 2010
7/5/2003	Wildfire	Maverick Fire - a lightning cause fire that burned an area 13 miles east of Clifton, Arizona. The fire started July 5, 2003 and was controlled July 13, 2003, and burned a total of 2,000 acres with over $85,000 in fire suppression costs,						$0	GACC, 2010
7/5/2003	Wildfire	Maple Fire - a lightning caused fire that burned an area 25 miles northeast of Clifton, Arizona. The fire started July 5, 2003 and was controlled July 18, 2003, and burned a total of 2,850 acres with over $200,000 in fire suppression costs.						$0	GACC, 2010
7/12/2003	Wildfire	Blue River Complex - a lightning caused fire that burned an area south of Alpine, Arizona. The fire started July 12, 2003 and burned a total of 18,600 acres with over $6,233,034 in fire suppression costs.						$0	GACC, 2010
5/16/2004	Wildfire	Rose Fire - a human caused fire that burned an area 30 miles north of Clifton, Arizona. The fire started May 16, 2004 and was controlled May 24, 2004, a burned a total of 780 acres with $594,489 in fire suppression costs.						$0	GACC, 2010
5/17/2004	Wildfire	KP Fire - a human caused fire that burned an area 20 miles south of Alpine, Arizona. The fire started May 17, 2004 and was controlled August 19, 2004, a burned a total of 16,625 acres with $2,024,202 in fire suppression costs.			6			$0	GACC, 2010
6/15/2006	Wildfire	Beaverhead Fire - the cause of the fire is under investigation that burned an area 15 miles south of Alpine on Highway 191. The fire started June 15, 2006 and was controlled June 26, 2006, and burned a total of 1,497 acres with over $838,482 in fire suppression costs.						$0	GACC, 2010
7/8/2006	Wildfire	Auger WFU Fire - a lightning caused fire that burned an area 21 miles northwest of Glenwood, New Mexico; 24 miles south of Alpine, Arizona. The fire started July 8, 2006 and was controlled August 15, 2006, and burned a total of 137 acres with over $81,000 in fire suppression costs.						$0	GACC, 2010
7/26/2006	Flooding	A county official reported that Ward Canyon and Limestone Canyon had several feet of water flow through them between 2245 MST and 2300 MST. Limestone Canyon had an area of significant road damage.	Clifton			$30,000		$30,000	NCDC, April 2010
9/13/2006	Flooding	Law enforcement in the City of Clifton reported a flash flood along Ward Canyon Road. The flash flooding continued towards the Town of Duncan, where Railroad Wash overtopped Highway 70 along the east side of the town. Arizona Department of Transportation closed Highway 70 at Railroad Wash due to the flood waters. One home was flooded in Duncan from the overflow of Railroad Wash.	Clifton			$15,000		$15,000	NCDC, April 2010
6/30/2007	Wildfire	Chitty Fire - the lightning caused fire that burned an area 6 miles SSW of Hannagan Meadows, Arizona. The fire started June 30, 2007 and was controlled July 16, 2007, and burned a total of 14,200 acres with one reported injury.			1			$0	GACC, 2010
7/14/2007	Severe Wind	Eight flagpoles were knocked down at Mares Bluff Veterans Memorial in Clifton. Another flagpole was partially knocked down, being supported by wires. Evening thunderstorms caused strong winds across portions of Graham and Greenlee County.	2 miles South South East of Clifton			$7,500		$7,500	NCDC, April 2010
4/22/2008	Wildfire	Eagle Fire - the human caused fire that burned an area 35 miles south of Alpine, Arizona. The fire started April 22, 2008 and burned a total of 3,852 acres with over $100,000 in fire suppression costs.						$0	GACC, 2010
6/22/2008	Wildfire	Hot Air Fire - the lightning caused fire that burned an area 39 miles southeast of Alpine, Arizona. The fire started June 22, 2008 and was controlled July 7 2008, and burned a total of 8,300 acres with over $562,000 in fire suppression costs.			1			$0	GACC, 2010
9/7/2009	Wildfire	Reno Fire - the lightning caused fire that burned an area 23 miles southwest of Alpine, Arizona. The fire started September 7, 2009 and was controlled December 8, 2009, and burned a total of 6,322 acres with over $212,582 in fire suppression costs.						$0	GACC, 2010
6/7/2010	Wildfire	Boggy Complex Fire - the lightning caused fire that burned an area 18 miles west-southwest of Alpine, Arizona. The fire started June 7, 2010 and was controlled July 20, 2010, and burned a total of 820 acres with over $1,558,930 in fire suppression costs.						$0	GACC, 2016
7/17/2010	Severe Wind	Severe thunderstorm winds caused damage near the village of Sheldon in Greenlee County. Several trees were uprooted, and a backyard trampoline was blown 100 yards by the thunderstorm winds. Doors of mobile homes were blown inward. Wind magnitude of 61 knots reported	Sheldon			$5,000		$5,000	NCDC, 2011
9/22/2010	Flooding	Thunderstorms developed over Clifton around 4:30 pm and intense rainfall resulted. According to Clifton officials, 2.25 inches fell in about 45 minutes, on already saturated soil. The storm resulted in tons of mud and rock piled on city streets. Two unoccupied vehicles parked on Turner Avenue were washed down Ward's Canyon and into the San Francisco River. A third vehicle was tossed onto its side in the canyon about 100 yards from the canyon's confluence with the river. Flash flooding also resulted in damage to a main water line feeding Clifton.	Clifton			$50,000		$50,000	NCDC, 2011

						Damage Estimates			
Date	**Hazard**	**Description**	**Location**	**Fatalities**	**Injuries**	**Property**	**Crop/Livestock**	**Total**	**Data Source**
2/2/2011	Frost/Freeze	Temperatures dropped into the single digits across the Gila River Vally with wind chills dropping as low as -10 degrees. As a result, a water main line broke at Fifth Avenue and Second Street. More than 100 calls were received by Safford Utility in response to frozen pipes that later turned to broken pipes. Safford Fire Department responded to more than a dozen calls for malfunctioning sprinkler systems. Some businesses that received minor water damage were the Arizona Credit Union, the Veterans Administration Office and Thriftee Supermarket. ‖In Thatcher, the Fire Department responded to the Thatcher school where sprinkler systems and backflow preventers in several buildings burst. ‖Pima also had numerous water lines burst as a result of the cold. One pipe burst at the entrance to the Pima Fire Station. The Graham County Jail also had water damage sustained in the honor pod by a broken pipe.‖Fire Departments in Safford, Thatcher and Pima also responded to fires involving space heaters and candles used to keep water pipes from freezing.		0	0	$300,000	$0	$300,000	NCDC, 2016
5/29/2011	Wildfire	Wallow Fire - the largest fire in the history of Arizona burned a significant portion of the White Mountains near Springerville and Alpine, Arizona. The fire started May 29, 2011 and was controlled July 12, 2011, burning a total of 538,049 acres with over $109 million in fire suppression costs. Five residences and one outbuilding were damaged, and 32 residences, 36 outbuildings and 4 commercial structures were completely destroyed. Total damages are estimated to exceed $10 million		0	8	$10,000,000		$10,000,000	GACC, 2016
7/1/2011	Wildfire	The Wallow Fire saw very little spread during the beginning of July thanks to very beneficial moisture. The fire was officially contained on July 8, 2011 at 1800 MST. A total of 538,049 acres were charred with around 100,000 acres charred in northern Greenlee County. Most of the structure damage and injuries were sustained north of Tucson's warning area, however, a few outbuildings were destroyed in Greenlee County. Crews stayed on scene throughout the much to monitor hot spots and work to mitigate the flash flood concerns due to the burn scar.		0	0	$50,000	$0	$50,000	NCDC, 2016
7/11/2011	Flooding	Heavy rain fell over portions of the Wallow Fire burned White Mountains resulting in flash flooding near Hannagan Meadow. A mud slide from rapid runoff forced the closure of Highway 191 from mile marker 232 to 239.	HANNAGAN MEADOW	0	0	$1,000	$0	$1,000	NCDC, 2016
8/23/2011	Flooding	Heavy rainfall resulted in flash flooding along the San Francisco River in southern Clifton. The flooding was confined to Ward Canyon where a few homes sustained minor water damage along Ward Canyon Road.	CLIFTON	0	0	$25,000	$0	$25,000	NCDC, 2016
9/6/2012	Severe Wind	Thunderstorm winds blew down an open ended Quonset hut outbuilding and a trailer in Hunter Estates near Duncan. Another trailer sustained considerable roof damage.	FOX	0	0	$25,000	$0	$25,000	NCDC, 2016
9/6/2012	Flooding	Up to three inches of rain fell in Duncan, causing flash flooding of most streets in Duncan's Hunter Estates where one home was also flooded. A wash that parallels and but remains just northwest of Carlisle Road climbed to a depth of about 8 feet, flooded Fairgrounds Road. Trees and other debris in the flood waters caused minor surface damage to the bridge at Fairgrounds Road before the waters entered the Gila River.	FOX	0	0	$25,000	$0	$25,000	NCDC, 2016
8/27/2013	Severe Wind	Strong outflow from a light rain shower collapsed part of a crudely supported porch attached to a house southwest of Pima, AZ. A nearby carport was undamaged.		0	0	$10,000	$0	$10,000	NCDC, 2016
8/29/2013	Flooding	Brief heavy rain caused mud to slide downhill, temporarily closing Highway 191 in Clifton near the old train depot. Debris was up to four feet deep across the roadway.	CLIFTON	0	0	$1,000	$0	$1,000	NCDC, 2016
9/14/2013	Flooding	During the evening of September 13th, heavy rain occurred along the Campbell Blue Creek near the headwaters of the Blue River in Arizona, which was an area that was affected by the 2011 Wallow Fire. Heavy rain also fell along Turkey Creek in Arizona and the Dry Blue Creek in New Mexico. Runoff continued downstream to the confluence of the Campbell Blue and Dry Blue Creeks, which forms the Blue River. In addition, heavy rain occurred during the evening of the 14th in Arizona and New Mexico, swelling the tributaries of the Blue River upstream of the community of Blue, Arizona. Multiple crests in the Blue River two to four feet above flood stage resulted. Sections of Blue River Road were washed out, isolating residents of the community. The Campbell Blue Bridge, which is a 30 foot concrete bridge just across the state line in New Mexico, was completely washed out. Electrical and telephone lines were damaged by the flooding. A utility company truck rolled into Turkey Creek after the adjacent flood-compromised road gave way. The driver was able to escape the six foot deep flowing water without injury.	SPRUCEDALE	0	0	$50,000	$0	$50,000	NCDC, 2016
8/1/2014	Flooding	Three inches of rain in less than an hour caused flash flooding in Duncan. One home was flooded with water up to 3 feet deep and damage was sustained to car wash structure. Two to three feet of water cover part of Highway 70 on the northwest edge of Duncan.	DUNCAN	0	0	$20,000	$0	$20,000	NCDC, 2016
7/10/2015	Severe Wind	Duncan Valley Electric reported a power pole down in Franklin.	FRANKLIN	0	0	$1,000	$0	$1,000	NCDC, 2016
8/17/2015	Severe Wind	Thunderstorm wind damage occurred at the Greenlee County Fairgrounds. One power pole was knocked over and the horse stalls building sustaining significant roof damage.	FOX	0	0	$5,000	$0	$5,000	NCDC, 2016
10/6/2015	Flooding	A mix of hail and rain caused flooding throughout the Town of Clifton with major debris and mud flows in the Chase Creek area and Highway 191 near the train depot, and many other areas of the town. Roads were closed for several hours.	CLIFTON	0	0	$10,000		$10,000	Town of Clifton

Appendix E

Plan Maintenance Review Reports