



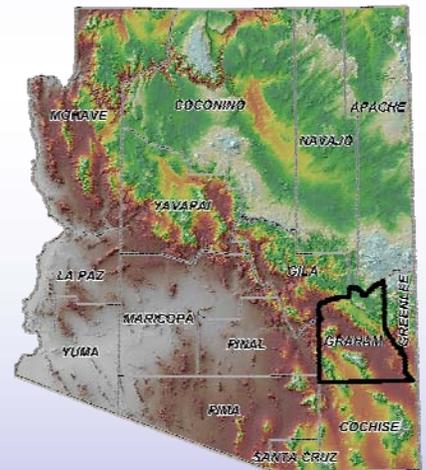
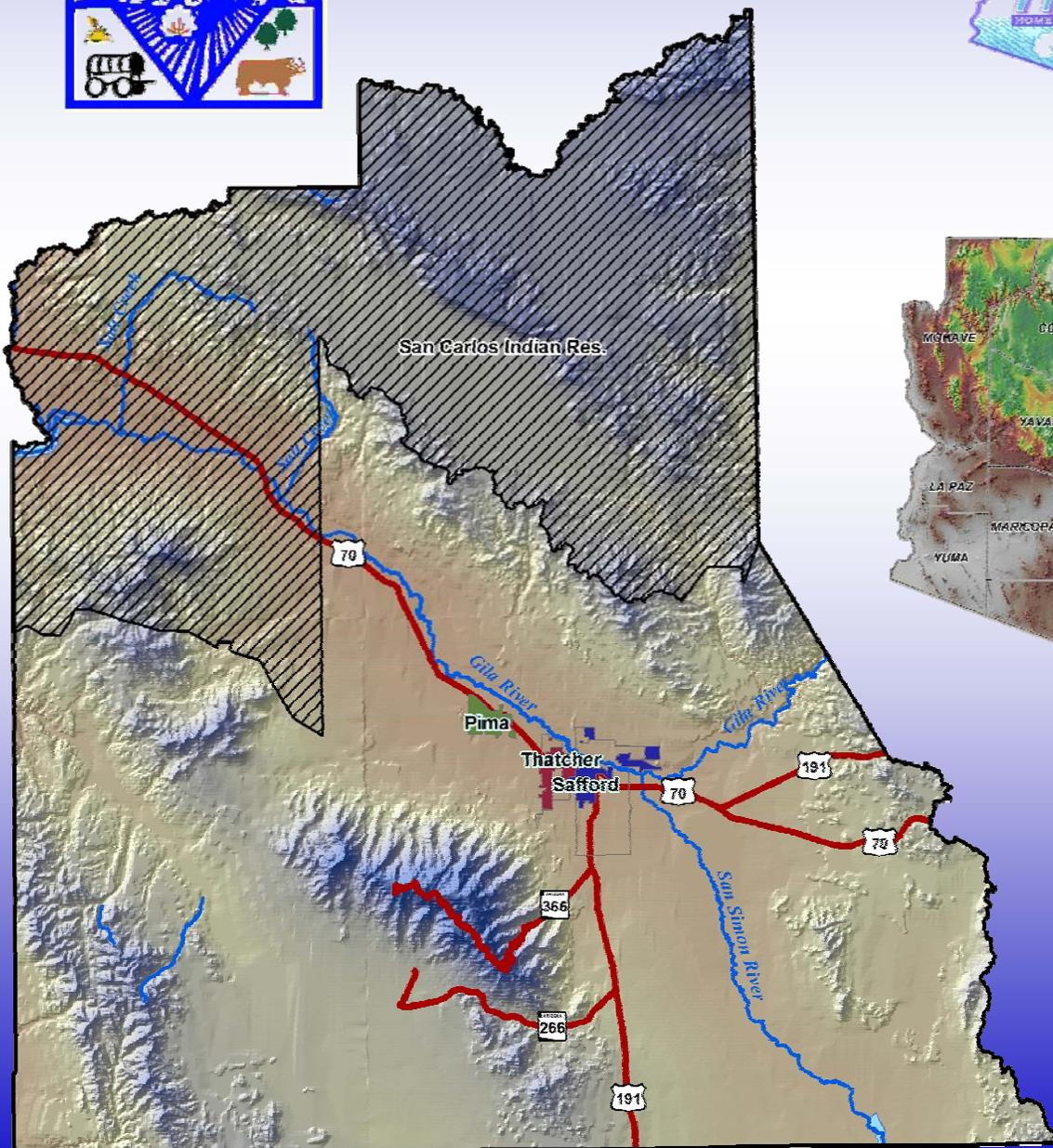
# Graham County Multi-Jurisdictional Hazard Mitigation Plan 2010

Town of Pima



City of Safford

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## **EXECUTIVE SUMMARY**

Across the United States, natural and human-caused disasters and emergencies have led to increasing levels of death, injury, property damage, and interruption of business and government services. As a result, 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 53 federal or state declarations, 42 other significant events, and a combined total of 95 disaster events recorded, the four jurisdictions within Graham 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. Graham County and participating jurisdictions know that with careful selection, mitigation actions in the form of projects and programs can become long-term, cost effective elements for reducing the impact of natural and certain human-caused hazards.

The elected and appointed officials of Graham County, Pima, Safford and Thatcher demonstrated their commitment to hazard mitigation in 2004-2005 by preparing the first set of Single Jurisdiction Multi-Hazard Mitigation Plans (2005 Plans). The 2005 Plans were developed through a planning effort that resulted in an unincorporated county plan and three city/town plans. The 2005 Plans were approved by FEMA during a period between August 29, 2005 and October 20, 2005, and require full, FEMA approved, updates prior to the subsequent five year expiration.

In response, the Arizona Division of Emergency Management (ADEM) secured a federal planning grant and hired JE Fuller/ Hydrology & Geomorphology, Inc. to assist the County and participating jurisdictions with the update process. Graham County reconvened a multi-jurisdictional planning team comprised of veteran and first-time representatives from each participating jurisdiction, various county departments and organizations, ADEM, local fire districts, and the Graham County Flood Control Districts. The Planning Team met five times during the period of November 2008 through April 2010 in a collaborative effort to review, evaluate, and update the 2005 Plans into a single, consolidated Graham County Multi-Jurisdictional Hazard Mitigation Plan (Plan). The 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 Graham County Planning Team.

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## SECTION 1: JURISDICTIONAL ADOPTION AND FEMA APPROVAL

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

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

### 1.1 DMA 2000 Requirements

#### 1.1.1 General Requirements

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

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

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

- Hazard Mitigation Grant Program (HMGP)
- Pre-Disaster Mitigation (PDM)
- Flood Mitigation Assistance (FMA)
- Severe Repetitive Loss (SRL)

FEMA, at its discretion, may also require a local mitigation plan under the Repetitive Flood Claims (RFC) program as well.

#### 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. Graham County, and the incorporated communities of Pima, Safford and Thatcher all currently have FEMA approved hazard mitigation plans. The Plan is the result of an update process performed by the Graham County jurisdictions to both update and consolidate individual community plans developed in 2005.

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<sup>1</sup> FEMA, 2008, *Local Multi-Hazard Mitigation Planning Guidance*

**1.2 Official Record of Adoption**

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

- Graham County
- City of Safford
- Town of Pima
- Town of Thatcher

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 Division of Emergency Management (ADEM), 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 2004 and 2005, Graham County and the incorporated communities of Pima, Safford and Thatcher, participated in a multi-jurisdictional mitigation planning process that resulted in the development of separate stand-alone plans for each participating jurisdiction. The San Carlos Apache Tribe also participated initially and then later finished the planning process separately. The following is a list of the plans that were produced:

- *Graham County Multi-Hazard Mitigation Plan*
- *City of Safford Multi-Hazard Mitigation Plan*
- *Town of Pima Multi-Hazard Mitigation Plan*
- *Town of Thatcher Multi-Hazard Mitigation Plan*

Collectively and individually, these plans will be referred to herein as the 2005 Plan. The 2005 Plan received official FEMA approval ranging from August 29, 2005 to October 20, 2005. The 2005 Plans are nearing the end of the 5-year planning cycle and the first of the single-jurisdictional plans will expire August 29, 2010.

### **2.2 Plan Purpose and Authority**

The purpose of the Plan is to identify natural hazards that impact the various jurisdictions located within Graham 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 2005 Plans listed in Section 2.1.

Graham County and all of the Cities and Towns are political subdivisions of the State of Arizona and are organized under Title 9 (cities/towns) and Title 11 of the Arizona Revised Statutes (ARS). 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 State of Arizona from FEMA. JE Fuller/ Hydrology & Geomorphology (JE Fuller) was retained by Arizona Division of Emergency Management (ADEM) to provide consulting services in guiding the update planning process and Plan development.

The following jurisdictions participated and are included in this Plan:

- Graham County
- City of Safford
- Town of Pima
- Town of Thatcher

### **2.3 General Plan Description**

The Plan is generally arranged and formatted to be consistent with the 2007 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 Plan acronyms and a glossary of definitions.

**2.4 Overall Plan Update Process**

The Plan is the result of a thorough update process that included a section by section review and evaluation of the 2005 Plans by the planning participants. As previously stated, the individual 2005 Plans are being consolidated into a single, multi-jurisdictional plan with this update. Accordingly, the final arrangement of the Plan is different from the 2005 Plans.

At the onset of the planning process, ADEM printed a copy of each of the 2005 Plans and provided them to each respective jurisdiction as a working document for their review and use during the planning process. This way the jurisdictions could keep their original 2005 Plan intact and unmarked. Digital versions of the Graham County 2005 Plan were made available to planning team members not directly associated with a specific jurisdiction. The Planning Team reviewed each section of the 2005 Plan(s) during the first meeting, wherein the plan purpose was explained, sections were discussed, and the plans’ relation to the DMA 2000 requirements were summarized. Using the existing Plan(s), gave way to discussions on how to update and improve the Plan. Planning participants were requested bring their working copy to every meeting as the team stepped through each stage of the update process. Table 2.1 summarizes the review and analysis of each section of the 2005 Plans and generally describes what changes were or were not made and why. Additional details of that process are also discussed in the Plan sections as well.

<b>Table 2-1: Summary of 2005 Plan review and 2010 Plan correlation</b>		
<b>2005 Plan Section</b>	<b>2010 Plan Section</b>	<b>Review and Changes Description (2005 Plan to the 2010 Plan)</b>
1	1, 2, and 4	<ul style="list-style-type: none"> <li>• Plan format changes were made to make the Plan more compatible with the 2007 State Plan format.</li> <li>• General plan descriptions were changed to reflect the update process, the new plan format, and authorizations</li> <li>• Community descriptions were compiled to provide both a county-wide and jurisdiction specific depiction. Much of the original text was kept. Time sensitive data such as demographics, climate statistics, and incorporated community boundaries were updated with the latest information available.</li> <li>• Descriptions of development history were updated to reflect the last five years.</li> </ul>
2	3	<ul style="list-style-type: none"> <li>• The 2005 Plan contacts were updated as necessary and recompiled into Section 3 of the 2010 Plan. The review concluded that the original Section 2 data did not warrant a separate section and it could be added to Section 3.</li> </ul>
3	3	<ul style="list-style-type: none"> <li>• Section 3 was expanded to include evaluation summaries and to better describe the planning team development.</li> <li>• Added a column to the table listing the planning team participants to describe their roles</li> <li>• Decided to keep the table format summarizing the planning team meetings and agendas, but provide supplemental meeting minutes in an Appendix</li> <li>• Provided a new section to address agency/organization participation and changes between the 2005 Plan and 2010 Plan participation</li> </ul>

<b>Table 2-1: Summary of 2005 Plan review and 2010 Plan correlation</b>		
<b>2005 Plan Section</b>	<b>2010 Plan Section</b>	<b>Review and Changes Description (2005 Plan to the 2010 Plan)</b>
4	5	<ul style="list-style-type: none"> <li>• Risk Assessment changed from Section 4 to Section 5</li> <li>• The whole structure of the risk assessment was revised to provide a hazard based approach to the subsections. The planning team felt this would make the plan easier to understand and follow.</li> <li>• Each hazard profile and vulnerability analysis was carefully updated to reflect either more current or totally new data.</li> <li>• Asset inventories were updated and refined to make them more complete and current.</li> </ul>
5	6	<ul style="list-style-type: none"> <li>• Mitigation Strategy changed from Section 5 to Section 6</li> <li>• A review of the goals and objectives subsection resulted in a significant change to much simpler goals and objectives. Reasoning for the changes are summarized in Section 6.1</li> <li>• Tables 5.1 and 5.4 of the capability assessment were compiled into one table to provide an “at-a-glance” summary of these elements. The details of the old Table 5.4 were relegated to the reference lists provided at the end of each hazard subsection of the new Plan Section 5.3 and at other locations throughout the Plan where the documents are referenced.</li> <li>• Tables summarizing previous mitigation activities for each jurisdiction were provided to document past mitigation activities</li> <li>• Section addressing the NFIP program was added in compliance to requirement changes from the 2005 Plan to the 2010 Plan</li> <li>• Each mitigation action/project in the 2005 Plan were reviewed and assessed by the respective jurisdiction. Tables summarizing the results are provided</li> <li>• Planning team chose to combine the old tables 5.5 and 5.6 into one table to have all the details of the new mitigation actions/projects in one table.</li> </ul>
6	7	<ul style="list-style-type: none"> <li>• Plan Maintenance Procedures changed from Section 6 to Section 7.</li> <li>• In general, the review of this section highlighted the lack of plan maintenance actually performed and forced a better definition of future efforts. It is anticipated that a multi-jurisdictional plan will provide the platform for a more regular review.</li> <li>• Added text to discuss review past plan maintenance activities and reasons for successes/failures.</li> <li>• Identified the need to expand Section 7.3 to provide a better explanation of plan incorporation by each of the jurisdictions.</li> <li>• Identified a need to provide more definition and specificity to the approach in Section 7.4. Revised to be more specific in the types and schedules of future public involvement opportunities.</li> </ul>

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## **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 Graham County. In addition, the necessary public involvement meetings and actions that were applied to this process are also detailed.

### **3.1 Update Process Description**

ADEM applied for and received a PDM planning grant to fund a multi-jurisdictional effort to review, update and consolidate the 2005 Plan. Once the grant was received, ADEM 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 ADEM was convened August 26, 2008 to begin the plan update process, outline the plan objectives, outline the meeting dates and agendas for the plan update efforts, and to discuss the new plan format and other administrative tasks. Initial points of contact were also established. A total of five Planning Team meetings were conducted over the period of November 2008 to April 2010, beginning with the first meeting on November 12, 2008. Throughout that period of time, all the work required to collect, process, and document updated data and make changes to the plan was performed, culminating in draft of 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 2005 Plans. This was initially discussed by ADEM and JE Fuller prior to the county planning team kickoff meeting. The previous planning approach included a blended use of multi-jurisdictional planning team meetings and individual local planning team meetings within each jurisdiction, all facilitated by JE Fuller. This was mostly due to the development of individual plans for each participating jurisdiction and the difficulty in getting the needed data acquired. The process worked moderately well, but required a tremendous amount of time and expense that is not available for the Plan update process. A conclusion of the 2005 Plans process assessment was that the new planning process and approach would result in a paradigm shift away from individual plans and planning meetings, and will require a slightly different strategy in gathering and compiling the Plan information. The result will be a true multi-jurisdictional plan (one document for all participating jurisdictions).

The Plan update process was presented and discussed at the first multi-jurisdictional planning team meeting and was contrasted to the 2005 Plan approach. Less than half of the planning team members were involved with the development of the 2005 Plan, so there was some institutional knowledge of the prior process.

### **3.3 Primary Point of Contact**

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

<b>Jurisdiction</b>	<b>Name</b>	<b>Department / Position</b>	<b>Address</b>	<b>Phone</b>	<b>Email</b>
Graham County	Brian Douglas	Graham County Health Dept, Emergency Management Office – Deputy Director	826 W. Main St., Safford, AZ 85546	928-428-0110	bdouglas@graham.az.gov
Pima	Gerald Schmidt	Town Manager	110 W. Center Street , P.O. Box 426, Pima, AZ 85543	928-485-2611	gschmidt@graham.az.gov
Safford	Randy Petty	Engineering Department – City Engineer	P.O. Box 272, 405 W. Discovery Park Blvd., Safford, AZ 85548-0272	928-432-4261	nrpetty@ci.safford.az.us
Thatcher	Heath Brown	Engineering Department – Town Engineer	P.O. Box 970, 3700 W. Main St., Thatcher, AZ 85552	928-428-2290	hbrown@graham.az.gov

### **3.4 Planning Teams**

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

The role of the Planning Team was to work with the planning consultant to perform the coordination, research, and planning element activities required to update the 2005 Plans. Attendance by each participating jurisdiction was required for every Planning Team meeting as the meetings were structured to progress through the plan update process. Steps and procedures for updating the 2005 Plans were presented and discussed at each Planning Team meeting, and assignments were normally given. Each meeting built on information discussed and assignments given at the previous meeting. The Planning Team also had the responsibility of liaison to the Local Planning Team, and were tasked with:

- Conveying information and assignments received at the Planning Team meetings to the Local Planning Team
- Ensuring that all requested assignments was completed fully and returned on a timely basis.
- Arranging for review and official adoption of the Plan.

The function and role of the Local Planning Team was to:

- Provide support and data
- Assist the Planning Team representative in completing each assignment
- Make planning decisions regarding plan update components
- Review the Plan draft documents

#### *3.4.1 Planning Team Assembly*

At the beginning of the update planning process, Graham County organized and identified members for the core Planning Team by initiating contact with various county departments and all of the incorporated communities. Other entities invited to participate included the Graham County Electric Cooperative, Inc., Freeport-McMoRan Copper and Gold, Inc., ADOT, SEAGO, and the Eastern Arizona Courier. The participating members of the Planning Team are summarized in Table 3-2. Returning planning team members are highlighted.

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

<b>Name</b>	<b>Jurisdiction / Organization</b>	<b>Department / Position</b>	<b>Planning Team Role</b>
Heath Brown	Town of Thatcher	Engineering Department – Town Engineer	Planning Team representative and jurisdictional Point of Contact Lead coordinator for LPT
Michael Bryce	Graham County	Engineering – County Engineer	Planning Team participant Floodplain Management, CIP, and regulatory resource
Rob Chesley	City of Safford	Public Works Department – Superintendent	Planning Team participant Secondary Point of Contact Support in planning elements related to development Asset inventory and mitigation strategy development
Brian Douglas	Graham County	Emergency Management Office – Deputy Director	County Point of Contact Planning Team participant Lead coordinator for Local Planning Team Emergency management resource
John Griffin	City of Safford	Police Department – Police Chief	Planning Team representative Public safety resource
McCoy Hawkins	Graham County / Fort Thomas Fire District	GIS Department – GIS Manager / Fire Chief	Planning Team participant GIS data acquisition and management Hazard profile map development
Lee Hurston	Graham County	Highway Department – Operations Supervisor	Planning Team participant Transportation issues resource
Steve McGaughey	Graham County	Planning and Zoning Department – Safety Officer	Planning Team participant Asset inventory and public safety resource
Hank Metzger	Graham County	Health Department – Assistant Bio-Terrorism Coordinator	Planning Team participant Bio-Terrorism and health services resource
Jerry Nelson	Graham County	Sheriff’s Office – Captain	Planning Team participant Public safety resource
Mike Payne	Town of Thatcher	Fire Department / Planning and Zoning Department – Fire Chief / Inspector	Planning Team participant Wildfire management and building inspection resource
Randy Petty	City of Safford	Engineering Department – City Engineer	Planning Team representative and jurisdictional Point of Contact Lead coordinator for Local Planning Team Asset inventory, CIP, mitigation strategy resource
Gerald Schmidt	Town of Pima	Town Manager	Planning Team representative and jurisdictional Point of Contact Lead coordinator for Local Planning Team Performed majority of planning work for Town
Mark Stevens	Town of Thatcher	Police Department – Police Chief	Planning Team participant Public safety resource
W. Scott Ogden	JE Fuller/ Hydrology & Geomorphology, Inc.	Project Manager	Planning Team Lead Consultant Preparation and presentation of plan update elements
Sue Wood	ADEM	State/Local Mitigation Program Manager	Planning Team participant Project/Grant Manager State reviewer

Lists of Local Planning Team members and their respective roles, for each jurisdiction, are provided in Appendix B.

**3.4.2 Planning Team Activities**

The Planning Team met for the first time on February 20, 2009 to begin the plan update process. Three more meetings were convened on about a bi-monthly basis to step through the plan review and update process. Planning Team members used copies of the 2005 Plan for their jurisdiction for review and reference. Following each Planning Team meeting, the Point of Contact for each jurisdiction would convene meetings with the Local Planning Team as needed to work through the assignments. Table 3-3 summarizes the Planning Team meetings along with a brief list of the agenda items

discussed. Detailed meeting notes for all of the Planning Team meetings are provided in Appendix B. There are no details of the Local Planning Team meetings.

<b>Table 3-3: Summary of planning meetings convened as part of the plan update process</b>	
<b>Meeting Type, Date, and Location</b>	<b>Meeting Agenda</b>
Planning Team Meeting No. 1  <u>Initial Meeting:</u> November 12, 2008 Graham County BOS Room Safford, AZ	<ul style="list-style-type: none"> <li>• Team introductions</li> <li>• Present an overview of mitigation planning and the update process</li> <li>• Discussed converting from single to a true Multi-Jurisdictional Plan</li> <li>• Presented the Planning Team roles and responsibilities</li> <li>• Discussed the public involvement requirements</li> <li>• Discussed what is included in risk assessment</li> <li>• Next meeting set for December 17, 2008</li> <li>• Assignments included:                             <ul style="list-style-type: none"> <li>○ Identify a Point of Contact for each jurisdiction</li> <li>○ Issuing public notices through newspaper and website</li> <li>○ JEF provide historical hazard spreadsheets for review and augmentation.</li> <li>○ Providing inundation maps for Stockton Wash Dam</li> <li>○ Provide CPRI to each jurisdiction.</li> <li>○ JEF will provide asset inventory to jurisdictions for updating</li> <li>○ Each community will provide latest General Plan, city boundaries, and future critical facility locations</li> </ul> </li> </ul>
Planning Team Meeting No. 2  December 17, 2008  Graham County Assembly Room Safford, AZ	<ul style="list-style-type: none"> <li>• Reviewed status of action items from previous meeting</li> <li>• Presented mapping elements for hazards identified and cut-off date for new data</li> <li>• Provided and discussed ADWR listing of repetitive loss properties</li> <li>• Presented and discussed the need for capability assessment tables</li> <li>• Presented overview and discussed plan maintenance elements</li> <li>• Next meeting set for February 4, 2009</li> <li>• Assignments included:                             <ul style="list-style-type: none"> <li>○ JEF finish modifications of asset inventory and return to team for review</li> <li>○ M. Hawkins provide polygon coverage of RL lots in question</li> <li>○ JEF will provide new capability assessment tables using old plan data, distribute for update</li> <li>○ JEF will draft Plan Maintenance Section to reflect discussion and provide to Planning Team for review</li> </ul> </li> </ul>

<b>Table 3-3: Summary of planning meetings convened as part of the plan update process</b>	
<b>Meeting Type, Date, and Location</b>	<b>Meeting Agenda</b>
<p>Planning Team Meeting No. 3</p> <p>February 4, 2009</p> <p>Graham County Assembly Room Safford, AZ</p>	<ul style="list-style-type: none"> <li>• Task assignments status review                             <ul style="list-style-type: none"> <li>○ JEF finished modifications of asset inventory and returned to team for review.</li> <li>○ Email sent using County domain were not receiving the emails. Discovered emails being filtered and quarantined. B. Douglas and M. Hawkins will make sure JEF's email get through. (Done)</li> <li>○ M. Hawkins will provide polygon coverage to show the RL lots in question. (Done)</li> <li>○ JEF will put together new capability assessment table, etc. (Done)</li> <li>○ JEF will draft up a Plan Maintenance Section that reflects the discussions, etc. (Pending)</li> </ul> </li> <li>• Presented a list of 2005 goals and objectives and discussed.</li> <li>• Reviewed the existing mitigation actions/projects and each jurisdiction provided a status for each project.</li> <li>• Presented NFIP compliance and discussed.</li> <li>• Next meeting is set for March 24, 2009</li> <li>• Assignments included:                             <ul style="list-style-type: none"> <li>○ Check into all emails from JEF and let JEF know the results.</li> <li>○ All jurisdictions evaluate the Plan 2005 mitigation projects and forward to JEF.</li> <li>○ All jurisdictions shall provide corrected/revised asset inventory worksheets by no later than February 23, 2009.</li> </ul> </li> </ul>
<p>Planning Team Meeting No. 4</p> <p>March 24, 2009</p> <p>Graham County Assembly Room Safford, AZ</p>	<ul style="list-style-type: none"> <li>• Task assignments status review.                             <ul style="list-style-type: none"> <li>○ JEF allowed through firewall for email (Completed)</li> <li>○ 2005 Plan mitigation actions/projects evaluations and results forwarded to JEF. (Completed – except Pima and Safford, but will be completed soon)</li> <li>○ ALL jurisdiction to complete asset inventory (Completed)</li> </ul> </li> <li>• Presented results of vulnerability analysis to the Planning Team summarized by community which resulted in discussion.</li> <li>• Overview was provided on development of new mitigation actions and implementation strategy for all projects considered. JEF discussed the format of tables and provided examples.</li> <li>• Discussed ADEM documentation request of past mitigation activities</li> <li>• ADEM discussed ranking alternatives used by the State of Arizona and provided the factors and rating system.</li> <li>• Reviewed the NFIP compliance requirement and Planning Team brainstormed an action/project and implementation strategy for inclusion in the plan.</li> <li>• JEF discussed the final planning steps to FEMA review.</li> <li>• Assignments included:                             <ul style="list-style-type: none"> <li>○ JEF will distribute mitigation action/ implementation strategy template document for use by Planning Team</li> <li>○ All jurisdictions will complete the above document.</li> <li>○ All jurisdictions will provide a list of recent projects and actions that are a form of mitigation.</li> <li>○ Upon receipt of the completed Task assignments, JEF will finalize the draft plan and distribute to Planning Team for review.</li> </ul> </li> </ul>

<b>Meeting Type, Date, and Location</b>	<b>Meeting Agenda</b>
Planning Team Meeting No. 5  April 12, 2010  Graham County Assembly Room Safford, AZ	<ul style="list-style-type: none"> <li>• Discussed and reviewed outstanding task assignments</li> <li>• Discussed Plan incorporation mechanisms</li> <li>• Discussed future public involvement efforts</li> <li>• Discussed final plan development schedule</li> </ul>

**3.4.3 Agency/Organizational Participation**

The planning process used to develop the 2005 Plan included participation from several agencies and organizations, including the adopting jurisdictions, that operate within or have jurisdiction over small and large areas of Pinal County. At the start of the Plan update, a list of the stakeholder agencies and organizations that participated in the development of the 2005 Plan was compiled to provide continuity and institutional knowledge to the planning team and the overall update process. Invitations were sent via an email that was addressed to the original participant or their successor. The following were included on the invitation list, and included the following entities:

- Arizona Division of Emergency Management
- Arizona Department of Transportation
- City of Safford
  - Administration
  - Engineering
  - Police
  - Fire
  - Public Works
- Graham County
  - Administration
  - Engineering
  - Health
  - Highway
  - IT
  - GIS
  - Planning and Zoning
  - Sheriff
- J.E. Fuller/ Hydrology & Geomorphology, Inc.
- Town of Pima
  - Administration
  - Fire
- Town of Thatcher
  - Administration
  - Engineering
  - Fire

Table 3-4 summarizes the organizations and agencies that participated in the 2005 Plan and those that participated in the 2009-2010 Plan update process. An explanation of the differences between the two lists is also provided where appropriate.

<b>Agency / Organization</b>	<b>Participation</b>		<b>Explanation</b>
	<b>2005 Plan</b>	<b>2010 Plan</b>	
Arizona Division of Emergency Management	yes	yes	
Arizona Department of Transportation	yes	no	ADOT was invited to participate but did not send any representatives to the planning team meetings.
Gila Valley Irrigation District	yes	no	Only attended one of the 2005 Plan meetings and had no involvement after that. Accordingly no invitation was extended to attend planning team meetings, but verbal communication with the District is maintained by Graham County.
Qwest Communications	yes	no	Only attended first meeting of 2005 Plan effort and did not participate after that. Accordingly, no invitation was extended for 2010 Plan effort.
Town of Thatcher	yes	yes	
Town of Pima	yes	yes	
JE Fuller/ Hydrology & Geom.	yes	yes	
Graham County	yes	yes	
Gila Resources	yes	no	Gila Resources is owned and operated by the City of Safford, so the entity was represented via City of Safford participation

**Table 3-4: Comparative summary of agency/organization participation in the plan update process**

Agency / Organization	Participation		Explanation
	2005 Plan	2010 Plan	
Town of Duncan	yes	no	The Town Manager for Duncan attended the 2005 Plan meetings to learn about the DMA 2000 process on his own accord. No invitation was extended to Duncan as they will be planning with Greenlee County.
Arizona Department of Corrections	yes	no	ADOC participation was limited to the first meeting in the 2005 Plan effort. Accordingly, no invitation was extended for the 2010 Plan effort.
San Carlos Apache Tribe	yes	no	SCAT was invited to participate but did not send any representatives. It is noted that SCAT has their own Tribal Plan.
Bureau of Indian Affairs – San Carlos Office	yes	no	BIA attended the first 2005 Plan meeting at the request of SCAT. Since SCAT has their own Tribal Plan, no invitation was extended by Graham County
Mt. Graham Regional Medical Center	yes	no	With the 2010 Plan focusing on natural hazards and mitigation, MGRMC attendance was not deemed necessary. Hence no invitation was extended and communication with MGRMC, as needed, was done informally.
Eastern Arizona Courier	yes	no	The EAC was made aware of the meeting dates, although no formal invitation to the meetings was extended.
Valley Telecomm	yes	no	Only attended first meeting of 2005 Plan effort and did not participate after that. Accordingly, no invitation was extended for 2010 Plan effort.
Graham County Electric Co-op	yes	no	Only attended first meeting of 2005 Plan effort and did not participate after that. Accordingly, no invitation was extended for 2010 Plan effort.

The population for Graham County and Pima, Safford and Thatcher is relatively small and the majority of the county’s population is generally located within the area of the three incorporated communities. In this small community, members of the Planning Team hold multi disciplined roles and usually wear several hats. For instance, the PPOC for this plan represented Graham County Emergency Management, Graham County Health Department, Graham County Medical Examiner, and was also a spokesperson for the local funeral homes. All of the planning team members live within the planning area and not only represented their local jurisdiction, but also the greater public. Additional opportunities for participation in the planning process by organizations not directly represented on the Planning Team such as schools, non-profits, and businesses was extended using general public notices in the local newspaper and notices of the planning team activities posted on the county and local community websites.

An integral part of the planning process included coordination with agencies and organizations outside of the participating jurisdiction’s governance to obtain information and data for inclusion into the Plan or to provide more public exposure to the planning process. Much of the information and data that is used in the risk assessment is developed by agencies or organizations other than the participating jurisdictions. In some cases, the jurisdictions may be members of a larger organization that has jointly conducted a study or planning effort like the development of a community wildfire protection plan or participation in an area association of governments. Examples of those data sets include the FEMA floodplain mapping, severe weather statistics and incidents, and the South Eastern Arizona Governments Organization. A summary of the resources obtained, reviewed and compiled into the risk assessment are summarized at the end of each subsection of Section 5.3 and in Section 3.6. Jurisdictions needing these data sets obtained them by either requesting them directly from the host agency or organization, downloading information posted to website locations, or engaging consultants.

**3.5 Public Involvement**

*3.5.1 Previous Plan Assessment*

The pre-draft public involvement strategy for the 2005 Plan development included public notices and articles in the Eastern Arizona Courier, the development of a FAQ brochure for posting on the Graham

County website to distribute with the Gila Resources and Department of Corrections newsletters. A reporter for the Eastern Arizona Courier was also invited to attend all of the planning team meetings and wrote several corresponding articles in the EAC.

The post-draft strategy included posting the draft plan to the county website and requesting public comment and participation in the formal council and board of supervisors meetings wherein the 2005 Plans were presented and promulgated. 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 2005 Plan was made during a working session of the council/board. The final adoption of the resolutions were almost unanimously done as part of a consent agenda at a formal council/board meeting.

There were no records of any public comment on the 2005 Plan development and adoption process, despite all of the extra coverage provided by the EAC reporter. 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.

### *3.5.2 Plan Update*

Public involvement and input to the plan update process was encouraged cooperatively among all of the participating jurisdictions using several venues throughout the course of the pre-draft planning. The Graham County website was used to post a public notice of the planning activities and a public notice was also posted both in paper and digital form in the November 30, 2008 edition of the Eastern Arizona Courier. No questions, concerns, or responses were received from the first round of notices from the general public.

A post-draft public notice and copy of the draft plan was posted to the Graham County website. A similar public notice was run in the Eastern Arizona Courier. Both notices encouraged review and comment of the draft plan by the public. Interested citizens were also encouraged to participate in the local community adoption process which, depending upon the jurisdiction, may have included a public meeting and a formal public hearing. Copies of the public notices, web pages, and newspaper notices are provided in Appendix C.

## **3.6 Reference Documents and Technical Resources**

Over the course of the update planning process, numerous other plans, studies, reports, and technical information were obtained and reviewed for incorporation or reference purposes. The majority of sources referenced and researched pertain to the risk assessment and the capabilities assessment. To a lesser extent, the community descriptions and mitigation strategy also included some document or technical information research. 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.

<b>Table 3-5: List of resource documents and references reviewed and incorporated in the plan update process</b>		
<b>Referenced Document or Technical Source</b>	<b>Resource Type</b>	<b>Description of Reference and Its Use</b>
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. Used in the risk assessment.
Arizona Land Subsidence Group (2007)	Technical Resource	Resource for fissure and subsidence data. Used in the risk assessment.
Arizona Model Local Hazard Mitigation Plan	Hazard Mitigation Plan	Guidance document for preparing and formatting hazard mitigation plans for Arizona.
Arizona State Land Department	Data Source	Source for statewide GIS coverages (ALRIS) and statewide wildfire hazard profile information (Division of Forestry). Used in the risk assessment.
Arizona Wildland Urban Interface Assessment (2004)	Report	Source of wildfire hazard profile data and urban interface at risk communities. Used in the risk assessment.
Arizona Workforce Informer	Website	Source for employment statistics in Arizona.
Bureau Net (2010)	Website Database	Source for NFIP statistics for Arizona.
City of Safford General Plan (2004)	General Plan	Source for history, demographic and development trend data for the city.
City of Safford MHMP (2005)	Hazard Mitigation Plan	FEMA approved hazard mitigation plan that together with the other Graham County jurisdiction's MHMPs, formed the starting point for the update process. See Section 2.4 for further discussion
Climatology of Thunder Events in the Conterminous U.S., Part I: Temporal Aspects and Part II: Spatial Aspects	Technical Resource	Source for determining the frequency of thunder events in Arizona.
Climate Prediction Center (2010)	Hazard Data	Branch of NOAA/NWS with seasonal drought information
Earth Fissure Risk Zone Investigation Report (AMEC, 2006)	Hazard Data	Source of fissure risk data and historic fissure and subsidence events. Used in the risk assessment. Used in the risk assessment.
Environmental Working Group's Farm Subsidy Database (2009)	Website Database	Source of disaster related agricultural subsidies. Used in the risk assessment.
Federal Emergency Management Agency	Technical and Planning Resource	Resource for HMP guidance (How-To series), floodplain and flooding related NFIP data (mapping, repetitive loss, NFIP statistics), and historic hazard incidents. Used in the risk assessment and mitigation strategy.
Graham County Chamber of Commerce	Website	Source of county and community profile information.
Graham County Comprehensive Plan	Comprehensive Plan	Source for history, demographic and development trend data for the county.
Graham County GIS	GIS Data	Source for county-wide GIS data and supplemental asset inventory data sets. Used for maps and risk assessment.
Graham County MHMP (2005)	Hazard Mitigation Plan	FEMA approved hazard mitigation plan that together with the other PinalCounty jurisdiction's MHMPs, formed the starting point for the update process. See Section 2.4 for further discussion
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 (2007)	Technical Resource	Source for drought related projections and conditions. Used in the risk assessment.
National Inventory of Dams (2009)	Technical Resource	Database used in the dam failure hazard profiling. Used in the risk assessment.
National Response Center	Technical Resource	Source of traffic related HAZMAT incidents and rail accidents. Used in the risk assessment.

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

<b>Referenced Document or Technical Source</b>	<b>Resource Type</b>	<b>Description of Reference and Its Use</b>
National Weather Service	Technical Resource	Source for hazard information, data sets, and historic event records. Used in the risk assessment.
National Wildfire Coordination Group (2010)	Technical Resource	Source for historic wildfire hazard information. Used in the risk assessment.
Office of the State Climatologist for Arizona	Website Reference	Reference for weather characteristics for the county. Used for community description.
Safford Economic Development Corporation	Website Reference	Referenced for economic development statistics for the Safford area.
Southwest Incident Management Team	Website Data	Wildfire details related to the Nuttall Complex Fire.
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 (2007)	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.
Thatcher General Plan Update (2008)	General Plan	Source for history, demographic and development trend data for the town.
Town of Pima MHMP (2005)	Hazard Mitigation Plan	FEMA approved hazard mitigation plan that together with the other Pinal County jurisdiction's MHMPs, formed the starting point for the update process. See Section 2.4 for further discussion
Town of Thatcher MHMP (2005)	Hazard Mitigation Plan	FEMA approved hazard mitigation plan that together with the other Pinal 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. Forest Service	Technical Data	Source for local wildfire data. Used in the risk assessment.
U.S. Geological Survey	Technical Data	Source for geological hazard data and incident data. Used in the risk assessment.
Western Regional Climate Center	Website Data	Online resource for climate data used in climate discussion of Section 4
World Wildlife Fund (2010)	GIS Data	Terrestrial ecoregions database used in the general county description.

## SECTION 4: COMMUNITY DESCRIPTIONS

### 4.1 General

The purpose of this section is to provide updated basic background information on Graham 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 Geography

Graham County is located in southeastern Arizona as illustrated in Figure 4-1, and was formed in 1881 by the 11<sup>th</sup> Territorial Legislature. The county was named after Mount Graham, which is the highest peak in the area, and which was named after Lieutenant Colonel James Duncan Graham, a senior officer in the U.S Army Corps of Topographical Engineers. The City of Safford serves as the county seat and has done so since 1915.<sup>2</sup>

The county encompasses approximately 4,630 square miles and is generally bounded on the east and west by Longitudes 110.45 and 109.11 degrees West, and on the south and north between Latitudes 32.43 to 33.66 degrees North. Major transportation routes through the area are shown on Figure 4-2 and include U.S. Highway 70, U.S. Highway 191, State Route 170, State Route 266, State Route 366, and the Arizona Eastern Railroad.

The terrestrial characteristics of Graham County are quite diverse, ranging from the gradually sloping riparian corridor of the Gila River Valley with its adjoining agricultural areas, to the steeply inclined pine-oak forests located on Mount Graham and other parts of the Pinaleno and Santa Teresa Mountains. The majority of the county is comprised of high desert plains and foothills that are typical to the Sonoran and Chihuahuan Deserts as represented in Figure 4-2.

The geographical characteristics of Graham County have been mapped into four terrestrial ecoregions, which are depicted in Figure 4-2 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 varies between 3,000 to 4,500 feet. The average temperatures for the Chihuahuan Desert tends 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.

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<sup>2</sup> Arizona Department of Commerce, 2008, *Profile of Graham County, Arizona*

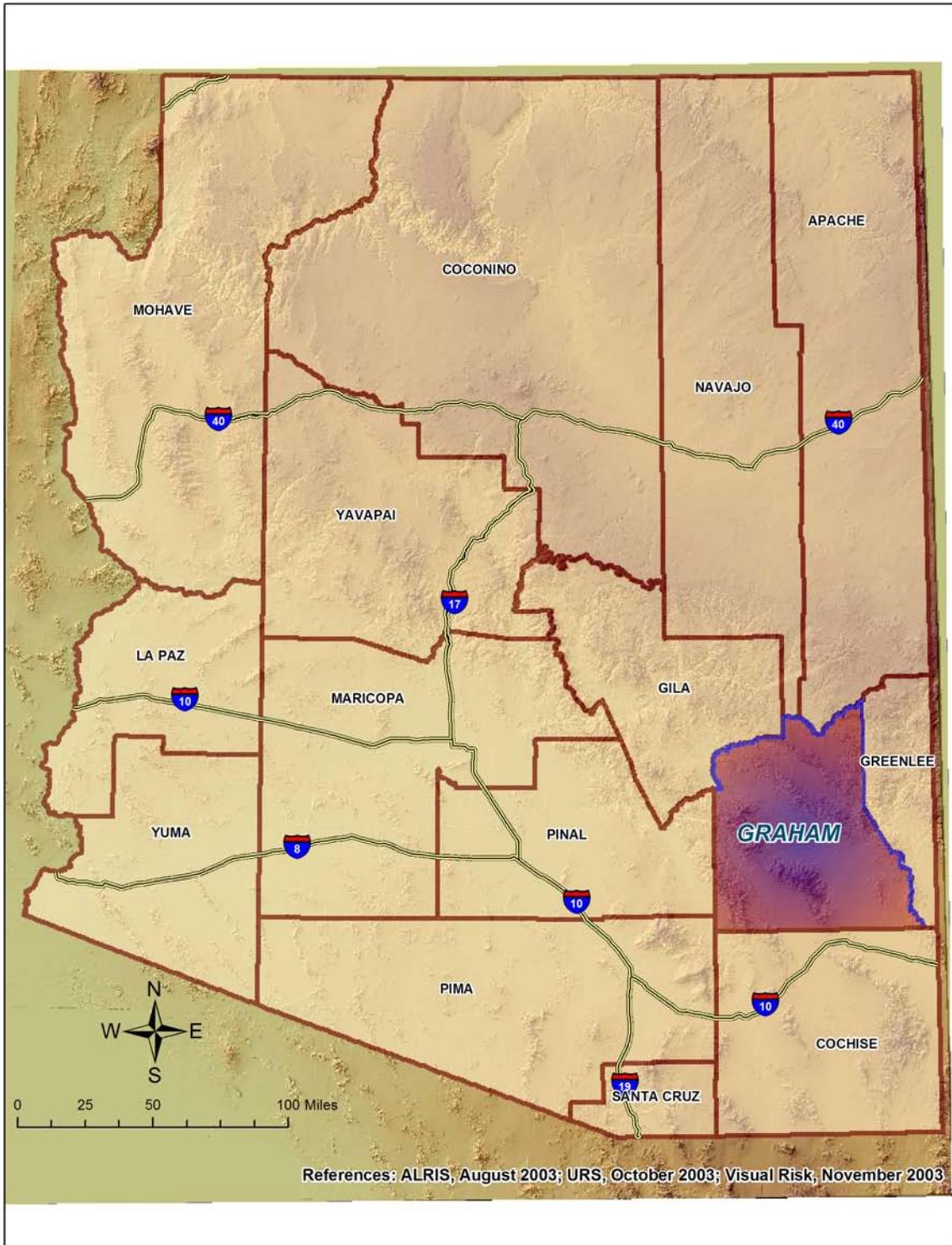


Figure 4-1: Vicinity Map

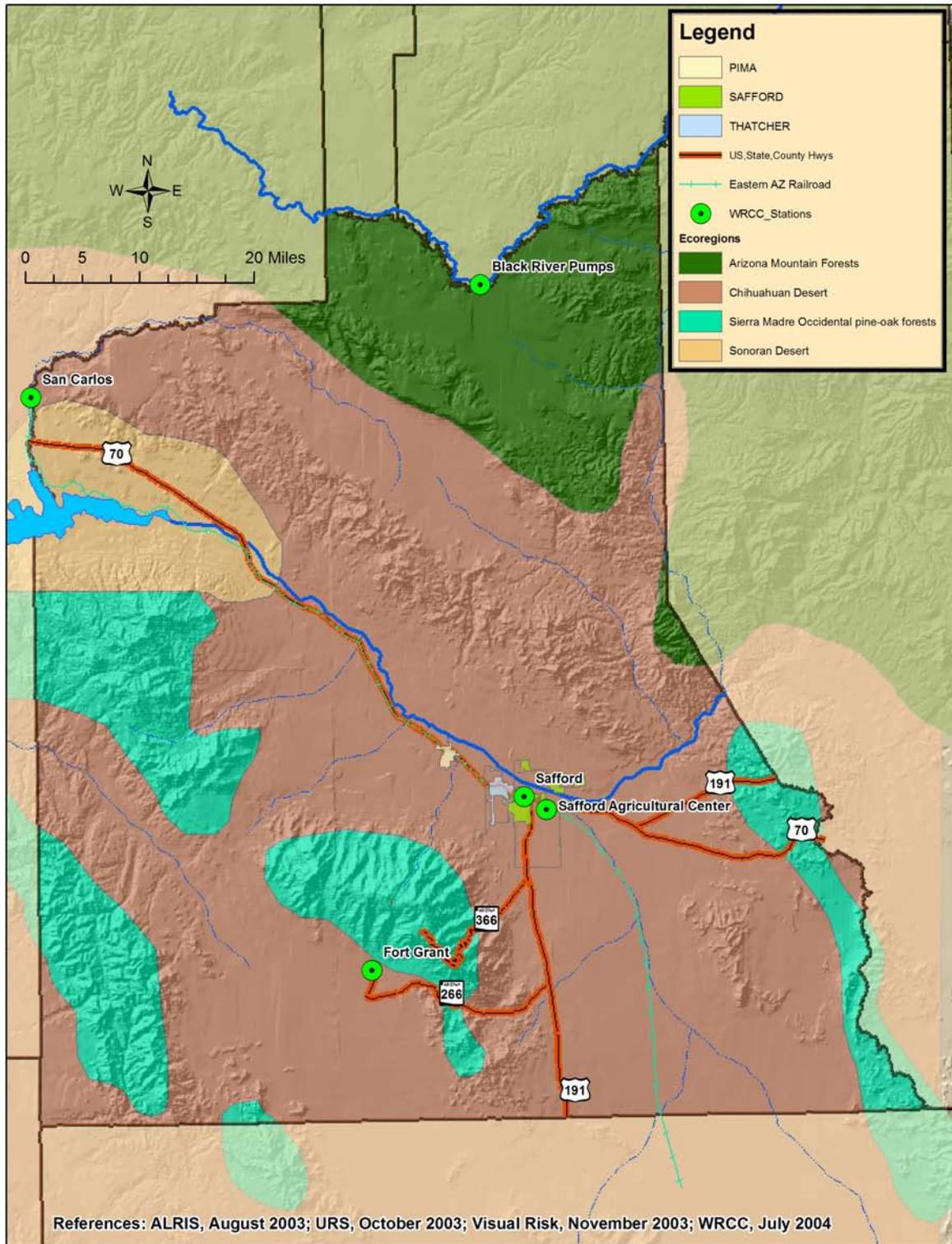


Figure 4-2: Terrestrial Ecoregions Map

- **Sonoran Desert** – this ecoregion is an arid environment that covers much of southwestern Arizona. The elevation varies in this zone from approximately sea level to 3,000 feet. Vegetation in this zone is comprised mainly of Sonoran Desert Scrub and is one of the few locations in the world where saguaro cactus can be found. The climate is typically hot and dry during the summer and mild during the winter.

The primary watercourse within Graham County is the Gila River, which is one of the few designated riparian corridors within the State of Arizona. Other major watercourses within the county include, but are not limited to the Black River, Bonita Creek, Aravaipa Creek, Eagle Creek, and San Simon Creek. There are also numerous other ephemeral washes and watercourses that primarily convey flood waters. The Gila River and groundwater serve as the primary sources for agricultural irrigation. Potable water is primarily obtained from groundwater and developed springs.

Federal and State government entities own 56 percent of Graham County land, including the U.S. Bureau of Land Management and the U.S Forest Service (38%), and the State of Arizona (18%). An additional 9.9% is publicly owned, and 36% is Indian reservation land. Figure 4-3 shows a depiction of land ownership and jurisdictional boundaries within Graham County.

#### 4.2.2 *Climate*

For the majority of Graham County, the climate, when compared to other regions in the State of Arizona, is relatively moderate. Climatological statistics for weather stations within Graham County are produced by the Western Region Climate Center and span records dating back to the early 1900's.<sup>3</sup> Locations of reporting stations within or near Graham County are shown on Figure 4-3.

Average temperatures within Graham 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. For instance, temperature extremes at the top of Mount Graham are significantly different from those for the Gila River Valley. Figure 4-4 presents a graphical depiction of temperature variability and extremes throughout the year for the Safford Agricultural Center station, which is situated at an elevation of 2,900 feet.

The Safford Agricultural Center data are fairly representative of the Chihuahuan and Sonoran Ecoregions within the county. A similar graph is presented in Figure 4-5 for the Black River Pumps station, which is located at an elevation of 6,040 feet. In general, there is a ten degree reduction in temperatures between the lower and upper elevation stations. It is plausible to expect another 10 degree reduction for areas above 9,000 feet.

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

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<sup>3</sup> 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>

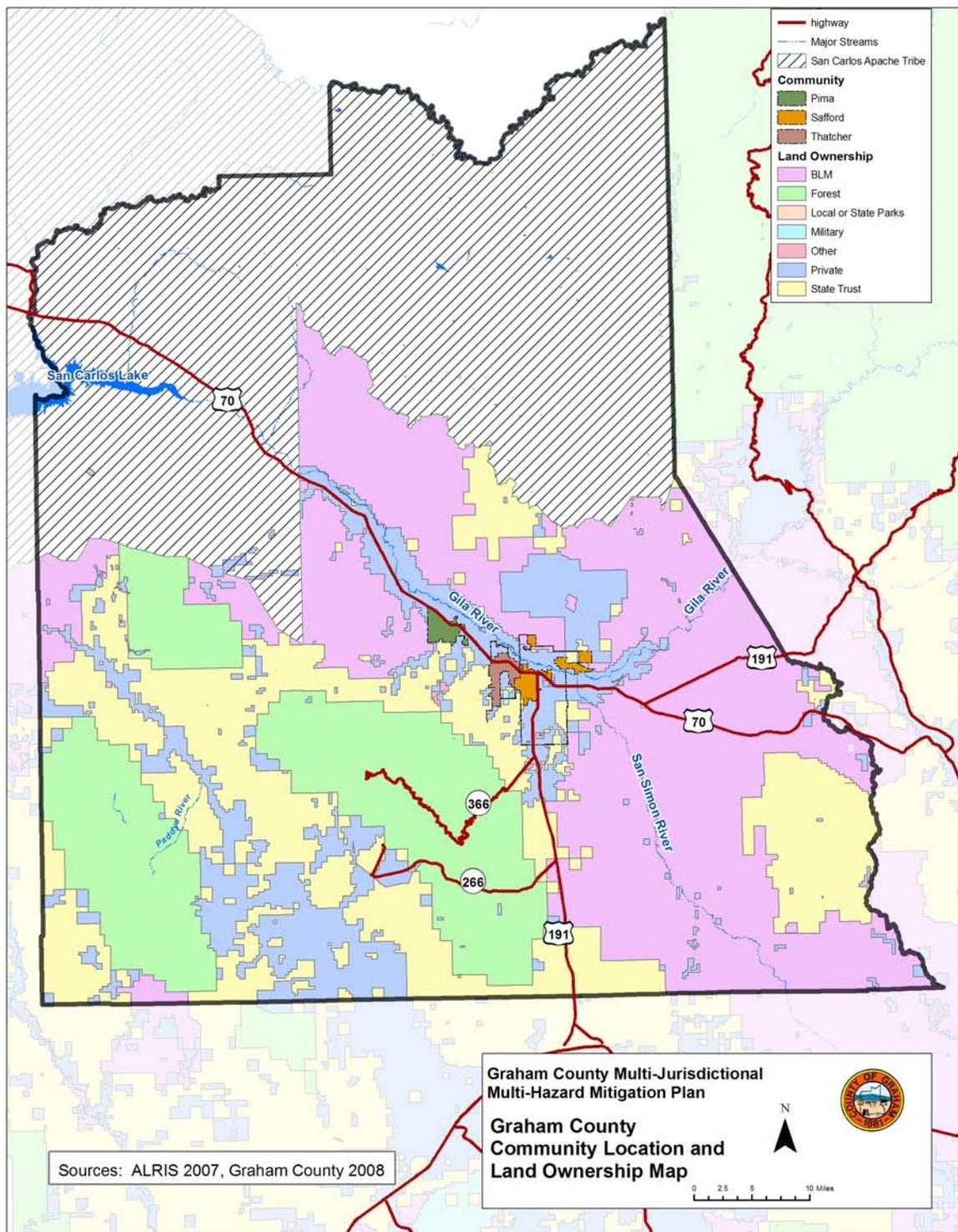
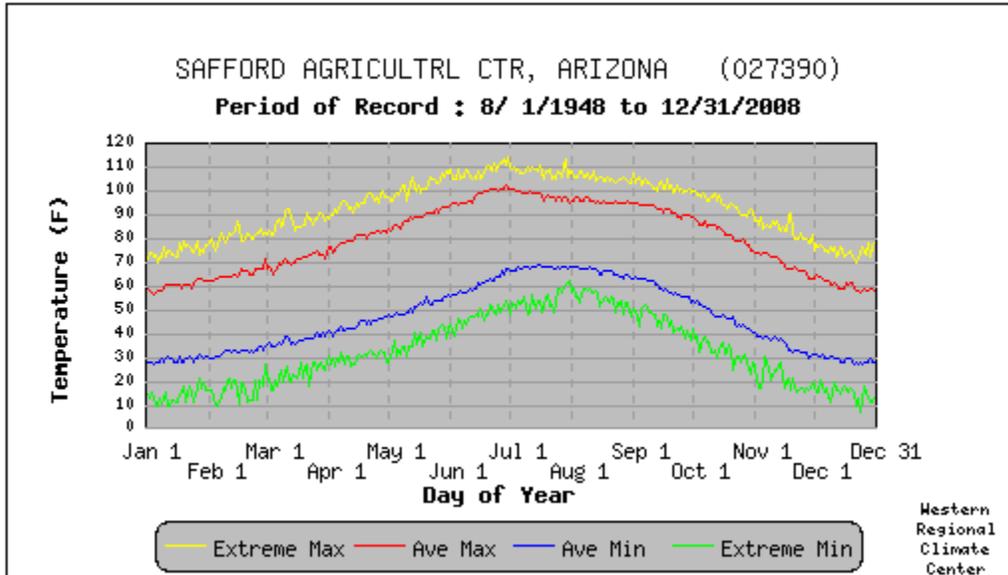


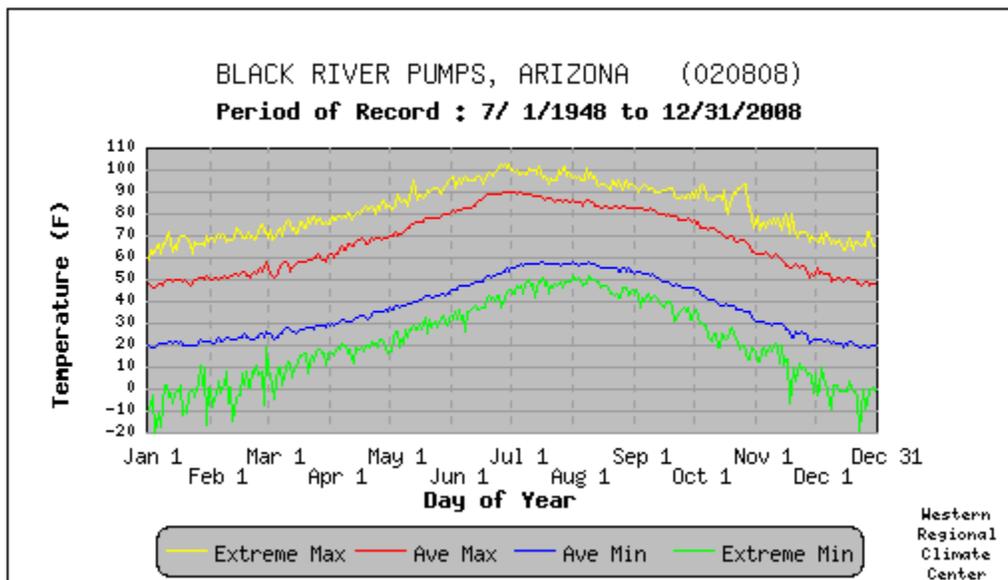
Figure 4-3: Map of Land Ownership for Graham County

portions of Arizona. These thunderstorms are often accompanied by strong winds, blowing dust, and infrequent hail storms.<sup>4</sup>

Figures 4-6 and 4-7 present tabular temperature and precipitation statistics for the Safford Agricultural Center and Black River Pump stations.



**Figure 4-4  
Daily Temperatures and Extremes for Safford Agricultural Center, Arizona**



**Figure 4-5  
Daily Temperatures and Extremes for Black River Pumps, Arizona**

<sup>4</sup> Office of the State Climatologist for Arizona, 2004. Partially taken from the following weblink:  
<http://geography.asu.edu/azclimate/narrative.htm>

<b>SAFFORD AGRICULTURAL CENTER, ARIZONA (027390)</b>													
<b>Period of Record Monthly Climate Summary</b>													
Period of Record : 8/ 1/1948 to 12/31/2008													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	60.0	64.9	70.8	79.7	88.8	98.1	98.3	95.7	92.0	82.5	69.3	60.2	80.0
Average Min. Temperature (F)	28.8	31.9	37.1	43.3	51.3	60.4	67.7	66.0	59.0	47.1	35.5	28.8	46.4
Average Total Precipitation (in.)	0.68	0.63	0.57	0.25	0.18	0.26	1.63	1.63	1.01	0.85	0.48	0.81	8.99
Average Total SnowFall (in.)	0.3	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	1.0
Average Snow Depth (in.)	0	0	0	0	0	0	0	0	0	0	0	0	0
Percent of possible observations for period of record.													
Max. Temp.: 99.7% Min. Temp.: 99.6% Precipitation: 100% Snowfall: 99.9% Snow Depth: 99.2%													
Check <a href="#">Station Metadata</a> or <a href="#">Metadata graphics</a> for more detail about data completeness.													
Western Regional Climate Center, <a href="mailto:wrcc@dri.edu">wrcc@dri.edu</a>													

**Figure 4-6**  
**Monthly Climate Summary for Safford Agricultural Center, Arizona**

<b>BLACK RIVER PUMPS, ARIZONA (020808)</b>													
<b>Period of Record Monthly Climate Summary</b>													
Period of Record : 7/ 1/1948 to 12/31/2008													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	49.2	52.4	57.3	66.2	75.5	85.9	87.5	84.2	79.9	70.4	57.9	50.3	68.1
Average Min. Temperature (F)	20.8	23.3	26.9	32.7	40.5	49.6	56.6	55.7	49.7	38.9	27.4	20.9	36.9
Average Total Precipitation (in.)	1.70	1.44	1.49	0.67	0.53	0.59	3.22	3.31	1.75	1.49	1.11	1.65	18.96
Average Total SnowFall (in.)	3.2	2.6	1.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.4	3.4	11.4
Average Snow Depth (in.)	0	0	0	0	0	0	0	0	0	0	0	0	0
Percent of possible observations for period of record.													
Max. Temp.: 93.7% Min. Temp.: 93.6% Precipitation: 99.1% Snowfall: 89.8% Snow Depth: 83.9%													
Check <a href="#">Station Metadata</a> or <a href="#">Metadata graphics</a> for more detail about data completeness.													
Western Regional Climate Center, <a href="mailto:wrcc@dri.edu">wrcc@dri.edu</a>													

**Figure 4-7**  
**Monthly Climate Summary for Black River Pumps, Arizona**

4.2.3 *Population*

As of July 2009, Graham County was home to 39,792 residents, which represents a growth of approximately 15% from the July 2003 statistics reported in the 2005 Plan. The majority of these citizens live in the incorporated communities or reservation portion of Graham County. The largest community is the City of Safford, which is the home of the county seat. All three incorporated cities are located within the Gila River Valley and are located relatively close to each other. There are also 21 other “places” located throughout the county, with most situated along Highway 70 and mostly comprised of only one structure or landmark. Over a third of the county is occupied by the San Carlos Apache Indian Reservation. Table 4-1 summarizes jurisdictional population statistics for Graham County communities and the County as a whole.

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

<b>Jurisdiction</b>	<b>1990</b>	<b>2000</b>	<b>2009</b>	<b>2010</b>	<b>2020</b>
Graham County	26,611	33,495	39,792	37,441	41,119
<b>City and Towns</b>					
Pima	1,725	1,989	2,442	2,182	2,362
Safford	7,359	9,232	10,094	9,489	9,729
San Carlos Apache Tribe	7,110	9,385	No Data	No Data	No Data
Thatcher	3,763	4,022	5,819	5,083	6,071
Note: Figures for 1990 and 2000 from US Census Bureau; <a href="http://www.arizonaindicators.org/pages/economy/demographics/population.html">http://www.arizonaindicators.org/pages/economy/demographics/population.html</a> Figures for 2010 and 2020 from AZDES Population Statistics approved June 6, 2007 Figures for 2009 from Az Dept of Commerce, July 2009					

**4.2.4 Economy**

The primary economic industry for Graham County is based in agricultural farming and ranching. During the 1870s, farming communities began to sprout up along the Gila River, which was and still is, a rich agricultural area. Cotton is a principle crop produced in the communities, along with alfalfa, small grains, apples, pumpkins and other vegetables. The world’s finest long staple cotton was developed in Graham County and today, 89,000 bales of both long and short staple cotton are produced annually with two cotton gins serving the area.<sup>5</sup> Graham County is also home to one of the state’s few hydroponic tomato nurseries. Mining continues to have a significant economic presence and recently expanded with the addition of the Freeport-McMoRan Copper and Gold North American headquarters and mine technology division. A new copper mine, the Dos Pobres Mine is now in production. The Freeport Process Technology Center and new Analytical Center are also located in Graham County.<sup>6</sup> Recreation and tourism follow farming and ranching as the next principle industries in Graham County. The San Carlos Indian Reservation covers approximately one-third of the land, with San Carlos Lake a popular site for fishing and camping. Other major industries include educational services, retail trade, health care, and social assistance.

In 2005, the total labor force for the county was estimated to average 12,200 with an unemployment rate of 6.0%. As of January 2010, the labor force was estimated at 14,650 with an unemployment rate of 15.5%.<sup>7</sup> The declines experienced by Graham County communities and population reflect those occurring statewide.

**4.3 Jurisdictional Overviews**

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

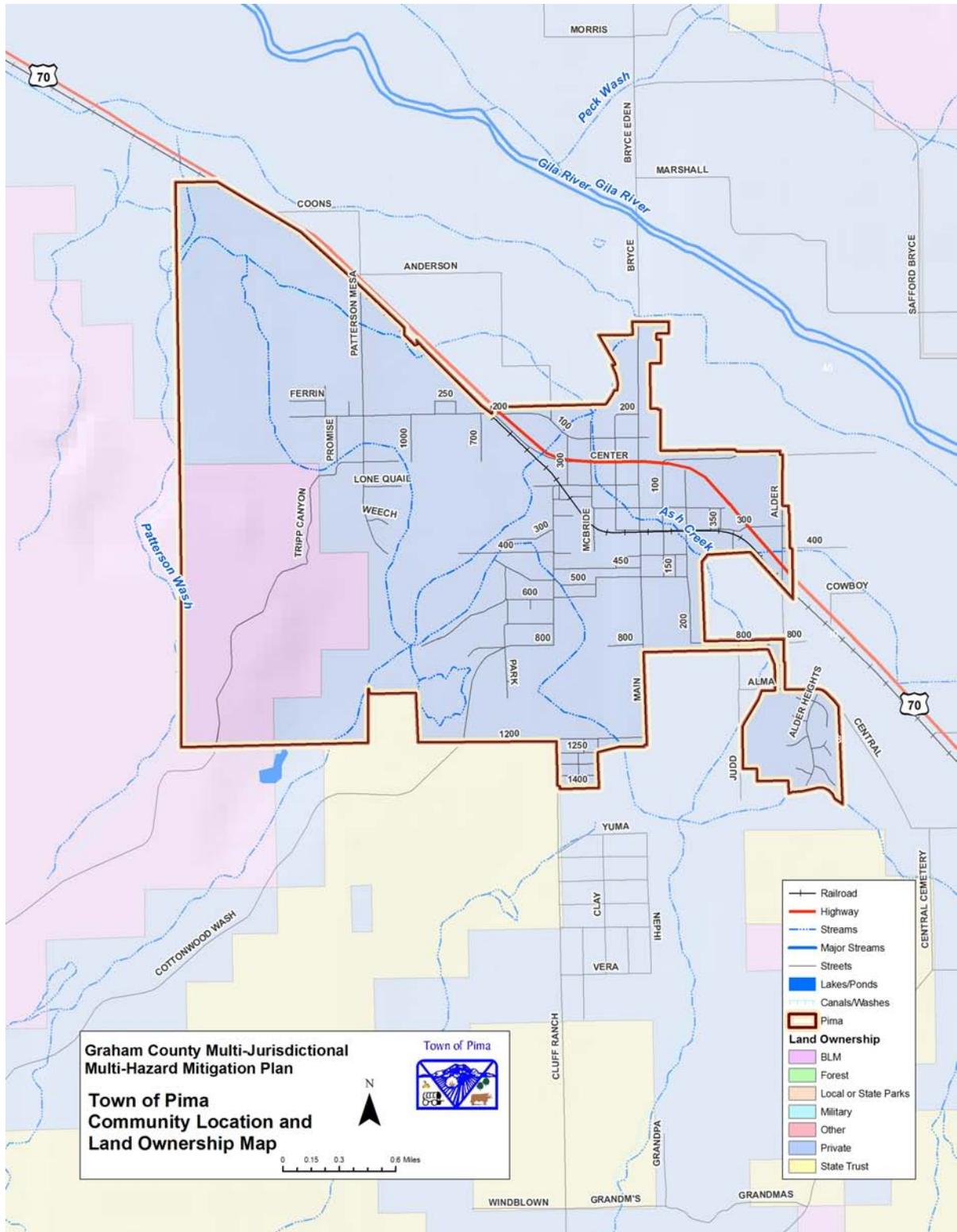
**4.3.1 Pima**

Pima is generally positioned at Longitude 109.83 degrees East and Latitude 32.89 degrees north with an average elevation of about 2,850 feet. Pima is located approximately 153 miles southeast of Phoenix and 151 miles east of Tucson, and is approximately 10 miles north of the Safford, the county seat. The Town is situated along the south bank of the Gila River on either side of U.S. Highway 70. A regional map depicting the major transportation and land ownership elements in and around Pima is provided in Figure 4-8.

<sup>5</sup> Graham County Chamber of Commerce website at: <http://www.graham-chamber.com/community.htm>

<sup>6</sup> *ibid.*

<sup>7</sup> Source: Arizona Workforce Informer website at:  
<http://www.workforce.az.gov/cgi/dataanalysis/?PAGEID=94&SUBID=142>



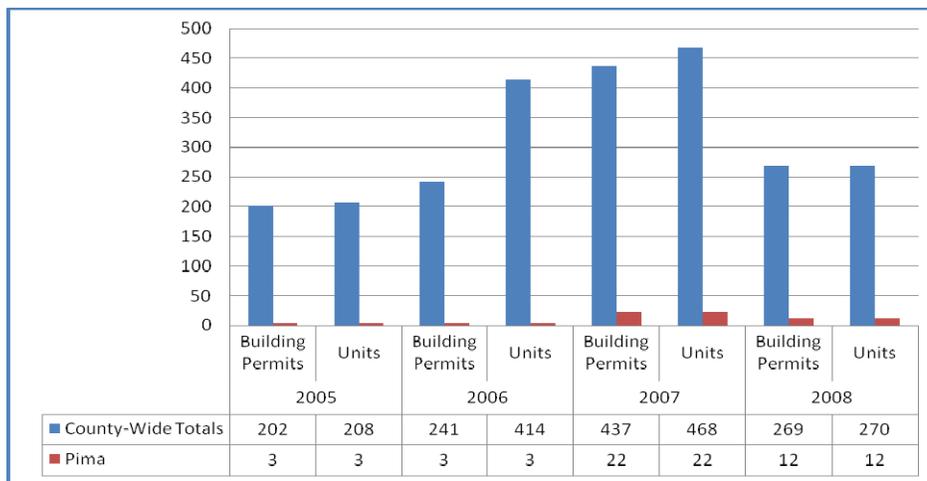
Sources: ALRIS 2007, Graham County 2008

Figure 4-8: Town of Pima community location and land ownership map

Since its founding by Mormons in 1879, the Town of Pima has primarily been an agricultural community. The settlers found a location in the Gila Valley where they planned to place a canal and later named the place Smithville to honor Jesse N. Smith, a Mormon leader who arrived in Arizona in September 1878 with Erastus Snow. Within months, the village had been laid out in sixteen blocks of four lots each. In 1894, the name of the town was changed to Pima after the Indian Tribe. In 1916, the town incorporated.

According to the Arizona Department of Commerce, Pima historically has been an agricultural farm trade center serving the surrounding agricultural areas. Pima is also becoming a popular retirement community, with increases in tourism and winter visitors. Major employers include Label Masters, Minit Mart, Glen Bar Gin, Graham County Co-op, Pima Town Government and Pima Public Schools. In 2007, there were approximately \$12.1 million of taxable sales in the Town.<sup>8</sup> As of January 2010, the Pima labor force was estimated at 1,076 with a 12.4% unemployment rate.<sup>9</sup>

In the last five years, the land size of the town has nearly doubled with recent annexations to the west and south. Residential building permits issued and units constructed in the town over the period of 2005-2008, is shown in Figure 4-9. County-wide totals are also provided for comparison.



Source: U.S. Census Bureau 2010

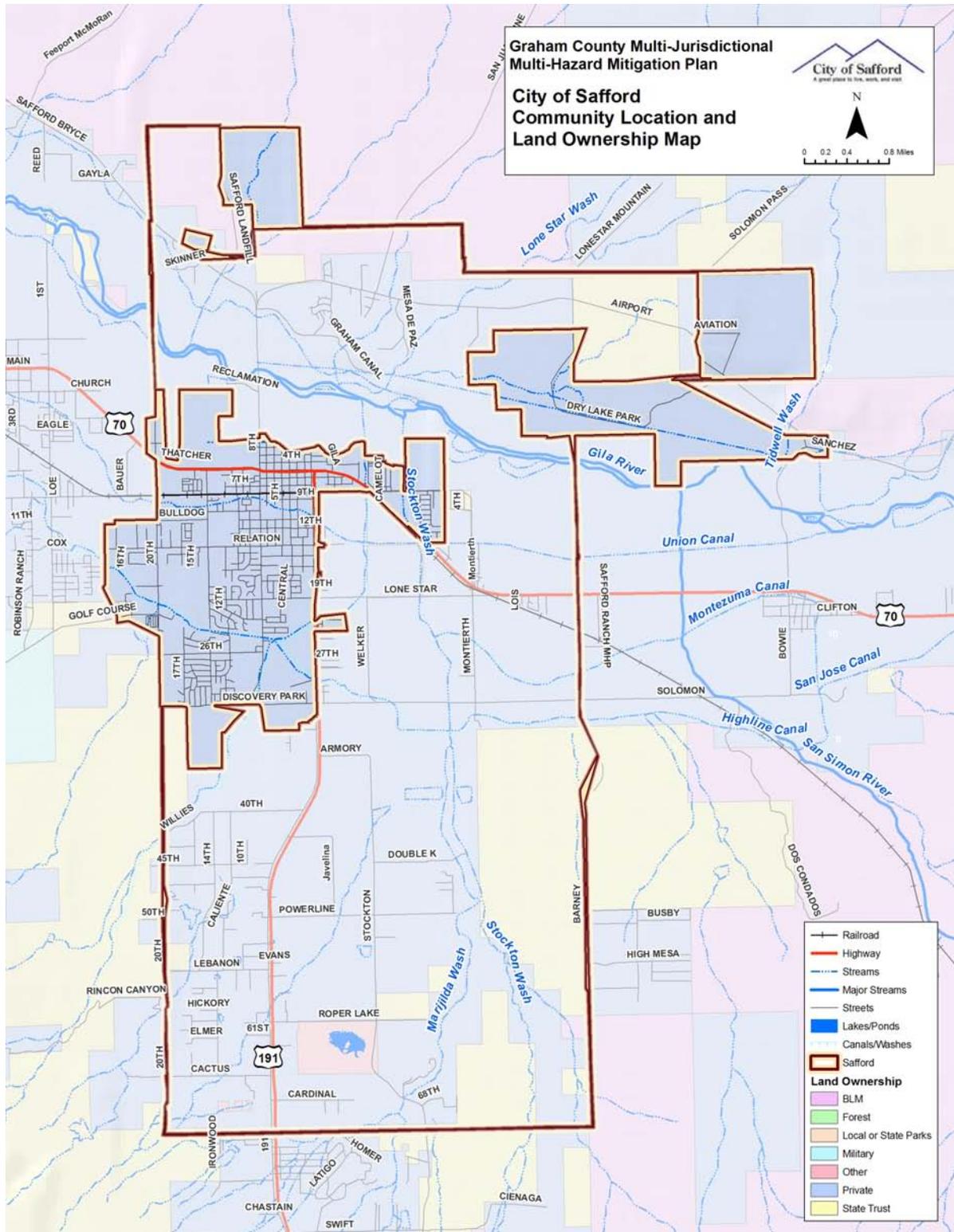
**Figure 4-9: Residential building permits issued and units constructed for the Town of Pima during 2005 to 2008**

**4.3.2 Safford**

The City of Safford is located east and south of Thatcher and Pima in Graham County, Arizona, as illustrated by Figure 4-3. The average elevation is about 2,840 feet. Safford is located approximately 164 miles southeast of Phoenix and 130 miles east of Tucson, and is predominantly south of the Gila River at the junction of U.S. Highways 70 and 191. A regional map depicting the major transportation and land ownership elements in and around Safford is provided in Figure 4-10. Nearly all the land within the City’s corporate boundaries is owned by private entities.

<sup>8</sup><http://www.azcommerce.com/doclib/COMMUNE/pima.pdf>

<sup>9</sup> Arizona Workforce Informer website at: <http://www.workforce.az.gov/cgi/dataanalysis/?PAGEID=94&SUBID=142>



Sources: ALRIS 2007, Graham County 2008

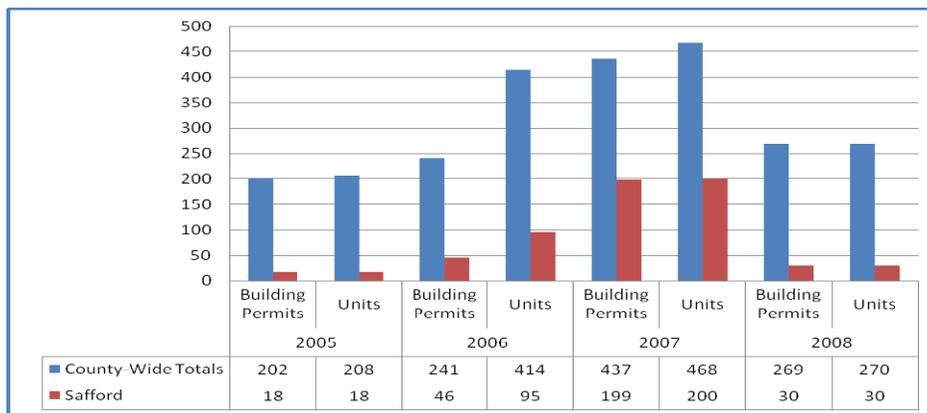
**Figure 4-10: City of Safford community location and land ownership map**

Joshua Eaton Bailey, Daniel Hughes, Hiram Kennedy and John C. Glasby, farmers from the Gila Bend area who had been wiped out when the Gila River flooded in 1873, decided to try their luck further upriver, and made their way to the present site of Safford in January 1874. They set to work clearing fields and digging the Central Canal to bring Gila River water to irrigate them. Bailey, known as Safford’s founding father, christened the new settlement “Safford” in honor of Territorial Governor Anson P. K. Safford, who toured the valley shortly after the farmers’ arrival. In addition to his farming ventures, Bailey established the new community’s first business, a combination general store, gaming parlor and saloon. He also set up a post office in the store and became the town’s first postmaster on March 5, 1875. C. M. Ritter surveyed the Safford Townsite in December 1875, and recorded the town plat on January 11, 1876. When the 11th Territorial Assembly carved Graham County out of portions of Apache and Pima counties in 1881, Safford was designated as the county seat.<sup>10</sup> Safford was later incorporated in 1901.

Safford was founded as an agricultural community, and the growing of cotton and alfalfa, as well as cattle ranching, continue play an important role in the local economy. As county seat of Graham County, Safford is the location of the county courts and administrative operations. The City of Safford, Bureau of Land Management, U. S. Forest Service and Safford School District also provide employment in the public sector. Two state prisons and one federal prison in the Safford vicinity are major employers. There is also substantial employment in a wide variety of retail and service businesses, as well as some light manufacturing. Due, in part, to the relative isolation of Safford from the major metropolitan areas of Phoenix and Tucson, the community has developed a larger mix of retail and service enterprises than is found in other rural communities of comparable size.<sup>11</sup>

In 2007, there were approximately \$253.7 million of taxable sales in the City.<sup>12</sup> As of January 2010, the Safford labor force was estimated at 4,124 with a 10.5% unemployment rate.<sup>13</sup>

Development and growth within Safford over the last five years has fluctuated with the area economy and industry health. Most of the commercial growth has been focused along U.S. Highway 70. Industrial growth within the city has been very limited and is primarily focused in the light industrial sector. Residential building permits issued and units constructed in the city over the period of 2005-2008, are shown in Figure 4-11. County-wide totals are also provided for comparison.



Source: U.S. Census Bureau 2010

**Figure 4-11: Residential building permits issued and units constructed for the City of Safford during 2005 to 2008**

<sup>10</sup> Historic description taken from the Safford Economic Development Corporation website at the following URL: <http://www.saffordeconomicdevelopment.com/exec/ePhotoAlbum.asp>

<sup>11</sup> City of Safford, 2004, *City of Safford General Plan 2004*

<sup>12</sup> <http://www.azcommerce.com/doclib/commune/safford.pdf>

<sup>13</sup> Arizona Workforce Informer, op. cit.

4.3.3 *Thatcher*

The Town of Thatcher is located within Graham County between Pima and Safford, as illustrated by Figure 4-3. The average elevation is about 2,929 feet. Thatcher is located approximately 160 miles southeast of Phoenix and 134 miles east of Tucson, and is approximately 4 miles north of the Safford, the county seat. The Town is situated along the southwest bank of the Gila River on either side of U.S. Highway 70. A regional map depicting the major transportation and land ownership elements in and around Thatcher is provided in Figure 4-12.

Thatcher was originally settled in 1881 by a group of Mormon settlers. The settlers chose a spot along the Gila River's south bank to start building their community. Christopher Layton, one of the early pioneers, was a farmer and businessman and is known for his work in the creation of the Town of Thatcher. The town was named for the Mormon Apostle Moses Thatcher and was incorporated in 1899.

Since its founding, the Town of Thatcher has primarily been an agricultural community. In the last ten years, however, the Town has experienced a slow but steady growth in the retail trade and services sector. Improvements and expansions associated with Eastern Arizona College have also spurred some growth within the area. Although, not directly located within the city limits, Freeport-McMoRan Copper and Gold Incorporated, a major north American copper facility, is a short distance east from Town Hall. This facility is providing over \$60 million dollars annually to the local economy and is expected to continue over the next quarter century. With central location of Thatcher, it is been seen as the retail trade and service sector for the future economic infrastructure in the region. This is occurring as the agricultural lands are being replaced with residential and retail establishments. Bashas, Thatcher Building Supply, Safeway and Wal-Mart are other major employers. Existing and future employment centers in Thatcher are illustrated in Figure 4-13.

Residential development has become a priority in recent years, as the Town has seen an increase in population. New residential development can be seen throughout the Thatcher Planning Area, concentrated in the northern half of the Town, north of Frye Creek Dam. Medium and high-density residential areas have been established within Thatcher's Town core.<sup>14</sup> Residential building permits issued and units constructed in the city over the period of 2005-2008, are shown in Figure 4-14. County-wide totals are also provided for comparison.

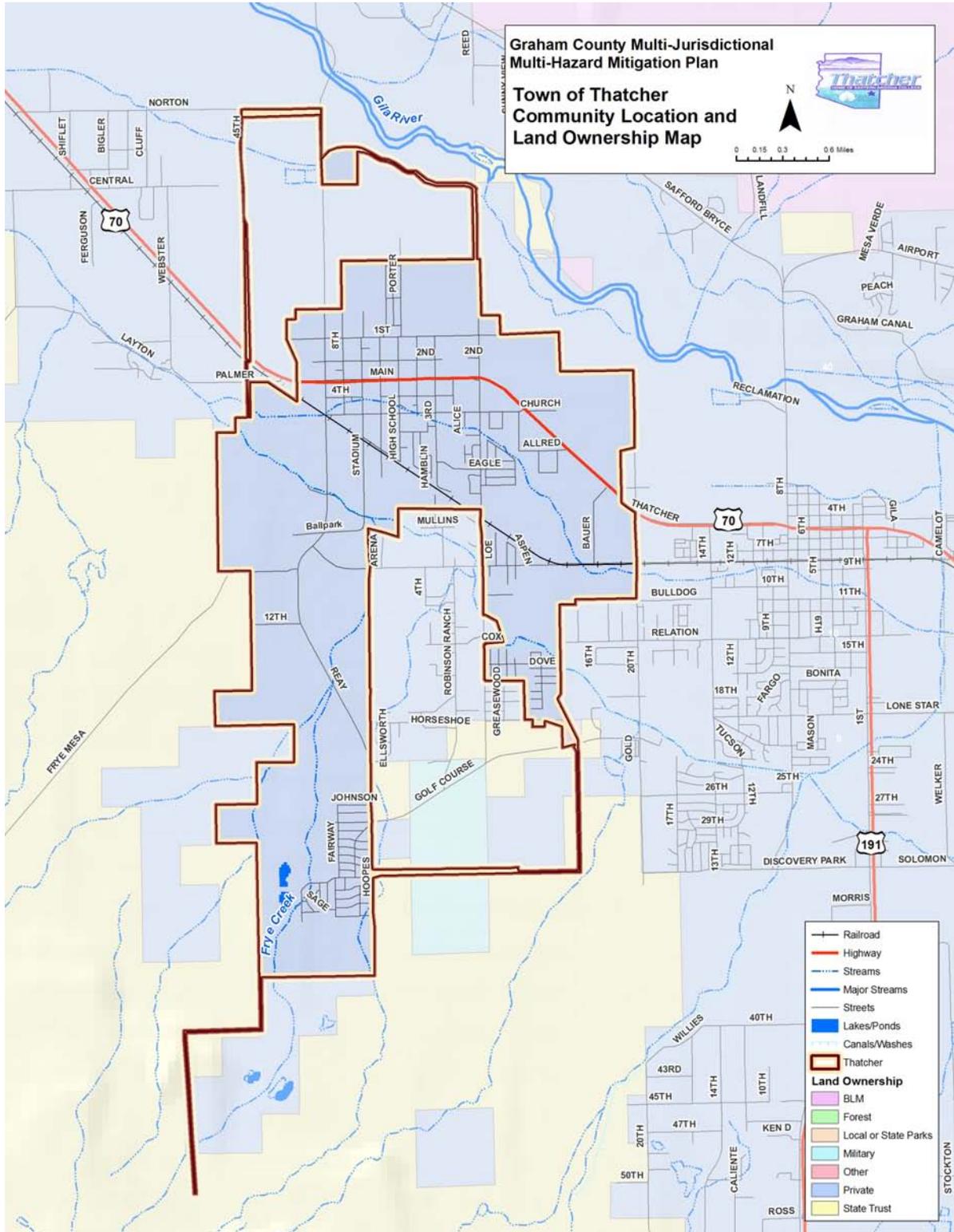
The civilian labor force in 2007 was 2,117 with an unemployment rate of 2.8 percent. In 2007, there were approximately \$80 million of taxable sales in the Town which does not include shared sales tax from City of Safford.<sup>15</sup> As of January 2010, the Thatcher labor force was estimated at 2,044 with a 10.6% unemployment rate.<sup>16</sup>

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<sup>14</sup> Town of Thatcher, 2008, *Thatcher General Plan Update*

<sup>15</sup> <http://www.azcommerce.com/doclib/commune/thatcher.pdf>

<sup>16</sup> Arizona Workforce Informer, op. cit.



Sources: ALRIS 2007, Graham County 2008

**Figure 4-12: Town of Thatcher community location and land ownership map**

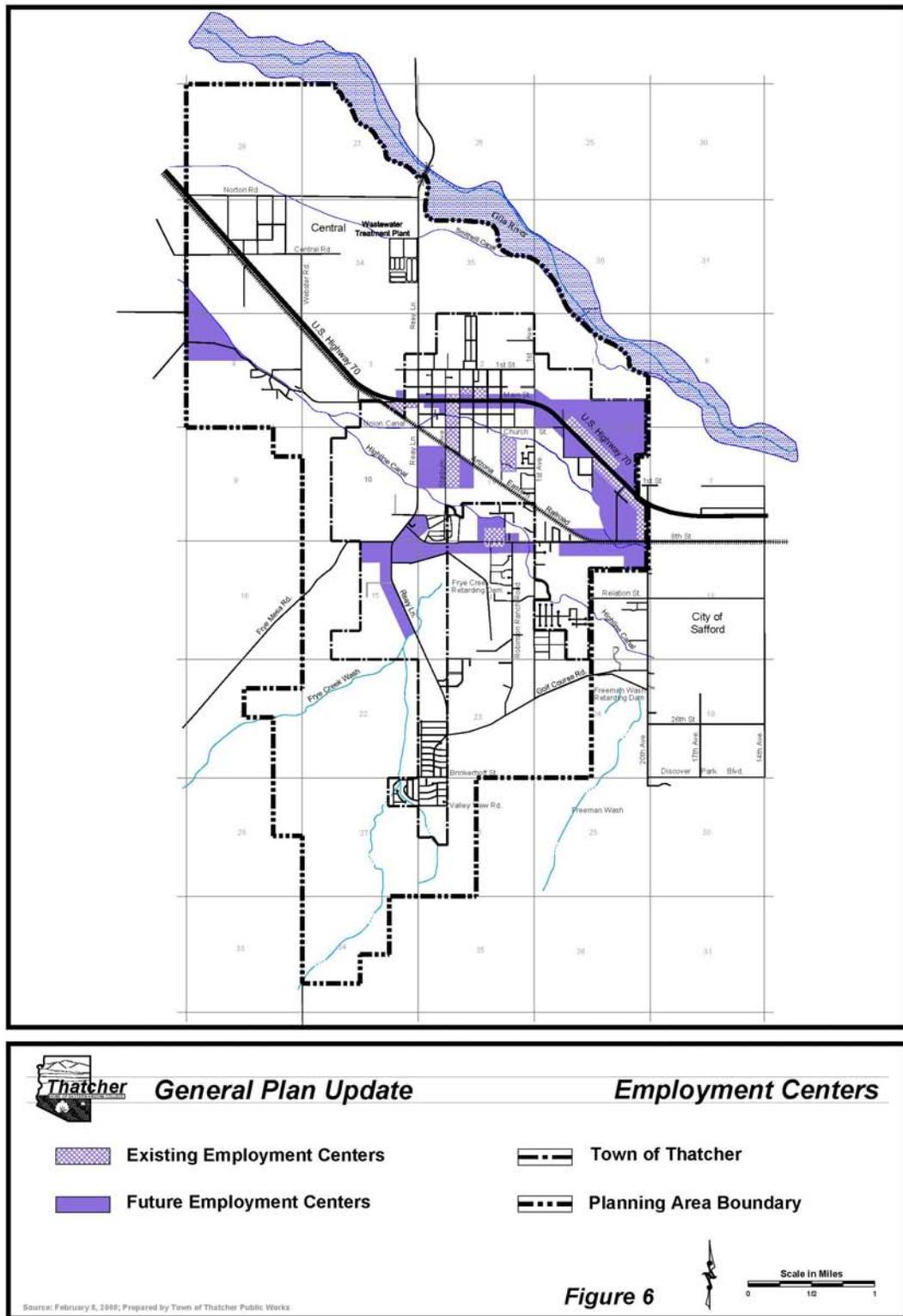
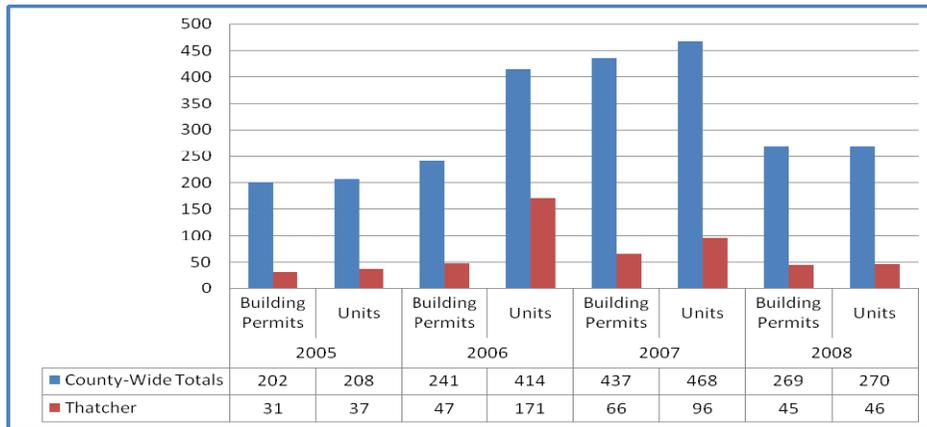


Figure 4-13: Town of Thatcher Employment Centers map



Source: U.S. Census Bureau 2010

**Figure 4-14: Residential building permits issued and units constructed for the Town of Thatcher during 2005 to 2008**

## 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<sup>17</sup>. 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 Graham 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 update, the list of hazards identified in the 2005 Plan were reviewed by the Planning Team with the goal of refining the list to reflect the natural hazards that pose the greatest risk to the jurisdictions represented by this MJHMP. The planning team also chose to focus on natural hazards, with the exception of dam failure and transportation accidents, which were considered to be closely tied to natural events and therefore kept. The Planning Team also compared and contrasted the 2005 Plan list to the comprehensive hazard list summarized in the 2007 State Plan<sup>18</sup> to ensure compatibility with the State Plan. Table 5-1 summarizes the 2005 Plan and 2007 State Plan hazard lists.

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<sup>17</sup> National Fire Protection Association, 2000, *Standard on Disaster/Emergency Management and Business Continuity Programs*, NFPA 1600.

<sup>18</sup> ADEM, 2007, *State of Arizona Multi-Hazard Mitigation Plan*

<b>Table 5-1: Summary of Initial Hazard Identification Lists</b>	
<b>2005 Graham County Plan Hazard List</b>	<b>2007 State Plan Hazard List</b>
<ul style="list-style-type: none"> <li>• Dam/Levee Failure</li> <li>• Drought</li> <li>• Flooding/Flash Flooding</li> <li>• Hazardous Material Incidents</li> <li>• Tropical Storms/Hurricane</li> <li>• Wildfire</li> </ul>	<ul style="list-style-type: none"> <li>• Dam Failure</li> <li>• Drought</li> <li>• Earthquake</li> <li>• Fissure</li> <li>• Flooding/Flash Flooding</li> <li>• Hazardous Materials Incidents</li> <li>• Landslides/Mudslides</li> <li>• Monsoon</li> <li>• Subsidence</li> <li>• Thunderstorms/High Winds</li> <li>• Tornadoes/Dust Devils</li> <li>• Tropical Storms/Hurricane</li> <li>• Wildfires</li> <li>• Winter Storms</li> </ul>

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 2005 Plan. With this update, the 2005 Plan database was reviewed and revised to separately summarize declared disaster events versus non-declared events. Declared event sources included 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), United States Forest Service (USFS), United States National Park Service, National Response Center, and ADEM. Both data sets were updated with additional hazard events that have occurred over the last plan cycle and were also modified to primarily represent the period of August 1957 to December 2009. Two tables are used in this update to summarize the historic hazard events. Table 5-2 summarizes the federal and state disaster declarations that included Graham County. Table 5-3 summarizes all non-declared hazard events that meet the following selection criteria:

- 1 or more fatalities
- 1 or more injuries
- Any dollar amount in property or crop damages
- Significant event, as expressed in historical records or according to defined criteria above

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

**Table 5-2: State and Federally Declared Natural Hazard Events That Included Graham County – December 1967 to October 2008**

Hazard	No. of	Recorded Losses		
	Declarations	Fatalities	Injuries	Damage Costs (\$)
Drought	11	0	0	\$303,000,000
Flooding / Flash Flooding	17	25	112	\$515,266,000
Tropical Storm	3	26	1,075	\$763,000,000
Wildfire	22	0	28	\$150,000

**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 costs do not include the cost of suppression which can be quite substantial.

**Sources:** ADEM, FEMA, NWCG, USDA

**Table 5-3: Graham County Historic Hazard Events – August 1957 to December 2009**

Hazard	No. of	Recorded Losses		
	Records	Fatalities	Injuries	Damage Costs (\$)
Drought	1	0	0	\$2,000,000
Flooding / Flash Flooding	4	0	0	\$45,000
Severe Wind	30	0	0	\$529,000
Wildfire	7	0	5	\$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 costs do not include the cost of suppression which can be quite substantial.

**Sources:** ADEM, ASLD, NCDC, NRC, NWCG, NWS, USFS, USGS, USNPS

Detailed historic hazard records are provided in Appendix D.

The culmination of the review and screening process by the Planning Team resulted in a revised list of hazards that will be carried forward with this updated mitigation plan. Several of the hazards in the 2005 Plan list may be better described as storm events wherein the effects of the storm may pose exposure to multiple hazards. For instance, hazards associated with *Tropical Storms/Hurricane* may include flooding and severe winds in a single event. With the direction of ADEM, the Planning Team chose to eliminate this hazard and account for its impacts in other categories. Similarly, the predominant perceived hazard associated with *Thunderstorms/High Winds* and *Tornadoes/Dust Devils* is the associated damaging high winds. Therefore, the Planning Team in consultation with ADEM, decided to combine these hazards into a new category named *Severe Winds*.

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:

- Dam Failure
- Drought
- Fissure
- Flooding/Flash Flooding
- Severe Wind
- Wildfire

## **5.2 Vulnerability Analysis Methodology**

### *5.2.1 General*

The following sections summarize the methodologies used to perform the vulnerability analysis portion of the risk assessment. For this update, 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. A comparison was made between the new vulnerability analysis and the 2005 Plan for Dam Failure, Flooding/Flash Flooding and Wildfire and is noted in Section 5.3.

For the purposes of this vulnerability analysis, hazard profile maps were developed for Dam 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 March 2009.

### *5.2.2 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<sup>19</sup> (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 5-4 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:

$$\text{CPRI} = [(3 \times 0.45) + (3 \times 0.30) + (2 \times 0.15) + (1 \times 0.10)]$$

$$\text{CPRI} = 2.65$$

### *5.2.3 Asset Inventory*

A detailed asset inventory was performed for the 2005 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 2005 Plan was updated to reflect the current critical and non-critical facilities potentially exposed to hazards. Details of the update are discussed later in this section.

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<sup>19</sup> ADEM, 2003, *Arizona Model Local Hazard Mitigation Plan*, prepared by JE Fuller/ Hydrology & Geomorphology, Inc.

**Table 5-4: 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	<ul style="list-style-type: none"> <li>▪ Extremely rare with no documented history of occurrences or events.</li> <li>▪ Annual probability of less than 0.001.</li> </ul>	1	45%
	Possibly	<ul style="list-style-type: none"> <li>▪ Rare occurrences with at least one documented or anecdotal historic event.</li> <li>▪ Annual probability that is between 0.01 and 0.001.</li> </ul>	2	
	Likely	<ul style="list-style-type: none"> <li>▪ Occasional occurrences with at least two or more documented historic events.</li> <li>▪ Annual probability that is between 0.1 and 0.01.</li> </ul>	3	
	Highly Likely	<ul style="list-style-type: none"> <li>▪ Frequent events with a well documented history of occurrence.</li> <li>▪ Annual probability that is greater than 0.1.</li> </ul>	4	
Magnitude/ Severity	Negligible	<ul style="list-style-type: none"> <li>▪ Negligible property damages (less than 5% of critical and non-critical facilities and infrastructure).</li> <li>▪ Injuries or illnesses are treatable with first aid and there are no deaths.</li> <li>▪ Negligible quality of life lost.</li> <li>▪ Shut down of critical facilities for less than 24 hours.</li> </ul>	1	30%
	Limited	<ul style="list-style-type: none"> <li>▪ Slight property damages (greater than 5% and less than 25% of critical and non-critical facilities and infrastructure).</li> <li>▪ Injuries or illnesses do not result in permanent disability and there are no deaths.</li> <li>▪ Moderate quality of life lost.</li> <li>▪ Shut down of critical facilities for more than 1 day and less than 1 week.</li> </ul>	2	
	Critical	<ul style="list-style-type: none"> <li>▪ Moderate property damages (greater than 25% and less than 50% of critical and non-critical facilities and infrastructure).</li> <li>▪ Injuries or illnesses result in permanent disability and at least one death.</li> <li>▪ Shut down of critical facilities for more than 1 week and less than 1 month.</li> </ul>	3	
	Catastrophic	<ul style="list-style-type: none"> <li>▪ Severe property damages (greater than 50% of critical and non-critical facilities and infrastructure).</li> <li>▪ Injuries or illnesses result in permanent disability and multiple deaths.</li> <li>▪ Shut down of critical facilities for more than 1 month.</li> </ul>	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	

The 2007 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 asset inventory is generally tabularized into *critical* and *non-critical* categories. **Critical facilities and infrastructure** are systems, structures and infrastructure within a community whose incapacity or destruction would:

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

Following the criteria set forth by the Critical Infrastructure Assurance Office (CIAO), the State of Arizona has adopted eight general categories<sup>20</sup> that define critical facilities and infrastructure:

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

Other assets such as public libraries, schools, museums, parks, recreational facilities, historic buildings or sites, churches, residential and/or commercial subdivisions, apartment complexes, and so forth, are classified as non-critical facilities and infrastructure, as they would not necessarily have a debilitating impact on the defense or economic security of that community and/or significantly hinder a community's ability to recover following a disaster. They are, however, still considered by the Planning Team to be important facilities and critical and non-critical should not be construed to equate to important and non-important. For each asset, attributes such name, description, physical address, geospatial position, and estimated replacement cost were identified to the greatest extent possible and entered into a GIS geodatabase.

The 2005 Plan used a combination of the Asset Inventory and HAZUS<sup>®</sup>-MH<sup>21</sup> data to represent the critical and non-critical facilities for Graham County jurisdictions. The 2005 Plan Asset Inventory was distributed to each jurisdiction, as appropriate, and the responsibility for updating the database was

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<sup>20</sup> Instituted via Executive Order 13010, which was signed by President Clinton in 1996.

<sup>21</sup> U.S. Department of Homeland Security, Federal Emergency Management Agency, HAZUS<sup>®</sup>-MH.

given to the Local Planning Team, including decisions regarding which and how many assets would be reported. Updates included changes to the geographic position, revision of asset names, updating replacement costs, etc. New facilities were also added as appropriate and available. 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 5-5 summarizes the facility counts by category provided by each of the participating jurisdictions in this plan.

**Table 5-5: Summary of Critical and Non-Critical Facility counts by category and jurisdiction as of March 2009**

Participating Jurisdiction	Critical Facilities and Infrastructure								Non-Critical Facilities and Infrastructure					
	Communications Infrastructure	Electrical Power Systems	Gas and Oil Facilities	Banking and Finance Institutions	Transportation Networks	Water Supply Systems	Government Services	Emergency Services	Educational	Cultural	Business	Flood Control	Residential	Recreational
Graham County	20	0	2	0	9	0	12	11	6	25	16	13	1	3
Pima	4	0	1	0	0	0	5	3	10	5	3	0	0	0
Safford	4	1	6	4	11	27	14	3	9	30	58	1	13	4
Thatcher	1	1	2	0	0	1	2	1	10	8	27	1	0	0

It should be noted that the facility counts summarized in Table 5-5 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.

There were no future buildings, infrastructure, and critical facilities identified with this Plan.

**5.2.4 Loss Estimations**

In the original 2005 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<sup>®</sup>-MH map layer. Other quantitative methods included statistical methods based on historic data. The loss estimates for this Plan update represent the current hazard map layers and asset databases using the procedures discussed below.

Economic loss and human exposure estimates for each of the final hazards identified in Section 5.1 begins with an assessment of the potential exposure of critical and non-critical assets and human populations to those hazards. Exposure estimates of critical and non-critical assets 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 2009 population statistics projected from the 2000 Census Data population statistics that have been re-organized into GIS compatible databases and distributed with HAZUS<sup>®</sup>-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 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. The reality is that 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 update will not include quantitative exposure and loss estimates. The vulnerability of people and assets associated with some hazards are nearly impossible to evaluate given the uncertainty associated with where these hazards will occur as well as the relatively limited focus and extent of damage. Instead, a qualitative review of vulnerability will be discussed to provide insight to the nature of losses that are associated with the hazard. For subsequent updates of this Plan, the data needed to evaluate these unpredictable hazards may become refined such that comprehensive vulnerability statements and thorough loss estimates can be made.

#### *5.2.5 Development Trend Analysis*

The 2005 Plan development trend analysis will require updating to reflect growth and changes in Graham 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**
- **Vulnerability**
- **Sources**
- **Profile Maps (if applicable)**

Much of the 2005 Plan data has been updated, incorporated and/or revised to reflect current data and Planning Team changes, as well as an overall plan format change. County-wide and jurisdiction specific profile maps are provided at the end of the section (if applicable). Also, the maps are not included in the page count.

5.3.1 *Dam Failure*

**Description**

The primary risk associated with dam failure in Graham County is the inundation of downstream facilities and population by the resulting flood wave. Dams within or impacting Graham County can generally be divided into two groups: (1) storage reservoirs designed to permanently impound water, provide flood protection, and possibly generate power, and (2) single purpose flood retarding structures (FRS) designed to attenuate or reduce flooding by impounding stormwater for relatively short durations of time during flood events. The majority of dams within Graham County are earthen structures equipped with emergency spillways. The purpose of an emergency spillway is to provide a designed and protected outlet to convey runoff volumes exceeding the dam’s storage capacity during extreme or back-to-back storm events. Dam failures may be caused by a variety of reasons including: seismic events, extreme wave action, leakage and piping, overtopping, material fatigue and spillway erosion.

**History**

Graham County has no history of dam failure.

**Probability and Magnitude**

The probability and magnitude of dam failure discharges vary greatly with each dam and are directly influenced by the type and age of the dam, its operational purpose, storage capacity and height, downstream conditions, and many other factors. There are two sources of data that publish hazard ratings for dams impacting Graham County. The first is the Arizona Department of Water Resources (ADWR) and the second is the National Inventory of Dams (NID). Hazard ratings from each source are based on either an assessment of the consequence of failure and/or dam safety considerations, and they are not tied to probability of occurrence.

ADWR has regulatory jurisdiction over the non-federal dams impacting the County and is responsible for regulating the safety of these dams, conducting field investigations, and participating in flood mitigation programs with the goal of minimizing the risk for loss of life and property to the citizens of Arizona. ADWR jurisdictional dams are inspected regularly according to downstream hazard potential classification, which follows the NID classification system. High hazard dams are inspected annually, significant hazard dams every three years, and low hazard dams every five years. Via these inspections, ADWR identifies safety deficiencies requiring correction and assigns each dam one of six safety ratings. Examples of safety deficiencies include: lack of an adequate emergency action plan, inability to safely pass the required Inflow Design Flood (IDF), embankment erosion, dam stability, etc. Further descriptions of each safety classification are summarized in Table 5-6.

<b>Table 5-6: Summary of ADWR safety categories</b>	
<b>ADWR Safety Rating</b>	<b>Definition</b>
No Deficiency	Not Applicable
Safety Deficiency	One or more conditions at the dam that impair or adversely affects the safe operation of the dam.
<b>Unsafe Categories</b>	
Category 1: Unsafe Dams with Elevated Risk of Failure	These dams have confirmed safety deficiencies for which there is concern they could fail during a 100-year or smaller flood event. There is an urgent need to repair or remove these dams.
Category 2: Unsafe Dams Requiring Rehabilitation or Removal	These dams have confirmed safety deficiencies and require either repair or removal. These dams are prioritized for repair or removal behind the Category 1 dams.

<b>Table 5-6: Summary of ADWR safety categories</b>	
<b>ADWR Safety Rating</b>	<b>Definition</b>
Category 3: Unsafe Dams with Uncertain Stability during Extreme Events (Requiring Study)	Concrete or masonry dams that have been reclassified to high hazard potential because of downstream development (i.e. hazard creep”). The necessary documentation demonstrating that the dams meet or exceed standard stability criteria for high hazard dams during extreme overtopping and seismic events is lacking. The dams are classified as unsafe pending the results of required studies. Upon completion of these studies, the dams are either removed from the list of unsafe dams or moved to Category 2 and prioritized for repair or removal.
Category 4: Unsafe Dams Pending Evaluation of Flood-Passing Capacity (Requiring Study)	<p>In 1979, the U.S. Army Corps of Engineers established Federal Guidelines for assessing the safe-flood passing capacity of high hazard potential dams (CFR Vol. 44 No. 188). These guidelines established one-half of the “probable maximum flood” (PMF) as the minimum storm which must be safely passed without overtopping and subsequent failure of the dam. Dams unable to safely pass a storm of this size were classified as being in an “unsafe, non-emergency” condition.</p> <p>Prior studies for these earthen dams (mostly performed in the 1980’s) predicted they could not safely pass one-half of the PMF. They were predicted to overtop and fail for flood events ranging from 30 to 46 percent of the PMF. Recent studies both statewide and nationwide have indicated that the science of PMF hydrology as practiced in the 1990’s commonly overestimates the PMF for a given watershed. The ADWR is leading efforts on a statewide update of probably maximum precipitation (PMP) study scheduled for completion in 2011. These dams should be re-evaluated using updated methods to confirm their safety status. Upon completion of these evaluations, they are either removed from the list of unsafe dams or moved to Category 2 and prioritized for repair or removal.</p>
Source: ADWR, 2009.	

The NID database contains information on approximately 77,000 dams in the 50 states and Puerto Rico, with approximately 30 characteristics reported for each dam, such as: name, owner, river, nearest community, length, height, average storage, max storage, hazard rating, Emergency Action Plan (EAP), latitude, and longitude.

The NID and ADWR databases provide useful information on the potential hazard posed by dams. Each dam in the NID is assigned one of the following three hazard potential classes based on the potential for loss of life and damage to property should the dam fail (listed in increasing severity): low, significant, or high. The hazard potential classification is based on an evaluation of the probable present and future incremental adverse consequences that would result from the release of water or stored contents due to failure or improper operation of the dam or appurtenances, regardless of the condition of the dam. The ADWR evaluation includes land-use zoning and development projected for the affected area over the 10-year period following the classification of the dam. It is important to note that the hazard potential classification is an assessment of the consequences of failure, but not an evaluation of the probability of failure or improper operation. Table 5-7 summarizes the hazard potential classifications and criteria for dams regulated by the State of Arizona.

<b>Table 5-7: Downstream hazard potential classes for state regulated dams</b>		
<b>Hazard Potential Classification</b>	<b>Loss of Human Life</b>	<b>Economic, Environmental, Lifeline Losses</b>
Low	None expected	Low and generally limited to owner

Significant	None expected	Yes
High	Probable. One or more expected	Yes (but not necessary for this classification)
Note: The hazard potential classification is an assessment of the consequences of failure, but not an evaluation of the probability of failure.		
Source: ADWR and NID 2009		

The NID database includes dams that are either:

- High or Significant hazard potential class dams, or,
- Low hazard potential class dams that exceed 25 feet in height and 15 acre-feet storage, or,
- Low hazard potential class dams that exceed 50 acre-feet storage and 6 feet height.

There are 45 dams in Graham County based on the two databases. Of the 45 dams, 26 are under ADWR jurisdiction. Table 5-8 provides a summary of the high and significant hazard dams in both the ADWR and NID databases.

Hazard Class	ADWR ID No.	NID ID No.	Dam Name	ADWR Safety Types	EAP	Inundation Mapping	Nearest Downstream Development	Distance in Miles
<b>High</b>	05.04	AZ00071	Cluff Ranch #3	Safety Deficiency	Yes	Yes	Dublin & Pima	6
	05.06	AZ00065	Central Detention	Unsafe Dams Pending Evaluation of Flood-Passing Capacity (Requiring Study)	Outdated	Yes	Central	2
	05.07	AZ00069	Frye Mesa	Unsafe Dams with Uncertain Stability during Extreme Events (Requiring Study)	Yes	Yes	Thatcher	8
	05.16	AZ00066	Graveyard Wash	Unsafe Dams Pending Evaluation of Flood-Passing Capacity (Requiring Study)	Yes	Yes	Safford	2
	05.17	AZ00072	Freeman Wash Retarding	Safety Deficiency	Yes	Yes	Thatcher	1
	05.18	AZ00067	Stockton Wash Retarding	Unsafe Dams Pending Evaluation of Flood-Passing Capacity (Requiring Study)	Yes	Yes	Safford	2
	05.19	AZ00068	Frye Creek Retarding	Unsafe Dams Pending Evaluation of Flood-Passing Capacity (Requiring Study)	Yes	Yes	Thatcher	1
	05.21	AZ00091	Roper Lake	No Deficiency	Yes	Yes	Safford	5
	05.23	AZ00055	Haralson	No Deficiency	Draft	Draft (2004)	Thatcher	4
	05.24	AZ00159	Grant Morris	No Deficiency	Yes	Yes	Thatcher	2
	05.25	AZ00160	Howard	No Deficiency	Yes	Yes	Pima	3
	05.26	AZ00161	Chesley-Wamslee	No Deficiency	Yes	Yes	Pima	3

**Table 5-8: Summary of NID and ADWR dams by hazard classification**

Hazard Class	ADWR ID No.	NID ID No.	Dam Name	ADWR Safety Types	EAP	Inundation Mapping	Nearest Downstream Development	Distance in Miles
	05.27	AZ00162	Foote Wash	No Deficiency	Draft	Yes	Lone Star	2
	05.28	AZ00163	No Name Wash	No Deficiency	Yes	Yes	Lone Star	2
	05.29	AZ00164	Lee	No Deficiency	Yes	Yes	Eden	5
	05.30	AZ00165	Indian Farms	No Deficiency	Yes	Yes	Eden	1
	05.31	AZ00166	Billingsley	No Deficiency	Yes	Yes	Eden	2
	05.33	AZ00245	Cook Reservoir	Unsafe Dams with Elevated Risk of Failure	No	Yes	Safford	0.5
	N/A	AZ10381	Dry Lake	N/A	Yes	Yes	Point of Pines	9
	N/A	AZ10380	Point of Pines	N/A	Yes	Yes	Point of Pines	3
Significant	N/A	AZ11000	Upper Point of Pines	N/A	Yes	Yes	Point of Pines	5
	05.08	AZ00158	Riggs Reservoir	Safety Deficiency	Yes	No	Thatcher	4
	05.10	AZ00054	Lebanon Reservoir #1 (Upper)	Safety Deficiency	Yes	Yes	Safford	13
	05.14	AZ00070	Judy Wash Retarding	Safety Deficiency	Outdated (1987)	Outdated (1987)	Solomon	1

Sources: NID, ADWR Dam Safety Database (October 2009)

The magnitude of impacts due to dam failure are usually depicted by mapping the estimated downstream inundation limits based on an assessment of a combination of flow depth and velocity. These limits are typically a critical part of the emergency action plan. Of the 45 dams considered, only 13 emergency action plans showing downstream dam failure inundation limits were readily available. For inundation resulting from dam failure, the following two classes of hazard risk are depicted:

HIGH Hazard = Inundation limits due to dam failure

LOW Hazard = All other areas outside the inundation limits

Map 1A is a county-wide map showing the location and hazard classifications for each dam and the corresponding dam failure inundation limits (if available). Maps 1B, 1C and 1D are similar maps that are scaled to present the hazard around the general vicinity of Pima, Safford and Thatcher, respectively.

**Vulnerability – CPRI Results**

Dam inundation CPRI results for each community are summarized in Table 5-9.

**Table 5-9: Summary of CPRI results by jurisdiction for dam failure**

Participating Jurisdiction	Probability	Magnitude/Severity	Warning Time	Duration	CPRI Score
Graham County	Possibly	Critical	6-12 hours	>1 week	2.65
Pima	Unlikely	Negligible	12-24 hours	<6 hours	1.15
Safford	Possibly	Catastrophic	>24 hours	>1 week	2.65
Thatcher	Unlikely	Critical	6-12 hours	<6 hours	1.90
<b>County-wide average CPRI =</b>					<b>2.09</b>

**Vulnerability – Loss Estimations**

The estimation of potential losses due to inundation from a dam failure was accomplished by intersecting the human and facility assets with the inundation limits depicted on Maps 1A – 1D. As stated previously, only 13 of the 45 dams has a delineated dam failure inundation limit downstream of the dam. Therefore, the results of this analysis are expected to underestimate the exposure of people and infrastructure within Graham County.

Since no common methodology is available for obtaining losses from the exposure values, estimates of the loss-to-exposure ratios were assumed based on the perceived potential for damage. Any hazard event, or series of hazard events of sufficient magnitude to cause a dam failure scenario, would have potentially catastrophic consequences in the inundation area. Floodwaves from these types of events travel very fast and possess tremendous destructive energy. Accordingly, an average event based loss-to-exposure ratio for the inundation areas with a high hazard rating are estimated to be 0.25. Low rated areas are zero.

It should be noted that the Planning Team recognizes that the probability of a dam failure occurring on multiple (or all) structures at the same time is essentially zero. Accordingly, the loss estimates presented below are intended to serve as a collective evaluation of the potential exposure to dam failure inundation events.

Table 5-10 summarizes estimations of losses to Planning Team identified assets for the dam failure inundation hazard. Table 5-11 summarizes the estimated population exposed to the dam failure inundation hazard. Tables 5-12 through 5-16 summarize exposure and loss estimates to the HAZUS residential, commercial, and industrial building stock for the dam failure inundation hazard. Table 5-12 summarizes the HAZUS based exposure and losses for the entirety of Graham County. Tables 5-13 through 5-16 summarize jurisdiction specific HAZUS data exposure and loss estimates. It should be noted that County-Wide exposure totals for HAZUS building stock and the population within Graham County includes statistics from the San Carlos Apache Tribe, which is not participating in this Plan.

In summary, \$236 million in asset related losses are estimated for dam failure inundation for all the participating jurisdictions in Graham County. An additional \$285 million in losses to HAZUS defined residential, commercial, and industrial facilities is estimated for all participating Graham County jurisdictions. Regarding human vulnerability, a total population of 15,031 people, or 52.0% of the total Graham County population, is potentially exposed to a dam failure inundation event. The potential for deaths and injuries are directly related to the warning time and type of event. Given the magnitude of such an event(s), it is realistic to anticipate at least one death and several injuries. There is also a high probability of population displacement for most of the inhabitants within the inundation limits downstream of the dam(s).

#### **Vulnerability – Development Trend Analysis**

The flood protection afforded by dams in Graham County has encouraged development of downstream lands, and it reasonable to expect additional development within these areas. Public awareness measures such as notices on final plats and public education on dam safety are ways that the local county, city and town officials can mitigate the potential impact of a dam failure. Over the past five years, Graham County, Safford and Thatcher have been actively working with ADWR and NRCS to update and improve the dams upstream of Safford and Thatcher to enhance the safety of those structures. They have also worked on installing gages and telemetry to provide tools for monitoring and prediction. Also, Emergency Action Plans (EAPs) that establish potential dam failure inundation limits, notification procedures, and thresholds are also prepared for response to potential dam related disaster events.

#### **Sources**

Arizona Department of Water Resources, 2009,

<http://www.azwater.gov/AzDWR/SurfaceWater/DamSafety/default.htm>

Arizona Division of Emergency Management, 2009, *State of Arizona Multi-Hazard Mitigation Plan, 2010 Update, DRAFT.*

US Army Corps of Engineers, National Inventory of Dams, 2009, <https://nid.usace.army.mil/>

#### **Profile Maps**

Maps 1A, 1B, 1C and 1D – Potential Dam Failure Inundation Hazard Map

<b>Table 5-10: Summary asset inventory losses due to dam failure flooding</b>					
<b>Community</b>	<b>Total Facilities Reported by Community</b>	<b>Impacted Facilities</b>	<b>Percentage of Total Community Facilities Impacted</b>	<b>Estimated Replacement Cost (x \$1000)</b>	<b>Estimated Structure Loss (x \$1000)</b>
<b>HIGH</b>					
<b>County-Wide Totals</b>	<b>388</b>	<b>229</b>	<b>59.0%</b>	<b>\$471,197</b>	<b>\$235,599</b>
Graham County	118	31	26.3%	\$36,835	\$18,418
Pima	31	0	0.0%	\$0	\$0
Safford	185	153	82.7%	\$235,682	\$117,841
Thatcher	54	45	83.3%	\$198,680	\$99,340

<b>Table 5-11: Summary of population sectors exposed to dam failure</b>						
<b>Community</b>	<b>Total Population</b>	<b>Population Exposed</b>	<b>Percent of Population Exposed</b>	<b>Total Population Over 65</b>	<b>Population Over 65 Exposed</b>	<b>Percent of Population Over 65 Exposed</b>
<b>HIGH</b>						
<b>County-Wide Totals</b>	<b>28,889</b>	<b>15,031</b>	<b>52.03%</b>	<b>3,724</b>	<b>2,317</b>	<b>62.21%</b>
Pima	2,055	0	0.00%	249	0	0.00%
Safford	9,329	8,961	96.05%	1,624	1,561	96.13%
Thatcher	4,032	3,711	92.04%	458	419	91.62%
Unincorporated County	13,473	2,359	17.51%	1,393	336	24.14%

**Table 5-12: Summary of Graham County HAZUS building exposure to Dam Failure**

	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SUMMARY		
Graham 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)
<b>County-Wide Totals</b>	<b>12,563</b>	<b>\$1,512,062</b>	<b>464</b>	<b>\$348,377</b>	<b>103</b>	<b>\$75,321</b>	<b>\$1,935,759</b>		
High Hazard Exposure	6,250	\$845,730	308	\$247,110	48	\$46,752	\$1,139,591	25%	\$284,898
Graham County HAZUS Summary	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact			
High Hazard Exposure	49.75%	55.93%	66.44%	70.93%	46.54%	62.07%			

**Table 5-13: Summary of Pima HAZUS building exposure to Dam Failure**

	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SUMMARY		
Pima 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)
<b>Community-Wide Totals</b>	<b>940</b>	<b>\$79,248</b>	<b>25</b>	<b>\$11,730</b>	<b>8</b>	<b>\$2,452</b>	<b>\$93,431</b>		
High Hazard Exposure	0	\$0	0	\$0	0	\$0	\$0	25%	\$0
Pima 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%			

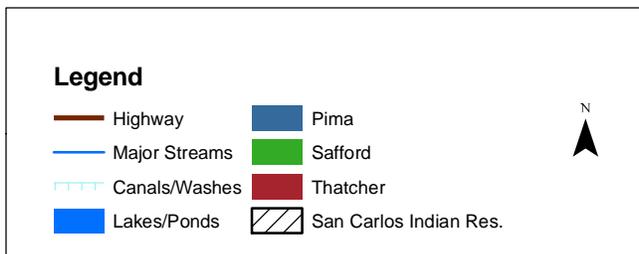
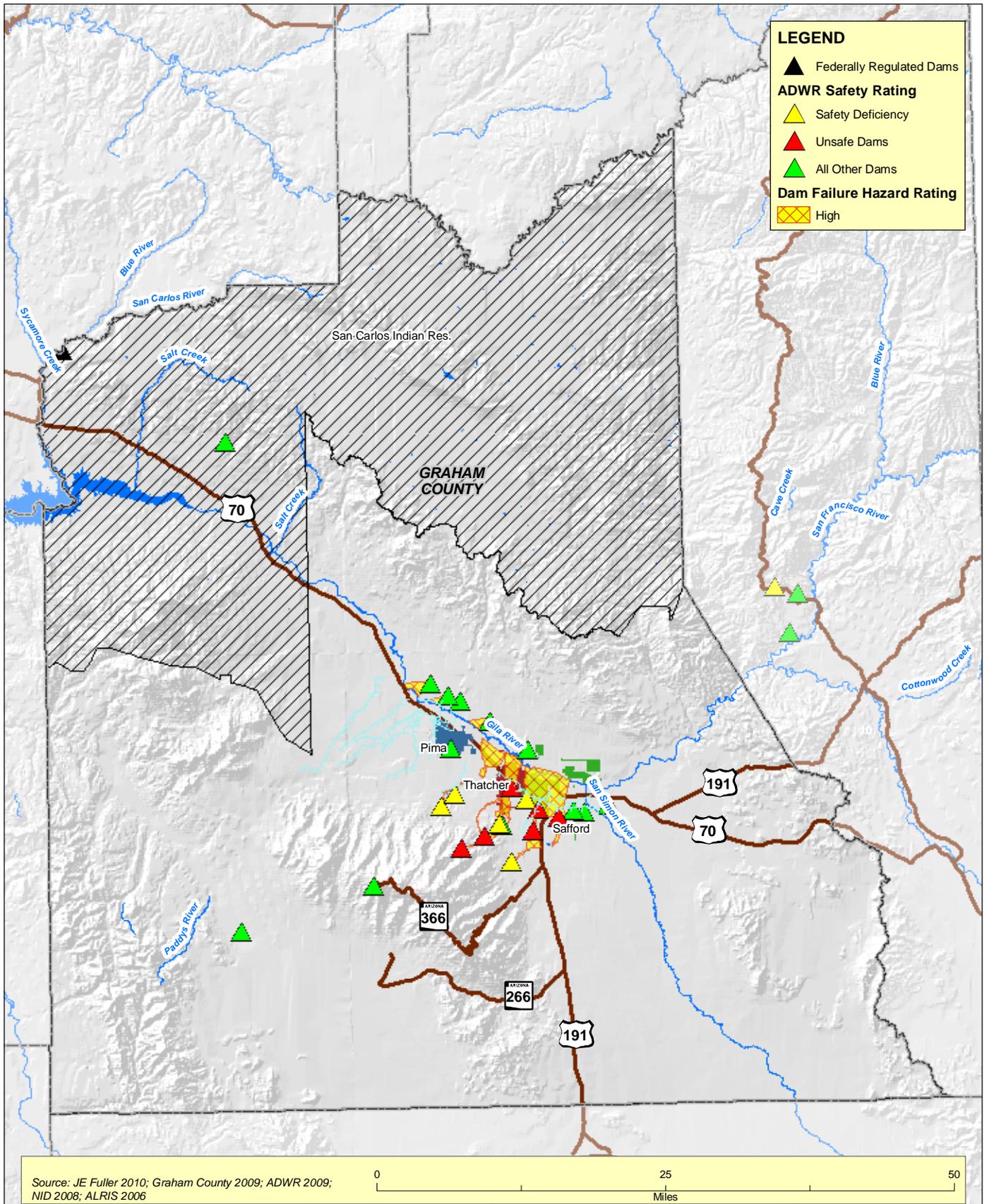
**Table 5-14: Summary of Safford HAZUS building exposure to Dam Failure**

	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SUMMARY		
Safford 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)
<b>Community-Wide Totals</b>	<b>4,004</b>	<b>\$572,404</b>	<b>223</b>	<b>\$184,171</b>	<b>27</b>	<b>\$36,717</b>	<b>\$793,292</b>		
High Hazard Exposure	3,863	\$545,038	213	\$174,232	26	\$36,368	\$755,638	25%	\$188,910
Safford HAZUS Summary	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact			
High Hazard Exposure	96.50%	95.22%	95.47%	94.60%	94.54%	99.05%			

**Table 5-15: Summary of Thatcher HAZUS building exposure to Dam Failure**

	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SUMMARY		
Thatcher 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)
<b>Community-Wide Totals</b>	<b>1,605</b>	<b>\$217,989</b>	<b>60</b>	<b>\$40,397</b>	<b>10</b>	<b>\$3,489</b>	<b>\$261,875</b>		
High Hazard Exposure	1,470	\$201,589	49	\$32,653	9	\$3,160	\$237,403	25%	\$59,351
Thatcher HAZUS Summary	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact			
High Hazard Exposure	91.62%	92.48%	81.16%	80.83%	86.33%	90.58%			

	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SUMMARY		
Unincorporated Graham 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)
<b>Community-Wide Totals</b>	<b>4,871</b>	<b>\$514,816</b>	<b>142</b>	<b>\$89,464</b>	<b>53</b>	<b>\$24,762</b>	<b>\$629,042</b>		
<b>High Hazard Exposure</b>	916	\$99,102	46	\$40,225	13	\$7,223	\$146,550	25%	\$36,638
Unincorporated Graham County HAZUS Summary	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact			
<b>High Hazard Exposure</b>	18.81%	19.25%	32.68%	44.96%	25.41%	29.17%			

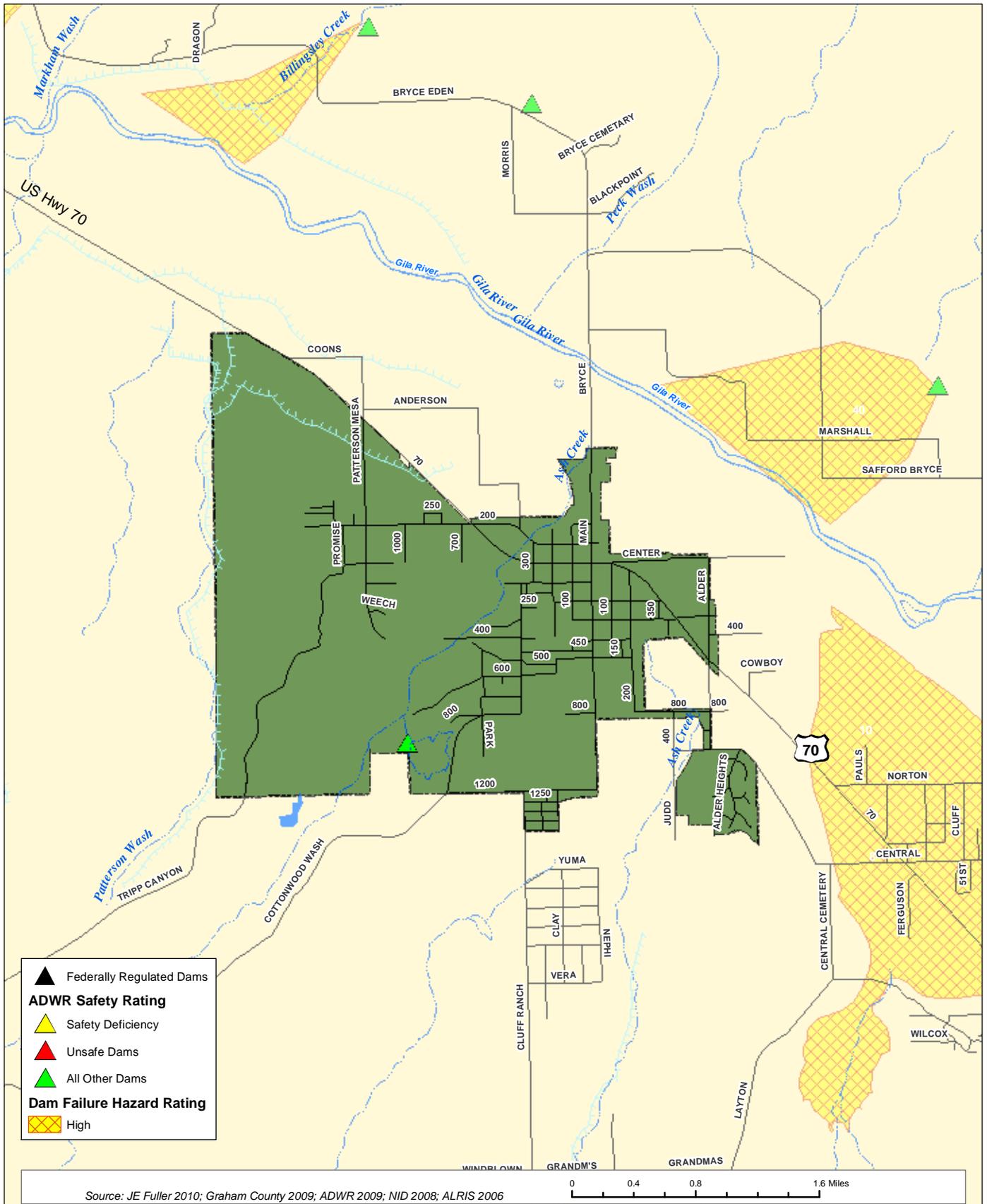


**Graham County Multi-Jurisdictional Multi-Hazard Mitigation Plan**

**Map 1A**

**Graham County Dam Failure Hazard Map**

County of Graham  
Town of Pima  
Thatcher  
City of Safford  
A great place to live, work, and play



**Legend**

- Major Streams
- Streets
- Canals/Washes
- Lakes/Ponds
- County

**Community**

- Pima
- Safford
- Thatcher
- Unincorporated
- San Carlos Indian Res.

N

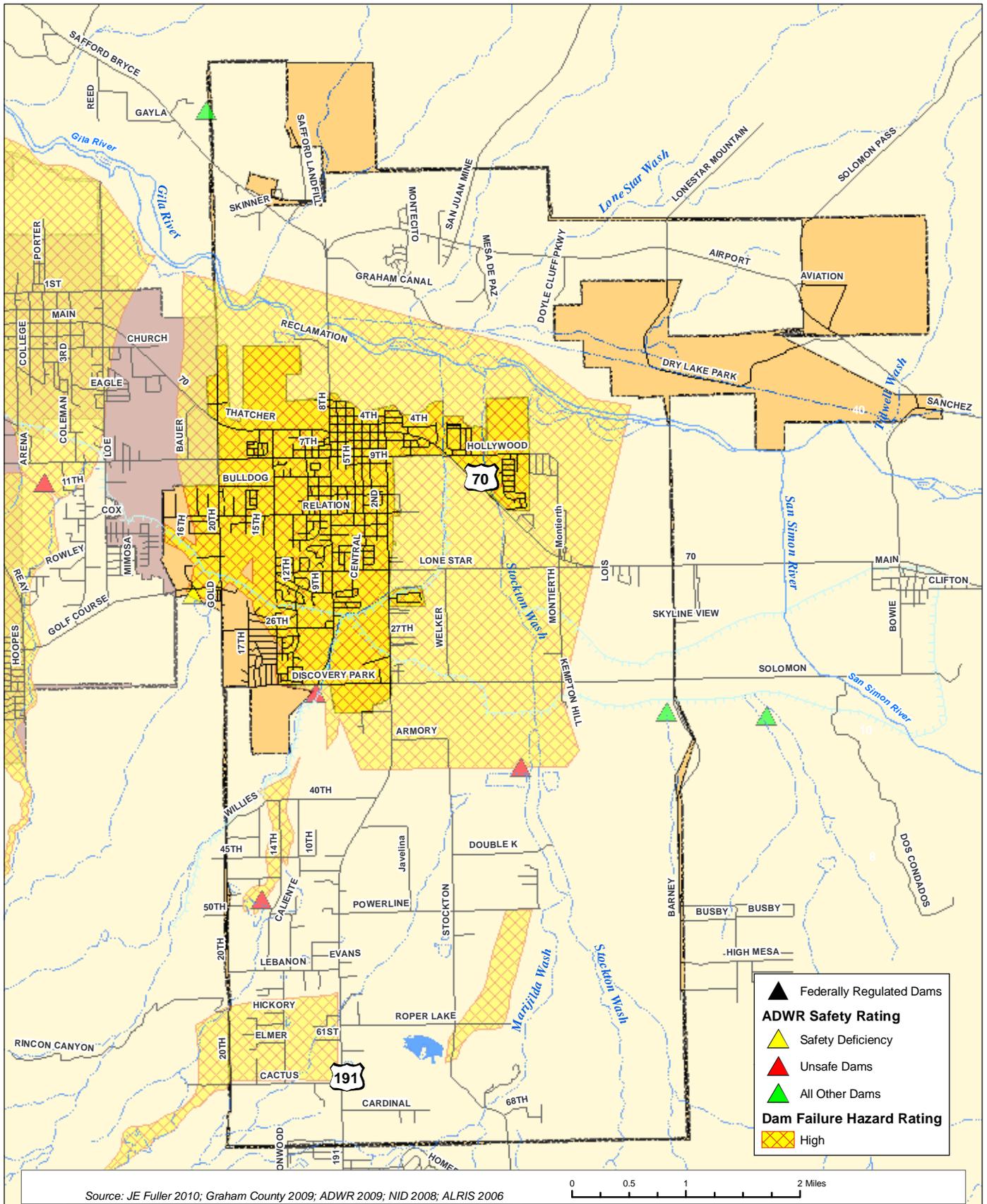
**Graham County Multi-Jurisdictional Multi-Hazard Mitigation Plan**

**Map 1B**

**Town of Pima Dam Failure Hazard Map**

City of Safford  
A great place to live, work, and visit

Town of Pima



**Legend**

- Major Streams
- Streets
- Canals/Washes
- Lakes/Ponds
- County

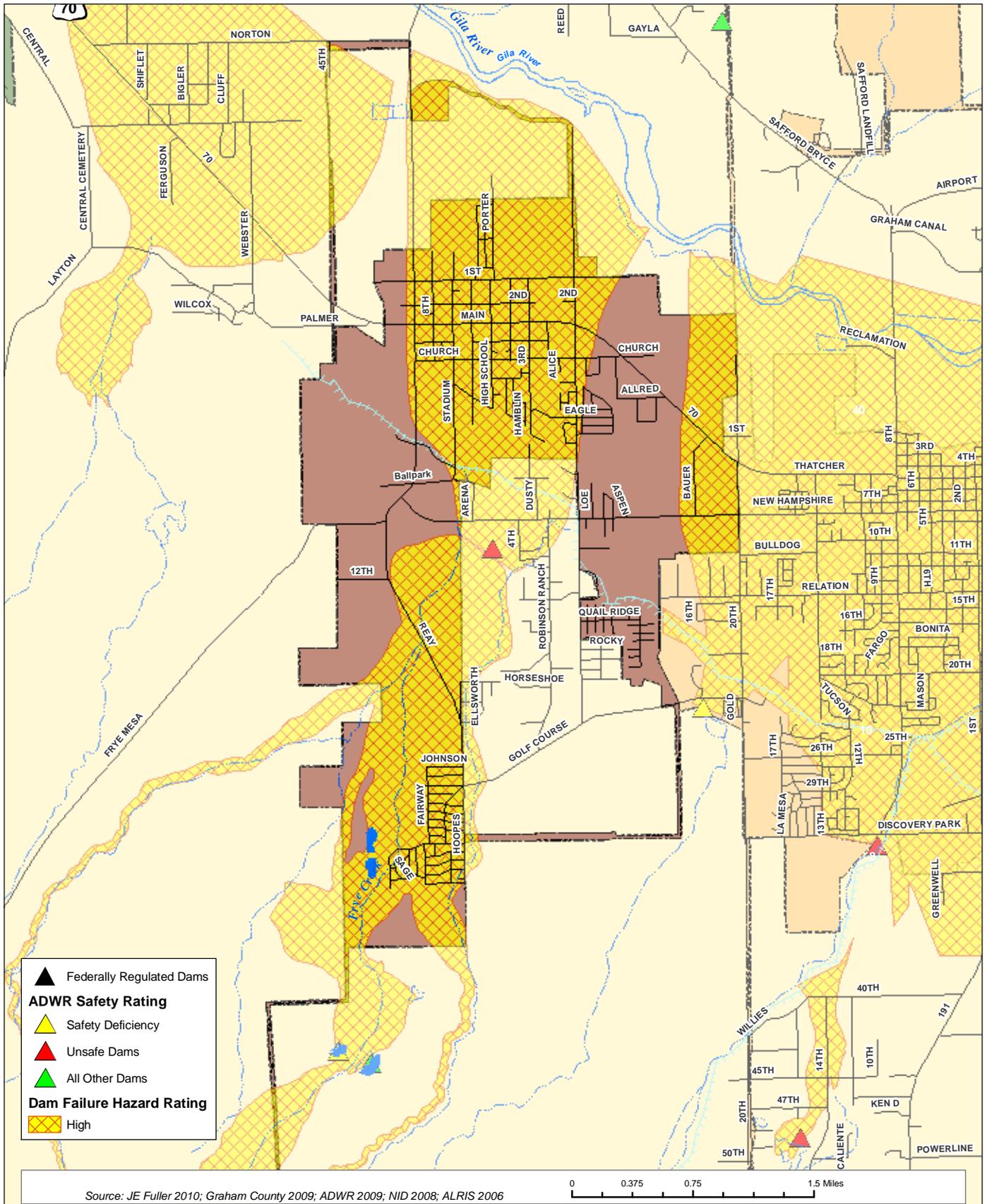
**Community**

- Pima
- Safford
- Thatcher
- Unincorporated
- San Carlos Indian Res.

**Graham County Multi-Jurisdictional Multi-Hazard Mitigation Plan**

**Map 1C**

**City of Safford Dam Failure Hazard Map**



**Legend**

- Major Streams
- Streets
- Canals/Washes
- Lakes/Ponds
- County

**Community**

- Pima
- Safford
- Thatcher
- Unincorporated
- San Carlos Indian Res.

N

**Graham County Multi-Jurisdictional Multi-Hazard Mitigation Plan**

**Map 1D**

**Town of Thatcher Dam Failure Hazard Map**

5.3.2 *Drought*

**Description**

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

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

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

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

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

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

**History**

Arizona has experienced 17 droughts declared as drought disasters/emergencies and 93 drought events (droughts affecting multiple years are recorded as a distinct event for each year affected). Figures 5-1 and 5-2 depict the most 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 1979-1983 appears to have been anomalously wet, while the rest of the historical records shows that dry conditions are most likely the normal condition for Arizona. Between 1998 and 2007, there have been more months with below normal precipitation than months with above normal precipitation.

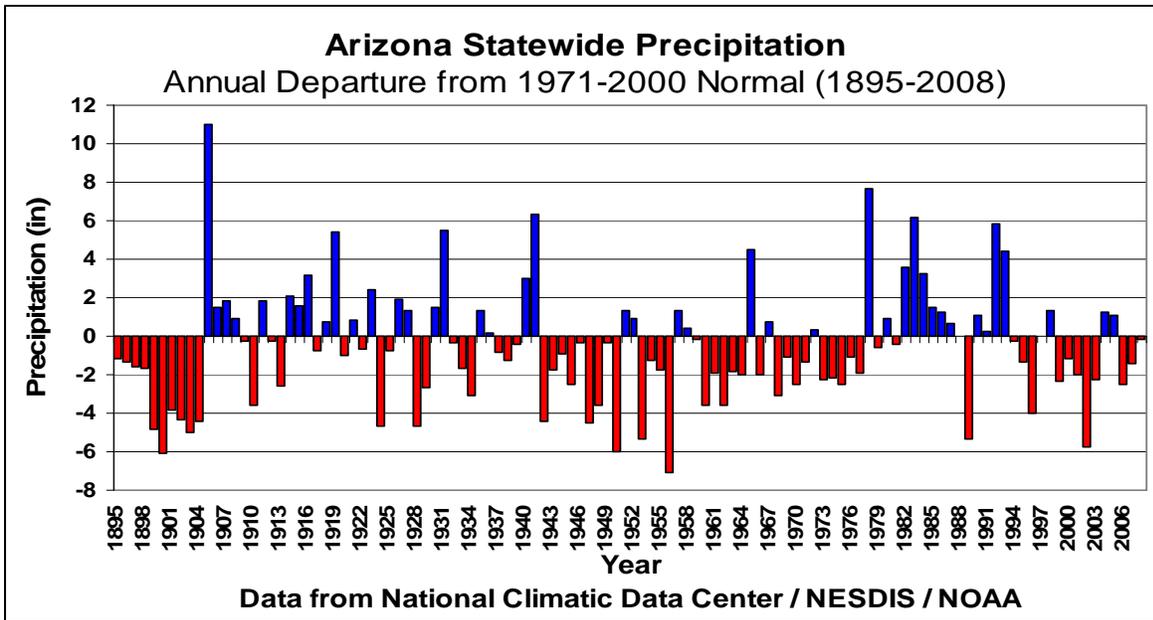


Figure 5-1: Average statewide precipitation variances from a normal based on 1971-2000 period.

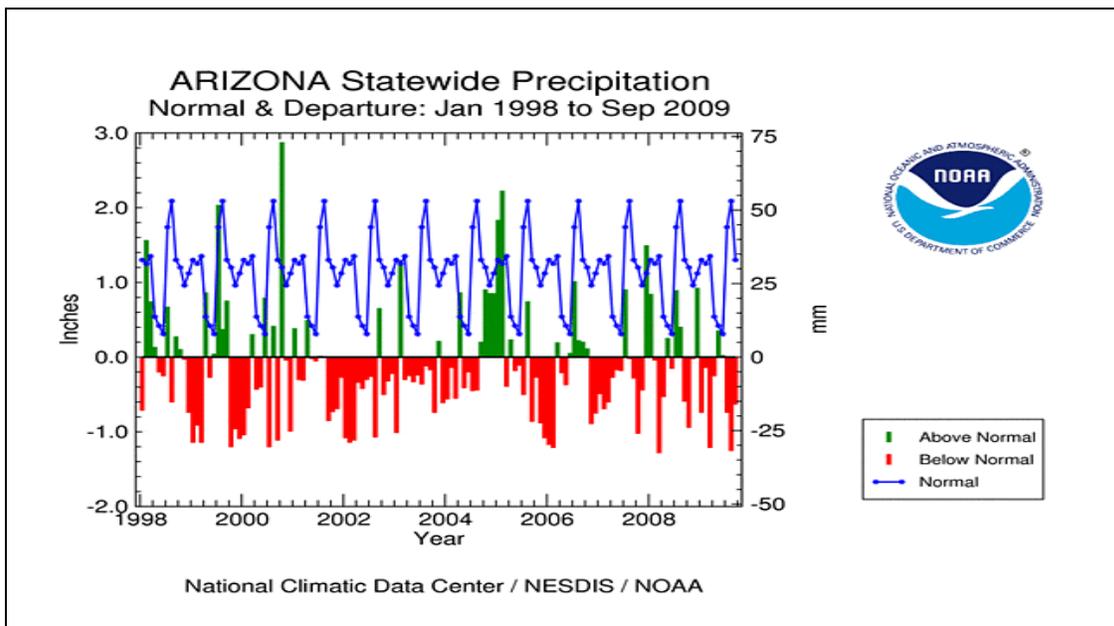
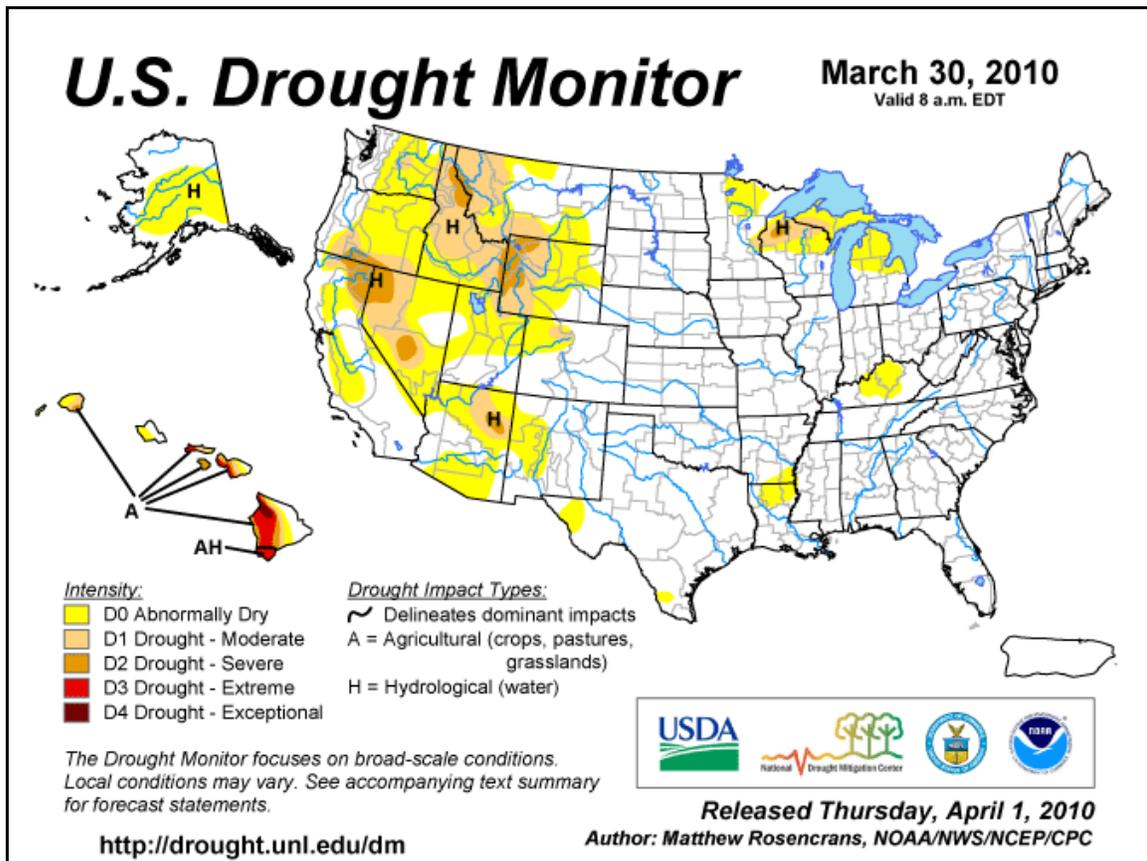


Figure 5-2: Average statewide precipitation variances from a normal based on 1998-2009 period

**Probability and Magnitude**

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

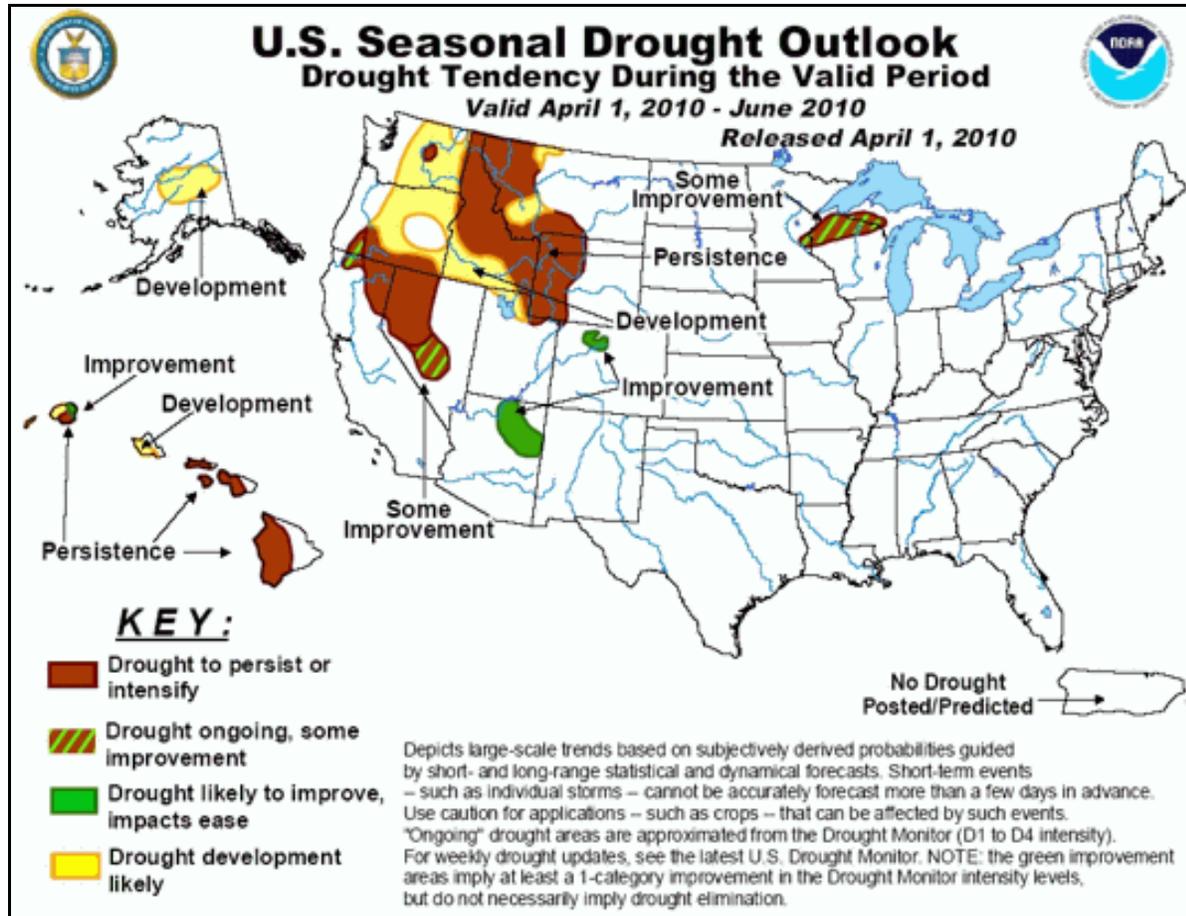
The National Integrated Drought Information System (NIDIS) Act of 2006 (Public Law 109-430) prescribes an interagency approach for drought monitoring, forecasting, and early warning (NIDIS, 2007). The NIDIS maintains the U.S. Drought Portal<sup>22</sup> which is a centralized, web-based access point 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://www.drought.gov/portal/server.pt/gateway/PTARGS\\_0\\_2\\_693\\_208\\_0\\_43/http%3B/drought.unl.edu/dm/monitor.html](http://www.drought.gov/portal/server.pt/gateway/PTARGS_0_2_693_208_0_43/http%3B/drought.unl.edu/dm/monitor.html)

**Figure 5-3: U.S. Drought Monitor Map for March 30, 2010**

<sup>22</sup> NIDIS U.S. Drought Portal website is located at: <http://www.drought.gov/portal/server.pt/community/drought.gov/202>

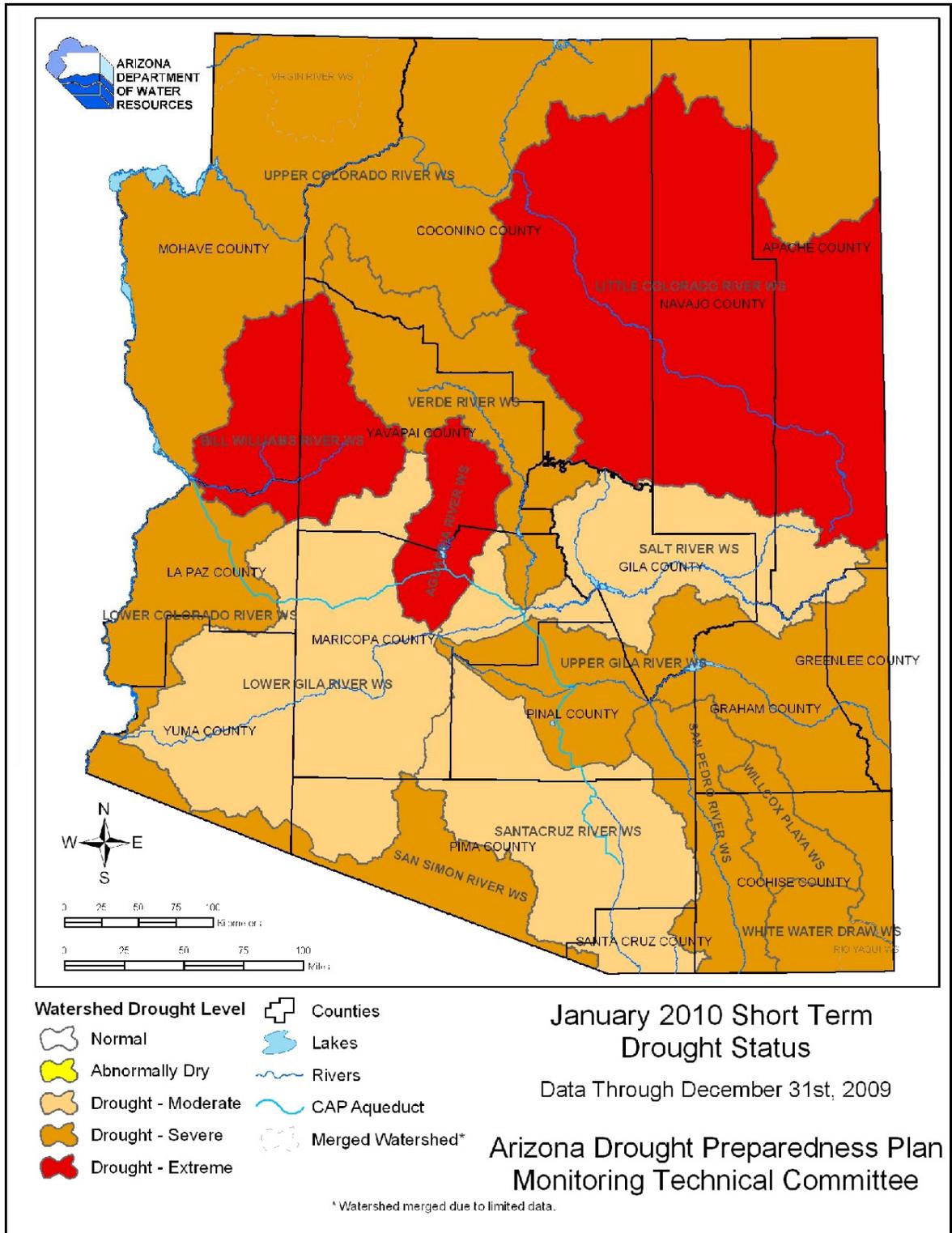


Source: [http://www.cpc.ncep.noaa.gov/products/expert\\_assessment/seasonal\\_drought.html](http://www.cpc.ncep.noaa.gov/products/expert_assessment/seasonal_drought.html)

**Figure 5-4: U.S. Seasonal Drought Outlook, April to June, 2010**

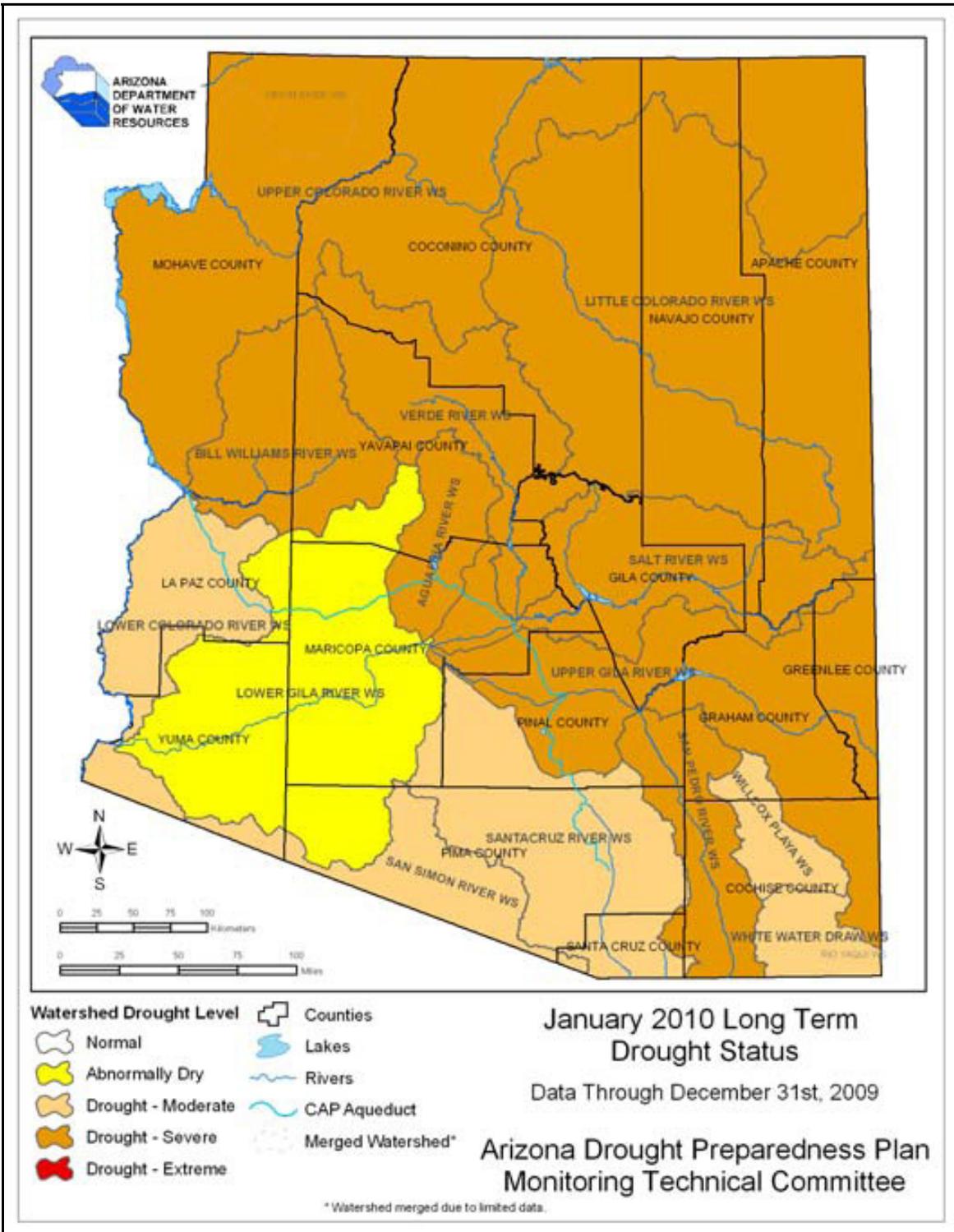
In 2003, Governor Janet Napolitano created the Arizona Drought Task Force (ADTF), led by ADWR, which developed a statewide drought plan. The plan includes criteria for determining both short and long-term drought status for each of the 15 major watersheds in the state using assessments that are based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

The current drought maps are in general agreement that Graham County is currently abnormally dry and in a moderate to severe drought condition for the long term. Figure 5-4 indicates that the drought conditions will likely remain the same for Graham County over the next few months.



Source: ADWR, 2010, *Arizona Drought Monitor Report - January 2010*

Figure 5-5: Arizona short term drought status map for August 2009



Source: ADWR, 2010, *Arizona Drought Monitor Report - January 2010*

Figure 5-6: Arizona long term drought status map for July 2009

**Vulnerability – CPRI Results**

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

**Table 5-17: Summary of CPRI results by jurisdiction for drought**

<b>Participating Jurisdiction</b>	<b>Probability</b>	<b>Magnitude/ Severity</b>	<b>Warning Time</b>	<b>Duration</b>	<b>CPRI Score</b>
Graham County	Highly Likely	Limited	>24 hours	>1 week	2.95
Pima	Highly Likely	Critical	>24 hours	>1 week	3.25
Safford	Likely	Critical	>24 hours	>1 week	2.80
Thatcher	Highly Likely	Negligible	>24 hours	>1 week	2.65
<b>County-wide average CPRI =</b>					<b>2.91</b>

**Vulnerability – Loss Estimations**

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

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

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

From 1995 to 2006, Graham County farmers and ranchers received \$3.5 million in disaster related assistance funding from the U.S Department of Agriculture (USDA) for crop and livestock damages (EWG, 2009). Over \$2.5 million of those funds were received in 2003 (\$1.0 million) and 2005 (\$1.5 million), which corresponds to the most severe period of the current drought cycle for Graham County. Other direct costs such as increased pumping costs due to lowering of groundwater levels and costs to expand water infrastructure to compensate for reduced yields or to develop alternative water sources, are a significant factor but very difficult to estimate due to a lack of documentation. There are also the intangible costs associated with lost tourism revenues, and impacts to wildlife habitat and animals. Typically, these impacts are translated into the general economy in the form of higher food and agricultural goods prices and increased utility costs.

**Vulnerability – Development Trends**

Population growth in Graham County will also require additional surface and ground water to meet the demands of potable, landscape, and industrial uses. It is unlikely that significant growth will occur in the ranching and farming sectors given the current constraints on water rights, grazing rights, and available range land. Drought planning should be a critical component of any domestic water system expansions or land development planning. The ADTF is also working cooperatively with water providers within the State to develop System Water Plans that are comprised of three components:

- *Water Supply Plan* – describes the service area, transmission facilities, monthly system production data, historic demand for the past five years, and projected demands for the next five, 10 and 20 years.

- *Drought Preparedness Plan* – includes drought and emergency response strategies, a plan of action to respond to water shortage conditions, and provisions to educate and inform the public.
- *Water Conservation Plan* – addresses measures to control lost and unaccounted for water, considers water rate structures that encourage efficient use of water, and plans for public information and education programs on water conservation.

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

**Sources**

Arizona Department of Water Resources, 2010, *Arizona Drought Monitor Report - January 2010*

Arizona Division of Emergency Management, 2009, *State of Arizona Multi-Hazard Mitigation Plan, 2010 Update, DRAFT.*

Environmental Working Group's Farm Subsidy Database, 2010,  
<http://farm.ewg.org/farm/regiondetail.php?fips=04009&summlevel=2>

Federal Emergency Management Agency, 1997, *Multi-Hazard Identification and Risk Assessment – A Cornerstone of the National Mitigation Strategy.*

Jacobs, Katharine and Morehouse, Barbara. June 11-13, 2003. "Improved Drought Planning for Arizona," from Conference on Water, Climate, and Uncertainty: Implications for Western Water Law, Policy and Management  
[http://www.water.az.gov/gdtf/content/files/06262003/Improved\\_Drought\\_Planning\\_for\\_AZ\\_6-17.pdf](http://www.water.az.gov/gdtf/content/files/06262003/Improved_Drought_Planning_for_AZ_6-17.pdf)

National Integrated Drought Information System, 2007, *National Integrated Drought Information System Implementation Plan*, NOAA.

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

NOAA, NWS, Climate Prediction Center, 2010, website located at:  
[http://www.cpc.ncep.noaa.gov/products/expert\\_assessment/seasonal\\_drought.html](http://www.cpc.ncep.noaa.gov/products/expert_assessment/seasonal_drought.html)

**Profile Maps** - No profile maps are provided.

5.3.3 *Fissure*

**Description**

Earth fissures are linear cracks, seams, or separations in the ground surface that extend from the groundwater table or bedrock, and are caused by tensional forces related to differential land subsidence. In many cases, fissures form as a direct result of subsidence caused by groundwater depletion. The surface expression of fissures ranges from less than a yard to several miles long and from less than an inch to tens of feet wide. The longest fissure is in Pinal County, near Picacho, and is over 10 miles long. Earth fissures occur at the edges of basins, usually parallel to mountain fronts, or above local bedrock highs in the subsurface, and typically cut across natural drainage patterns. Fissures can alter flood patterns, break buried pipes and lines, cause infrastructure to collapse, provide a direct conduit to the groundwater table for contaminants, and even pose a life safety hazard for both humans and animals.

**History**

In Arizona, fissures were first noted near Picacho in 1927. The number of fissures has increased dramatically since the 1950s due to the accelerated depletion of groundwater. Initially the heaviest use of groundwater was for agricultural irrigation use. More recently, however, exponential population growth has dramatically increased domestic demands. The risk posed by fissures is also increasing as the population expands into the outlying basin edges and mountain fronts. For Graham County, fissures (or possibly giant dessication cracks) have appeared in the Klondyke area on the south side of Mt. Graham, threatening the county maintained Bonita Aravaipa Road. The area of concern is shown in Figure 5-7. According to the Graham County Transportation Department, the fissures in the area have resulted in damages to Bonita Aravaipa Road that require ongoing repairs.

**Probability/Magnitude**

There are no methods of quantifiably predicting the probability and magnitude of earth fissures. The locations of potential fissures or extension of existing fissures may be predictable in specific areas if enough information about the subsurface material properties and groundwater levels are available. It is a fair assurance that continued groundwater depletion will result in more fissures. The magnitude of existing and new fissures is dependent upon several variables including the depth to groundwater, type and depth of surficial material present, amount and rate of groundwater depletion, groundwater basin depth, depth to bedrock, volume and rate of runoff due to precipitation entering the fissure, and human intervention.

The Arizona Geological Survey has mapped known and suspected fissure lineaments for certain areas within the state. Currently, no fissure mapping is available for Graham County.

**Vulnerability – CPRI Results**

Fissure CPRI results for each community are summarized in Table 5-18 below.

<b>Participating Jurisdiction</b>	<b>Probability</b>	<b>Magnitude/ Severity</b>	<b>Warning Time</b>	<b>Duration</b>	<b>CPRI Score</b>
Graham County	Highly Likely	Limited	<6 hours	>1 week	3.40
Pima	Unlikely	Negligible	>24 hours	>1 week	1.30
Safford	Likely	Limited	>24 hours	>1 week	2.50
Thatcher	Unlikely	Limited	<6 hours	<6 hours	1.75
<b>County-wide average CPRI =</b>					<b>2.24</b>

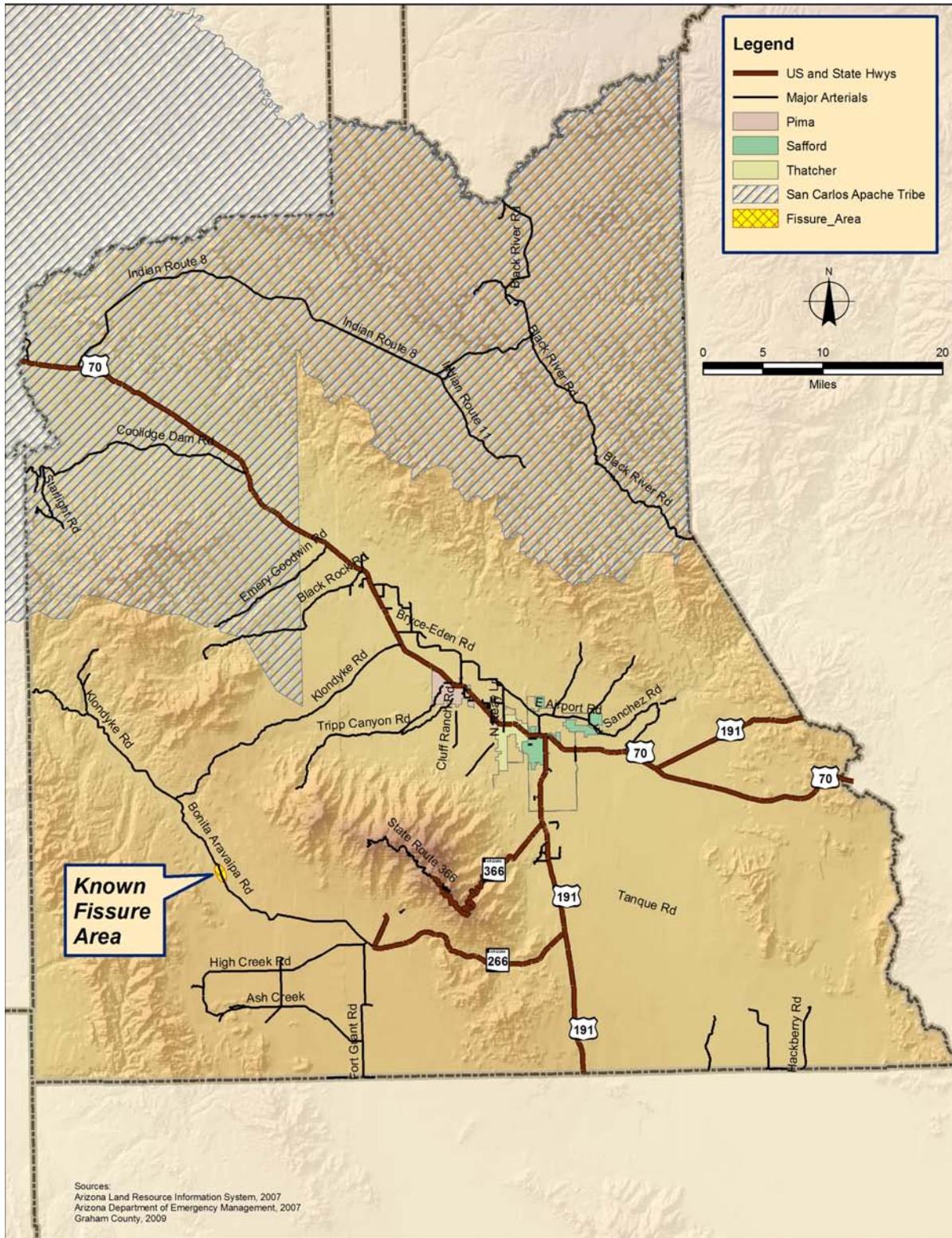


Figure 5-7: Known fissure hazard area for Graham County

**Vulnerability – Loss Estimations**

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

Table 1. Hazards Directly Associated with Earth Fissures	
<ul style="list-style-type: none"> <li>• Cracked or collapsing roads</li> <li>• Broken pipes &amp; utility lines</li> <li>• Damaged or breached canals</li> <li>• Cracked foundation/separated walls</li> <li>• Loss of agricultural land</li> <li>• Livestock &amp; wildlife injury or death</li> </ul>	<ul style="list-style-type: none"> <li>• Severed or deformed railroad track</li> <li>• Damaged well casing or wellhead</li> <li>• Disrupted drainage</li> <li>• Contaminated groundwater aquifer</li> <li>• Sudden discharge of ponded water</li> <li>• Human injury or death</li> </ul>

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

Historic losses in Graham County due to fissures are mostly minor losses associated with damages to Bonita Aravaipa Road. It is therefore very difficult to estimate potential economic losses due to a lack of an established methodology. Accordingly, no estimation of potential losses due to fissure risk will be made.

**Vulnerability – Development Trends**

Given the isolated nature of the identified fissure risk area, it is not anticipated that significant development of the area will occur in the next five years. Monitoring of the fissure and regular maintenance of the roadway within the fissure area will probably be the extent of needed activity.

**Sources**

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

Arizona Geological Survey, 2009, Webpage entitled: Arizona’s Earth Fissure Center, <http://www.azgs.az.gov/EFC.shtml>

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

**Profile Maps**

No Profile Maps provided for Fissure Risk.

5.3.4 *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 failures is addressed separately. The three seasonal atmospheric events that tend to trigger floods in Graham 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 can be primarily categorized as either riverine or local area flows. 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. 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.

**History**

Flooding is clearly a major hazard in Graham County as shown in Tables 5-2 and 5-3. Graham County has been part of 17 presidential disaster declarations for flooding, with two (2) of those declarations occurring in the past 5 years. There have been at least 4 other non-declared events of reported flooding incidents that met the thresholds outlined in Section 5.1, none of which occurred in the last 5 years. The following incidents represent examples of major flooding that has impacted the County:

- In January-February 1993, heavy rain fell over most of north, central and southeastern Arizona resulting in significant flooding along most major watercourses. In Graham County, damages consisted primarily of public damages related to irrigation delivery systems and water supply systems located along the Gila River. and most of the private damages were agricultural related. According to the USACE Flood Damages Report Graham County had in excess of \$6.95 million in public and private losses due to flooding damages. The flooding prompted a federal disaster declaration for almost the entire state.<sup>23</sup>
- In October 2000, heavy rain damaged cotton crops and pinto bean fields in valley. Flooding on Sally Bryce Road in the Tally Wash area resulted in road closure. Property and agricultural damages were estimated at \$5,000 and \$10,000 each. (NCDC, 2010)
- In July 2004, heavy rainfall from several thunderstorms caused the buildup of rain on the roof of a museum in Thatcher. The roof collapsed around 10:30 pm that night causing an estimated \$10,000 in damages. (NCDC, 2010)

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<sup>23</sup> US Army Corps of Engineers, Los Angeles District, 1994, *Flood Damage Report – State of Arizona – Floods of 1993*

- In August 2004, U.S. Highway 70, west of the town of Pima, was closed due to flooding of Matthews Wash. There was also a swift water rescue performed when a truck got stuck in Talley Wash near Thatcher. The Arizona Department of Transportation reported that flooding damages to portions of U.S. Highway 191 forced its closure. Property damages were estimated at \$20,000. (NCDC, 2010)
- In February 2005, a strong storm system drew moist subtropical air from the Pacific to give northern and central Arizona widespread moderate to heavy rains. The 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. 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.
- 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 and exceeding bank full capacities. U.S. Highway 70 was flooded 2 miles west of the Town of Pima. Heavy rainfall over Mount Graham, just southwest of the City of Safford, caused roadway flooding along Highway 366, with the Arizona Department of Transportation reporting water, rocks and debris over the highway at mile post 121 (Noon Creek) and again at mile post 123 (Wet Canyon).

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 Graham County jurisdictions are based on the 1% probability floodplains delineated on FEMA Flood Insurance Rate Maps (FIRMs), plus any provisional floodplain delineations used for in-house purposes by participating jurisdictions. 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 one percent (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.

Map 2A is a county-wide map showing the flood hazard areas for the entire county. Maps 2B, 2C and 2D are similar maps that are scaled to present the flood hazard areas around the general vicinity of Pima, Safford and Thatcher, respectively.

**Vulnerability – CPRI Results**

Flooding CPRI results for each community are summarized in Table 5-18 below.

<b>Table 5-19: Summary of CPRI results by jurisdiction for flooding hazard</b>					
<b>Participating Jurisdiction</b>	<b>Probability</b>	<b>Magnitude/ Severity</b>	<b>Warning Time</b>	<b>Duration</b>	<b>CPRI Score</b>
Graham County	Highly Likely	Critical	6-12 hours	>1 week	3.55
Pima	Highly Likely	Critical	>24 hours	<1 week	3.15
Safford	Highly Likely	Critical	<6 hours	<6 hours	3.40
Thatcher	Likely	Limited	6-12 hours	<1 week	2.70
<b>County-wide average CPRI =</b>					<b>3.20</b>

**Vulnerability – Loss Estimations**

The estimation of potential exposure to high and medium flood hazards was accomplished by intersecting the human and facility assets with the flood hazard limits depicted on Maps 2A, 2B, 2C and 2D. Loss estimates to all facilities located within the high and medium flood hazard areas were made based on the loss estimation tables published by FEMA (FEMA, 2001). Most of the assets located within high hazard flood areas will be subject to three feet or less 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%). A loss to exposure ratio of 0.05 (5%) is assumed for assets located in the medium hazard areas. Table 5-20 summarizes the Planning Team identified critical and non-critical facilities potentially exposed to high and medium flood hazards, and the corresponding estimates of losses. Table 5-21 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 5-22 through 5-26. It should be noted that County-Wide exposure totals for HAZUS building stock and the population within Graham County includes statistics from the San Carlos Apache Tribe, which is not participating in this Plan.

**Table 5-20: Summary of 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)
<b>HIGH</b>					
<b>County-Wide Totals</b>	<b>388</b>	<b>57</b>	<b>14.7%</b>	<b>\$178,953</b>	<b>\$35,791</b>
Graham County	118	29	24.6%	\$138,310	\$27,662
Pima	31	16	51.6%	\$8,798	\$1,760
Safford	185	11	12.9%	\$11,845	\$2,369
Thatcher	54	1	1.8%	\$20,000	\$4,000
<b>MEDIUM</b>					
<b>County-Wide Totals</b>	<b>388</b>	<b>5</b>	<b>1.3%</b>	<b>\$48,550</b>	<b>\$2,428</b>
Graham County	118	1	0.8%	\$25,000	\$1,250
Pima	31	1	3.2%	\$300	\$15
Safford	185	0	0.0%	\$0	\$0
Thatcher	54	3	5.6%	\$23,250	\$1,163

**Table 5-21: Summary of 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
<b>HIGH</b>						
<b>County-Wide Totals</b>	<b>28,889</b>	<b>2,497</b>	<b>8.64%</b>	<b>3,724</b>	<b>321</b>	<b>8.61%</b>
Pima	2,055	540	26.30%	249	69	27.51%
Safford	9,329	43	0.47%	1,624	7	0.44%
Thatcher	4,032	104	2.58%	458	17	3.75%
Unincorporated County	13,473	1,809	13.42%	1,393	228	16.34%
<b>MEDIUM</b>						
<b>County-Wide Totals</b>	<b>28,889</b>	<b>923</b>	<b>3.19%</b>	<b>3,724</b>	<b>151</b>	<b>4.07%</b>
Pima	2,055	154	7.49%	249	22	8.69%
Safford	9,329	0	0.00%	1,624	0	0.00%
Thatcher	4,032	655	16.24%	458	112	24.45%
Unincorporated County	13,473	114	0.84%	1,393	18	1.29%

**Table 5-22: Summary of Graham County HAZUS building exposure to Flooding**

	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SUMMARY		
Graham 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)
<b>County-Wide Totals</b>	<b>12,563</b>	<b>\$1,512,062</b>	<b>464</b>	<b>\$348,377</b>	<b>103</b>	<b>\$75,321</b>	<b>\$1,935,759</b>		
High Hazard Exposure	1,182	\$111,404	45	\$29,138	15	\$7,903	\$148,445	20%	\$29,689
Medium Hazard Exposure	446	\$50,467	12	\$4,145	1	\$204	\$54,816	5%	\$2,741
Graham County HAZUS Summary	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact			
High Hazard Exposure	9.41%	7.37%	9.62%	8.36%	15.00%	10.49%			
Medium Hazard Exposure	3.55%	3.34%	2.56%	1.19%	1.11%	0.27%			

**Table 5-23: Summary of Pima HAZUS building exposure to Flooding**

	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SUMMARY		
Pima 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)
<b>Community-Wide Totals</b>	<b>940</b>	<b>\$79,248</b>	<b>25</b>	<b>\$11,730</b>	<b>8</b>	<b>\$2,452</b>	<b>\$93,431</b>		
High Hazard Exposure	247	\$21,855	11	\$5,294	3	\$1,627	\$28,776	20%	\$5,755
Medium Hazard Exposure	72	\$6,521	3	\$1,601	1	\$183	\$8,306	5%	\$415
Pima HAZUS Summary	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact			
High Hazard Exposure	26.29%	27.58%	45.15%	45.13%	45.51%	66.33%			
Medium Hazard Exposure	7.68%	8.23%	12.74%	13.65%	13.38%	7.48%			

**Table 5-24: Summary of Safford HAZUS building exposure to Flooding**

	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SUMMARY		
Safford 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)
<b>Community-Wide Totals</b>	<b>4,004</b>	<b>\$572,404</b>	<b>223</b>	<b>\$184,171</b>	<b>27</b>	<b>\$36,717</b>	<b>\$793,292</b>		
High Hazard Exposure	17	\$4,792	4	\$4,142	1	\$3,714	\$12,648	20%	\$2,530
Medium Hazard Exposure	0	\$5	0	\$0	0	\$0	\$6	5%	\$0
Safford HAZUS Summary	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact			
High Hazard Exposure	0.42%	0.84%	1.67%	2.25%	2.67%	10.11%			
Medium Hazard Exposure	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%			

**Table 5-25: Summary of Thatcher HAZUS building exposure to Flooding**

	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SUMMARY		
Thatcher 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)
<b>Community-Wide Totals</b>	<b>1,605</b>	<b>\$217,989</b>	<b>60</b>	<b>\$40,397</b>	<b>10</b>	<b>\$3,489</b>	<b>\$261,875</b>		
High Hazard Exposure	51	\$6,313	1	\$436	0	\$8	\$6,757	20%	\$1,351
Medium Hazard Exposure	301	\$37,498	8	\$2,222	0	\$0	\$39,720	5%	\$1,986
Thatcher HAZUS Summary	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact			
High Hazard Exposure	3.19%	2.90%	1.51%	1.08%	0.48%	0.23%			
Medium Hazard Exposure	18.74%	17.20%	12.54%	5.50%	0.00%	0.00%			

	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SUMMARY		
Unincorporated Graham 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)
<b>Community-Wide Totals</b>	<b>4,871</b>	<b>\$514,816</b>	<b>142</b>	<b>\$89,464</b>	<b>53</b>	<b>\$24,762</b>	<b>\$629,042</b>		
High Hazard Exposure	660	\$103,111	30	\$31,323	8	\$4,010	\$138,444	20%	\$27,689
Medium Hazard Exposure	92	\$15,481	5	\$2,987	2	\$788	\$19,255	5%	\$963
Unincorporated Graham County HAZUS Summary	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact			
High Hazard Exposure	17.78%	15.23%	20.31%	21.51%	21.14%	10.32%			
Medium Hazard Exposure	1.50%	1.25%	0.86%	0.36%	0.24%	0.08%			

In summary, \$35.8 million and \$2.4 million in asset related losses are estimated for high and medium flood hazards, for all the participating jurisdictions in Graham County. An additional \$29.7 and \$2.7 million in high and medium flood losses to HAZUS defined residential, commercial, and industrial facilities is estimated for all participating Graham County jurisdictions. Regarding human vulnerability, a total population of 2,497 people, or 8.6% of the total population, is potentially exposed to a high hazard flood event. A total population of 923 people, or 3.2% of the total population, is potentially exposed to a medium 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.

A summary comparison of the 2005 Plan flooding vulnerability analysis results to the current plan is shown in Table 5-27. Changes shown in Table 5-26 are a result of revisions to the Planning Team asset inventory and a different flood hazard layer (DFIRM).

**Table 5-27: 2005 Plan flooding vulnerability analysis compared to current Plan**

<b>Exposure</b>	<b>2005 Plan</b>	<b>Current Plan</b>
Assets: High Hazard	\$8.6 Million	\$35.8 Million
Assets: Medium Hazard	N/A	\$2.4 Million
HAZUS Facilities: High Hazard	\$7.6 Million	\$29.7 Million
HAZUS Facilities: Medium Hazard	N/A	\$2.7 Million
Human: High Hazard	2,755	2,497
Human: Medium Hazard	N/A	923

**Vulnerability – Repetitive Loss Properties**

Repetitive Loss (RL) properties are those NFIP-insured properties that since 1978, have experience multiple flood losses. FEMA tracks RL properties 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 October 31, 2007 (provided by ADWR) indicate that there are 3 identified RL properties in Graham County, with a total of over \$47,000 in associated building and contents value payments. Table 5-28 summarizes the RL property characteristics by jurisdiction.

**Table 5-28: Summary of RL property statistics for Graham County jurisdictions**

<b>Jurisdiction</b>	<b>No. of Properties</b>	<b>No. of Properties Mitigated</b>	<b>Total Payments</b>
Safford	2	0	\$34,178
Unincorporated Graham County	1	0	\$12,910

Source: FEMA, 2010

**Vulnerability – Development Trends**

For most Graham County jurisdictions, adequate planning and regulatory tools are in place to regulate future development. Challenges with new growth will include the need for master drainage planning and additional floodplain delineations to identify and map the flood hazards within the growth areas where no mapping currently exists.

**Sources**

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

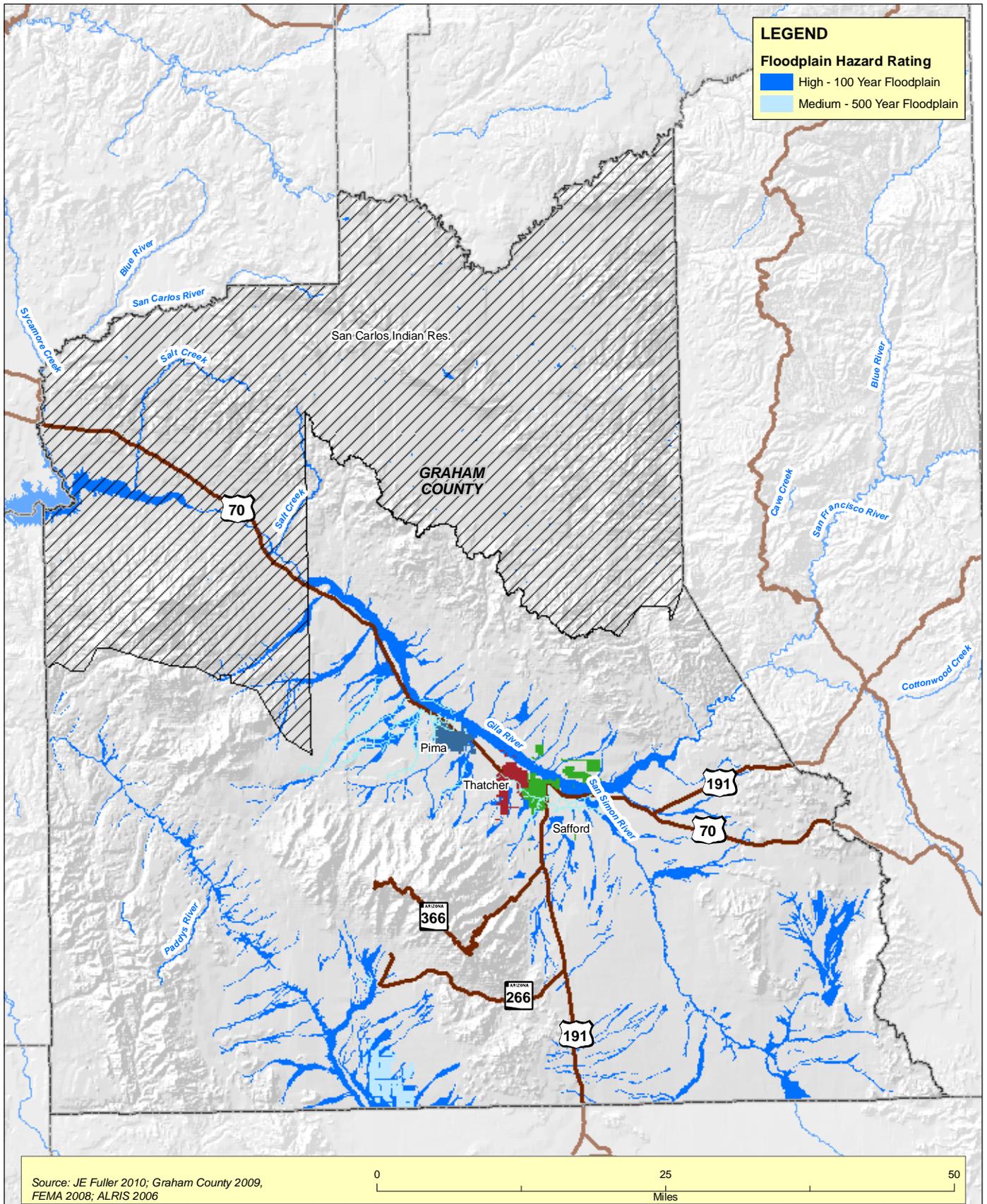
FEMA, 2001, Understanding Your Risks; Identifying Hazards and Estimating Losses, FEMA Document No. 386-2.

U.S. Dept of Commerce, National Climatic Data Center, 2010, Storm Events Database, accessed via the following URL: <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms>

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

**Profile Maps**

Maps 2A, 2B, 2C and 2D – Flood Hazard Map



**Legend**

Highway	Pima
Major Streams	Safford
Canals/Washes	Thatcher
Lakes/Ponds	San Carlos Indian Res.

N  
▲

**Graham County Multi-Jurisdictional  
Multi-Hazard Mitigation Plan**

**Map 2A**

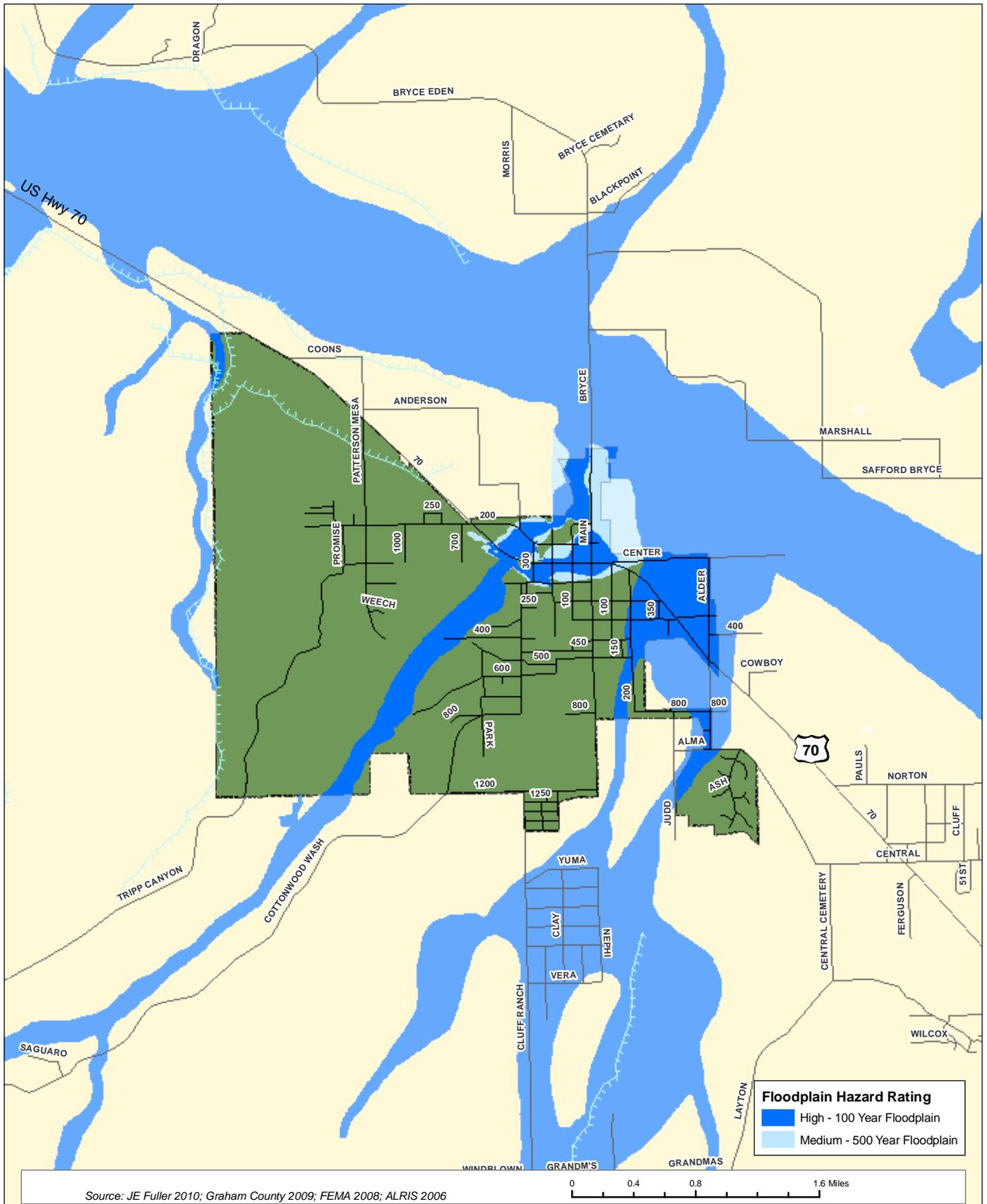
**Graham County  
Flood Hazard Map**

**Based on Sep 07 DFIRM Data**









**Legend**

Highway	<b>Community</b>
Major Streams	Pima
Streets	Safford
Canals/Washes	Thatcher
Lakes/Ponds	Unincorporated
County	San Carlos Indian Res.

N

**Graham County Multi-Jurisdictional Multi-Hazard Mitigation Plan**

**Map 2B**

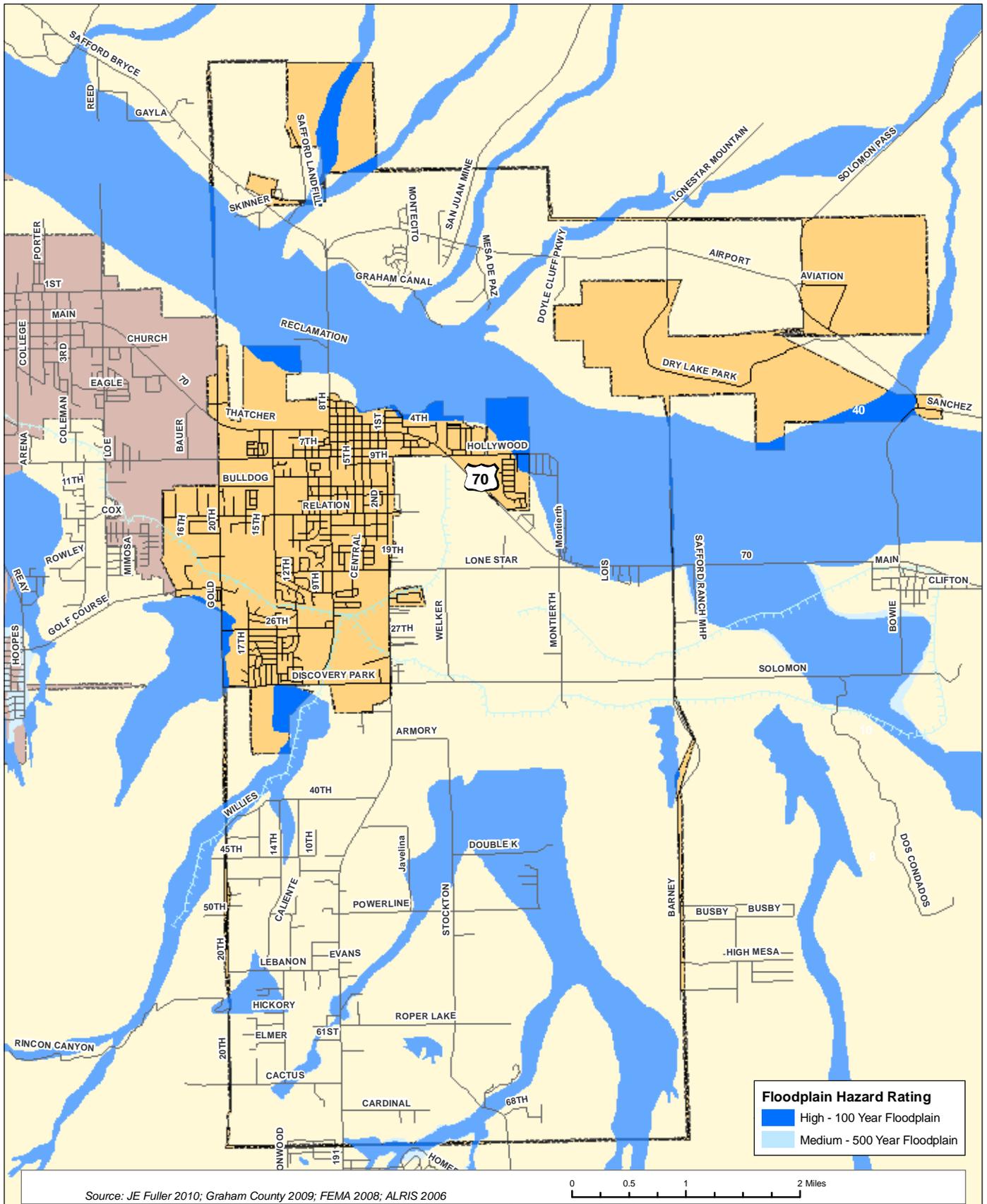
**Town of Pima Floodplain Hazard Map**

Based on Sep 07 DFIRM Data









**Legend**

Highway	<b>Community</b>
Major Streams	Pima
Streets	Safford
Canals/Washes	Thatcher
Lakes/Ponds	Unincorporated
County	San Carlos Indian Res.

N

**Graham County Multi-Jurisdictional Multi-Hazard Mitigation Plan**

**Map 2C**

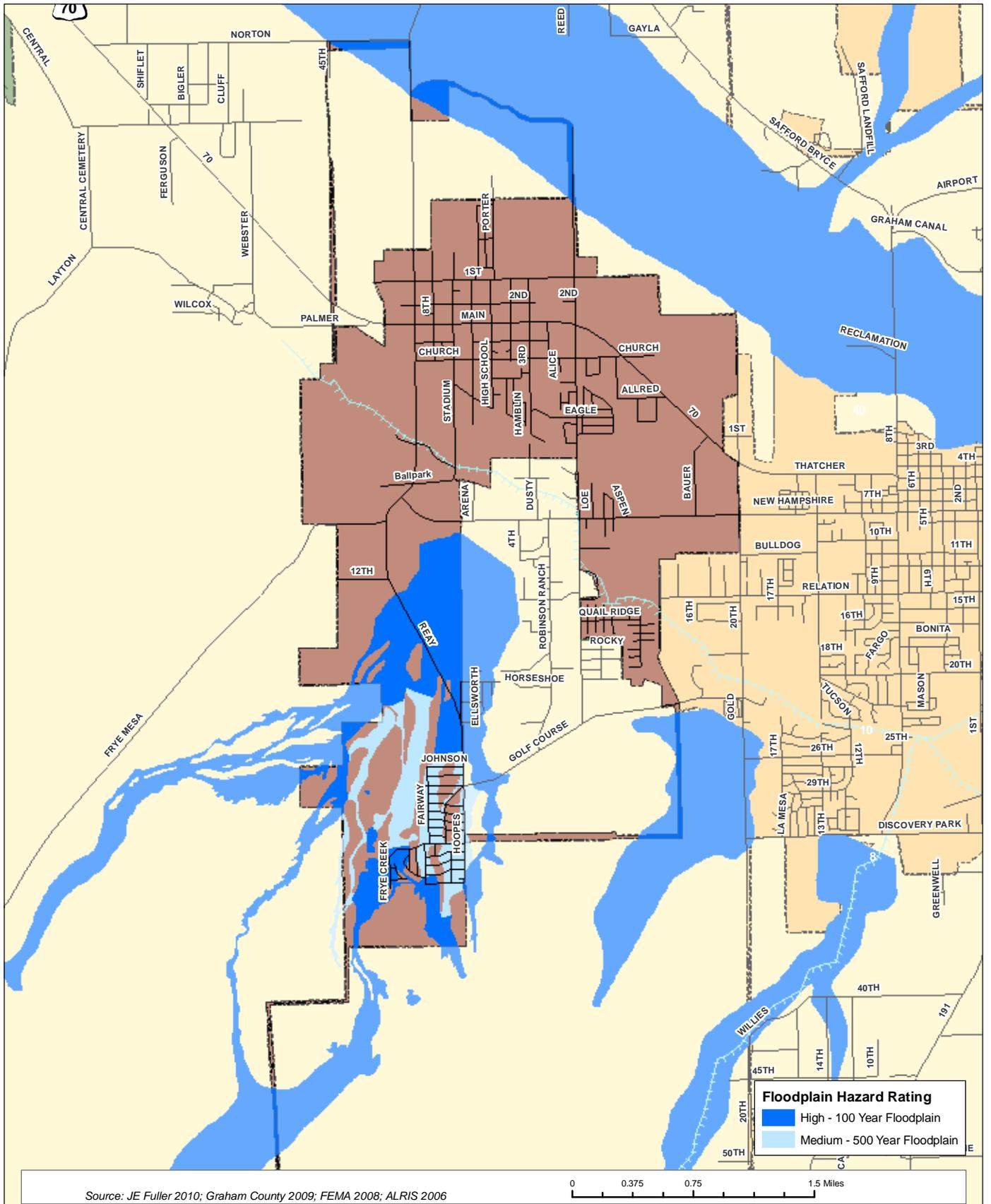
**City of Safford Floodplain Hazard Map**

Based on Sep 07 DFIRM Data









**Legend**

Highway	<b>Community</b>
Major Streams	Pima
Streets	Safford
Canals/Washes	Thatcher
Lakes/Ponds	Unincorporated
County	San Carlos Indian Res.

N

**Graham County Multi-Jurisdictional Multi-Hazard Mitigation Plan**

**Map 2D**

**Town of Thatcher Floodplain Hazard Map**

Based on Sep 07 DFIRM Data






5.3.5 *Severe Wind*

**Description**

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

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

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

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

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

**History**

According to Table 5-3, Graham County has been subject to over 30 severe wind events meeting the criteria listed in Section 5.1, with a combined loss of over \$529,000 to structures and agriculture in the last 50 years. The Planning Team recognizes that severe wind events occur in the county on a frequent basis and that Table 5-3 under represents the true historic account of severe winds in the County. In fact, a total of 17 severe wind events were noted in the NCDC database for period of January 2004 through July 2009 alone. The following are examples of documented past events:

- In August 2005, strong winds associated with a thunderstorm in the City of Safford, caused damage to two large observation towers, several trailers, and several vehicles as sheet metal was blown off a roof hitting the cars. Damages were estimated to exceed \$25,000. (NCDC, 2010).
- In August 2008, severe thunderstorms rolled across portions of Graham and Eastern Pima Counties producing wind damage and large hail. Multiple power lines were blown down between Safford and Thatcher. Damages were estimated to exceed \$15,000 (NCDC, 2010).
- In July 2009, a trained spotter reported many trees were downed in the central part of Safford. ASOS measured a 63 mph thunderstorm wind gust at the Safford Regional Airport. Amateur radio operators reported numerous power poles down near Safford. Damages were estimated to exceed \$30,000. (NCDC, 2010).

**Probability and Magnitude**

Most severe wind events are associated with thunderstorms as previously mentioned. The probability of a severe thunderstorm occurring with high velocity winds increases as the average duration and number of thunderstorm events increases. The average annual duration of thunderstorms in Graham County ranges from 90 to 100 minutes and is among the longest in the nation. An area stretching northwest from Flagstaff to the junction of the Arizona, Utah, and Nevada borders has an average annual thunderstorm duration of 110-130 minutes. Despite the long duration time, the highest number of thunderstorms on average in Graham County is 50-60 annually. Lightning strikes are another indicator of thunderstorm hazard. Graham County has 6-8 lightning strikes per square kilometer annually (ADEM, 2004).

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

Based on the historic record, the probability of tornadoes occurring in Graham County is very limited. Tornado damage severity is measured by the Fujita Tornado Scale, which assigns a numerical value of 0 to 5 based on wind speeds, as shown in Table 5-29, with the letter F preceding the number (e.g., F0, F1, F2). Most tornadoes last less than 30 minutes, but some last for over an hour. The path of a tornado can range from a few hundred feet to miles. The width of a tornado may range from tens of yards to more than a quarter of a mile.

<b>Table 5-29: Fujita Tornado Scale</b>		
<b>Category</b>	<b>Wind Speed</b>	<b>Description of Damage</b>
F0	40-72 mph	Light damage. Some damage to chimneys; break branches off trees; push over shallow-rooted trees; damage to sign boards.
F1	73-112 mph	Moderate damage. The lower limit is the beginning of hurricane speed. Roof surfaces peeled off; mobile homes pushed off foundations or overturned; moving autos pushed off roads.
F2	113-157 mph	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light-object missiles generated.
F3	158-206 mph	Severe damage. Roofs and some walls torn off well constructed houses; trains overturned; most trees in forest uprooted; cars lifted off ground and thrown.
F4	207-260 mph	Devastating damage. Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.
F5	261-318 mph	Incredible damage. Strong frame houses lifted off foundations and carried considerable distance to disintegrate; automobile-sized missiles fly through the air in excess of 100-yards; trees debarked.
Source: FEMA, 1997.		

Map 3 presents a graphical depiction of historic severe wind occurrences in Graham County, as recorded by the NCDC for the period of August 1955 to October 2007. It is noted that the data presented does not reflect all documented events, but only those that included latitude and longitude coordinates for location. Also, the locations are approximate..

**Vulnerability – CPRI Results**

Severe Wind CPRI results for each community are summarized in Table 5-30 below.

**Table 5-30: Summary of CPRI results by jurisdiction for severe wind**

<b>Participating Jurisdiction</b>	<b>Probability</b>	<b>Magnitude/ Severity</b>	<b>Warning Time</b>	<b>Duration</b>	<b>CPRI Score</b>
Graham County	Highly Likely	Critical	> 24 hours	<6 hours	2.95
Pima	Highly Likely	Critical	>24 hours	<1 week	3.15
Safford	Highly Likely	Limited	<6 hours	<6 hours	3.10
Thatcher	Likely	Negligible	6-12 hours	<6 hours	2.20
<b>County-wide average CPRI =</b>					<b>2.85</b>

**Vulnerability – Loss Estimations**

The entire County is assumed to be equally exposed to the damage risks associated with the severe winds. Typically, incidents are fairly localized and damages associated with individual events are relatively small. Based on the historic record over the last 30 years, it is feasible to expect average annual losses of \$15,000 to \$20,000 (county-wide) It is difficult to estimate losses for individual jurisdictions within the County due to the lack of discrete data.

**Vulnerability – Development Trend Analysis**

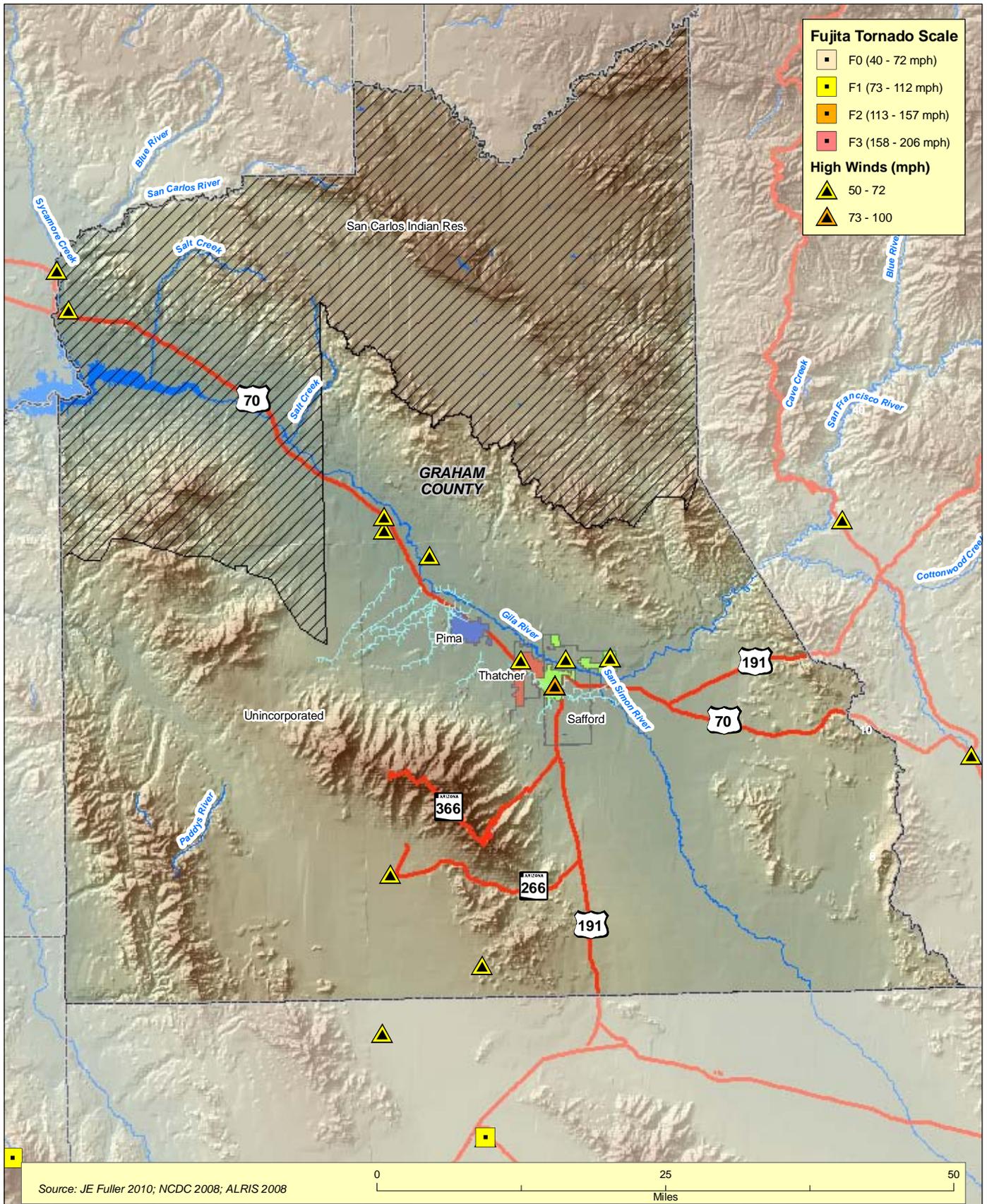
Future development will expand the exposure of life and property to the damaging effects of severe wind events. Enforcement and/or implementation of modern building codes to regulate new developments in conjunction with public education on how to respond to severe wind conditions are arguably the best way to mitigate against losses.

**Sources**

- Arizona Division of Emergency Management, 2004, State of Arizona All Hazard Mitigation Plan.
- Arizona Division of Emergency Management, 2010, State of Arizona Multi-Hazard Mitigation Plan, 2010 Update, DRAFT.
- Changnon, Jr. S., 1988, *Climatology of Thunder Events in the Conterminous U.S., Part I: Temporal Aspects and Part II: Spatial Aspects*, Journal of Climate, Vol. 1, No. 4, pp. 389-405.
- U.S. Dept of Commerce, National Climatic Data Center, 2008, Storm Events Database

**Profile Maps**

Map 3 – Severe Wind Event Location Map



**Legend**

Highway	County
Major Streams	Pima
Canals/Washes	Safford
Lakes/Ponds	Thatcher
	San Carlos Indian Res.

N

**Graham County Multi-Jurisdictional Multi-Hazard Mitigation Plan** **Map 3**

**Graham County Severe Wind Event Location Map**

**as of October 2007**







5.3.7 *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 139 wildfires greater than 100 acres in size, have occurred in all of Graham County (this includes the San Carlos Apache Tribe). Four of those fires were larger than 10,000 acres, and are described below in order of magnitude:

- In June 1993, the Markham Fire located in the Bollen Wash area west of the Galiuro Mountains in the southwest corner of the county, was started by natural causes and burned 35,696 acres in a period of 30 days. Firefighters had the fire under control within 5 days of the start (Arizona State Forestry Division, 2009).
- In July of 2004, Graham County experienced one of the largest fires in its history. The Nuttal Fire Complex (NFC), which began as two separate fires that eventually joined together, burned across the upper portion of the Pinaleno Mountains, consuming over 29,400 acres. The chief concern of firefighters was the multimillion dollar Mount Graham International Observatory and the summertime mountain communities of Columbine and Turkey Flat. A total of 683 personnel were involved with the fire and the firefighting efforts cost about \$9.2 million. One structure was damaged and one was destroyed when the fire overran the communications tower cluster at Heliograph Peak. A total of 28 injuries and no fatalities were reported (Southwest Area Incident Management Team, 2004).
- In May 2006, the North Taylor Fire, a lightning caused fire, burned an area 19 miles southwest of Safford, AZ. The fire started on May 18<sup>th</sup> and was controlled May 27<sup>th</sup>. The fire burned a total of 117 acres with over \$1 million in fire suppression costs and 3 fire related injuries.
- In May 2008, the Frye Mesa Fire was a fire that began as a prescribed burn to help eradicate a noxious weed growing in the Frye Mesa area, about four miles southwest of Safford, AZ. The fire started on May 20<sup>th</sup> and was controlled May 27<sup>th</sup>. The fire burned a total of 3,100 acres with over \$1,116,000 in fire suppression costs.

There have been 15 wildfires in excess of 100 acres for the period of 2005 to 2008. Map 4B provides 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, damage estimates for the Nuttal fire were estimated at \$150,000. However, the suppression costs for the Nuttal Fire exceeded \$9.2 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 Graham County are influenced by numerous factors including vegetation densities, previous burn history, hydrologic conditions, climatic conditions such as temperature, humidity, and wind, ignition source (human or natural), topographic aspect and slope, and remoteness of area.

Wildfire hazard areas have been identified by the State of Arizona as a part of the 2003/04 Arizona Wildland Urban Interface Assessment (AWUIA) project (Fisher, 2004). The increasing growth of Arizona’s rural populations, urban sprawl, and increasing wildland fuel loads ads to create a mix of situations that is known as the wildland urban interface (WUI). The purpose of the AWUIA was to attempt to conduct an analysis on a statewide basis using a common spatial model, for validation of those communities listed in the federal register as WUI, and further identify possible other communities at risk. 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 of 1-15 was used for all layers.

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:

$$\text{LAND HAZARD} = (\text{HAZARD} * 70\%) + (\text{RISK} * 20\%) + (\text{TOPO} * 10\%)$$

Weighting 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). Map 4A and 4B indicates the various wildfire hazard areas for Graham County based on the “Land Hazard” layer.

The AWUIA identified three Graham County WUI communities (Graham Mountain, Point of Pines, and William Creek NFH) as having a moderate wildfire risk. Each of these communities are located on Map 4B.

**Vulnerability – CPRI Results**

Wildfire CPRI results for each community are summarized in Table 5-31 below.

<b>Participating Jurisdiction</b>	<b>Probability</b>	<b>Magnitude/ Severity</b>	<b>Warning Time</b>	<b>Duration</b>	<b>CPRI Score</b>
Graham	Highly Likely	Critical	6-12 hours	>1 week	2.65
Pima	Likely	Limited	12-24 hours	<1 week	2.55
Safford	Highly Likely	Critical	6-12 hours	<1 week	3.45
Thatcher	Unlikely	Limited	<6 hours	< 24 hours	1.85
<b>County-wide average CPRI =</b>					<b>2.63</b>

**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 Map 4A. Loss to exposure ratios of 0.20 (20%) and 0.05 (5%) were assumed to estimate losses for all facilities located within the high and medium wildfire hazard areas, respectively. Table 5-32 summarizes the Planning

Team identified critical and non-critical facilities potentially exposed to high and medium wildfire hazards, and the corresponding estimates of losses. Table 5-33 summarizes population sectors exposed to the high and medium wildfire hazards. HAZUS residential, commercial and industrial exposures and loss estimates to high and medium wildfire hazards are summarized in Tables 5-34 through 5-37. It should be noted that County-Wide exposure totals for HAZUS building stock and the population within Graham County includes statistics from the San Carlos Apache Tribe, which is not participating in this Plan.

**Table 5-32: Summary of asset inventory exposure to high and medium wildfire hazard 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)
<b>HIGH</b>					
<b>County-Wide Totals</b>	<b>388</b>	<b>2</b>	<b>0.52%</b>	<b>\$130,200</b>	<b>\$26,040</b>
Unincorporated Graham County	118	2	1.69%	\$130,200	\$26,040
Pima	31	0	0.00%	\$0	\$0
Safford	185	0	0.00%	\$0	\$0
Thatcher	54	0	0.00%	\$0	\$0
<b>MEDIUM</b>					
<b>County-Wide Totals</b>	<b>388</b>	<b>2</b>	<b>0.52%</b>	<b>\$550</b>	<b>\$28</b>
Unincorporated Graham County	118	2	1.69%	\$550	\$28
Pima	31	0	0.00%	\$0	\$0
Safford	185	0	0.00%	\$0	\$0
Thatcher	54	0	0.00%	\$0	\$0

**Table 5-33: Summary of population sectors exposed to high and medium wildfire hazard**

Community	Total Population	Population Exposed	Percent of Population Exposed	Total Population Over 65	Population Over 65 Exposed	Percent of Population Over 65 Exposed
<b>HIGH</b>						
<b>County-Wide Totals</b>	<b>28,889</b>	<b>45</b>	<b>0.54%</b>	<b>3,724</b>	<b>7</b>	<b>0.28%</b>
Pima	2,055	0	0.00%	249	0	0.00%
Safford	9,329	0	0.00%	1,624	0	0.00%
Thatcher	4,032	0	0.00%	458	0	0.00%
Unincorporated County	13,473	45	0.33%	1,393	7	0.47%
<b>MEDIUM</b>						
<b>County-Wide Totals</b>	<b>28,889</b>	<b>65</b>	<b>8.28%</b>	<b>3,724</b>	<b>9</b>	<b>2.46%</b>
Pima	2,055	0	0.00%	249	0	0.00%
Safford	9,329	0	0.00%	1,624	0	0.00%
Thatcher	4,032	0	0.00%	458	0	0.00%
Unincorporated County	13,473	65	0.48%	1,393	9	0.66%

**Table 5-34: Summary of Graham County HAZUS building exposure to Wildfire**

	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SUMMARY		
GRAHAM 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)
<b>County-Wide Totals</b>	<b>12,563</b>	<b>\$1,512,062</b>	<b>464</b>	<b>\$348,377</b>	<b>103</b>	<b>\$75,321</b>	<b>\$1,935,759</b>		
High Hazard Exposure	96	\$10,513	5	\$11,140	2	\$990	\$22,643	20%	\$4,529
Medium Hazard Exposure	723	\$81,868	5	\$6,998	3	\$6,704	\$95,570	5%	\$4,779
GRAHAM County HAZUS Summary	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact			
High Hazard Exposure	0.77%	0.70%	1.08%	3.20%	1.96%	1.31%			
Medium Hazard Exposure	5.76%	5.41%	1.06%	2.01%	2.49%	8.90%			

**Table 5-35: Summary of Pima HAZUS building exposure to Wildfire**

	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SUMMARY		
Pima 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)
<b>Community-Wide Totals</b>	<b>940</b>	<b>\$79,248</b>	<b>25</b>	<b>\$11,730</b>	<b>8</b>	<b>\$2,452</b>	<b>\$93,431</b>		
High Hazard Exposure	0	\$0	0	\$0	0	\$0	\$0	20%	\$0
Medium Hazard Exposure	0	\$0	0	\$0	0	\$0	\$0	5%	\$0
Pima HAZUS Summary	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact			
High Hazard Exposure	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%			
Medium Hazard Exposure	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%			

**Table 5-36: Summary of Safford HAZUS building exposure to Wildfire**

	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SUMMARY		
Safford 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)
<b>Community-Wide Totals</b>	<b>4,004</b>	<b>\$572,404</b>	<b>223</b>	<b>\$184,171</b>	<b>27</b>	<b>\$36,717</b>	<b>\$793,292</b>		
High Hazard Exposure	0	\$0	0	\$0	0	\$0	\$0	20%	\$0
Medium Hazard Exposure	0	\$0	0	\$0	0	\$0	\$0	5%	\$0
Safford HAZUS Summary	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact			
High Hazard Exposure	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%			
Medium Hazard Exposure	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%			

**Table 5-37: Summary of Thatcher HAZUS building exposure to Wildfire**

	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SUMMARY		
Thatcher 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)
<b>Community-Wide Totals</b>	<b>1,605</b>	<b>\$217,989</b>	<b>60</b>	<b>\$40,397</b>	<b>10</b>	<b>\$3,489</b>	<b>\$261,875</b>		
High Hazard Exposure	0	\$0	0	\$0	0	\$0	\$0	20%	\$0
Medium Hazard Exposure	0	\$0	0	\$0	0	\$0	\$0	5%	\$0
Thatcher HAZUS Summary	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact			
High Hazard Exposure	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%			
Medium Hazard Exposure	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%			

**Table 5-38: Summary of Unincorporated Graham County HAZUS building exposure to Wildfire**

	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SUMMARY		
Unincorporated Graham 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)
<b>Community-Wide Totals</b>	<b>4,871</b>	<b>\$514,816</b>	<b>142</b>	<b>\$89,464</b>	<b>53</b>	<b>\$24,762</b>	<b>\$629,042</b>		
High Hazard Exposure	59	\$5,019	0	\$109	0	\$0	\$5,128	20%	\$1,026
Medium Hazard Exposure	94	\$7,747	0	\$138	0	\$5	\$7,890	5%	\$394
Unincorporated Graham County HAZUS Summary	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact			
High Hazard Exposure	1.21%	0.97%	0.15%	0.12%	0.00%	0.00%			
Medium Hazard Exposure	1.92%	1.50%	0.19%	0.15%	0.04%	0.02%			

In summary, \$26.0 million and \$28,000 in asset related losses are estimated for high and medium wildfire hazards, for all the participating jurisdictions in Graham County, with the majority of loss potential associated with the Mt. Graham Observatory. An additional \$4.6 and \$4.8 million in high and medium hazard wildfire losses to HAZUS defined residential, commercial, and industrial facilities, is estimated for all Graham County jurisdictions including the portion of the San Carlos Apache Tribe located within the county limits. It should be noted that these exposure dollar amounts 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 total population of 45 and 65 people, or 0.5% and 8.3% of the 2000 population estimates for Graham County and the participating jurisdictions, 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.

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.

A summary comparison of the 2005 Plan wildfire vulnerability analysis results to the current plan is shown in Table 5-38. Changes are mostly the result of revisions to the asset inventory and a different source for the wildfire hazard areas and categories. In the 2005 Plan, four categories of wildfire hazard were used, extreme, high, medium and low. The numbers shown in Table 5-38 for the High hazard rows are really a summation of the extreme and high hazard numbers from the 2005 Plan. The numbers for the updated Plan are considered to be more realistic.

**Table 5-38: 2005 Plan wildfire vulnerability analysis compared to current Plan**

<b>Exposure</b>	<b>2005 Plan</b>	<b>Current Plan</b>
Assets: High Hazard	\$65.0 Million	\$26.0 Million
Assets: Medium Hazard	\$4.3 Million	\$28,000
HAZUS Facilities: High Hazard	\$12.5 Million	\$4.6 Million
HAZUS Facilities: Medium Hazard	\$27.3 Million	\$4.8 Million
Human: High Hazard	209	45
Human: Medium Hazard	13,082	65
Human: High Hazard	1%	0.5%
Human: Medium Hazard	39%	8.3%

**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 very 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 primary areas for mitigation and focus are the communities located on Mount Graham and along the upper plateau regions of the San Carlos Apache Reservation. Wildfire risks along the urban fringe of Pima, Safford and Thatcher are relatively low and mitigation efforts for future development are more related to the management of grasses and brush.

**Sources**

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

Fisher, M., 2004, Arizona Wildland Urban Interface Assessment, 2003, prepared for the Arizona Interagency Coordination Group.  
<http://www.azsf.az.gov/UserFiles/PDF/Arizona%20Wildland%20Urban%20Interface%20Assessment%2005MAR04.pdf>

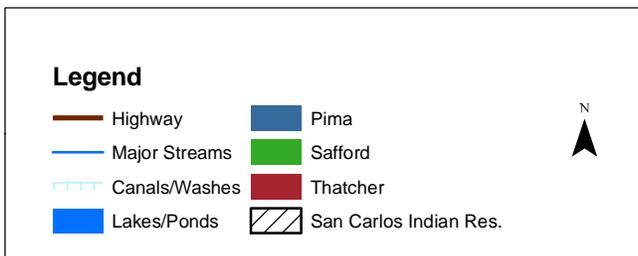
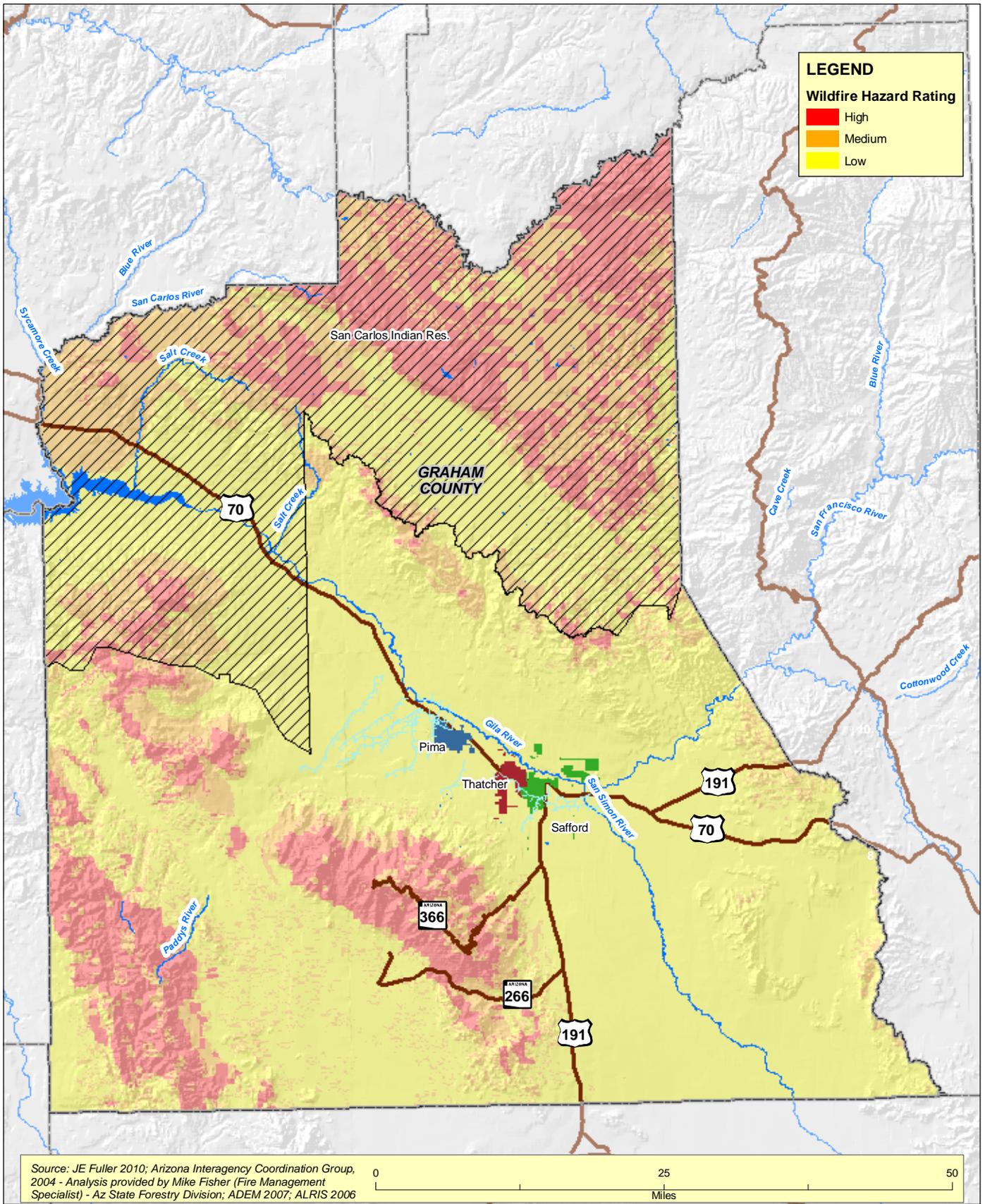
National Wildfire Coordination Group, 2010, Historical ICS 209 reports at: [http://fam.nwcg.gov/fam-web/hist\\_209/report\\_list\\_209](http://fam.nwcg.gov/fam-web/hist_209/report_list_209)

Southwest Area Incident Management Team, 2004, website data at the following URL:  
<http://www.fireteam-sw.com/oltrogge/incidents/nuttall/maps/index.htm>

**Profile Maps**

Map 4A – Wildfire Hazard Map

Map 4B – Historic Wildfire and At-Risk Community Location Map

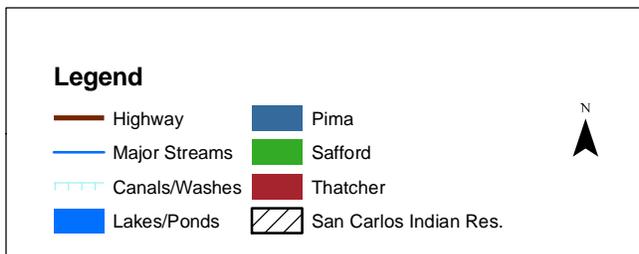
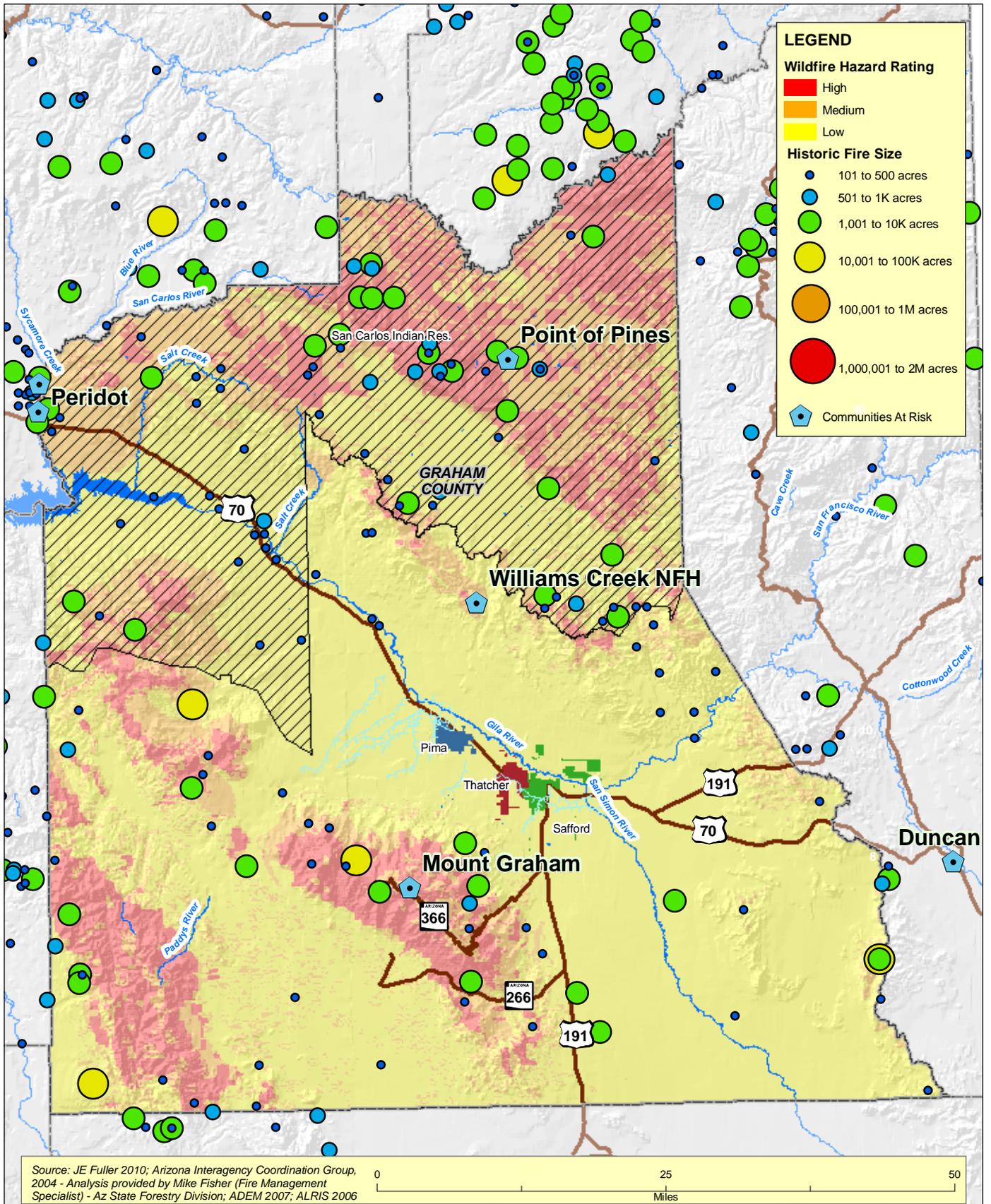


**Graham County Multi-Jurisdictional Multi-Hazard Mitigation Plan**

**Map 4A**

**Graham County Wildfire Hazard Map**

**as of February 2009**



**Graham County Multi-Jurisdictional Multi-Hazard Mitigation Plan**

**Map 4B**

**Graham County Historic Wildfire Location and At Risk Community Map as of February 2009**

County of Graham  
Town of Pima  
Thatcher  
City of Safford

**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 5-39 summarizes the hazards selected for mitigation by each jurisdiction and will be the basis for each jurisdictions mitigation strategy.

<b>Table 5-39: Summary of hazards to be mitigated by each participating jurisdiction</b>						
<b>Jurisdiction</b>	<b>Dam Failure</b>	<b>Drought</b>	<b>Fissure</b>	<b>Flooding</b>	<b>Severe Wind</b>	<b>Wildfire</b>
Unincorporated Graham County	x	x	x	x	x	x
Pima		x		x	x	
Safford	x			x		
Thatcher	x			x	x	x

## 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 2005 Plan mitigation strategy was reviewed and updated by the Planning Team, including a major re-organization of the mitigation strategy elements into this multi-jurisdictional plan format. Specifics of the changes and updates are discussed in the subsections below.

## 6.1 Hazard Mitigation Goals and Objectives

The 2005 Plan goals and objectives were developed using the 2004 State Plan<sup>24</sup> 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<sup>25</sup>:

- Do the goals and objectives identified in the 2005 Plan reflect the updated risk assessment?
- Did the goals and objectives identified in the 2005 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 2005 Plan support any changes in mitigation priorities?
- Are the goals and objectives identified in the 2005 Plan reflective of current State goals?

After much discussion and comparison of the 2005 Plan goals and objectives to the 2007 State Plan, the Planning Team chose to completely drop the current list of goals and objectives in favor of preparing a multi-jurisdictional template of goals and objectives that are closely based on the 2007 State Plan. Reasons for the change included:

- The 2005 Plan goals and objectives were overly complicated and even confusing in some instances.
- The 2007 State Plan goals and objectives were much simpler and better captured the overall planning vision of the Planning Team.
- Having a simpler, common set of goals and objectives for the multi-jurisdictional plan will make future assessment of the progress and achievements easier.

<sup>24</sup> State of Arizona, 2004, *State of Arizona All Hazard Mitigation Plan*, prepared by URS.

<sup>25</sup> FEMA, 2008, *Local Multi-Hazard Mitigation Planning Guidance*

The result of the discussions resulted in establishing one goal and four clear objectives that will be used by all participating jurisdictions, as follows:

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

## **6.2 Capability Assessment**

While not required by DMA 2000, an important component of the Mitigation Strategy is a review of each participating jurisdiction's resources in order to identify, evaluate, and enhance the capacity of local resources to mitigate the effects of hazards. The capability assessment is comprised of several components:

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

For this update, the Planning Team reviewed the information provided in Section 5 of the 2005 Plan, and specifically Tables 5-1 – 5-4. The Planning Team chose to keep the format of Tables 5-2 and 5-3 for reporting the staff/personnel and fiscal resources. Table 5-1 and 5-4 were combined into a new table to not only report on the regulatory capabilities, but also to summarize the codes, plans, and studies/reports used by a jurisdiction. Therefore, Table 5-4 was dropped from the Plan.

*6.2.1 Jurisdictional Capabilities*

Tables 6-1-1 through 6-1-4 summarize the legal and regulatory mitigation capability for each jurisdiction. Information provided includes a brief listing of current codes, mitigation relevant ordinances, plans, and studies/reports. Tables 6-2-1 through 6-2-4 summarize the staff and personnel resources employed by each jurisdiction that serve as a resource for hazard mitigation. Tables 6-3-1 through 6-3-4 summarize the fiscal capability and budgetary tools available to each participating jurisdiction. Each of these three tables are listed below by jurisdiction.

<b>Table 6-1-1: Summary of legal and regulatory capabilities for Graham County</b>		
<b>Regulatory Tools for Hazard Mitigation</b>	<b>Description</b>	<b>Responsible Department/Agency</b>
CODES	<ul style="list-style-type: none"> <li>• International Building Code 2003</li> <li>• Uniform Plumbers Code 1994</li> </ul>	<ul style="list-style-type: none"> <li>• Planning &amp; Zoning</li> </ul>
ORDINANCES	<ul style="list-style-type: none"> <li>• Graham County Flood Damage Prevention Ordinance (Ordinance No. 1998-100, Adopted March 1998; Amended July 2007)</li> <li>• Graham County Zoning Ordinance (August 2008)</li> </ul>	<ul style="list-style-type: none"> <li>• Engineering</li> <li>• Planning &amp; Zoning</li> </ul>
PLANS, MANUALS, and/or GUIDELINES	<ul style="list-style-type: none"> <li>• Graham County Comprehensive Plan (Adopted April 2002)</li> <li>• Graham County Multi-Hazard Mitigation Plan (Adopted February 2005)</li> <li>• Emergency Operations Plan (Adopted January 2004)</li> <li>• Graham County Community Wildfire Protection Plan (November 2005)</li> </ul>	<ul style="list-style-type: none"> <li>• Planning &amp; Zoning</li> <li>• Engineering</li> <li>• Emergency Management</li> </ul>
STUDIES	<ul style="list-style-type: none"> <li>• Upper Gila River Fluvial Geomorphology Study (USBR, August 2004)</li> <li>• Engineering Study for Stockton Wash Flood Retarding Structure (KHA, 2005)</li> <li>• FEMA DFIRM Maps (FEMA, Effective date of September 2007)</li> </ul>	<ul style="list-style-type: none"> <li>• Engineering</li> </ul>

**Table 6-2-1: Summary of technical staff and personnel capabilities for Graham County**

<b>Staff/Personnel Resources</b>	<input checked="" type="checkbox"/>	<b>Department/Agency - Position</b>
Planner(s) or engineer(s) with knowledge of land development and land management practices	<input checked="" type="checkbox"/>	Engineering – County Engineer
Engineer(s) or professional(s) trained in construction practices related to buildings and/or infrastructure	<input checked="" type="checkbox"/>	Engineering – County Engineer
Planner(s) or engineer(s) with and understanding of natural and/or human-caused hazards	<input checked="" type="checkbox"/>	Engineering – County Engineer
Floodplain Manager	<input checked="" type="checkbox"/>	Engineering – County Engineer
Surveyors	<input checked="" type="checkbox"/>	Engineering – County Engineer
Staff with education or expertise to assess the community’s vulnerability to hazards		
Personnel skilled in GIS and/or HAZUS	<input checked="" type="checkbox"/>	Graham County IT – GIS Manager
Scientists familiar with the hazards of the community		
Emergency manager	<input checked="" type="checkbox"/>	Emergency Response and Preparedness Program – Deputy Director
Grant writer(s)		

**Table 6-3-1: Summary of fiscal capabilities for Graham County**

<b>Financial Resources</b>	<b>Accessible or Eligible to Use (Yes, No, Don’t Know)</b>	<b>Comments</b>
Community Development Block Grants	Yes	
Capital Improvements Project funding	No	
Authority to levy taxes for specific purposes	Yes	Flood Control Transportation
Fees for water, sewer, gas, or electric service	No	
Impact fees for homebuyers or new developments/homes	No	
Incur debt through general obligation bonds	Yes	No bonds outstanding
Incur debt through special tax bonds	Yes	No bonds outstanding

**Table 6-1-2: Summary of legal and regulatory capabilities for Pima**

<b>Regulatory Tools for Hazard Mitigation</b>	<b>Description</b>	<b>Responsible Department/Agency</b>
CODES	<ul style="list-style-type: none"> <li>• 2009 International Building Code</li> <li>• 2003 International Residential Code</li> <li>• 2006 International Plumbing Code</li> <li>• 2003 International Mechanical Code</li> <li>• 2006 International Fire Code</li> <li>• 2008 National Electric Code</li> <li>• 1999 Town Code of the Town of Pima</li> </ul>	<ul style="list-style-type: none"> <li>• Administration</li> <li>• P&amp;Z</li> <li>• Pima Fire</li> </ul>
ORDINANCES	<ul style="list-style-type: none"> <li>• Graham County Flood Damage Prevention Ordinance (Ordinance No. 1998-100, Adopted March 1998; Amended July 2007)</li> <li>• 1998 Town of Pima Planning &amp; Zoning Ordinance</li> <li>• 2006 Town of Pima Subdivision Regulations</li> </ul>	<ul style="list-style-type: none"> <li>• Administration</li> <li>• P&amp;Z</li> </ul>
PLANS, MANUALS, and/or GUIDELINES	<ul style="list-style-type: none"> <li>• 2006 Town of Pima Drainage Policy Manual</li> <li>• Graham County Community Wildfire Protection Plan (November 2005)</li> <li>• Town of Pima Multi-Hazard Mitigation Plan (Adopted September 2005, currently being updated)</li> <li>• Town of Pima Emergency Operations Plan (revision currently in progress)</li> <li>• 1990 ADOT District II Emergency Route Plans Manual</li> </ul>	<ul style="list-style-type: none"> <li>• Administration</li> <li>• Public Works</li> </ul>
STUDIES	<ul style="list-style-type: none"> <li>• Flood Insurance Study for Graham County (1988)</li> <li>• FEMA DFIRM Maps (FEMA, Effective date of September 2007)</li> <li>• 1997 Upper Gila River Watershed Ecological Inventory &amp; Analysis</li> <li>• 1970 Soil Survey of the Safford Area, Arizona (NRCS)</li> <li>• 1989 Regional Solid Waste Study</li> <li>• 2003 Environmental Impact Statement Dos Pobres / San Juan Project</li> <li>• 1998 Graham County Regional Transportation Study</li> </ul>	<ul style="list-style-type: none"> <li>• Administration</li> </ul>

**Table 6-2-2: Summary of technical staff and personnel capabilities for Pima**

<b>Staff/Personnel Resources</b>	<input checked="" type="checkbox"/>	<b>Department/Agency - Position</b>
Planner(s) or engineer(s) with knowledge of land development and land management practices		
Engineer(s) or professional(s) trained in construction practices related to buildings and/or infrastructure		
Planner(s) or engineer(s) with and understanding of natural and/or human-caused hazards		
Floodplain Manager		(Floodplain Management provided by Graham County – County Engineer)
Surveyors		
Staff with education or expertise to assess the community’s vulnerability to hazards		
Personnel skilled in GIS and/or HAZUS		(GIS services provided by Graham County – County Engineer)
Scientists familiar with the hazards of the community		
Emergency manager	<input checked="" type="checkbox"/>	Administration – Town Manager
Grant writer(s)		
Others		

**Table 6-3-2: Summary of fiscal capabilities for Pima**

<b>Financial Resources</b>	<b>Accessible or Eligible to Use (Yes, No, Don’t Know)</b>	<b>Comments</b>
Community Development Block Grants	Yes	Available in areas which qualify (Low/Moderate Income)
Capital Improvements Project funding	Yes	(None provided)
Authority to levy taxes for specific purposes	Yes	(None provided)
Fees for water, sewer, gas, or electric service	Yes	The Town of Pima provides sewer only.
Impact fees for homebuyers or new developments/homes	No	(None provided)
Incur debt through general obligation bonds	Yes	(None provided)
Incur debt through special tax bonds	Yes	(None provided)
Savings	Yes	The Town of Pima has capital in reserve

**Table 6-1-3: Summary of legal and regulatory capabilities for Safford**

<b>Regulatory Tools for Hazard Mitigation</b>	<b>Description</b>	<b>Responsible Department/Agency</b>
CODES	<ul style="list-style-type: none"> <li>• 2003 International Building Code</li> <li>• 2003 International Residential Code</li> <li>• 2003 International Plumbing Code</li> <li>• 2003 International Mechanical Code</li> <li>• 2003 International Fire Code</li> <li>• 2002 National Electrical Code</li> </ul>	<ul style="list-style-type: none"> <li>• Community Development</li> </ul>
ORDINANCES	<ul style="list-style-type: none"> <li>• 1999 City of Safford Municipal Code which includes all Ordinances and Arizonians with Disabilities Act</li> </ul>	<ul style="list-style-type: none"> <li>• Community Development</li> </ul>
PLANS, MANUALS, and/or GUIDELINES	<ul style="list-style-type: none"> <li>• City of Safford General Plan (May 2004)</li> <li>• Emergency Operations Plan (November 2004)</li> <li>• Summary of City of Safford Capital Improvement Plans (April 2003)</li> <li>• Emergency Operations Plan for Graveyard Wash FRS (July 2008)</li> <li>• Emergency Operations Plan for Freeman Wash FRS (Update sent to ADWR 3/12/09, pending approval)</li> <li>• Emergency Water Management Plan (May 2004)</li> <li>• Public Awareness Plan (April 2004)</li> </ul>	<ul style="list-style-type: none"> <li>• Community Development</li> <li>• Public Works</li> <li>• Engineering</li> <li>• Utilities</li> </ul>
STUDIES	<ul style="list-style-type: none"> <li>• FEMA DFIRM Maps (FEMA, Effective date of September 2007)</li> </ul>	<ul style="list-style-type: none"> <li>• Engineering</li> </ul>

<b>Table 6-2-3: Summary of technical staff and personnel capabilities for Safford</b>		
<b>Staff/Personnel Resources</b>	<input checked="" type="checkbox"/>	<b>Department/Agency - Position</b>
Planner(s) or engineer(s) with knowledge of land development and land management practices	<input checked="" type="checkbox"/>	Planning and Community Services – Director
Engineer(s) or professional(s) trained in construction practices related to buildings and/or infrastructure	<input checked="" type="checkbox"/>	Public Works – Director
Planner(s) or engineer(s) with and understanding of natural and/or human-caused hazards	<input checked="" type="checkbox"/>	Public Works – Director
Floodplain Manager	<input checked="" type="checkbox"/>	Public Works –Director
Surveyors	<input checked="" type="checkbox"/>	Public Works – Director and Engineering Staff
Staff with education or expertise to assess the community’s vulnerability to hazards	<input checked="" type="checkbox"/>	Public Works – Director
Personnel skilled in GIS and/or HAZUS	<input checked="" type="checkbox"/>	Public Works - Director
Scientists familiar with the hazards of the community		
Emergency manager	<input checked="" type="checkbox"/>	Police – Police Chief
Grant writer(s)	<input checked="" type="checkbox"/>	Planning and Community Services – Community Development Specialist

<b>Table 6-3-3: Summary of fiscal capabilities for Safford</b>		
<b>Financial Resources</b>	<b>Accessible or Eligible to Use (Yes, No, Don’t Know)</b>	<b>Comments</b>
Community Development Block Grants	Yes	(None provided)
Capital Improvements Project funding	Yes	(None provided)
Authority to levy taxes for specific purposes	Yes	(None provided)
Fees for water, sewer, gas, or electric service	Yes	(None provided)
Impact fees for homebuyers or new developments/homes	Yes	(None provided)
Incur debt through general obligation bonds	Yes	(None provided)
Incur debt through special tax bonds	Yes	(None provided)

<b>Table 6-1-4: Summary of legal and regulatory capabilities for Thatcher</b>		
<b>Regulatory Tools for Hazard Mitigation</b>	<b>Description</b>	<b>Responsible Department/Agency</b>
CODES	<ul style="list-style-type: none"> <li>• 2003 International Building Code</li> <li>• 2003 International Residential Code</li> <li>• 2003 International Plumbing Code</li> <li>• 2003 International Mechanical Code</li> <li>• 2003 International Fire Code</li> <li>• 1999 National Electric Code</li> <li>• 1999 Town Code of the Town of Thatcher</li> </ul>	<ul style="list-style-type: none"> <li>• Building Dept.</li> <li>• Planning &amp; Zoning</li> <li>• Fire Dept.</li> <li>• Police Dept.</li> <li>• Engineering</li> </ul>
ORDINANCES	<ul style="list-style-type: none"> <li>• 2004 Town of Thatcher Planning &amp; Zoning Ordinance                             <ul style="list-style-type: none"> <li>• Floodplain, Zoning, and Weed Abatement</li> </ul> </li> <li>• 1998 Graham County Flood Damage Prevention Ordinance (Amended July 2007)</li> <li>• 2004 Town of Thatcher Subdivision Regulations</li> </ul>	<ul style="list-style-type: none"> <li>• Planning &amp; Zoning</li> <li>• Engineering</li> <li>• Building Dept.</li> <li>• Fire Dept.</li> </ul>
PLANS, MANUALS, and/or GUIDELINES	<ul style="list-style-type: none"> <li>• 2008 Town of Thatcher General Plan Update</li> <li>• 1999 Town of Thatcher Drainage Policy Manual</li> <li>• 2005 Town of Thatcher Multi-Hazard Mitigation Plan (currently being updated)</li> <li>• 2005 Graham County Community Wildfire Protection Plan</li> <li>• 1992 Town of Thatcher Emergency Operations Plan (currently being updated)</li> </ul>	<ul style="list-style-type: none"> <li>• Planning &amp; Zoning</li> <li>• Engineering</li> <li>• Fire Dept.</li> <li>• Police Dept.</li> </ul>
STUDIES	<ul style="list-style-type: none"> <li>• 1988 Flood Insurance Study for Graham County</li> <li>• 1980 Flood Hazard Study of Daley Estates of Thatcher, AZ</li> <li>• 1986 Floodplain Management Study for Frye Creek – Spring Canyon</li> <li>• 2008 Site Specific Probable Maximum Precipitation Analysis for Frye Creek, Graveyard Wash, &amp; Stockton Wash, Graham County, AZ</li> <li>• Frye Creek FRS #3, Individual Structure Assessment</li> <li>• 2008 Emergency Action Plan for Frye Creek Dam</li> <li>• 1997 Upper Gila River Watershed Ecological Inventory &amp; Analysis</li> <li>• 1970 Soil Survey of Safford Area, Arizona</li> <li>• 1989 Regional Solid Waste Study</li> <li>• 2003 Environmental Impact Statement Dos Pobres / San Juan Project</li> <li>• 1998 Graham County Regional Transportation Study (currently being updated)</li> <li>• 1990 ADOT District II Emergency Route Plans Manual</li> <li>• FEMA DFIRM Maps (FEMA, Effective date of September 2007)</li> </ul>	<ul style="list-style-type: none"> <li>• Engineering</li> <li>• Planning &amp; Zoning</li> <li>• Police Dept.</li> <li>• Fire Dept.</li> </ul>

<b>Table 6-2-4: Summary of technical staff and personnel capabilities for Thatcher</b>		
<b>Staff/Personnel Resources</b>	<input checked="" type="checkbox"/>	<b>Department/Agency - Position</b>

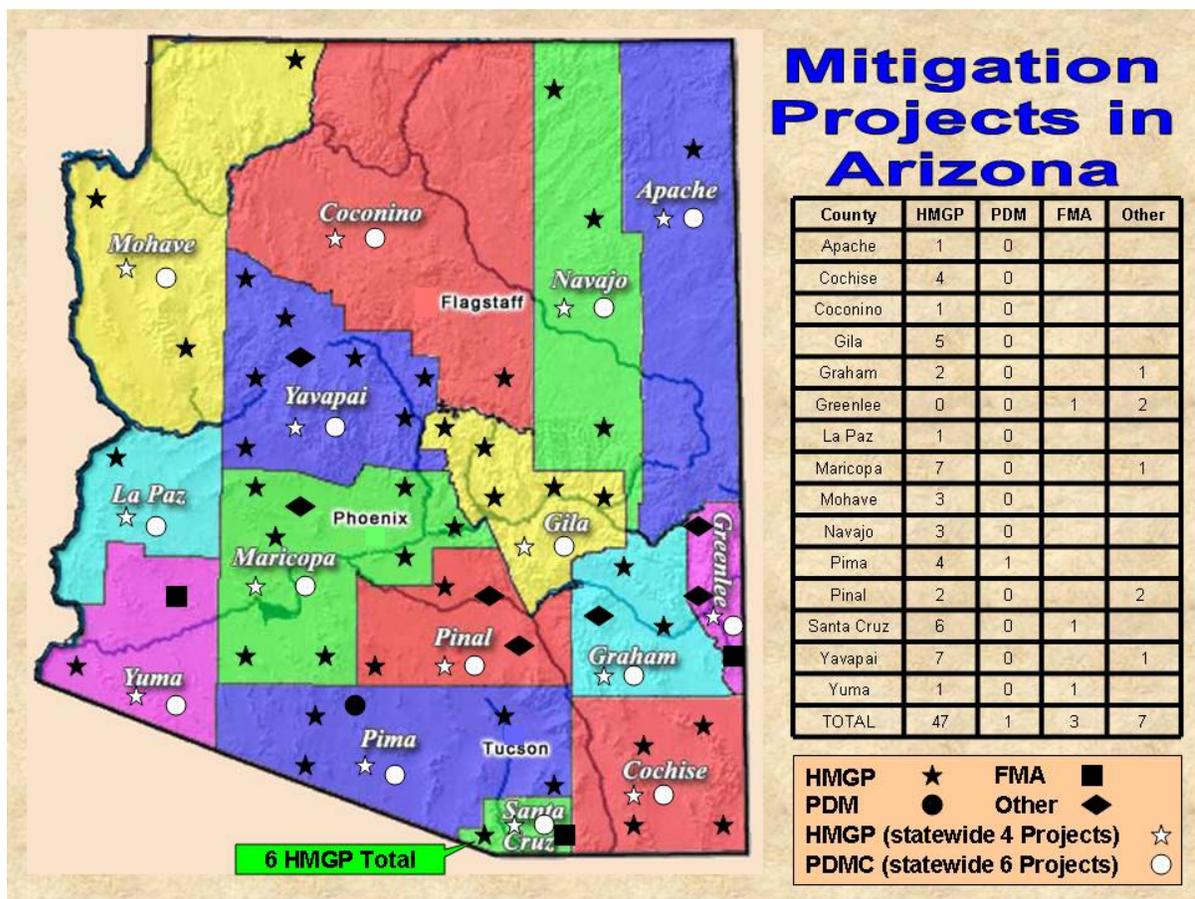
<b>Table 6-2-4: Summary of technical staff and personnel capabilities for Thatcher</b>		
<b>Staff/Personnel Resources</b>	<input checked="" type="checkbox"/>	<b>Department/Agency - Position</b>
Planner(s) or engineer(s) with knowledge of land development and land management practices	<input checked="" type="checkbox"/>	Engineering – Community Development Director
Engineer(s) or professional(s) trained in construction practices related to buildings and/or infrastructure	<input checked="" type="checkbox"/>	Engineering – Town Engineer
Planner(s) or engineer(s) with and understanding of natural and/or human-caused hazards	<input checked="" type="checkbox"/>	Engineering – Town Engineer
Floodplain Manager		(Floodplain Management provided by Graham County – County Engineer)
Surveyors	<input checked="" type="checkbox"/>	Engineering – Town Engineer
Staff with education or expertise to assess the community’s vulnerability to hazards	<input checked="" type="checkbox"/>	Engineering – Town Engineer
Personnel skilled in GIS and/or HAZUS	<input checked="" type="checkbox"/>	Engineering –Engineering Assistant
Scientists familiar with the hazards of the community		
Emergency manager	<input checked="" type="checkbox"/>	Administration – Town Manager
Grant writer(s)	<input checked="" type="checkbox"/>	Engineering –Engineering Assistant

<b>Table 6-3-4: Summary of fiscal capabilities for Thatcher</b>		
<b>Financial Resources</b>	<b>Accessible or Eligible to Use (Yes, No, Don’t Know)</b>	<b>Comments</b>
Community Development Block Grants	Yes	Available in areas which qualify (Low/Mod Income)
Capital Improvements Project funding	Yes	(None provided)
Authority to levy taxes for specific purposes	Yes	(None provided)
Fees for water, sewer, gas, or electric service	Yes	The Town of Thatcher provides sewer, electric, & refuse collection only
Impact fees for homebuyers or new developments/homes	Yes	The Town of Thatcher is eligible, but does not have any impact fees in place at this time
Incur debt through general obligation bonds	Yes	(None provided)
Incur debt through special tax bonds	Yes	(None provided)
Savings	Yes	The Town of Thatcher has capital in reserve

*6.2.2 Previous Mitigation Activities*

During the last planning cycle many mitigation activities have been accomplished by the jurisdictions within Graham County. Table 6-4 provides an updated summary, by jurisdiction, of recent mitigation activities performed over the last planning cycle or generally within the last five to ten years.

Graham County and Pima have received funding for a project through federal hazard mitigation grant money such as FMA, HMGP, or PDM. In 1979, Graham County received nearly \$500,000 in HUD and ADEM monies for the relocation of residents within the Little Hollywood area along the Gila River. In 2000, the county again received approximately \$16,000 in HMGP funds towards installation of an alert system. In 2006, the Town of Pima received \$12,500 in HMGP funds to construct flood barrier gates on a crossing of Cottonwood Wash. Figure 6-1 is a graphical depiction of past federally funded mitigation projects in the State tracked by ADEM.



**Figure 6-1: Past Mitigation Projects in Arizona**

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**Table 6-4: Summary of previous mitigation activities for Graham County jurisdictions**

Jurisdiction	Project Name	Project Description	Project Cost	Funding Source	Responsible Department	Completion Date
Pima	Cottonwood Wash Barrier Gates	The town designed and constructed barrier gates at the east and west entrances to the 200 North low water crossing of Cottonwood Wash.	\$12,500	HMGP (1586-DR)	Town Administration / Town Manager	May 2007
Safford	9th Street	Installed driveway approaches at 101-107 9th Street to eliminate standing water due to low points.	\$2,240	General Fund	Public Works Department	February 2009
Safford	Central Avenue	Extended drainage pipe 300' and installed four drop drains, previously the drainage had to ascend to reach Union Canal. Installed two driveway approaches, one sidewalk approach and two handicap ramps to eliminate standing water. East and west sides.	\$14,550	General Fund	Public Works Department	October 2008
Safford	Central Avenue	Replaced 175' CMP at 400 block and 365' CMP at 300 block.	\$8,800	General Fund	Public Works Department	August 2009
Safford	3rd Avenue	Replaced 160' CMP at 400 block.	\$3,700	General Fund	Public Works Department	July 2009
Safford	Little Horn Addition	Rebuilt drainage structure.	\$2,500	General Fund	Public Works Department	September 2009
Safford	5th Avenue	Extend drainage 100' and install one drop drain.	\$5,500	General Fund	Public Works Department	February 2010
Safford	3rd Avenue	Extended drainage pipe 300' and installed Five drop drains to eliminate standing water, previously the drainage had to ascend to reach Union Canal. East and west sides.	\$16,300	General Fund	Public Works Department	August 2008
Thatcher	First Street Improvements	First Street from First Ave to Reay Lane was reconstructed with curb and sidewalk and storm drain improvements. The new improvements provided for storm water to be collected and routed to underground culverts to keep the street and many homes from being flooded.	\$450,000	CDBG	Public Works Department	July-2002
Thatcher	Johnson St, Bingham St, & Fairway Ave. Improvements	Johnson, Bingham, and Fairway street were reconstructed with curb and sidewalk and storm drain improvements. The new improvements provided for storm water to be collected and re-routed to keep the street and many homes from being flooded.	\$400,000	CDBG	Public Works Department	June-2006
Thatcher	Reay Lane Frye Creek Bridge Reconstruction	The Reay Lane crossing of Frye Creek was reconstructed with a two barrel 8'X20' precast arch culvert. This location previously consisted of 24 - 2' culverts which did not have sufficient capacity and plugged-up, causing floodwaters to overtop the roadway.	\$200,000	Town CIP	Public Works Department	December-2007
Thatcher	First Avenue Improvements	First Avenue from Church St to Eagle Drive was reconstructed with curb and sidewalk and storm drain improvements. The new improvements provided for storm water to be collected and routed to underground culverts to keep the street and many homes from being flooded. Also, the overhead electric was placed underground.	\$350,000	Town CIP	Public Works Department	December-2008

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**Table 6-4: Summary of previous mitigation activities for Graham County jurisdictions**

Jurisdiction	Project Name	Project Description	Project Cost	Funding Source	Responsible Department	Completion Date
Thatcher	Frye Creek Retarding Dam Study	In response to the Frye Creek Flood Retarding Structure being placed on the unsafe list, a study and analysis of the structure, spillway, and flood channel have been and are being conducted to determine the best course of action.	\$150,000	NRCS	Engineering	Ongoing
Thatcher	Town Weed Abatement	On a continual basis, town crews remove unwanted weeds, brush, etc. and monitor Town residents to be sure their properties are clear also.	Staff Salaries	Town CIP	Public Works Department	Ongoing
Thatcher	Town Culvert & Floodway Clearing	On a continual basis, town crews keep culverts and floodways clear of debris and silt to ensure proper drainage capacity.	Staff Salaries	Town CIP	Public Works Department	Ongoing

**6.2.3 National Flood Insurance Program Participation**

Participation in the NFIP is a key element of any community’s local floodplain management and flood mitigation strategy. Graham County and all three incorporated jurisdictions participate in the NFIP. Joining the NFIP requires the adoption of a floodplain management ordinance that requires jurisdictions to follow established minimum standards set forth by FEMA and the State of Arizona, when developing in the floodplain. These standards require that all new buildings and substantial improvements to existing buildings will be protected from damage by the 100-year flood, and that new floodplain development will not aggravate existing flood problems or increase damage to other properties. As a participant in the NFIP, communities also benefit from having Flood Insurance Rate Maps (FIRM) that map identified flood hazard areas and can be used to assess flood hazard risk, regulate construction practices and set flood insurance rates. FIRMs are also an important source of information to educate residents, government officials and the private sector about the likelihood of flooding in their community. Table 6-5 summarizes the NFIP status and statistics as of March 31, 2010, for each of the jurisdictions participating in this Plan.

**Table 6-5: Summary of NFIP status and statistics for Graham 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
Graham County	040032	12/4/1984	9/28/2007	108	\$18,462	The county provides floodplain management for Pima, Thatcher, and the unincorporated areas.
Pima	040033	2/15/1984	9/28/2007	73	\$10,237	Floodplain management provided by the county
Safford	040124	1/18/1985	9/28/2007	17	\$4,100	Provides in-house floodplain management.
Thatcher	040117	12/15/1983	9/28/2007	22	\$4,113	Floodplain management provided by the county. Town staff review concurrent with the county.

**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 5 of the 2005 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 Planning Team and Local Planning Team for each jurisdiction reviewed and assessed the actions and projects listed in Tables 5-5 and 5-6 of their corresponding 2005 Plans. The assessment included evaluating and classifying each of the previously identified A/Ps based on the following criteria:

<i><b>STATUS</b></i>		<i><b>DISPOSITION</b></i>	
<i><b>Classification</b></i>	<i><b>Explanation Requirement:</b></i>	<i><b>Classification</b></i>	<i><b>Explanation Requirement:</b></i>
<i><b>“No Action”</b></i>	Reason for no progress	<i><b>“Keep”</b></i>	None required
<i><b>“In Progress”</b></i>	What progress has been made	<i><b>“Revise”</b></i>	Revised components
<i><b>“Complete”</b></i>	Date of completion and final cost of project (if applicable)	<i><b>“Delete”</b></i>	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 2005 Plan A/Ps is summarized by jurisdiction in Tables 6-6-xx.

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**Table 6-6-1  
Summary of Graham County assessment of previous plan cycle mitigation actions/projects**

<b>ID</b>	<b>Name</b>	<b>Description</b>	<b>Lead Agency Proposed Cost Proposed Comp Date</b>	<b>Status</b>	<b>Disposition</b>	<b>Explanation</b>
7.A.1	Evacuation plans	Develop/distribute evacuation plans and educate the public about evacuation plans and areas of risk.	<ul style="list-style-type: none"> <li>• Emergency Mgmt</li> <li>• \$80,000</li> <li>• Dependent on funding</li> </ul>	In Progress	Keep	Emergency management will continue to work on evacuation plans.
1.B.1	Code Adoption	Adopt a building code in the County	<ul style="list-style-type: none"> <li>• Planning &amp; Zoning</li> <li>• \$30,000</li> <li>• January 2005</li> </ul>	Complete	Revise	Currently 2003 codes adopted. Will continue to review tri-annually .
4.A.1	Interoperable Communications	Improve the communication infrastructure to provide interoperable communications for emergency personnel and other agencies which need to be in the communication loop in a disaster scenario.	<ul style="list-style-type: none"> <li>• Emergency Mgmt</li> <li>• \$4.2 million</li> <li>• January 2007</li> </ul>	In Progress	Keep	County continually improves its communication infrastructure.
5.A.1	Dam Flood Warning	Install flood monitoring equipment	<ul style="list-style-type: none"> <li>• ADEM</li> <li>• \$6,000</li> <li>• November 2004</li> </ul>	No Action	Delete	No funding available for county.
6.A.1	Forest Fuel Load Reduction	Reduce fuel load on Mt. Graham, particularly in the area of the scopes, cabins.	<ul style="list-style-type: none"> <li>• US Forest Service</li> <li>• \$974,500</li> <li>• Dependent on funding</li> </ul>	In Progress	Revise	Cabin owners are required to reduce fuel loads around their properties. Need to revise project to work with regulators on easing environmental roadblocks
5.B.2	8th Avenue Bridge	Evaluate 100 year floodplain at 8th Avenue Bridge	<ul style="list-style-type: none"> <li>• Engineering Dept</li> <li>• \$50,000</li> <li>• October 2007</li> </ul>	Complete	Revise	Completed during engineering requirements for bridge. New approaches will require a reevaluation.
5.B.3	8th Avenue Bridge	Replace scour critical bridge	<ul style="list-style-type: none"> <li>• Engineering Dept.</li> <li>• \$9.95 million</li> <li>• October 2009</li> </ul>	Completed	Delete	Replacement bridge construction completed April 2010.
8.A.1	Drought Contingencies	Develop drought contingencies to include water tanker deployment, culinary well protection, and conservation plans.	<ul style="list-style-type: none"> <li>• Emergency Mgmt</li> <li>• \$50,000</li> <li>• In process</li> </ul>	In Progress	Revise	Change to maintenance of current stock of tankers.

**Table 6-6-1  
Summary of Graham County assessment of previous plan cycle mitigation actions/projects**

<b>ID</b>	<b>Name</b>	<b>Description</b>	<ul style="list-style-type: none"> <li>• <b>Lead Agency</b></li> <li>• <b>Proposed Cost</b></li> <li>• <b>Proposed Comp Date</b></li> </ul>	<b>Status</b>	<b>Disposition</b>	<b>Explanation</b>
2.A.1	Floodplain Workshop	Hold workshop for citizens involved in floodplain development	<ul style="list-style-type: none"> <li>• Engineering and Planning &amp; Zoning Depts</li> <li>• \$1,000</li> <li>• June 2005</li> </ul>	In Progress	Revise	Giving public presentations on a request basis.
5.B.4	Diversion Dams	Modify diversion dams.	<ul style="list-style-type: none"> <li>• Engineering Dept and NRCS</li> <li>• \$5 million</li> <li>• Dependent on funding</li> </ul>	In Progress	Delete	Irrigation Districts make repairs as a consequence of flooding.
9.A.1	Hazardous Materials	Develop acid accident plan	<ul style="list-style-type: none"> <li>• Emergency Mgmt</li> <li>• \$200</li> <li>• December 2004</li> </ul>	No Action	Delete	Planning Team chose to drop the action since the Plan update is focused on natural hazards.
5.B.1	Floodplain Mapping	Obtain detail studies of unnumbered "A Zones" to improve floodplain administration in order to update mapping to increase credibility of the maps.	<ul style="list-style-type: none"> <li>• (None provided)</li> <li>• (None estimated)</li> <li>• (None provided)</li> </ul>	In Progress	Keep	County requiring drainage clearance which sometimes require detail studies.
9.A.2	Hazardous Materials	Develop propane explosion mitigation plan for propane storage facilities in the county	<ul style="list-style-type: none"> <li>• (None provided)</li> <li>• (None estimated)</li> <li>• (None provided)</li> </ul>	No Action	Delete	Planning Team chose to drop the action since the Plan update is focused on natural hazards.
5.C.1	Coordination	Bring conflicts in regulations between state and federal agencies to the attention of the regulators	<ul style="list-style-type: none"> <li>• (None provided)</li> <li>• (None estimated)</li> <li>• (None provided)</li> </ul>	In Progress	Delete	Working with state flood plain management organization to raise regulatory awareness of conflicts. Not really mitigation per se, so the project will be deleted
10.A.1	Lightning	Educate the public on the dangers of lightening and precautions for safety in thunder storms.	<ul style="list-style-type: none"> <li>• (None provided)</li> <li>• (None estimated)</li> <li>• (None provided)</li> </ul>	In Progress	Delete	Through National Preparedness Month in September, ads were run in our local newspaper advertising AZ-211. This website is no longer available due to state budget cuts.
11.A.1	Community Awareness	Increase community awareness of man-made disasters such as traffic accidents by publishing community statistics	<ul style="list-style-type: none"> <li>• (None provided)</li> <li>• (None estimated)</li> <li>• (None provided)</li> </ul>	No Action	Delete	Planning Team chose to drop the action since the Plan update is focused on natural hazards.

**Table 6-6-2  
Summary of Pima assessment of previous plan cycle mitigation actions/projects**

<b>ID</b>	<b>Name</b>	<b>Description</b>	<b>Lead Agency Proposed Cost Proposed Comp Date</b>	<b>Status</b>	<b>Disposition</b>	<b>Explanation</b>
5.B.3	Cottonwood Wash Barrier	Design and construct a set of barrier gates at the 200 North low water crossing of Cottonwood Wash	<ul style="list-style-type: none"> <li>• Town Administration</li> <li>• \$10,000</li> <li>• June 2006</li> </ul>	Complete	Delete	Project is completed
6.D.1	Wildland Fire Public Education	Conduct a public education outreach to inform existing and future property owners of wildland fire dangers and mitigation measures	<ul style="list-style-type: none"> <li>• Town Administration</li> <li>• \$2,000</li> <li>• August 2005</li> </ul>	No Action	Delete	The town has chosen to drop Wildfire as hazard...Re-evaluation of the wildfire hazard
8.D.1	Drought Public Outreach	Conduct a public education outreach to inform citizens of the impacts of drought and the benefits of water conservation	<ul style="list-style-type: none"> <li>• Town Administration</li> <li>• \$2,000</li> <li>• August 2005</li> </ul>	No Action	Keep	Changes in town management and staff have precluded any progress on action/project
9.C.1	HAZMAT Public Outreach	Conduct a public education outreach to inform citizens of the types of hazardous materials being transported through the town and what to do in the case of a HAZMAT spill.	<ul style="list-style-type: none"> <li>• Town Administration</li> <li>• \$2,000</li> <li>• August 2006</li> </ul>	No Action	Delete	The Town of Pima is focusing on natural hazards and is no longer mitigating HAZMAT in this plan
1.A.1	County-Wide Code Standardization	Coordinate with Graham County, Safford and Thatcher to develop and adopt standard uniform codification for future building practices in the area.	<ul style="list-style-type: none"> <li>• Town Administration</li> <li>• \$15,000</li> <li>• December 2005</li> </ul>	In Progress	Keep	The town will continue to do this...
5.B.1 7.B.1	Cottonwood Wash Levee	Design and rebuild the levee to FEMA standards.	<ul style="list-style-type: none"> <li>• Town Administration</li> <li>• \$300,000</li> <li>• December 2008</li> </ul>	No Action	Keep	Changes in town management and staff have precluded any progress on action/project. Continuing to pursue funding opportunities.
5.B.2 7.B.2	Sewer Pond Dike	Design and construct an extension of the existing dike upstream	<ul style="list-style-type: none"> <li>• Town Administration</li> <li>• \$560,000</li> <li>• December 2007</li> </ul>	No Action	Delete	Further evaluation by town has determined the project infeasible and is pursuing other options for the sewer
9.B.1	HAZMAT Alternative Routes Evaluation	Perform a study to quantify the types and amount of HAZMAT being transported through the Town, and identify and evaluate alternative transport routes.	<ul style="list-style-type: none"> <li>• Town Administration, ADOT, Graham County DOT</li> <li>• \$50,000</li> <li>• December 2010</li> </ul>	No Action	Delete	The Town of Pima is focusing on natural hazards and is no longer mitigating HAZMAT in this plan

**Table 6-6-3  
Summary of Safford assessment of previous plan cycle mitigation actions/projects**

<b>ID</b>	<b>Name</b>	<b>Description</b>	<b>Lead Agency Proposed Cost Proposed Comp Date</b>	<b>Status</b>	<b>Disposition</b>	<b>Explanation</b>
6.F.1	Improve Water Supply to Safford Regional Airport	Propose to improve the water supply at the Safford Regional Airport to provide sufficient capacity for firefighting base at Airport.	<ul style="list-style-type: none"> <li>• Gila Resources</li> <li>• \$1 million</li> <li>• June 2006</li> </ul>	No Action	Delete	The committed money was extracted by the legislature in an attempt to balance the state budget.
7.A.1	Graveyard Dam Flood Emergency Warning System	Propose to install a telemetered rain gauge and stream gauge system to provide information about runoff into the Graveyard Wash Dam Flood retarding structure. This will decrease potential loss of life from dam failure. We also propose to install an emergency warning siren system to warn residents of imminent evacuations.	<ul style="list-style-type: none"> <li>• City of Safford</li> <li>• \$50,000</li> <li>• June 2005</li> </ul>	In Progress	Revise	The telemetry rain gauge and stream gauge system is in place but still lacking a software upgrade that will cost \$4,000 - \$5,000 for a web based interface with the computer terminal.

<b>Table 6-6-4 Summary of Thatcher assessment of previous plan cycle mitigation actions/projects</b>						
<b>ID</b>	<b>Name</b>	<b>Description</b>	<b>Lead Agency Proposed Cost Proposed Comp Date</b>	<b>Status</b>	<b>Disposition</b>	<b>Explanation</b>
7.A.1	Engineering Study for Fry Creek FRS No. 3	Hire consultant to study the effects of failures and what is needed to upgrade dam	<ul style="list-style-type: none"> <li>• Town of Thatcher</li> <li>• \$100,000</li> <li>• January 2005</li> </ul>	In Progress	Keep	Study is nearly complete
5.A.1	Rain/Stream Gauge Siting and Implementation Project	Watersheds in the Gila Valley produce flash flood conditions. The need for rain gauges, stream gauges and telemetry should be evaluated for these watersheds.	<ul style="list-style-type: none"> <li>• Coalition of Governments</li> <li>• \$30,000</li> <li>• August 2007</li> </ul>	No Action	Delete	No funding available
9.C.1	Hazardous Materials Public Education	Work in a partnership with Freeport McMoRan and other governmental entities in educating the public through seminars.	<ul style="list-style-type: none"> <li>• Coalition of Governments and Public Companies</li> <li>• \$5,000</li> <li>• August 2007</li> </ul>	No Action	Keep	Awaiting Staff Availability & Funding
1.A.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 flood, thunderstorm/high wind, earthquake, transportation and other hazards on new buildings and infrastructure.	<ul style="list-style-type: none"> <li>• Town of Thatcher</li> <li>• \$40,000</li> <li>• Annual ongoing</li> </ul>	In Progress	Keep	Ongoing process
8.D.1	Drought Mitigation	Conduct a public education campaign in cooperation with other County entities to encourage citizens to conserve water (pamphlets, brochures, fliers, etc.).	<ul style="list-style-type: none"> <li>• Town of Thatcher</li> <li>• \$5,000</li> <li>• Annual ongoing</li> </ul>	In Progress	Keep	Graham County Water Providers "Water Counts" Committee & Program has been Formed & is Functioning
2.B.1	Inter-Governmental Partnering	Work together with the other entities to pool resources in order to accomplish the goals to implement mitigation actions.	<ul style="list-style-type: none"> <li>• Coalition of Governments</li> <li>• \$1,000</li> <li>• August 2006</li> </ul>	In Progress	Keep	The Town Has & Will Continue to Partner with Others to Mitigate Hazards
2.A.1	Hazard Mitigation Public Information Strategy	Plan and facilitate town meetings to help inform the public.	<ul style="list-style-type: none"> <li>• Town of Thatcher</li> <li>• \$1,000</li> <li>• August 2006</li> </ul>	No Action	Delete	Will perform this as a part of other opportunities
6.C.1	Wildfire Mitigation	Enforce the Town's current weed abatement ordinance to protect existing and future assets from wildfire within the town limits.	<ul style="list-style-type: none"> <li>• Town of Thatcher</li> <li>• \$1,000</li> <li>• Annual ongoing</li> </ul>	In Progress	Keep	Ongoing process

6.3.2 *New Mitigation Actions / Projects and Implementation Strategy*

Upon completion of the assessment summarized in Section 6.4.1, each jurisdiction's Local Planning Team met and developed new A/Ps using the goals and objectives, results of the vulnerability analysis and capability assessment, and the planning team's institutional knowledge of hazard mitigation needs in the 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 effect the mitigation goals. Examples may include forest thinning, 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 the A/P.
- **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 as staff time.

Once the full list of A/Ps was completed to the satisfaction of the Local Planning Team, 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 a part of the implementation strategy included:

- **Priority Ranking** – each A/P was reviewed by the Local Planning Team and assigned a priority ranking of either "High", "Medium", or "Low". The assignments were subjectively made using a simple discussion 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 6-7-4 summarize the updated mitigation A/P and implementation strategy for each participating Plan jurisdiction. Projects (A/Ps) 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 and will be retained in the Plan.

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MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN**

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**Table 6-7-1: Summary of mitigation actions and projects and implementation strategy for Graham County**

<b>GOAL: Reduce or eliminate the risk to people and property from natural hazards.</b>									
<b>Objective 1:</b> Reduce or eliminate risks that threaten life and property in the incorporated, unincorporated, and Tribal jurisdictions within Graham County.									
<b>Objective 2:</b> Reduce risk to critical facilities and infrastructure from natural hazards.									
<b>Objective 3:</b> Promote hazard mitigation throughout the incorporated, unincorporated, and Tribal jurisdictions within Graham County.									
<b>Objective 4:</b> Increase public awareness of hazards and risks that threaten the incorporated, unincorporated, and Tribal jurisdictions within Graham County.									
<b>Mitigation Action/Project</b>					<b>Implementation Strategy</b>				
<b>ID No.</b>	<b>Description</b>	<b>Hazard(s) Mitigated</b>	<b>Community Assets Mitigated (Ex/New)</b>	<b>Estimated Cost</b>	<b>Priority Ranking</b>	<b>Planning Mechanism(s) for Implementation</b>	<b>Anticipated Completion Date</b>	<b>Primary Agency / Job Title Responsible for Implementation</b>	<b>Funding Source(s)</b>
1	Compliance with NFIP regulations by enforcement of the county floodplain management ordinance through review of new development located in the floodplain and issuance of floodplain use permits.	Flood	New	Staff Time	High	Building Permit Requirements	Annual – Ongoing	Graham County / County Engineer	FCD Levy, Community Assistance Program, Floodplain Use Permit Fees
2	<i>Develop/distribute emergency action plans and educate the public about areas of risk posed by a potential dam failure.</i>	<i>Dam Failure</i>	<i>Both</i>	<i>Staff Time</i>	<i>High</i>	<i>ADWR Dam Safety Regulation</i>	<i>Annual</i>	<i>Graham County / County Engineer</i>	<i>FCD Levy</i>
3	<i>Improve the communication infrastructure to provide interoperable communications for emergency personnel and other agencies which need to be in the communication loop in a disaster scenario.</i>	<i>All</i>	<i>Both</i>	<i>\$250,000</i>	<i>High</i>	<i>FCC Narrow Band Mandate</i>	<i>August 2011</i>	<i>Information Technology / IT Director</i>	<i>Federal Grants, General Fund</i>
4	Work proactively with federal agencies (USFS, EPA, USFW) to ease regulations that will allow effective mitigation of wildland fire fuels next to structures.	Wildfire	Ex	Staff Time	High	Community Wildfire Protection Plan	Dependent on federal agency response	County Board of Supervisors	General Fund
5	<i>Maintain county water tankers for deployment on an as-needed basis.</i>	<i>Drought</i>	<i>Both</i>	<i>Staff Time</i>	<i>Medium</i>	<i>N/A</i>	<i>As needed</i>	<i>Highway Department / Highway Superintendent</i>	<i>HURF</i>
6	Distribute information packets to citizens located within floodplains to educate about the risks of flooding and preparedness	Flood	Both	Staff Time	Medium	Scheduled public events	Ongoing	Emergency Management / Deputy Emergency Manager	Preparedness grant funds
7	Obtain detail studies of unnumbered "A Zones" to improve floodplain administration in order to update mapping and increase credibility of the maps.	Flood	Both	\$60,000	Medium	Floodplain Ordinance	Within 1-year of funding availability	Engineering / County Engineer	Federal Grant

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**Table 6-7-1: Summary of mitigation actions and projects and implementation strategy for Graham County**

<b>GOAL: Reduce or eliminate the risk to people and property from natural hazards.</b>									
<b>Objective 1:</b> Reduce or eliminate risks that threaten life and property in the incorporated, unincorporated, and Tribal jurisdictions within Graham County.									
<b>Objective 2:</b> Reduce risk to critical facilities and infrastructure from natural hazards.									
<b>Objective 3:</b> Promote hazard mitigation throughout the incorporated, unincorporated, and Tribal jurisdictions within Graham County.									
<b>Objective 4:</b> Increase public awareness of hazards and risks that threaten the incorporated, unincorporated, and Tribal jurisdictions within Graham County.									
<b>Mitigation Action/Project</b>					<b>Implementation Strategy</b>				
<b>ID No.</b>	<b>Description</b>	<b>Hazard(s) Mitigated</b>	<b>Community Assets Mitigated (Ex/New)</b>	<b>Estimated Cost</b>	<b>Priority Ranking</b>	<b>Planning Mechanism(s) for Implementation</b>	<b>Anticipated Completion Date</b>	<b>Primary Agency / Job Title Responsible for Implementation</b>	<b>Funding Source(s)</b>
8	Review and evaluate current IBC codes for potential update on a tri-annual basis.	All	Both	Staff Time \$10,000	High	N/A	Every three years	Planning & Zoning / Planning & Zoning Director	General Fund
9	Re-evaluate 100 year floodplain at 8th Avenue Bridge to reflect the revised approach design.	Flood	Both	\$5,000	High	Floodplain Management Ordinance	July 2010	Engineering / County Engineer	ADOT
10	Continue to monitor active fissure area and coordinate with AZGS to identify possible mitigation actions	Fissure	Both	Staff Time	Medium	N/A	Ongoing	Transportation Dept / Operations Supervisor Engineering / County Engineer	General Fund

**GRAHAM COUNTY  
MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN**

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**Table 6-7-2: Summary of mitigation actions and projects and implementation strategy for Pima**

<b>GOAL: Reduce or eliminate the risk to people and property from natural hazards.</b>									
<b>Objective 1:</b> Reduce or eliminate risks that threaten life and property in the incorporated, unincorporated, and Tribal jurisdictions within Graham County.									
<b>Objective 2:</b> Reduce risk to critical facilities and infrastructure from natural hazards.									
<b>Objective 3:</b> Promote hazard mitigation throughout the incorporated, unincorporated, and Tribal jurisdictions within Graham County.									
<b>Objective 4:</b> Increase public awareness of hazards and risks that threaten the incorporated, unincorporated, and Tribal jurisdictions within Graham County.									
<b>Mitigation Action/Project</b>					<b>Implementation Strategy</b>				
<b>ID No.</b>	<b>Description</b>	<b>Hazard(s) Mitigated</b>	<b>Community Assets Mitigated (Ex/New)</b>	<b>Estimated Cost</b>	<b>Priority Ranking</b>	<b>Planning Mechanism(s) for Implementation</b>	<b>Anticipated Completion Date</b>	<b>Primary Agency / Job Title Responsible for Implementation</b>	<b>Funding Source(s)</b>
1	Compliance with NFIP regulations by enforcement of the county floodplain management ordinance through review of new development located in the floodplain and issuance of floodplain use permits.	Flood	New	Staff Time	High	Building Permit Requirements	Annual – Ongoing	Graham County / County Engineer	FCD Levee, Community Assistance Program, Floodplain Use Permit Fees
2	Conduct a public education outreach to inform citizens of the impacts of drought and the benefits of water conservation	Drought	Both	Staff Time	Medium	Graham County Coop	August 2009	Town of Pima/administration/council	Town of Pima / General fund
3	Coordinate with Graham County, Safford and Thatcher to develop and adopt standard uniform codification for future building practices in the area.	All	Both	Staff Time	Low	IGA's	Annual-Ongoing	County/P&Z	Individual municipality / general fund
4	Design and rebuild the Cottonwood Wash levee to FEMA standards to mitigate potential flood hazard for a large portion of the downtown area.	Flood	Both	\$250,000	High	Feasibility study	2012	Town of Pima/administration/council	WIFA
5	Conduct a public education outreach to inform citizens of the impacts of severe winds (microburst, thunderstorm winds, tornado, dust devils, etc.)	Severe wind	New	Staff Time	Medium	Planning and Zoning	August 2009	Town of Pima/administration/council	Town of Pima / General fund

**Table 6-7-3: Summary of mitigation actions and projects and implementation strategy for Safford**

<b>GOAL: Reduce or eliminate the risk to people and property from natural hazards.</b>									
<b>Objective 1:</b> Reduce or eliminate risks that threaten life and property in the incorporated, unincorporated, and Tribal jurisdictions within Graham County.									
<b>Objective 2:</b> Reduce risk to critical facilities and infrastructure from natural hazards.									
<b>Objective 3:</b> Promote hazard mitigation throughout the incorporated, unincorporated, and Tribal jurisdictions within Graham County.									
<b>Objective 4:</b> Increase public awareness of hazards and risks that threaten the incorporated, unincorporated, and Tribal jurisdictions within Graham County.									
<b>Mitigation Action/Project</b>					<b>Implementation Strategy</b>				
<b>ID No.</b>	<b>Description</b>	<b>Hazard(s) Mitigated</b>	<b>Community Assets Mitigated (Ex/New)</b>	<b>Estimated Cost</b>	<b>Priority Ranking</b>	<b>Planning Mechanism(s) for Implementation</b>	<b>Anticipated Completion Date</b>	<b>Primary Agency / Job Title Responsible for Implementation</b>	<b>Funding Source(s)</b>
1	Compliance with NFIP regulations by enforcement of the county floodplain management ordinance through review of new development located in the floodplain and issuance of floodplain use permits.	Flood	New	Staff Time	High	Building Permit Requirements	Annual – Ongoing	Graham County / County Engineer	FCD Levee, Community Assistance Program, Floodplain Use Permit Fees
2	Obtain software for telemetered rain gauge and stream gauge system on Graveyard Wash Dam Flood retarding structure to establish a web based interface with the base workstation computer.	Dam Failure, Flood	Both	\$3,000	High	Dam Safety	2010	JE Fuller / COS	COS General Fund
3	Jensen Addition 1) Construct Retention pond north of East 4 <sup>th</sup> Street, between Safford Bowl and Impressive Labels; 2) Obtain easement with a request to pipe drainage from AZ Eastern Railway	Flood	New	\$4,000	High	Agreement w/Railroad and discussion with property owner	2012	City of Safford	COS General Fund
4	Construct drainage improvements designed for Sunflowr Canal and Prina Channel by TrueLine Engineering to minimize flooding in the area. Construction will coincide with development of the area.	Flood	New	\$90,000	Med	Discussion with developer and landowner	2013	City of Safford	COS General Fund
5	Graveyard Wash – Fence Relocation	Dam Failure	New	\$23,000	Med	Submitted memo to ADWR for approval and Gila Watershed Partnership	2011	City of Safford	Gila Watershed and COS Cost share grant
6	Glenn Meadows – Construct three retention basins in Conquistador Estates within City owned roadways.	Flood	New	\$10,000	High	Design and Construction	2011	City of Safford	COS General Fund

**GRAHAM COUNTY  
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**Table 6-7-3: Summary of mitigation actions and projects and implementation strategy for Safford**

<b>GOAL: Reduce or eliminate the risk to people and property from natural hazards.</b>									
<b>Objective 1:</b> Reduce or eliminate risks that threaten life and property in the incorporated, unincorporated, and Tribal jurisdictions within Graham County.									
<b>Objective 2:</b> Reduce risk to critical facilities and infrastructure from natural hazards.									
<b>Objective 3:</b> Promote hazard mitigation throughout the incorporated, unincorporated, and Tribal jurisdictions within Graham County.									
<b>Objective 4:</b> Increase public awareness of hazards and risks that threaten the incorporated, unincorporated, and Tribal jurisdictions within Graham County.									
<b>Mitigation Action/Project</b>					<b>Implementation Strategy</b>				
<b>ID No.</b>	<b>Description</b>	<b>Hazard(s) Mitigated</b>	<b>Community Assets Mitigated (Ex/New)</b>	<b>Estimated Cost</b>	<b>Priority Ranking</b>	<b>Planning Mechanism(s) for Implementation</b>	<b>Anticipated Completion Date</b>	<b>Primary Agency / Job Title Responsible for Implementation</b>	<b>Funding Source(s)</b>
7	Colonial Village – Construct retention basin in vacant lot.	Flood	New	\$18,000	Med	Design and Construction	2014	City of Safford	COS General Fund
8	12 <sup>th</sup> Ave / 26 <sup>th</sup> St – Redesigned low water crossing to all weather crossing.	Flood	New	\$18,000	Med	Design and Construction	2010	City of Safford	COS General Fund
9	Construct the redesigned Hopi Avenue low water crossing to provide an all weather access at the crossing location.	Flood	New	\$13,000	Med	Design and Construction	2010	City of Safford	COS General Fund

**Table 6-7-4: Summary of mitigation actions and projects and implementation strategy for Thatcher**

<b>GOAL: Reduce or eliminate the risk to people and property from natural hazards.</b>									
<b>Objective 1:</b> Reduce or eliminate risks that threaten life and property in the incorporated, unincorporated, and Tribal jurisdictions within Graham County.									
<b>Objective 2:</b> Reduce risk to critical facilities and infrastructure from natural hazards.									
<b>Objective 3:</b> Promote hazard mitigation throughout the incorporated, unincorporated, and Tribal jurisdictions within Graham County.									
<b>Objective 4:</b> Increase public awareness of hazards and risks that threaten the incorporated, unincorporated, and Tribal jurisdictions within Graham County.									
<b>Mitigation Action/Project</b>					<b>Implementation Strategy</b>				
<b>ID No.</b>	<b>Description</b>	<b>Hazard(s) Mitigated</b>	<b>Community Assets Mitigated (Ex/New)</b>	<b>Estimated Cost</b>	<b>Priority Ranking</b>	<b>Planning Mechanism(s) for Implementation</b>	<b>Anticipated Completion Date</b>	<b>Primary Agency / Job Title Responsible for Implementation</b>	<b>Funding Source(s)</b>
1	Compliance with NFIP regulations by enforcement of the county floodplain management ordinance through review of new development located in the floodplain and issuance of floodplain use permits.	Flooding	New	Staff Time	High	Building Permit Requirements	Annual – Ongoing	Graham County / County Engineer	Town CIP, Floodplain Use Permit Fees
2	Hire consultant to study the effects of failures and what is needed to upgrade Fry Creek FRS No. 3	Dam Failure	Both	\$150,000	High	Process Under Way	Fall 2010	Thatcher / Town Engineer	NRCS
3	Continue to enforce zoning and building codes through current site plan, subdivision, and building permit review processes to reduce the effects of flooding, high wind, transportation and other hazards on new buildings and infrastructure.	Flooding, Severe Wind, Transportation	New	Staff Time	High	Building Permit Requirements	Annual – Ongoing	Thatcher / Building Official	Town CIP, Building Permit Fees
4	Conduct a public education campaign in cooperation with the City of Safford and the UofA Cooperative Extension to encourage citizens to conserve water (pamphlets, brochures, fliers, etc.).	Drought	Both	Staff Time	Moderate	Process Under Way	Annual – Ongoing	Thatcher / Town Engineer	Town CIP
5	Conduct quarterly coordination meetings with Graham County Engineering, Pima Town Management, Safford City Engineering, and others as needed, to discuss opportunities to pool resources toward accomplishing common mitigation goals.	All	Both	Staff Time	Moderate	Town Policy	Quarterly – Ongoing	Thatcher / Town Engineer	Town CIP
6	Enforce the Town’s current weed abatement ordinance to protect existing and future assets from wildfire within the town limits.	Wildfire	Both	Staff Time	High	Town Ordinance Compliance	Annual – Ongoing	Thatcher / Planning & Zoning Director	Town CIP

**Table 6-7-4: Summary of mitigation actions and projects and implementation strategy for Thatcher**

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<b>ID No.</b>	<b>Description</b>	<b>Hazard(s) Mitigated</b>	<b>Community Assets Mitigated (Ex/New)</b>	<b>Estimated Cost</b>	<b>Priority Ranking</b>	<b>Planning Mechanism(s) for Implementation</b>	<b>Anticipated Completion Date</b>	<b>Primary Agency / Job Title Responsible for Implementation</b>	<b>Funding Source(s)</b>
7	<i>Work in a partnership with Freeport McMoRan and other governmental entities in educating the public about hazardous materials through seminars.</i>	HAZMAT	Both	<i>Staff Time &amp; Advertising Expenses</i>	Moderate	Town Policy	Fall 2011	Thatcher / Town Engineer	Town CIP

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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

### Incorporation of the Plan into Other Existing Planning Mechanisms

### Continued Public Participation

Graham County and all of the participating jurisdictions recognize that this hazard mitigation plan is intended to be a “living” document with regularly scheduled monitoring, evaluation, and updating.

Section 6 of the 2005 Plan outlined specific steps for plan maintenance. A poll of the Planning Team indicated that few formal reviews or maintenance occurred over the past five years. Periodic references to the mitigation A/Ps summarized in the 2005 Plan were made by each jurisdiction. Reasons for the lack of review included:

- The plan maintenance requirements were not effectively communicated when changes in personnel occurred.
- A general forgetfulness and lack of understanding regarding the importance and requirements of the maintenance element.

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

## 7.1 Monitoring and Evaluation

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

- **Schedule** – The Plan shall be reviewed on at least an annual basis or following a major disaster. Graham County Emergency Management will take the lead to reconvene the Planning Team on or around the anniversary of the Plan and will work out a suitable reporting format with ADEM. ADEM has also committed to help with reminders to the county as a double accountability. Copies of the annual review report will also be included in Appendix E.
- **Review Content** – One month prior to the Planning Team review meeting, the acting county emergency manager or appointed representative will distribute a reminder questionnaire to each jurisdictions’ Point of Contact, with the following questions:
  - **Hazard Identification:** *Have the risks and hazards changed?*
  - **Goals and objectives:** *Are the goals and objectives still able to address current and expected conditions?*
  - **Mitigation Projects and Actions:** *Has the project been completed? If not complete but started, what part of the project has been completed (include a percent complete and description of what has actually been accomplished to-date)? How much money*

*has been expended on incomplete projects? Did the project require additional funds over the expected amount or were the costs less than expected?*

During the annual meeting, each Point of Contact will have the opportunity to provide a report to the group of his/her review of the Plan. The report will include their responses to the above questions and any other items specific to their community. Documentation of the annual meeting will include notes on the results of the meeting as well as more specific information on the reasoning behind proposed changes to the Plan.

An informal presentation of the status of the goals, objectives and A/Ps will be made to each jurisdiction's board or council following the review meeting. The presentation will be informational only and will not require a formal action on the part of the board or council unless a major update to the Plan is proposed prior to the next five year update.

## **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 Planning Team will re-convene to review and assess the materials accumulated in Appendix E.
- ✓ The Planning Team will update and/or revise the appropriate or affected portions of the plan and produce a revised draft plan document.
- ✓ The revised plan will be submitted to ADEM and FEMA for review, comment and approval.
- ✓ The updated plan document will be presented before the respective councils and boards for an official concurrence/adoption of the new plan.

## **7.3 Incorporation into Existing Planning Mechanisms**

Incorporation of the Plan into other planning mechanisms, either by content or reference, enhances a community's ability to perform natural hazard mitigation by expanding the scope of the Plan's influence. A poll of the participating jurisdictions revealed that success of incorporating the 2005 Plan elements over the past planning cycle into other planning programs, has varied. Ways in which the 2005 Plans have been successfully incorporated or referenced into other planning mechanisms for each jurisdiction are summarized below:

### **Graham County:**

- GIS floodplain coverages developed as a part of the 2005 Plan, were used by the county to aide in floodplain management until the recent FEMA DFIRM database maps were released.
- After review of our flooding history, Graham County Search and Rescue purchased 'Swift Water Rescue equipment and provided training in its use to members.
- The 2005 Plan played an important part in the formation of the Health Department's *All Hazard Plan* which was required for our Project Public Health Ready (PPHR) submittal in 2010.
- The Arizona Department of Transportation developed an exercise for all emergency organizations in Graham County including the San Carlos Apache Nation involving a response to a Sulfuric Acid spill that had an effect in a number of communities and two counties. The 2005 Plan was used as a reference document during that exercise.
- Freeport McMoRan Copper and Gold Mine developed a Tabletop and Functional Exercise which included local fire and emergency medical services (EMS) to test response, resources, and our ability to work together. The 2005 Plan was used as a reference document during that exercise.
- The Graham county Health Department has about \$100,000 in vaccine in refrigerators with automatic backup power. The 2005 Plan played a part in development of a *Power Failure Procedure Plan* for the Health Department to prevent the loss of vaccine.

**Town of Pima:**

- Most of the planning documents and mechanisms summarized in Table 6-1-2, are joint planning efforts with other communities. The Town of Pima does not have any formal planning mechanisms and is not required to have general plan due to its size. Accordingly, there are really no planning mechanisms that the 2005 Plan could have been incorporated into. Land use and zoning considerations are done a case-by-case basis, and the 2005 Plan serves as a reference to the Planning and Zoning Commission for determining hazard risks when considering those cases.

**City of Safford:**

- The 2005 Plan was instrumental for the City of Safford in implementation of its Executive Drainage Plan. The Executive Drainage Plan is being used as a tool in conjunction with the city's 5 year capital improvements plan to address drainage issues for repair and future budgeting.
- Several elements of the 2005 Plan were incorporated into the update of the city's Emergency Operations Plan to meet NIMS standards.

**Town of Thatcher:**

- The Town has used the 2005 Plan in drafting its new General Plan Update, and specifically the Future Land Use Map and Transportation Plan. Also, in zoning and zone planning the 2005 Plan has been consulted for information on hazard avoidance. Generally, flooding is the main hazard that the Town has attempted to mitigate through the General Plan and Zoning Plan.

In all of the above instances, the 2005 Plan was found to be very beneficial, and especially with regard to the critical facility inventories and the vulnerability analysis results. Obstacles to further incorporation of the 2005 Plan for some of the communities were generally tied to a lack of awareness of the Plan by departments outside of the emergency management community, and the relative "newness" of the Plan with regard to other, more commonplace planning mechanisms such as comprehensive or general plans. Another obstacle was the lack of regular plan review, which would have kept the Plan in view on a more frequent basis. One jurisdiction stated that the Plan "...must be used, reviewed, and kept current. It can be easy for the plan to be set on the shelf and forgotten." It is anticipated that with each passing year, the usage and knowledge of the Plan will grow within a jurisdiction, and so will its use.

Typical ways the current Plan will be incorporated over the next five-year planning cycle will include:

- Use of, or reference to, Plan elements in updates to general and comprehensive planning documents.
- Addition of defined mitigation A/Ps to capital improvement programming.
- Inclusion of Plan elements into development planning and practices.
- Function as a resource for developing and/or updating emergency operations plans.

The Plan will continue to function as a standalone document subject to its own review and revision schedule presented in Sections 7.1 and 7.2. The Plan will also serve as a reference for other mitigation and land planning needs of the participating jurisdictions. Whenever possible, each jurisdiction will endeavor to incorporate the risk assessment results and mitigation actions and projects identified in the Plan, into existing and future planning mechanisms. At a minimum, each of the responsible agencies/departments noted in the Summary Of Legal And Regulatory Capabilities Tables 6-1-1 through 6-1-4 will review and reference the Plan, and revise and/or update the legal and regulatory planning documents, manuals, codes, and ordinances summarized in the Summary Of Legal And Regulatory Capabilities Tables 6-1-1 through 6-1-4, as appropriate. Specific incorporation of the Plan risk assessment elements into the natural resources and safety elements of each jurisdictions' general plans (county comprehensive plan) and development review processes, adding or revising building codes, adding or changing zoning and subdivision ordinances, and incorporating mitigation goals and strategies into general and/or comprehensive plans, will help to ensure hazard mitigated future development. In addition, an implementation strategy outlining assignments of responsibility and completion schedules for specific actions/projects proposed in this plan are summarized in the Summary Of Mitigation Actions And Projects And Implementation Strategy Tables 6-7-1 through 6-7-4.

#### **7.4 Continued Public Involvement**

Graham County is committed to keeping the public informed about the hazard mitigation planning efforts, actions and projects. In order to accomplish this, the Planning Team shall pursue the following opportunities for public involvement and dissemination of information whenever possible and appropriate:

- Provide a permanent webpage on the County's website that will house a digital copy of the Plan and document future planning activities. Contact information for the County point of contact will be posted as well.
- Participate in the following events through distribution of hazard mitigation materials and education about the Plan:
  - LDS preparedness fair , which is held at county fairground on an annual basis every September
  - County health fair, which is held annually in February
  - CERT classes, which are held annually, and CERT related community service projects
- The county will prepare an informational mitigation newsletter that will follow the annual review.
- Education and outreach to the special needs community on a regular basis with goal of elevating the awareness of hazards.

**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
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
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
FMA .....	Flood Mitigation Assistance Grant Program
GIS .....	Geographic Information System
HAZMAT .....	Hazardous Material
HAZUS-99 .....	Hazards United States 1999
HAZUS-MH .....	Hazards United States Multi-Hazard
IFCI .....	International Fire Code Institute
LEPC .....	Local Emergency Planning Committee
MJHMP .....	Multi-Jurisdictional Hazard Mitigation Plan
MMI .....	Modified Mercalli Intensity
NCDC .....	National Climate Data Center
NDMC .....	National Drought Mitigation Center
NESDIS .....	National Environmental Satellite, Data and Information Service
NFIP .....	National Flood Insurance Program
NFPA .....	National Fire Protection Association
NHC .....	National Hurricane Center
NIBS .....	National Institute of Building Services
NID .....	National Inventory of Dams
NIST .....	National Institute of Standards and Technology
NSF .....	National Science Foundation
NOAA .....	National Oceanic and Atmospheric Administration
NRC .....	National Response Center
NWCG.....	National Wildfire Coordination Group
NWS .....	National Weather Service
PSDI .....	Palmer Drought Severity Index
RL .....	Repetitive Loss
SARA .....	Superfund Amendments and Reauthorization Act

SEAGO.....Southeastern Arizona Governments Association  
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  
USGS .....United States Geological Survey  
VA .....Vulnerability Analysis  
WUI .....Wildland Urban Interface

**8.2 Definitions**

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

**ARIZONA HAZARDS**

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

**Earthquake**

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

**Fissure**

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

**Flooding**

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

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

**Landslide / Mudslide**

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

**Levee Failure / Breach**

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

**Severe Wind**

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

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

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

**Subsidence**

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

**Wildfire**

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

**Winter Storm**

Winter storms bring heavy snowfall and frequently have freezing rain and sleet. Sleet is defined as pellets of ice composed of frozen or mostly frozen raindrops or refrozen partially melted snowflakes. These pellets of ice usually bounce after hitting the ground or other hard surfaces. Freezing rain begins as snow at higher altitudes and melts completely on its way down while passing through a layer of air above freezing temperature, then encounters a layer below freezing at lower level to become supercooled, freezing upon impact of any object it then encounters. Because 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 subsistence supply to isolated communities. In extreme cases, snowloads can cause significant structural damage to under-designed buildings.

**GENERAL PLAN TERMS**

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**Asset**

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

**Building**

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

**Critical Facilities and Infrastructure**

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

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

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

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

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

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

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

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

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

**Disaster Mitigation Act of 2000 (DMA2K)**

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

**Emergency Preparedness and Response (EPR) Directorate**

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

**Emergency Response Plan**

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

**Federal Emergency Management Agency (FEMA)**

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

**Flood Insurance Rate Map (FIRM)**

Map of a community, prepared by FEMA that shows the special flood hazard areas and the risk premium zones applicable to the community.

**Frequency**

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

**Geographic Information Systems (GIS)**

A computer software application that relates physical features on the earth to a database to be used for mapping and analysis.

**Hazard**

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

**Hazard Event**

A specific occurrence of a particular type of hazard.

**Hazard Identification**

The process of identifying hazards that threaten an area.

**Hazard Mitigation**

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

**Hazard Profile**

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

**HAZUS**

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

**Mitigate**

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

**Mitigation Plan**

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

**100-Hundred Year Floodplain**

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

**Planning**

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

**Probability**

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

**Promulgation**

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

**Q3 Data**

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

**Repetitive Loss Property**

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

**Risk**

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

**Substantial Damage**

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

**Vulnerability**

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

**Vulnerability Analysis**

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

**Vulnerable Populations**

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

**Goals**

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

**Objectives**

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

**Actions/Projects**

Specific actions or projects that help achieve goals and objectives.

**Implementation Strategy**

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

**GENERAL HAZARD TERMS**

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**Fujita Scale of Tornado Intensity**

Rates tornadoes with numeric values from F0 to F5 based on tornado winds speed 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**

**Graham County Multi-Jurisdictional Hazard Mitigation Plan  
List of Local Planning Team Members**

<b>Name</b>	<b>Jurisdiction/Agency/Organization</b>	<b>Department/Division/Branch</b>	<b>Title</b>	<b>Planning Team Role / Description of Duties</b>
GRAHAM COUNTY				
Michael Bryce	Graham County	Engineering Department	County Engineer	Planning Team participant, Floodplain mgmt, CIP, and regulatory resource
Brian Douglas	Graham County	Emergency Management Office	Deputy Director	County Point of Contact, Planning Team participant, Lead coordinator for Local Planning Team, Emergency management resource
McCoy Hawkins	Graham County / Fort Thomas Fire District	GIS Department / Fort Thomas Fire Station	GIS Manager / Fire Chief	Planning Team participant, GIS data acquisition and management, Hazard profile map development
Lee Hurston	Graham County	Highway Department	Operations Supervisor	Planning Team participant, Transportation issues resource
Steve McGaughey	Graham County	Planning and Zoning Department	Safety Officer	Planning Team participant, Asset inventory and public safety resource
Hank Metzger	Graham County	Health Department	Assistant Bio-Terrorism Coordinator	Planning Team participant, Bio-Terrorism and health services resource
PIMA				
Gerald Schmidt	Town of Pima	Town Administration	Town Manager	Planning Team representative and jurisdictional Point of Contact, Lead coordinator for Local Planning Team, Performed majority of planning work for Town
SAFFORD				
Rob Chesley	City of Safford	Public Works Department	Superintendent	Planning Team participant, Secondary Point of Contact, Support in planning elements related to development, Asset inventory and mitigation strategy development
John Griffin	City of Safford	Police Department	Police Chief	Planning Team participant, public safety resource
Randy Petty	City of Safford	Engineering Department	City Engineer	Planning Team representative and jurisdictional Point of Contact, Lead coordinator for Local Planning Team, Asset inventory, CIP, mitigation strategy resource
THATCHER				
Heath Brown	Town of Thatcher	Engineering Department	Town Engineer	Planning Team representative and jurisdictional Point of Contact, Lead coordinator for Local Planning Team, Performed majority of planning work for Town
Mike Payne	Town of Thatcher	Fire Department / Planning and Zoning Department	Fire Chief / Inspector	Planning Team participant, Wildfire management and building inspection resource
Mark Stevens	Town of Thatcher	Police Department	Police Chief	Planning Team participant, public safety resource

**Memorandum**      **JE Fuller/ Hydrology & Geomorphology, Inc.**

**MEETING DATE:** November 12, 2008

**MEETING TIME:** 1:00PM – 4:00PM

**MEETING LOCATION:** Graham County BOS Room  
Safford, AZ

**DISTRIBUTION:** Meeting Attendees

**FROM:** W. Scott Ogden, P.E. - JEF

**RE: Graham County Multi-Jurisdictional Multi-Hazard Mitigation Plan**

**ATTENDEES:** Heath Brown - Town of Thatcher  
Rob Chesley – City of Safford Public Works Department  
Brian Douglas – Graham County Emergency Management  
John Griffin – Safford Police Department  
McCoy Hawkins – Graham County / Ft. Thomas Fire District  
Lee Hurston – Graham County Highway Department  
Steve McGaughey – Graham County Planning and Zoning Department  
Hank Metzger – Graham County Health Department  
Jerry Nelson – Graham County Sheriff’s Office  
Mike Payne – Town of Thatcher Fire Department / P&Z Department  
Randy Petty – City of Safford  
Gerald Schmidt – Town of Pima  
Mark Stevens – Town of Thatcher Police Department  
W. Scott Ogden – JEF

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**AGENDA**

- 1. INTRODUCTIONS / GREETING**
- 2. MITIGATION PLANNING OVERVIEW**
- 3. PLANNING PROCESS**
  - a. MJ Planning Team Roles**
  - b. Public Involvement Strategy**
- 4. RISK ASSESSMENT**
  - a. Hazard Identification / Profiling**
  - b. Asset Inventory**
- 5. OTHER DATA NEEDS**
- 6. MEETING ENDING**
  - a. Review of action items**
  - b. Set next meeting date**

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## DISCUSSION

### **Agenda Item 1:**

- Introductions were made for each member of the multi-jurisdictional planning team (MJPT). S. Ogden explained the role of JEF and ADEM.

### **Agenda Item 2:**

- S. Ogden presented an overview / review of the mitigation process and purpose for preparing a mitigation plan. He also discussed the process of converting from a single plans to a true Multi-Jurisdictional plan.

### **Agenda Item 3a:**

- S. Ogden led a discussion / presentation of the MJPT roles and responsibilities.
- B. Douglas was identified as the primary point of contact (PPOC) for the county and the MJPT as a whole.
- The community point of contacts (CPOC) were identified as follows:
  - Unincorporated Graham County – Brian Douglas
  - Town of Pima – Gerald Schmidt
  - City of Safford – Jay Howe (Randy Petty)
  - Town of Thatcher – Heath Brown

### **Agenda Item 3b:**

- S. Ogden led a discussion / presentation of the public involvement requirements of DMA2K.
- The MJPT discussed various options including newspaper notices, utility bill inserts, and web page postings.
- A decision was made to publish an announcement in the local newspaper and also to create a web page on the Graham County website that will contain the same announcement. Once the draft plan is ready, it will be posted to the website and a second newspaper announcement will be used.
- ADEM and JEF have developed template language for the county to use in the newspaper announcements. JEF will provide those to the MJPT via email
- B. Douglas will take responsibility for getting the first notice published.

### **Agenda Item 4a:**

- S. Ogden presented an overview of what a risk assessment includes.
- The MJPT reviewed the list of hazards previously evaluated in 2005 Plans as well as a comprehensive list of hazards identified by the State of Arizona MHMP.
- S. Ogden presented the results of a historic hazard event search and database compilation performed by JEF that looks at declared and undeclared hazard events.
- The MJPT reviewed the hazard lists and historic records and discussed which hazards should be evaluated further. The following is a brief summary of that discussion:

- HAZMAT was dropped from the list in order to focus the plan on natural hazards and recognizing that FEMA mitigation grant funds cannot be used for typical HAZMAT mitigation efforts.
- L. Hurston recommended adding Fissures to the list since the County is dealing with some active fissuring in the Klondyke area. Pima, Safford, nor Thatcher were very concerned with fissures and after further discussion, it was decided that this would be an Unincorporated County hazard only.
- All unanimously chose to add Thunderstorm / High Wind to the list.
- The resulting list of hazards to be addressed is as follows:
  - Dam Failure
  - Drought
  - Fissures (Unincorporated Graham County only)
  - Flooding / Flash Flooding
  - Thunderstorm / High Wind
  - Tropical Storms / Hurricane
  - Wildfire
- S. Ogden presented information regarding application and development of the Calculated Priority Risk Index (CPRI). The MJPT worked through an example using a preformatted spreadsheet and a handout with guidance on selecting CPRI parameters. S. Ogden will send the CPRI spreadsheet to the POC for each jurisdiction for them to complete and get back to JEF.
- S. Ogden presented draft GIS mapping layers for flooding, dam failure, and wildfire. The MJPT reviewed the layers and determined that the flooding and wildfire were acceptable for use. The dam failure was missing downstream inundation limits for Frye Creek and Stockton Wash dams. H. Brown will provide the Frye Creek limits to JEF. B. Douglas or M. Hawkins will get with Michael Bryce to get the Stockton Wash limits (*After the meeting, JEF reviewed the coverages and the Stockton Wash Dam inundation limits were included and are based on a very old map obtained from ADWR files. When compared to the dam location, the ADWR data would appear to be positionally incorrect and we may need to re-evaluate*).

**Agenda Item 4b:**

- S. Ogden presented an overview of the asset inventory data that was developed for the 2005 plans. It is known that many of the assets are not correctly positioned due to issues with geocoding by street address. There are also several of the assets that require replacement cost data.
- S. Ogden will send existing data-sets to each community and request that they provide the updated information.

**Agenda Item 5:**

- S. Ogden requested the following additional data from each community:
  - Latest General Plan or Comprehensive Plan
  - Latest Town/City boundaries
  - Known Future critical facility locations.

**Agenda Item 6:**

- Next meeting set for December 17, 2008 from 1pm to 4pm at the BOS room.

**ACTION ITEMS:**

1. JEF to provide template public notices to B. Douglas for his use
2. B. Douglas will prepare and submit at public notice for publishing in the Eastern Arizona Courier.
3. B. Douglas and M. Hawkins will work together to get the website up and running and will coordinate any linking from other websites.
4. JEF to provide Historic Hazard spreadsheets to MJPT members for review and augmentation if needed.
5. B. Douglas and M. Hawkins will coordinate with Michael Bryce to get inundation map for Stockton Wash Dam.
6. JEF to provide CPRI worksheet to each jurisdiction for completion prior to the next meeting.
7. JEF to provide asset inventory data sets to each community for update, correction, or provision of missing data.
8. Each Community to provide:
  - a. Latest General Plan or Comprehensive Plan
  - b. Latest Town/City boundaries
  - c. Known Future critical facility locations.

Graham County Multi-Jurisdictional Multi-Hazard Mitigation Planning Meeting

Date: November 12, 2008

Name	Agency/Organization/Company	Title	Phone Number	E-Mail Address
BENJAMIN DOUGLAS	GC Emergency Management	Dep Director for Emergency Mgmt	928-428-010	bdouglas@graham.az.gov
Heath Brown	Town of Thatcher	Town Engineer	928 428 2290	hbrown@graham.az.gov
RANDY PETTY	Safford	City Engineer	928-432-4261	NRPetty@ci.safford.az.us
McLOY HAWKINS	Graham County / Ft Thomas Fire	GIS Manager / Fire Chief	928-965-7917	MHawkins@graham.az.gov
Rob Chesley	City of Safford	PW Supt.	928-432-4190	rchesley@ci.safford.az.us
JERRY NELSON	GRAHAM COUNTY SHERIFF'S OFFICE	CAPTAIN	928-428-3141	JNELSON@GRAHAM.AZ.GOV
Steve McLaughley	Graham Co Planning/Zoning	Safety Officer	928-428-0410	Smcgaughey@graham.az.gov
Gerald Schmidt	Town of Pima	Town Manager	928 485-2611	gschmidt@graham.az.gov
Lee Hurston	Graham CO. Fire	operations supervisor	928-428-3652	LHurston@graham.az.gov
Hank Metzger	GC Health Dept	Asst ST Coordinator	928-428-0110	hmetzger@graham.az.gov
JOHN GRAFFIN	SAFFORD POLICE	CHIEF	(928)432-4100	jgriffin@ci.safford.az.us
Mark Stevens	Thatcher Police	Chief	(928)428-2296	mstevens@graham.az.gov
MIKE PAYNE	THATCHER FIRE/PTZ	CHIEF/INSPECTOR	928-965-2610	mpayne@graham.az.gov

**Memorandum**      **JE Fuller/ Hydrology & Geomorphology, Inc.**

**MEETING DATE:** December 17, 2008

**MEETING TIME:** 1:00PM – 4:00PM

**MEETING LOCATION:** Graham County Assembly Room  
Safford, AZ

**DISTRIBUTION:** Meeting Attendees

**FROM:** W. Scott Ogden, P.E. - JEF

**RE: Graham County Multi-Jurisdictional Multi-Hazard Mitigation Plan**

**ATTENDEES:** Heath Brown - Town of Thatcher  
Michael Bryce – Graham County Engineering  
Rob Chesley – City of Safford Public Works Department  
Brian Douglas – Graham County Emergency Management  
John Griffin – Safford Police Department  
McCoy Hawkins – Graham County / Ft. Thomas Fire District  
Hank Metzger – Graham County Health Department  
Randy Petty – City of Safford  
Gerald Schmidt – Town of Pima  
W. Scott Ogden – JEF

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**AGENDA**

1. STATUS REVIEW
  2. HAZARD PROFILE MAPS
  3. REPETITIVE LOSS PROPERTIES
  4. CAPABILITY ASSESSMENT
  5. PLAN MAINTENANCE STRATEGY
  6. MEETING ENDING
    - a. Review of action items
    - b. Set next meeting date
- 
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**DISCUSSION**

**Agenda Item 1:**

- S. Ogden reviewed the status of Action Items from previous meeting, which are summarized as follows:
  - AI1 - JEF to provide template public notices to B. Douglas for his use  
STATUS: Done (email sent 11/18)
  - AI2 - B. Douglas will prepare and submit at public notice for publishing in the Eastern Arizona Courier.

- STATUS: Done. Brian provided copy of the notice and the paper edition it ran in at meeting.
- AI3 - B. Douglas and M. Hawkins will work together to get the website up and running and will coordinate any linking from other websites.  
STATUS: Done. Website posting was available December 1<sup>st</sup>.
  - AI4 - JEF to provide Historic Hazard spreadsheets to MJPT members for review and augmentation if needed.  
STATUS: Done (email sent 11/20/08). No responses received.
  - AI5 - B. Douglas and M. Hawkins will coordinate with Michael Bryce to get inundation map for Stockton Wash Dam.  
STATUS: Done. The limits were discussed with M. Bryce during the meeting and a boundary was resolved.
  - AI6 - JEF to provide CPRI worksheet to each jurisdiction for completion prior to the next meeting.  
STATUS: Done (emailed on 11/19/08). All communities have provided the completed worksheets.
  - AI7 - JEF to provide asset inventory data sets to each community for update, correction, or provision of missing data.  
STATUS: In Progress. Data has been exchanged and M. Hawkins provided a general countywide database. Safford also provided a list of assets with partial data. JEF is working with the data to reformat.
  - AI8 - Each Community to provide:
    - Latest General Plan or Comprehensive Plan  
STATUS: Received new plans from Thatcher and Safford. Graham County and Pima plans are the same from the original planning cycle.
    - Latest Town/City boundaries  
STATUS: Data received for all jurisdictions
    - Known Future critical facility locations.  
STATUS: None received or anticipated

**Agenda Item 2:**

- S. Ogden presented mapping elements for each of the hazards identified for review and discussion. The following summarizes the main discussion items.
  - Data Cut-Off date – the MJPT agreed to set the cut-off date for new data at February 1, 2009.
  - Dam Failure – resolved Stockton Wash Dam inundation limits. Add in Cluff Dam if available (check with AG&F)
  - Drought – use the AzGTF latest long-term and short-term maps as of cut-off date.

- Fissure – no mapping available. M Bryce remembered an AZGS report on the fissure that was done sometime in the year 2,000. M. Bryce will look for the report, but recalled that the fissure was classified as dessication cracking and not a true fissure. R. Chesley will work with S. Ogden after the meeting to draw a general polygon around the area of interest.
- Flooding – Use the latest FEMA DFIRM data.
- Thunderstorm / High Wind – produce a map showing historic locations and magnitudes as available from the NCDC.
- Wildfire – Use the coverage provided by the Arizona State Forester’s Office.

**Agenda Item 3:**

- S. Ogden presented a spreadsheet obtained from ADWR listing the Repetitive Loss properties for the county. The location of the properties was discussed. M. Hawkins will provide a polygon coverage to show the lots in question. The planning team will review the data for further consideration during the mitigation strategy development.

**Agenda Item 4:**

- S. Ogden led a discussion / presentation of the need and purpose for performing a capability assessment, including the tables and formats that will appear in the plan.
- S. Ogden will put together new tables using the old data and distribute to each jurisdiction for update.

**Agenda Item 5:**

- S. Ogden presented an overview of plan maintenance elements required by DMA2K.
- The MJPT discussed past plan maintenance activities. For the most part, little was done except for a periodic reference to the mitigation actions/projects. Reasons given were primarily due to changes in staff and simply forgetting to do the maintenance activities.
- The MJPT discussed how to ensure that maintenance happens in the future. Ideas included:
  - Linking the maintenance process to other fixed and required administrative duties.
  - Working with ADEM to establish a state initiated protocol wherein the State would contact the PPOC at a certain defined time each year, and the PPOC would then in-turn contact each CPOC to set up an annual review meeting.
  - Establishing a fixed day for presenting the results of the review to the Board of Supervisors and Councils.
  - Switching to the multi-jurisdictional plan instead of individual plans will help consolidate the effort.

- S. Ogden will draft up a Plan Maintenance Section that reflects the discussions and provide to the MJPT for review and comment

**Agenda Item 6:**

- Next Meeting will be February 4, 2009 from 1-5pm at the Assembly Room of the County General Services Building.

**ACTION ITEMS:**

1. JEF to finish with modifications of asset inventory data and return to team for review / update / correction.
2. M. Hawkins will provide a polygon coverage to show the RL lots in question.
3. JEF will put together new capability assessment tables using the old plan data and distribute to each jurisdiction for review and update.
4. JEF will draft up a Plan Maintenance Section that reflects the discussions and provide to the MJPT for review and comment



**Memorandum**      **JE Fuller/ Hydrology & Geomorphology, Inc.**

**MEETING DATE:** February 4, 2009

**MEETING TIME:** 1:00PM – 3:00PM

**MEETING LOCATION:** Graham County Assembly Room  
Safford, AZ

**DISTRIBUTION:** Meeting Attendees  
Randy Petty – City of Safford

**FROM:** W. Scott Ogden, P.E. - JEF

**RE:** Graham County Multi-Jurisdictional Multi-Hazard Mitigation Plan

**ATTENDEES:** Heath Brown - Town of Thatcher  
Michael Bryce – Graham County Engineering  
Brian Douglas – Graham County Emergency Management  
John Griffin – Safford Police Department  
McCoy Hawkins – Graham County / Ft. Thomas Fire District  
Steve McGaughey – Graham County Planning & Zoning  
Hank Metzger – Graham County Health Department  
Gerald Schmidt – Town of Pima  
W. Scott Ogden – JEF

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**AGENDA**

1. STATUS REVIEW
2. GOALS & OBJECTIVES REVIEW/UPDATE
3. EXISTING MITIGATION ACTIONS/PROJECTS EVALUATION
4. NFIP COMPLIANCE DISCUSSION
5. MEETING ENDING
  - a. Review of action items
  - b. Set next meeting date

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**DISCUSSION**

**Agenda Item 1:**

- S. Ogden reviewed the status of Action Items from previous meeting, which are summarized as follows:
  - A11 – JEF to finish with modifications of asset inventory data and return to team for review / update / correction.  
STATUS: Done (email sent 1/20/09). All communities using the county email domain were not receiving the emails. It was discovered that the emails were being filtered and quarantined. B. Douglas will work with M. Hawkins to make sure that JEF's emails get through.

- AI2 – M. Hawkins will provide a polygon coverage to show the RL lots in question.  
STATUS: Done (emailed on 12/17/08)
- AI3 – JEF will put together new capability assessment tables using the old plan data and distribute to each jurisdiction for review and update.  
STATUS: Done (emailed on 1/20/09 but not received for reason given in AI1 discussion).
- AI4 – JEF will draft up a Plan Maintenance Section that reflects the discussions and provide to the MJPT for review and comment  
STATUS: Pending – JEF will send out draft at a later date.
- Due to the email confusion, each community will have until February 23<sup>rd</sup> to finish asset inventories.

**Agenda Item 2:**

- S. Ogden presented a list of the 2005 Plan goals and objectives. The same G&Os were used in all four jurisdictions' plans. S. Ogden also provided a copy of the State's current G&Os. Each were reviewed and discussed as follows:
  - The MJPT liked the simpler and more generalized G&O's used by the State as they felt it would provide greater flexibility for developing mitigation actions/projects.
  - The goals were seen as more overarching and the details of obtaining those goals would be in the actions/projects.
  - The simpler goals would make the annual reviews a bit easier.
- The MJPT decided to use the States goal and objectives with only minor modifications to make them relevant on a county level.

**Agenda Item 3:**

- S. Ogden provided jurisdiction specific worksheets of the mitigation actions/projects identified in the 2005 Plan. Each worksheet listed the A/P Identification Number, Name, and Description and provided evaluation columns for assessing the A/P Status and Future Disposition. Status categories included "No Action", "On-Going", or "Completed". Future Disposition categories included either "Keep" or "Delete". A third field was provided for any explanations. S. Ogden walked through an example evaluation and assigned each community to perform the evaluation for their respective list of projects.

**Agenda Item 4:**

- S. Ogden presented a draft table of NFIP statistics for each community and clarified each community's role in floodplain management.
  - Graham County provides floodplain management oversight for all the unincorporated county, the Town of Pima, and the Town of Thatcher.

- The Town of Thatcher performs parallel floodplain management review with the County, but defers to the County for ultimate floodplain management
- The City of Safford performs all floodplain management duties within the incorporated boundaries.
- S. Ogden explained that each community will be required to develop at least one mitigation action/project that deals with NFIP compliance and will come with some seed ideas at the next meeting.

**Agenda Item 5:**

- Next Meeting will be March 24, 2009 from 1-5pm at the 1<sup>st</sup> Floor Conference Room of the County General Services Building.

**ACTION ITEMS:**

1. B. Douglas and M. Hawkins will look into getting all emails from JEF to be allowed through the firewall. B. Douglas will let S. Ogden know the results of that effort.
2. ALL jurisdictions shall perform the existing 2005 Plan mitigation actions/projects evaluation and forward results to JEF. S. Ogden will distribute the template worksheets.
3. ALL jurisdictions shall provide corrected/revised asset inventory worksheets to JEF by no later than Feb 23, 2009.

Graham County Multi-Jurisdictional Multi-Hazard Mitigation Planning Meeting

Date: ~~December 17, 2008~~  
February 4, 2009

Name	Jurisdiction/Agency/Organization	Department/Division/Branch	Title	Office Phone	Cell Phone	E-Mail Address
Heath Brown	Town of Thatcher	Engineering	Town Engineer	928-428-2290	928-792-6754	hbrown@graham.az.gov
Michael Bryce	Graham County	Engineering	County Engineer	928-428-0410	928-965-7026	mbryce@graham.az.gov
Rob Chesley	City of Safford	Public Works Department	Public Works Superintendent	928-432-4190	928-965-5423	rchesley@ci.safford.az.us
Brian Douglas	Graham County	Emergency Management	Deputy Director	928-428-0110	928-965-8921	bdouglas@graham.az.gov
John Griffin	City of Safford	Police Department	Police Chief	928-432-4100	928-965-2427	jgriffin@ci.safford.az.us
McCoy Hawkins	Graham County / Fort Thomas Fire District	GIS Department	GIS Manager / Fire Chief	928-965-7917		mhawkins@graham.az.gov
Lee Hurston	Graham County	Highway Department	Operations Supervisor	928-428-3652		lhurston@graham.az.gov
Steve McGaughey	Graham County	Planning and Zoning Department	Safety Officer	928-428-0410	928-965-1397	smcgaughey@graham.az.gov
Hank Metzger	Graham County	Health Department	Assistant Bio-Terrorism Coordinator	928-420-0110	928-965-3365	hmetzger@graham.az.gov
Jerry Nelson	Graham County	Sheriff's Office	Captain	928-428-3141		jnelson@graham.az.gov
Mike Payne	Town of Thatcher	Fire Department / Planning and Zoning Department	Fire Chief / Inspector	928-965-2610		mpayne@graham.az.gov
Randy Petty	City of Safford	Engineering Department	City Engineer	928-432-4261		rpetty@ci.safford.az.us
Gerald Schmidt	Town of Pima		Town Manager	928-485-2611	928-651-5420	gschmidt@graham.az.gov
Mark Stevens	Town of Thatcher	Police Department	Police Chief	928-428-2296		mstevens@graham.az.gov

**Memorandum**      **JE Fuller/ Hydrology & Geomorphology, Inc.**

**MEETING DATE:** March 24, 2009

**MEETING TIME:** 1:00PM – 4:00PM

**MEETING LOCATION:** Graham County Assembly Room  
Safford, AZ

**DISTRIBUTION:** Meeting Attendees

**FROM:** W. Scott Ogden, P.E. - JEF

**RE: Graham County Multi-Jurisdictional Multi-Hazard Mitigation Plan**

**ATTENDEES:** Heath Brown - Town of Thatcher  
Michael Bryce – Graham County Engineering  
Rob Chesley – Safford Public Works Department  
Brian Douglas – Graham County Emergency Management  
McCoy Hawkins – Graham County / Ft. Thomas Fire District  
Hank Metzger – Graham County Health Department  
Gerald Schmidt – Town of Pima  
Sue Wood – Arizona Division of Emergency Management  
W. Scott Ogden – JEF

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**AGENDA**

1. STATUS REVIEW
  2. VULNERABILITY ANALYSIS RESULTS REVIEW
  3. MITIGATION ACTIONS/PROJECTS
  4. IMPLEMENTATION STRATEGY
  5. NFIP COMPLIANCE ACTION/PROJECT
  6. MEETING ENDING
    - a. Review of action items
    - b. Discuss next steps
- 

**DISCUSSION**

**Agenda Item 1:**

- S. Ogden reviewed the status of Action Items from previous meeting, which are summarized as follows:
  - AI1 - B. Douglas and M. Hawkins will look into getting all emails from JEF to be allowed through the firewall. B. Douglas will let S. Ogden know the results of that effort.  
STATUS: Completed
  - AI2 - ALL jurisdictions shall perform the existing 2005 Plan mitigation actions/projects evaluation and forward results to JEF. S. Ogden will

distribute the template worksheets.

STATUS: Homework completed by all but Safford and Pima. JEF worked with G. Schmidt to complete the worksheet for Pima. Safford will complete and return to JEF ASAP.

- AI3 - ALL jurisdictions shall provide corrected/revised asset inventory worksheets to JEF by no later than Feb 23, 2009.

STATUS: Done

**Agenda Item 2:**

- S. Ogden presented the results of the vulnerability analysis to the MJPT and distributed review sheets that were summarized by community. S. Ogden explained the base data sets and how the results were derived. The results were reviewed and discussed as follows:
  - The wildfire losses estimated are almost totally derived from presumed damages to the observatory. The MJPT decided to keep it that way, even though the observatory does have a decent buffer.
  - R. Chesley noted that there are more areas prone to flooding than what is depicted on the FEMA DFIRM maps. S. Ogden replied that the concern should lead to a mitigation action/project that proposes to delineate the known areas.

**Agenda Item 3:**

- S. Ogden provided an overview for the development of new mitigation actions and the implementation strategy for all projects considered. S. Ogden reviewed the table format that will be used to summarize the new mitigation actions/project and implementation strategy along with a couple of examples. S. Ogden will provide the file in template form for each community to complete.
- As a part of the Mitigation Strategy, ADEM is requesting documentation of past mitigation activities. JEF reviewed a spreadsheet for use by the communities to document past mitigation activities. The MJPT was encouraged to focus on projects accomplished over the last five years, but should go back farther if needed. JEF will provide the template spreadsheet for use by the communities in completing this task.

**Agenda Item 4:**

- S. Wood discussed ranking alternatives used by the State of Arizona. Each mitigation A/P will be evaluated based on the following factors:
  - Cost versus benefit
  - Direct impact on life and/or property
  - Long-term effectiveness as a solution
- Each A/P will be assigned an importance rating of either “High”, “Medium”, or “Low” as it pertains to satisfying each of the three evaluation criteria.

- Discretion was given to the MJPT to decide on how to assign the rankings (i.e. – either by simple vote or some point system). Each individual community will rank their own projects and report back to JEF on what methodology they used.

**Agenda Item 5:**

- S. Ogden reviewed the NFIP compliance requirement with the MJPT.
- The MJPT discussed current NFIP compliance practices and brainstormed an action/project and implementation strategy for inclusion in the plan.

**Agenda Item 6:**

- S. Ogden discussed the next planning steps as follows:
  - Upon receipt of the completed homework from this meeting (and any other outstanding items), JEF will finalize the draft plan and distribute to the MJPT for review.
  - Once comments are addressed, the draft will be submitted to ADEM for review. Once ADEM comments are addressed, ADEM will forward the final draft of the plan to FEMA for review
  - FEMA comments will be addressed and FEMA will ultimately issue an “approved pending adoption” letter to each jurisdiction and ADEM.
  - The plan will then need to be presented to the board and councils for promulgation and the final adopted resolutions need to be forwarded directly to FEMA.

**ACTION ITEMS:**

1. S. Ogden will distribute a mitigation action/project and implementation strategy template document for use by the MJPT.
2. Each jurisdiction will complete the mitigation action/project list and implementation strategy. Due Date is May 31, 2009
3. Each community will provide a list of recent projects and actions that are a form of mitigation. Due Date is May 31, 2009.
4. Upon receipt of the completed homework from this meeting (and any other outstanding items), JEF will finalize the draft plan and distribute to the MJPT for review.

Graham County Multi-Jurisdictional Multi-Hazard Mitigation Planning Meeting

Date: March 23, 2009

Name	Jurisdiction/Agency/Organization	Department/Division/Branch	Title	Office Phone	Cell Phone	E-Mail Address
Heath Brown <i>HB</i>	Town of Thatcher	Engineering	Town Engineer	928-428-2290	928-792-6754	hbrown@graham.az.gov
Michael Bryce <i>MB</i>	Graham County	Engineering	County Engineer	928-428-0410	928-965-7026	mbryce@graham.az.gov
Rob Chesley <i>RC</i>	City of Safford	Public Works Department	Public Works Superintendent	928-432-4190	928-965-5423	rchesley@ci.safford.az.us
Brian Douglas <i>BD</i>	Graham County	Emergency Management	Deputy Director	928-428-0110	928-965-8921	bdouglas@graham.az.gov
John Griffin	City of Safford	Police Department	Police Chief	928-432-4100	928-965-2427	jgriffin@ci.safford.az.us
McCoy Hawkins <i>MCH</i>	Graham County / Fort Thomas Fire District	GIS Department	GIS Manager / Fire Chief	928-965-7917		mhawkins@graham.az.gov
Lee Hurston	Graham County	Highway Department	Operations Supervisor	928-428-3652		lhurston@graham.az.gov
Steve McGaughey	Graham County	Planning and Zoning Department	Safety Officer	928-428-0410	928-965-1397	smcgaughey@graham.az.gov
Hank Metzger <i>HM</i>	Graham County	Health Department	Assistant Bio-Terrorism Coordinator	928-420-0110	928-965-3365	hmetzger@graham.az.gov
Jerry Nelson	Graham County	Sheriff's Office	Captain	928-428-3141		jnelson@graham.az.gov
Mike Payne	Town of Thatcher	Fire Department / Planning and Zoning Department	Fire Chief / Inspector	928-965-2610		mpayne@graham.az.gov
Randy Petty	City of Safford	Engineering Department	City Engineer	928-432-4261		rpetty@ci.safford.az.us
Gerald Schmidt <i>GS</i>	Town of Pima		Town Manager	928-485-2611	928-651-5420	gschmidt@graham.az.gov
Mark Stevens	Town of Thatcher	Police Department	Police Chief	928-428-2296		mstevens@graham.az.gov
<i>Susan Wood</i>	<i>AIDEM</i>	<i>Mitigation Off</i>	<i>Planner</i>	<i>602 464-6518</i>		

**Memorandum**      **JE Fuller/ Hydrology & Geomorphology, Inc.**

**MEETING DATE:** April 12, 2010

**MEETING TIME:** 2:00PM – 4:00PM

**MEETING LOCATION:** Graham County Assembly Room  
Safford, AZ

**DISTRIBUTION:** Meeting Attendees

**FROM:** W. Scott Ogden, P.E. - JEF

**RE: Graham County Multi-Jurisdictional Multi-Hazard Mitigation Plan**

**ATTENDEES:** Heath Brown - Town of Thatcher  
Michael Bryce – Graham County Engineering  
Rob Chesley – Safford Public Works Department  
John Griffin – Safford Police Department  
McCoy Hawkins – Graham County / Ft. Thomas Fire District  
Hank Metzger – Graham County Health Department  
Randy Petty – Safford Engineering Department  
Gerald Schmidt – Town of Pima  
W. Scott Ogden – JEF

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**AGENDA**

- 1. STATUS REVIEW**
  - a. Task Assignment Review and Discussion**
    - i. Existing Mitigation A/P Assessments**
    - ii. Prior Mitigation Activity Sheet**
    - iii. New Mitigation A/Ps and Implementation Strategy Discussion**
- 2. PLAN MAINTENANCE DISCUSSIONS**
  - a. Plan Integration Discussion**
  - b. Continuing Public Involvement Discussion**
- 3. FINAL SCHEDULE**
- 4. MEETING ENDING**
  - a. Review of task assignments**

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## DISCUSSION

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### **Agenda Item 1:**

- S. Ogden handed out a graphic depicting the status of all task assignments and each item was discussed to determine status and provide clarification or additional discussion on each topic as needed. A copy of the status sheet is attached hereto.
  - ***Existing Mitigation A/P Assessments*** – S. Ogden handed out redlined sheets to Thatcher and Graham County representatives showing areas that needed correction. Pima and Safford were okay. He explained what was needed and gave quick reminder of the intent of the sheet.
  - ***Prior Mitigation Activity*** – S. Ogden reiterated the purpose of this table and the value of filling it out. He also noted that it was not a requirement for FEMA approval.
  - ***New Mitigation A/P and Implementation Strategy*** – S. Ogden reiterated the purpose of the table and clarified the relationship between this table and the Existing Mitigation A/P Assessments. He re-explained each element and what should be provided.

### **Agenda Item 2:**

- S. Ogden handed out draft Sections 7.3 (Incorporation Into Existing Planning Mechanisms) and a modified version of the legal and regulatory tool table (Table 6-1-xx) to each jurisdiction. He explained past FEMA comments on this section of the plan and the need to provide additional and more specific data to help meet the DMA2K requirements. The Planning Team reviewed the draft section text and discussed. For the most part, the mitigation plan will be incorporated or referenced by the general and comprehensive plans and possibly the emergency operations plan, as appropriate. No other changes or additions were offered by the Planning Team.
- S. Ogden handed out a draft of Section 7.4 (Continuing Public Involvement) and asked the Planning Team to read. Based on past FEMA comments, S. Ogden led a discussion on more specific ways to accomplish the goal of this section. Items discussed included obtaining the mitigation brochures produced by ADEM and making them available at various events and outreach activities, presenting the plan at the same outreach activities, providing reports on annual reviews in a public forum, presenting the Plan to CERT teams, etc. Each jurisdiction was tasked to provide feedback on specific ways they plan to accomplish the needed elements.

### **Agenda Item 3:**

- S. Ogden presented the following schedule for the finalization of the Plan.
  - April 26th - All task assignments due by COB
  - May 10th - Draft Plan to ADEM and Planning Team for review
  - May 24th – ADEM/Planning Team Comments Due
  - June 3rd - Plan Submitted to FEMA

**ACTION ITEMS:**

1. JEF to send out a final email with templates and documents that need completing, to each jurisdiction
2. All jurisdictions must complete the outstanding planning elements and deliver to JEF by no later than COB on April 26<sup>th</sup>.

Jurisdiction	PI Website Posting	PI Newspaper Notice/Article	CPRI	Local Team List	Jurisdictional Boundary Confirmation	Logo	
Graham County	Received	Received	Received	Received	Received	Received	
Pima	Received	Received	Received	Received	Received	Received	
Safford	Received	Received	Received	Received	Received	Received	
Thatcher	Received	Received	Received	Received	Received	Received	
	Asset Inventory	Capability Assessment	Ex Mitigation A/P Assmt	Prior Mitigation Activity	New Mitigation A/P and Implementation Strategy	(Capability Assessment) Table 6.1.xx Update	Section 7.4 (Continuing Public Involvement) Language
Graham County	Received	Received	Partially Complete	Not Received	Not Received	Not Received	Not Received
Pima	Received	Received	Received	Not Received	Received	Not Received	Not Received
Safford	Received	Received	Received	Not Received	Not Received	Not Received	Not Received
Thatcher	Received	Received	Partially Complete	Received	Received	Not Received	Not Received

Name	Jurisdiction/Agency/Organization	Department/Division/Branch	Title	Office Phone	Cell Phone	E-Mail Address
Heath Brown	Town of Thatcher	Engineering	Town Engineer	928-428-2290	928-792-6754	hbrown@graham.az.gov
Michael Bryce	Graham County	Engineering	County Engineer	928-428-0410	928-965-7026	mbryce@graham.az.gov
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Brian Douglas	Graham County	Emergency Management	Deputy Director	928-428-0110	928-965-8921	bdouglas@graham.az.gov
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McCoy Hawkins	Graham County / Fort Thomas Fire District	GIS Department	GIS Manager / Fire Chief	928-965-7917		mhawkins@graham.az.gov
Lee Hurston	Graham County	Highway Department	Operations Supervisor	928-428-3652		lhurston@graham.az.gov
Steve McCaughey	Graham County	Planning and Zoning Department	Safety Officer	928-428-0410	928-965-1397	smcgaughey@graham.az.gov
Hank Metzger	Graham County	Health Department	Assistant Bio-Terrorism Coordinator	928-420-0110	928-965-3365	hmetzger@graham.az.gov
Jerry Nelson	Graham County	Sheriff's Office	Captain	928-428-3141		jnelson@graham.az.gov
W. Scott Ogden	JE Fuller/ Hydrology & Geomorphology, Inc.		Consultant	480-222-5717	480-299-3394	scott@jefuller.com
Mike Payne	Town of Thatcher	Fire Department / Planning and Zoning Department	Fire Chief / Inspector	928-965-2610		mpayne@graham.az.gov
Randy Petty	City of Safford	Engineering Department	City Engineer	928-432-4261		rpetty@ci.safford.az.us
Gerald Schmidt	Town of Pima		Town Manager	928-485-2611	928-651-5420	gschmidt@graham.az.gov
Mark Stevens	Town of Thatcher	Police Department	Police Chief	928-428-2296		mstevens@graham.az.gov
Susan Wood	Arizona Division of Emergency Management	Mitigation Office	State/Local Mitigation Program Manager	602-464-6578		susan.wood@azdema.gov



## **Appendix C**

### **Public Involvement Records**



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# County of Graham



- County Offices
- Elections
- Employment
- Explore Graham
- Links
- Court Calendar
- Document Search
- GIS Maps
- Parcel Info Search
- Small Area
- Transportation Study



**Election Results**

2008 Taxes

2010 Census

Property Values

**Hazard Mitigation Plan**

Safford, AZ

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**Graham County, City of Safford, Town of Thatcher, and Town of Pima Begins Work on Hazard Mitigation Plan  
Posting December 1, 2008**

Hazard mitigation planning is the process used to identify risks and vulnerabilities associated with natural disasters and to develop long-term strategies for protecting people and property in future hazard events. The process results in a mitigation plan that offers a strategy for breaking the cycle of disaster damage, reconstruction, and repeated damage and a framework for developing feasible and cost-effective mitigation projects. Under the Disaster Mitigation Act of 2000 (Public Law 106-390), state, county, local and tribal governments are required to develop a FEMA approved hazard mitigation plan as a condition for receiving certain types of non-emergency disaster assistance.

In order to meet the requirements to ensure assistance eligibility, a planning team comprised of representatives from Graham County, City of Safford, Town of Thatcher, and Town of Pima will be meeting regularly to develop a Multi-Hazard Mitigation Plan. The planning team anticipates having a plan draft in early 2009, at which time the public will be provided access to the plan and the opportunity to comment prior to submittal to FEMA.

The primary areas of work/focus in the plan development are:

- ❖ Identify hazards that may impact or have impacted the community
- ❖ Develop a profile of the most relevant hazards
- ❖ Assess vulnerability to hazards
- ❖ Establish goals and objectives for hazard risk reduction/elimination
- ❖ Develop actions/projects to achieve goals and objectives

**Additional Information & Questions**

Please contact:

Brian L. Douglas  
Deputy Director for Emergency Management  
821 W. Main St.  
Safford, AZ 85546  
Office: 928-428-0110 Fax: 928-428-8074  
[bdouglas@graham.az.gov](mailto:bdouglas@graham.az.gov)

# Eastern Arizona

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826 W MAIN ST  
SAFFORD AZ 85546

**SUNDAY**

NOVEMBER 30, 2008

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*Looking for work*



# College partners with U of A for mining engineering

BY TODD HAYNIE  
EASTERN ARIZONA COLLEGE

PHOTOS BY DIANE SAUNDERS

Mine workers from Freenort-McMoran's copper mine in Safford, Ariz. (left) and  
Representatives from Eastern Arizona College, the



## **Appendix D**

### **Detailed Historic Hazard Records**

**State and Federally Declared Events That Included Graham County  
January 1966 to October 2008**

Hazard	No. of Declarations	Recorded Losses		
		Fatalities	Injuries	Damages
Dam Failure	0	0	0	\$0
Drought	11	0	0	\$303,000,000
Earthquake	0	0	0	\$0
Fissure	0	0	0	\$0
Flooding / Flash Flooding	17	25	112	\$515,266,000
Hazardous Materials Incident	0	0	0	\$0
Landslide / Mudslide	0	0	0	\$0
Levee Failure	0	0	0	\$0
Snow Storm	0	0	0	\$0
Sleet / Freezing Rain	0	0	0	\$0
Subsidence	0	0	0	\$0
Thunderstorm / High Wind	0	0	0	\$0
Tornado	0	0	0	\$0
Tropical Storm / Hurricane	3	26	1075	\$763,000,000
Wildfire	22	0	28	\$150,000

Notes:

- No attempt has been made to adjust Damage Costs to current dollar values

State of Arizona Declaration				Federal Presidential Declaration			Counties Affected
Date	Hazard	State PCA No.	Expenditures	Date	ID	Expenditures	
2/24/1966	Flooding / Flash Flooding		\$43,673	04/30/66	217-DR	\$3,256,224	Graham, Greenlee, Maricopa, Pima, Pinal
11/12/1967	Flooding / Flash Flooding		\$15,000				Graham
10/19/1972	Tropical Storm / Hurricane		\$58,177	10/25/72	360-DR	\$16,819,609	Graham, Navajo, Greenlee
4/28/1973	Wildfire		\$36,718				Statewide
1/7/1974	Service Interruption		\$199,028				Statewide
4/22/1975	Wildfire		\$8,923				Statewide
9/19/1975	Flooding / Flash Flooding		\$91,500				Graham, Greenlee
9/2/1977	Infestation						Statewide
3/2/1978	Flooding / Flash Flooding		\$485,718	03/04/78	550-DR	\$67,122,627	Statewide
4/21/1978	Wildfire		\$11,528				Statewide
11/28/1978	Flooding / Flash Flooding		\$70,120				Graham, Greenlee
11/30/1978	Prison Problem		\$425				Statewide
12/16/1978	Flooding / Flash Flooding		\$1,909,498	12/21/78	570-DR	\$113,561,122	Statewide
4/16/1979	Wildfire		\$204,207				Statewide
6/2/1980	Wildfire		\$298,845				Statewide
6/16/1980	Infestation		\$67,773				Coconino, gila, Yavapai, Mohave, Apache, Graham, Navajo, Cochise
6/16/1980	Wildfire						Statewide
7/3/1980	Wildfire						Gila
7/4/1980	Wildfire						Yavapai
7/6/1980	Search and Rescue		\$8,305				Pima
7/25/1980	Wildfire						
8/21/1980	Flooding / Flash Flooding		\$102,319				Santa Cruz
6/26/1981	Wildfire						Statewide
6/30/1981	Wildfire		\$256,904				Statewide
6/30/1982	Wildfire		\$492,635				Statewide
9/28/1983	Tropical Storm / Hurricane		\$863,283	10/05/83		\$13,446,148	Mohave, Apache, Yavapai, Gila, Graham, Greenlee, Pinal, Pima, Santa Cruz, Cochise, Navajo

State of Arizona Declaration				
Date	Hazard	State PCA No.	Expenditures	Description
2/24/1966	Flooding / Flash Flooding		\$43,673	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.
11/12/1967	Flooding / Flash Flooding		\$15,000	August 11th and 12th heavy rain on the headwaters of the Gila and San Francisco Rivers caused flooding in Graham and Greenlee counties. The flood waters damaged roads, utilities, homes, businesses, irrigation canals and crops. Damages were estimated at over \$250,000.
10/19/1972	Tropical Storm / Hurricane		\$58,177	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 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 Greenlee County. Some deaths were caused by drowning. Levee protecting Holbrook needed emergency restoration; dikes around Winslow overtopped.
4/28/1973	Wildfire		\$36,718	
1/7/1974	Service Interruption		\$199,028	Energy Shortage
4/22/1975	Wildfire		\$8,923	
9/19/1975	Flooding / Flash Flooding		\$91,500	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.
9/2/1977	Infestation			Cotton Crop Pesticide Application
3/2/1978	Flooding / Flash Flooding		\$485,718	Warm temperatures 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 Angeles District, FCDMC Library #802.024.
4/21/1978	Wildfire		\$11,528	
11/28/1978	Flooding / Flash Flooding		\$70,120	Flooding caused by heavy rains.
11/30/1978	Prison Problem		\$425	Prison Break
12/16/1978	Flooding / Flash Flooding		\$1,909,498	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]
4/16/1979	Wildfire		\$204,207	
6/2/1980	Wildfire		\$298,845	
6/16/1980	Infestation		\$67,773	AZ Executive Order 81-4: [Terminating the Declaration of a State of Emergency of June 16, 1980 (caused by the abundance of grasshoppers).
6/16/1980	Wildfire			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. § 35-192 to the General Fund.
7/3/1980	Wildfire			Fire suppression assistance to Tonto National Forest
7/4/1980	Wildfire			Fire suppression assistance to Prescott National Forest
7/6/1980	Search and Rescue		\$8,305	Search and Rescue Operations Refrigerated Trucks for bodies of illegal immigrants
7/25/1980	Wildfire			Fire suppression assistance for Bureau of Land Management
8/21/1980	Flooding / Flash Flooding		\$102,319	Very heavy rains in the upstream area of the Santa Cruz River in Mexico caused considerable flood damage to mobile homes, houses, commercial buildings and streets in Santa Cruz County. The City of Nogales was struck by a flash flood with reported damages as high as \$400,000.
6/26/1981	Wildfire			Fire suppression assistance
6/30/1981	Wildfire		\$256,904	
6/30/1982	Wildfire		\$492,635	
9/28/1983	Tropical Storm / Hurricane		\$863,283	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. Damage 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 plant and at Safford to protect critical arterial bridge embankment from severe damage.

State of Arizona Declaration						Damage Estimates			Sources
Date	Hazard	State PCA No.	Expenditures	Fatalities	Injuries	Property	Crop/Livestock	Total	
2/24/1966	Flooding / Flash Flooding		\$43,673					\$0	ADEM, 2008; Tucson NWS, 2008 at <a href="http://www.wrh.noaa.gov/twc/hydro/floodhis.php">http://www.wrh.noaa.gov/twc/hydro/floodhis.php</a> ;
11/12/1967	Flooding / Flash Flooding		\$15,000			\$250,000		\$250,000	ADEM, 2008; Tucson NWS, 2008 at <a href="http://www.wrh.noaa.gov/twc/hydro/floodhis.php">http://www.wrh.noaa.gov/twc/hydro/floodhis.php</a> ;
10/19/1972	Tropical Storm / Hurricane		\$58,177	12	100	\$8,000,000	\$10,000,000	\$18,000,000	ADEM, 2008; AFMA Floods Happen, Spring 2003.
4/28/1973	Wildfire		\$36,718					\$0	ADEM, 2008
1/7/1974	Service Interruption		\$199,028					\$0	ADEM, 2008
4/22/1975	Wildfire		\$8,923					\$0	ADEM, 2008
9/19/1975	Flooding / Flash Flooding		\$91,500			\$366,000		\$366,000	ADEM, 2008; AFMA Floods Happen, Spring 2003.
9/2/1977	Infestation							\$0	ADEM, 2008
3/2/1978	Flooding / Flash Flooding		\$485,718	4		\$65,900,000		\$65,900,000	ADEM, 2008; Tucson NWS, 2008 at <a href="http://www.wrh.noaa.gov/twc/hydro/floodhis.php">http://www.wrh.noaa.gov/twc/hydro/floodhis.php</a> ; AFMA Flood Happens, Fall 2003
4/21/1978	Wildfire		\$11,528					\$0	ADEM, 2008
11/28/1978	Flooding / Flash Flooding		\$70,120					\$0	ADEM, 2008
11/30/1978	Prison Problem		\$425					\$0	ADEM, 2008
12/16/1978	Flooding / Flash Flooding		\$1,909,498	10		\$39,850,000		\$39,850,000	ADEM, 2008; Tucson NWS, 2008 at <a href="http://www.wrh.noaa.gov/twc/hydro/floodhis.php">http://www.wrh.noaa.gov/twc/hydro/floodhis.php</a> ; AFMA Flood Happens, Fall 2003
4/16/1979	Wildfire		\$204,207					\$0	ADEM, 2008
6/2/1980	Wildfire		\$298,845					\$0	ADEM, 2008
6/16/1980	Infestation		\$67,773					\$0	ADEM, 2008
6/16/1980	Wildfire							\$0	ADEM, 2008
7/3/1980	Wildfire							\$0	ADEM, 2008
7/4/1980	Wildfire							\$0	ADEM, 2008
7/6/1980	Search and Rescue		\$8,305					\$0	ADEM, 2008
7/25/1980	Wildfire							\$0	ADEM, 2008
8/21/1980	Flooding / Flash Flooding		\$102,319			\$400,000		\$400,000	ADEM, 2008 AFMA Flood Happens, Fall 2003
6/26/1981	Wildfire							\$0	ADEM, 2008
6/30/1981	Wildfire		\$256,904					\$0	ADEM, 2008
6/30/1982	Wildfire		\$492,635					\$0	ADEM, 2008
9/28/1983	Tropical Storm / Hurricane		\$863,283	14	975	\$370,000,000		\$370,000,000	ADEM, 2008

State of Arizona Declaration				Federal Presidential Declaration			Counties Affected
Date	Hazard	State PCA No.	Expenditures	Date	ID	Expenditures	
12/30/1984	Flooding / Flash Flooding		\$426,679				Graham, Greenlee
4/1/1986	Infestation		\$136,528				Graham, Cochise
03/17/1987	Wildfire	EUZSLD					Statewide
07/21/1989	Drought						Coconino, Gila, Navajo, Apache, Graham
03/17/1990	Wildfire	EUFIR					Statewide
06/29/1990	Service Interruption	EUZOJN	\$1,441				Graham
09/07/1990	Flooding / Flash Flooding	EUZ901	\$1,175,040	12/06/90	884-DR	\$5,875,202	Mohave, Gila, Pima, Pinal, Yavapai, Graham, Coconino, Maricopa
4/16/1991	Flooding / Flash Flooding	EUZ904	\$114,250				Graham
9/2/1992	Flooding / Flash Flooding	93002	\$40,853				Graham, La Paz
01/08/1993	Flooding / Flash Flooding	93003	\$30,072,157	01/19/93	977-DR	\$104,069,362	Statewide
09/09/1993	Wildfire	94002	\$200,000				Statewide
6/30/1994	Wildfire						Statewide
10/14/1994	Wildfire	95003	\$600,000				Statewide
01/10/1995	Flooding / Flash Flooding	95006	\$510,789				Apache, Gila, Graham, Greenlee, Navajo
02/15/1995	Flooding / Flash Flooding	95007	\$1,525,663				Coconino, Gila, Graham, Greenlee, La Paz, Maricopa, Navajo, Pinal, Yavapai, Yuma
03/13/1996	Infestation	96003	\$796,456				Statewide
05/16/1996	Wildfire	96004	\$1,000,729				Statewide
06/07/1996	Drought	96005	\$211,499				Statewide
09/24/1997	Tropical Storm / Hurricane	98002	\$2,318,259				Statewide
01/20/1999	Infestation	99001	\$177,702				Statewide
05/06/1999	Wildfire	99004	\$4,894				Statewide
6/23/1999	Drought	99006					Statewide
8/13/1999	Drought			08/13/99	USDA		Apache, Cochise, Coconino, Gila, Graham, Greenlee, Maricopa, Mohave, Navajo, Pima, Pinal, Santa Cruz, Yavapai
01/05/2000	Service Interruption	20005	\$23,073				Statewide
6/23/2000	Drought						Statewide

State of Arizona Declaration				
Date	Hazard	State PCA No.	Expenditures	Description
12/30/1984	Flooding / Flash Flooding		\$426,679	
4/1/1986	Infestation		\$136,528	Grasshoppers
03/17/1987	Wildfire	EUZSLD		Wildland fires statewide
07/21/1989	Drought			USDA drought declaration for the listed counties
03/17/1990	Wildfire	EUFIR		Wildland fire contingency
06/29/1990	Service Interruption	EUZOJN	\$1,441	Water Emergency
09/07/1990	Flooding / Flash Flooding	EUZ901	\$1,175,040	Severe storms caused monsoon rains from July 8 through September 14, 1990. Heavy rains and high winds caused flash flooding and wind damage. Havasupai reservation received heavy flood losses. Three lives were lost.
4/16/1991	Flooding / Flash Flooding	EUZ904	\$114,250	Flood emergency for Graham County. Winds in parts of Graham county were estimated at 65 mph as 8 power poles were downed and large trees blown over. There was also widespread urban and roadway flooding between Safford and Thatcher which lasted until about midnight. A spotter in Thatcher recorded 1.95 inches of rainfall. Cotton crops sustained widespread damage.
9/2/1992	Flooding / Flash Flooding	93002	\$40,853	Heavy rains and flooding
01/08/1993	Flooding / Flash Flooding	93003	\$30,072,157	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).
09/09/1993	Wildfire	94002	\$200,000	Statewide wildfire suppression - State Land Department
6/30/1994	Wildfire			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. § 37-623.02 effective June 30, 1994.
10/14/1994	Wildfire	95003	\$600,000	Statewide wildfire suppression - State Land Department
01/10/1995	Flooding / Flash Flooding	95006	\$510,789	The Governor proclaimed an emergency due to flooding in Graham and Greenlee Counties
02/15/1995	Flooding / Flash Flooding	95007	\$1,525,663	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.
03/13/1996	Infestation	96003	\$796,456	Wheat (karnal bunt)
05/16/1996	Wildfire	96004	\$1,000,729	Statewide wildfire suppression - State Land Department
06/07/1996	Drought	96005	\$211,499	
09/24/1997	Tropical Storm / Hurricane	98002	\$2,318,259	Hurricane Nora - \$200 million property damage. An estimated \$150 to \$200 million in damage was sustained by crops throughout Yuma County due mainly to flooded crops. About \$30 to \$40 million was to lemon trees. The heavy rain was attributed to Tropical Storm Nora. Flooding from Hurricane Nora results in the breaching of Narrows Dam. The calculated 24-hour, 100-year rainfall amount in NW Maricopa County was exceeded at six ALERT measuring sites. 3 to 5 inches of rain which fell from Nora led to some flash flooding in portions of northwest Maricopa County. Two earthen dams gave way in Aguila and caused widespread flooding. One dike was located seven miles east of Aguila and the second in the center of the Martori Farms complex. Half of the cotton crop was lost at Martori Farms, as well as 300 to 500 acres of melons. Up to five feet of water filled Aaguila. About 40 people were evacuated from the hardest hit area of the town. Water flowing down the Sols Wash was so high that the Sols Wash Bridge in Wickenburg was closed for more than two hours. There was some flooding below Sols Wash in the streets around Coffinger Park. Several houses in the area were flooded. Highway 71 west of Wickenburg and Highway 95 north were closed due to high water from the storm.
01/20/1999	Infestation	99001	\$177,702	Red Imported Fire Ant Emergency
05/06/1999	Wildfire	99004	\$4,894	Statewide wildland fire emergency
6/23/1999	Drought	99006		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. Jan DeDeo 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 deferral 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
8/13/1999	Drought			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 has already declared all or part of Arizona, Connecticut, Maryland, New Jersey, New Mexico, New York, Ohio, Pennsylvania, Virginia, and West Virginia as disaster areas. Due to the close proximity to these states, certain counties in California, Delaware, Indiana, Kentucky, Massachusetts, Michigan, Nevada, Rhode Island, Vermont, and Utah also qualify for emergency loan assistance.
01/05/2000	Service Interruption	20005	\$23,073	Y2K
6/23/2000	Drought			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.

State of Arizona Declaration				Fatalities	Injuries	Damage Estimates			Sources
Date	Hazard	State PCA No.	Expenditures			Property	Crop/Livestock	Total	
12/30/1984	Flooding / Flash Flooding		\$426,679					\$0	ADEM, 2008
4/1/1986	Infestation		\$136,528					\$0	ADEM, 2008
03/17/1987	Wildfire	EUZSLD						\$0	ADEM, 2008
07/21/1989	Drought							\$0	ADEM, 2008
03/17/1990	Wildfire	EUFIR						\$0	ADEM, 2008
06/29/1990	Service Interruption	EUZOJN	\$1,441					\$0	ADEM, 2008
09/07/1990	Flooding / Flash Flooding	EUZ901	\$1,175,040	3				\$0	ADEM, 2008
4/16/1991	Flooding / Flash Flooding	EUZ904	\$114,250					\$0	ADEM, 2008
9/2/1992	Flooding / Flash Flooding	93002	\$40,853					\$0	ADEM, 2008
01/08/1993	Flooding / Flash Flooding	93003	\$30,072,157	8	112	\$330,000,000	\$70,000,000	\$400,000,000	ADEM, 2008
09/09/1993	Wildfire	94002	\$200,000					\$0	ADEM, 2008
6/30/1994	Wildfire							\$0	ADEM, 2008
10/14/1994	Wildfire	95003	\$600,000					\$0	ADEM, 2008
01/10/1995	Flooding / Flash Flooding	95006	\$510,789					\$0	ADEM, 2008
02/15/1995	Flooding / Flash Flooding	95007	\$1,525,663					\$0	ADEM, 2008
03/13/1996	Infestation	96003	\$796,456					\$0	ADEM, 2008
05/16/1996	Wildfire	96004	\$1,000,729					\$0	ADEM, 2008
06/07/1996	Drought	96005	\$211,499					\$0	ADEM, 2008
09/24/1997	Tropical Storm / Hurricane	98002	\$2,318,259			\$200,000,000	\$175,000,000	\$375,000,000	ADEM, 2008
01/20/1999	Infestation	99001	\$177,702					\$0	ADEM, 2008
05/06/1999	Wildfire	99004	\$4,894					\$0	ADEM, 2008
6/23/1999	Drought	99006						\$0	ADEM, 2008
8/13/1999	Drought							\$0	ADEM, 2008
01/05/2000	Service Interruption	20005	\$23,073					\$0	ADEM, 2008
6/23/2000	Drought					\$2,000,000	\$1,000,000	\$3,000,000	ADEM, 2008

State of Arizona Declaration				Federal Presidential Declaration			Counties Affected
Date	Hazard	State PCA No.	Expenditures	Date	ID	Expenditures	
07/21/2000	Drought			07/21/00	USDA		Apache, Cochise, Graham, Greenlee, Pima, Pinal, Santa Cruz, Gila, Maricopa, Navajo, Yuma
6/23/2001	Drought						Statewide
05/17/2002	Drought			05/17/02	USDA		Statewide
5/18/2002	Disease						Statewide
6/23/2002	Drought						Statewide
07/11/2002	Drought			07/11/02	USDA		Statewide
5/2/2003	Wildfire	23003	\$2,378,020				Statewide
6/23/2003	Drought						Statewide
7/15/2004	Wildfire	25001	\$281,298				Gila, Graham
12/29/2004	Flooding / Flash Flooding	25004	\$2,131,217	2/17/2005	1581-DR	\$5,986,604	Gila, Graham, Greenlee, Pinal, Yavapai, Maricopa, Mohave
2/16/2005	Flooding / Flash Flooding	25005	\$4,669,352	3/14/2005	1586-DR	\$9,536,276	Gila, Graham, Greenlee, Pinal, Yavapai, Maricopa, Mohave
2/22/2006	Wildfire	26006	\$192,390				Statewide
8/8/2006	Flooding / Flash Flooding	27001	\$2,726,940	9/7/2006	1660-DR	\$13,634,698	Gila, Graham, Greenlee, Pima, Pinal

State of Arizona Declaration				Description
Date	Hazard	State PCA No.	Expenditures	
07/21/2000	Drought			GLICKMAN DECLARES 7 ARIZONA COUNTIES AGRICULTURAL DISASTER AREAS: Washington, July 17, 2000 - Agriculture Secretary Dan Glickman today declared seven of Arizona's 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." Glickman's disaster declaration covers 7 of Arizona's 15 counties: Apache, Cochise, Graham, Greenlee, Pima, Pinal and Santa Cruz. Four other contiguous Arizona counties also are covered by the declaration (Gila, Maricopa, Navajo and Yuma) and therefore are eligible for the same benefits. Other contiguous counties in New Mexico are Catron, Cibola, Grant, Hidalgo, McKinley, and San Juan counties. San Juan county in Utah and Montezuma county in Colorado are included in the declaration as contiguous counties. This designation makes qualified family-sized farm operators in both primary and contiguous counties eligible for emergency low-interest loans from USDA. Farmers in eligible counties have eight months to apply for the loans. Each loan application is considered on its own merits, taking into account the extent of losses, security available, repayment ability, and other eligibility requirements. USDA previously approved emergency haying and grazing on Conservation Reserve Program
6/23/2001	Drought			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.
05/17/2002	Drought			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.
5/18/2002	Disease			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 deer and elk.
6/23/2002	Drought			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.
07/11/2002	Drought			VENEMAN ANNOUNCES EXPANSION OF CRP EMERGENCY HAYING AND GRAZING PROGRAM FOR WEATHER-STRIKEN 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. ...
5/2/2003	Wildfire	23003	\$2,378,020	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 and diseased trees and other vegetation that interfere with emergency response and evacuation needs.
6/23/2003	Drought			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.
7/15/2004	Wildfire	25001	\$281,298	The Nuttal Complex Fire began as two separate fires on Mount Graham that eventually joined together to burn 29,400 acres. A total of 683 personnel were involved with the fire and the firefighting efforts has cost \$9.2 million. One structure was damaged and one was destroyed. A total of 28 injuries were reported.
12/29/2004	Flooding / Flash Flooding	25004	\$2,131,217	A strong Pacific storm system moved across Arizona December 28th and 29th with heavy rainfall. The heavy rain and melting snow resulted in excessive runoff in many areas from Williams to Flagstaff. Winslow and south to Prescott and Black Canyon City. High water, mudslides, and rock slides resulted in numerous road closures and evacuations in the area. Many creeks experienced significant rises. Seventy people were evacuated in southwest Flagstaff when water over-topped an earthen flood control dam. A dozen neighborhoods (about 300 people) along Oak Creek were evacuated in the Sedona area and two neighborhoods down stream. A 14 mile section of Highway 89 between Flagstaff and Sedona was closed because of rock slides. High water on the Verde River forced evacuations in Cornville and Bridgeport. Four RVs were lost in Oak Creek at the Page Springs RV park while 23 vehicles were removed before the water rose too high. About 100 people were evacuated in Black Canyon City in two different mobile-home parks. Portions of Navajo Route 71 and Old Navajo Route 2 were closed northeast of Winslow when the Little Colorado River overflowed the banks. Six families were evacuated near Bird Springs on the Navajo Reservation. All thirty-one low water crossings and seven other streets were closed in Prescott due to flooding. Two passengers were rescued from a stranded vehicle in Prescott. Preliminary counts indicate that as many as 150 homes may have sustained damages up to approximately one million dollars. Roads and bridges sustained an additional one million dollars damage.
2/16/2005	Flooding / Flash Flooding	25005	\$4,669,352	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 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
2/22/2006	Wildfire	26006	\$192,390	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 suppression 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.
8/8/2006	Flooding / Flash Flooding	27001	\$2,726,940	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. 1 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 roadways were washed away due to the strong flood waters.

State of Arizona Declaration				Fatalities	Injuries	Damage Estimates			Sources
Date	Hazard	State PCA No.	Expenditures			Property	Crop/Livestock	Total	
07/21/2000	Drought							\$0	ADEM, 2008
6/23/2001	Drought							\$0	ADEM, 2008
05/17/2002	Drought							\$0	ADEM, 2008
5/18/2002	Disease							\$0	ADEM, 2008
6/23/2002	Drought							\$0	ADEM, 2008
07/11/2002	Drought						\$300,000,000	\$300,000,000	ADEM, 2008
5/2/2003	Wildfire	23003	\$2,378,020					\$0	ADEM, 2008
6/23/2003	Drought							\$0	ADEM, 2008
7/15/2004	Wildfire	25001	\$281,298		28	\$150,000		\$150,000	ADEM, 2008 Graham County MHMP, 2005
12/29/2004	Flooding / Flash Flooding	25004	\$2,131,217			\$2,000,000		\$2,000,000	ADEM, 2008 NCDC, 2008
2/16/2005	Flooding / Flash Flooding	25005	\$4,669,352			\$1,500,000		\$1,500,000	ADEM, 2008 NCDC, 2008
2/22/2006	Wildfire	26006	\$192,390					\$0	ADEM, 2008
8/8/2006	Flooding / Flash Flooding	27001	\$2,726,940			\$5,000,000		\$5,000,000	ADEM, 2008 NCDC, 2008

**Graham County Undeclared Events  
January 1966 to January 2010**

<b>Hazard</b>	<b>No. of Records</b>	<b>Recorded Losses</b>		
		<b>Fatalities</b>	<b>Injuries</b>	<b>Damages</b>
Drought	1	0	0	\$2,000,000
Dam Failure	0	0	0	\$0
Earthquake	0	0	0	\$0
Fissure	0	0	0	\$0
Flooding / Flash Flooding	5	0	0	\$65,000
Hazardous Materials Incident	0	0	0	\$0
Landslide / Mudslide	0	0	0	\$0
Levee Failure	0	0	0	\$0
Snow Storm	0	0	0	\$0
Sleet / Freezing Rain	0	0	0	\$0
Subsidence	0	0	0	\$0
Severe Wind	30	0	0	\$529,000
Tornado	0	0	0	\$0
Tropical Storm / Hurricane	0	0	0	\$0
Wildfire	7	0	5	\$0

Notes:

- No attempt has been made to adjust Damage Costs to current dollar values

Date	Hazard	Description	Location	Fatalities	Injuries
6/6/1997	Severe Wind	A severe thunderstorm that moved through Safford knocked down 6 power poles, blew part of a roof off a house , broke off several large tree limbs, and damaged several other structures.	SAFFORD	0	0
7/28/1997	Severe Wind	Thunderstorm winds blew down several power poles in Safford and the nearby towns of Thatcher and Pima.	SAFFORD	0	0
2/24/1998	Severe Wind	A strong cold front moving across the area kicked up strong winds that caused considerable damage. Portions of the roofs of the Huachuca city school and several churches in Sierra Vista were blown off, numerous roofs had some shingles ripped off, 25 cars parked at a Sierra Vista school had their windows broken, another dozen cars parked at the Kmart store in Sierra Vista sustained some damage, some trees, street signs, and billboards were blown down, some businesses reported broken windows, and in Graham county several reports of roofs "blown off" were received. In Graham county an automated station on Guthrie Peak reported a gust to 77 knots, while a wind sensor at the Fort Huachuca army base reported a gust to 62 knots.		0	0
7/21/1998	Severe Wind	Thunderstorm winds blew the roof off a bar and destroyed the north wall. Also a roof was taken off a storage shed and some trees were blown down.	FT THOMAS	0	0
8/28/1998	Severe Wind	Two distinct lines of severe thunderstorms swept through much of southeast arizona from the northeast during the mid-afternoon to early evening hours. A roof was blown off a trailer and a 20 foot tree blown onto a truck near Fort Thomas.	FT THOMAS	0	0
4/7/1999	Severe Wind			0	0
8/7/2000	Severe Wind	Part of roof blowin off house.	FT THOMAS	0	0
10/11/2000	Flooding / Flash Flooding	Road closures due to flooding on Sally Bryce Road in Tally wash area. Heavy rain damaged cotton crops and pinto bean fields. Deep upper level trough over Nevada on the 10th moved over southeast Arizona through the 12th. The system was able to tap into moisture from the remnants of Tropical Storm Olivia which resulted in large amounts of rain and flooding. Early morning on the 11th, deep convection (with -65 to -70C cloud tops) developed. Isolated thunderstorms exploded across southeast Arizona. The low level center of Olivia passed through Cochise county between 09Z and 12Z on the 12th which ended the heavy rain.	SAFFORD	0	0
8/10/2001	Severe Wind	Damaging winds from a severe thunderstorm ripped off an awning from a mobile home and a large flourescent sign at an automobile dealership in Safford. Several 4 inch diameter tree branches were also broken in the Safford area. The 79 mph peak wind gust was reported at the Safford airport where several shingles were ripped off the two buildings. A spotter, located 10 miles south of Safford, reported 1.27 inches of rain in less than 20 minutes. Another spotter reported 1.12 inches of rain in 30 minutes and that the washes were filling rapidly. At the Safford airport, water had overflowed the runway with the storm water up to the wheels of the small aircrafts. The aiport rain gage registered 1.68 inches of rain in 30 minutes.	SAFFORD ARPT	0	0
7/8/2002	Severe Wind	Strong winds from a severe thunderstorm, over the town of Pima, downed several power poles and a large tree. A newspaper reported a fence blown down in the backyard of a residents home in the town of Pima. Three portions of the fence were flown into the neighbors yard and damages were estimated to 3,500 dollars. The strong winds also pealed portions of a roof off at a Mini Mart, which later caused leaking.	PIMA	0	0
7/13/2002	Wildfire	Sixty Six Fire - a lightning caused fire that burned an area 6 miles southwest of Klondyke, AZ. The fire started 7/13/2002 and was controlled 7/15/2002. The fire burned a total of 175 acres with over \$6,000 in fire suppression costs.		0	0
7/14/2002	Severe Wind	Severe thunderstorms produced damaging winds across an area 12 miles south of Safford. A spotter reported shingles being ripped off his roof by strong winds.	SAFFORD	0	0
8/20/2002	Severe Wind	Strong thunderstorms moved across the town of Safford on the late afternoon of the 20th. A peak wind gust of 57 mph was reported at the ASOS at Safford Airport. The newspaper reported several houses and carports received damage due to the strong winds from the thunderstorm. A 70 foot tree toppled onto a house located on Highway 191 and 12th Street. This 100 year old tree punched holes into the roof which caused more damage when the kitchen flooded.	SAFFORD	0	0

Date	Hazard	Damage Estimates			Sources
		Property	Crop/Livestock	Total	
6/6/1997	Severe Wind	\$60,000	\$0	\$60,000	NCDC, 2008
7/28/1997	Severe Wind	\$20,000	\$0	\$20,000	NCDC, 2008
2/24/1998	Severe Wind	\$28,000	\$0	\$28,000	NCDC, 2008
7/21/1998	Severe Wind	\$15,000	\$0	\$15,000	NCDC, 2008
8/28/1998	Severe Wind	\$4,000	\$0	\$4,000	NCDC, 2008
4/7/1999	Severe Wind	\$25,000	\$0	\$25,000	NCDC, 2008
8/7/2000	Severe Wind	\$20,000	\$0	\$20,000	NCDC, 2008
10/11/2000	Flooding / Flash Flooding	\$5,000	\$10,000	\$15,000	NCDC, 2008
8/10/2001	Severe Wind	\$10,000	\$0	\$10,000	NCDC, 2008
7/8/2002	Severe Wind	\$3,000	\$0	\$3,000	NCDC, 2008
7/13/2002	Wildfire	\$0	\$0	\$0	Arizona State Forestry, 2009 National Wildfire Coordinating Group, 2010
7/14/2002	Severe Wind	\$500	\$0	\$500	NCDC, 2008
8/20/2002	Severe Wind	\$15,000	\$0	\$15,000	NCDC, 2008

Date	Hazard	Description	Location	Fatalities	Injuries
7/25/2003	Severe Wind	Strong winds from nearby thunderstorm knocked several power poles down near Bonita. Safford dispatch also reported minor street flooding.	BONITA	0	0
7/25/2003	Severe Wind	A microburst occurred during the late evening over the town of Ft Thomas, producing damaging winds. The severe storm damaged 400 acres of cotton crops near Indian Hot Springs. Another farm nearby had 500 acres of damaged cotton crops. A roof of a home, near Highway 70, was blown off and landed some distance away from the house.	FT THOMAS	0	0
8/7/2003	Severe Wind	Severe thunderstorm moved through Safford area producing damaging winds. Several car windows were blasted out in the Mt Graham Shopping Center parking lot and a well house pump was lifted and thrown 100 yards. Two power poles were downed along Highway 70 and Seventh Street and the Safford Agriculture Center recorded wind gusts of 60 mph.	SAFFORD	0	0
4/10/2004	Severe Wind	An isolated thunderstorm moving east produced a 56 mph wind gust and knocked down a power pole in Safford. Also the Safford Agricultural Station reported wind gusts up to 57 mph. A trough of low pressure over Arizona led to the development of some showers and thunderstorms. A few short wave troughs embedded in the mean flow provided the dynamics necessary for gusty winds and small hail associated with the thunderstorms.	SAFFORD	0	0
6/28/2004	Wildfire	Upshaw Fire - a lightning caused fire that burned an area 15 miles east of San Carlos, AZ. The fire started 6/28/2004 and was controlled 7/4/2004. The fire burned a total of 2,000 acres with over \$600,000 in fire suppression costs.		0	0
7/24/2004	Flooding / Flash Flooding	Heavy rainfall from several thunderstorms caused the buildup of rain on the roof of a museum in Thatcher. The roof collapsed around 10:30 pm that night.	THATCHER	0	0
8/9/2004	Severe Wind	A strong thunderstorm produced wind gusts up to 61 knots (70 mph) as it moved from the northeast toward the Safford area. The first severe wind gust occurred at 1605 MST and was 53 knots (61 mph), these strong winds continued being reported by the ASOS at the Safford Airport until 1645 MST. The last severe gust reported at the airport was 52 knots (60 mph). The storms then moved into the city of Safford and downed several power poles, and one large tree by 1648 MST.	SAFFORD	0	0
8/15/2004	Flooding / Flash Flooding	Arizona Department of Transportation reported that due to flooding portions of Highway 191 had been damaged and were closed.	SAFFORD	0	0
8/16/2004	Severe Wind	About 106 pounds of cotton crops were damaged by hail near Safford. These 106 pounds were reported to be worth about 4000 dollars.	SAFFORD	0	0
8/16/2004	Severe Wind	Power lines were downed by strong winds.	SAFFORD	0	0
8/17/2004	Flooding / Flash Flooding	Highway 70, west of the town of Pima, was closed due to flooding of the Matthews wash. Also a swift water rescue was performed when a truck got stuck in the Talley wash near Thatcher.	PIMA	0	0
9/25/2004	Severe Wind	Significant hail damage was reported in the Safford area. The hail fell for about 30 minutes and stripped apples off of trees in a local orchard.	SAFFORD	0	0
12/31/2004	Drought	Lake levels in San Carlos Lake reached a dangerous low with a complete fish-kill and associated hazards and economic implications very possible. Over \$2 million dollars worth of water rights were purchased to maintain a minimum pool level.	SAN CARLOS	0	0
8/21/2005	Severe Wind	Strong winds associated with a thunderstorm in the City of Safford, caused damage to two large observation towers, several trailers, and several vehicles as sheet metal was blown off a roof hitting the cars.	SAFFORD	0	0
5/18/2006	Wildfire	North Taylor Fire - a lightning caused fire that burned an area 19 miles southwest of Safford, AZ. The fire started 5/18/2006 and was controlled 5/27/2006. The fire burned a total of 117 acres with over \$1,000,000 in fire suppression costs and 3 fire related injuries.		0	3
10/9/2006	Severe Wind	A severe thunderstorm produced penny sized hail resulting in damage to skylights of three homes. A low pressure system ejecting out of Southern California caused scattered thunderstorms to develop over Southeastern Arizona which produced severe hail.	KLONDYKE	0	0

Date	Hazard	Damage Estimates			Sources
		Property	Crop/Livestock	Total	
7/25/2003	Severe Wind	\$6,000	\$0	\$6,000	NCDC, 2008
7/25/2003	Severe Wind	\$60,000	\$100,000	\$160,000	NCDC, 2008
8/7/2003	Severe Wind	\$20,000	\$0	\$20,000	NCDC, 2008
4/10/2004	Severe Wind	\$1,000	\$0	\$1,000	NCDC, 2008
6/28/2004	Wildfire	\$0	\$0	\$0	Arizona State Forestry, 2009 National Wildfire Coordinating Group, 2010
7/24/2004	Flooding / Flash Flooding	\$10,000	\$0	\$10,000	NCDC, 2008
8/9/2004	Severe Wind	\$5,000	\$0	\$5,000	NCDC, 2008
8/15/2004	Flooding / Flash Flooding	\$10,000	\$0	\$10,000	NCDC, 2008
8/16/2004	Severe Wind	\$0	\$4,000	\$4,000	NCDC, 2008
8/16/2004	Severe Wind	\$1,000	\$0	\$1,000	NCDC, 2008
8/17/2004	Flooding / Flash Flooding	\$10,000	\$0	\$10,000	NCDC, 2008
9/25/2004	Severe Wind	\$0	\$2,000	\$2,000	NCDC, 2008
12/31/2004	Drought	\$2,000,000	\$0	\$2,000,000	Eastern Arizona Courier, 2004
8/21/2005	Severe Wind	\$25,000	\$0	\$25,000	NCDC, 2008
5/18/2006	Wildfire	\$0	\$0	\$0	Arizona State Forestry, 2009 National Wildfire Coordinating Group, 2010
10/9/2006	Severe Wind	\$2,000	\$0	\$2,000	NCDC, 2008

Date	Hazard	Description	Location	Fatalities	Injuries
5/8/2007	Severe Wind	A telephone pole was knocked down due to outflow winds along Highway 70. Numerous tree limbs were also broken from Thatcher to Safford to San Jose on Highway 70. An upper level low pressure moved across Southeast Arizona with enough moisture and instability to cause high based thunderstorms to develop.	CENTRAL	0	0
5/27/2007	Wildfire	Blue River Fire - a human caused fire that burned an area north of Indian Rt 8 and west-northwest of Warm Springs about 5 miles. The fire started 5/27/2007 and was controlled 5/30/2007. The fire burned a total of 3,616 acres with over \$50,000 in fire suppression costs.		0	0
7/14/2007	Severe Wind	A strong thunderstorm knocked down two power poles in Safford. Evening thunderstorms caused strong winds across portions of Graham and Greenlee County.	SAFFORD	0	0
7/21/2007	Severe Wind	Three large pine trees were uprooted and power lines were knocked down due to strong winds from thunderstorms. Daytime heating in combination with a moist flow caused thunderstorms to develop across Southeast Arizona.	FT THOMAS	0	0
8/23/2007	Severe Wind	A cinder block wall was knocked down at a residence in Safford due to strong winds. In addition, debris covered much of Highway 191 from just south of Safford to near Artesia. Monsoonal thunderstorms caused flash flooding in the City of Douglas in Cochise County and severe thunderstorms near Safford in Graham County.	SAFFORD	0	0
5/20/2008	Wildfire	Frye Mesa Fire - a human caused fire that burned an area 4 miles southwest of Safford, AZ. The fire started 5/20/2008 and was controlled 5/27/2007. The fire burned a total of 3,100 acres with over \$1,116,000 in fire suppression costs.		0	0
6/25/2008	Wildfire	Redington Fire - a lightning caused fire that burned an area southwest of Safford in Galuiri Mountains. The fire started 6/25/2008 and was controlled 7/31/2008. The fire burned a total of 12,000 acres with over \$250,000 in fire suppression costs.		0	0
7/3/2008	Wildfire	Whiskey Fire - a lightning caused fire that burned an area 23 miles east of San Carlos, AZ. The fire started 7/3/2008 and was controlled 7/10/2008. The fire burned a total of 1,133 acres with an unknown amount of fire suppression costs and 2 fire related injuries.		0	2
7/6/2008	Severe Wind	Monsoon moisture produced severe thunderstorms across the City of Safford causing a power pole to be knocked down at 2nd St and Thatcher.	SAFFORD	0	0
8/3/2008	Severe Wind	Strong to severe thunderstorms with locally heavy rainfall and flash flooding developed across Southeast Arizona. A tree was knocked over by the high winds and fell on a car.	SAFFORD	0	0
8/28/2008	Severe Wind	Severe thunderstorms rolled across portions of Graham and Eastern Pima Counties producing wind damage and large hail. Multiple power lines were blown down between Safford and Thatcher.	SAFFORD	0	0
7/8/2009	Severe Wind	Thunderstorm winds downed several power poles near the Bonita school.	BONITA	0	0
7/17/2009	Severe Wind	A trained spotter reported many trees were downed in the central part of Safford. ASOS measured a 63 mph thunderstorm wind gust at the Safford Regional Airport. Amateur radio operators reported numerous power poles down near Safford.	SAFFORD	0	0
1/21/2010	Flooding / Flash Flooding	Graham County law enforcement performed two swift water rescues just south of Safford during the late evening hours of January 21st. Deputies responded at 10:15 PM to a truck caught in a wash on Chastain Lane, just north of Highway 366. Law enforcement rescued the motorist of the truck. There were no injuries, but the truck was fully engulfed by the water. At approximately the same time, law enforcement spotted a van stuck in Stockton Wash, along Stockton Road south of Roper Lake. The occupants of the van exited the vehicle and waded to safety, before the van was washed further down Stockton Wash.	SAFFORD	0	0

Date	Hazard	Damage Estimates			Sources
		Property	Crop/Livestock	Total	
5/8/2007	Severe Wind	\$9,000	\$0	\$9,000	NCDC, 2008
5/27/2007	Wildfire	\$0	\$0	\$0	Arizona State Forestry, 2009 National Wildfire Coordinating Group, 2010
7/14/2007	Severe Wind	\$15,000	\$0	\$15,000	NCDC, 2008
7/21/2007	Severe Wind	\$10,000	\$0	\$10,000	NCDC, 2008
8/23/2007	Severe Wind	\$3,000	\$0	\$3,000	NCDC, 2008
5/20/2008	Wildfire	\$0	\$0	\$0	Arizona State Forestry, 2009 National Wildfire Coordinating Group, 2010
6/25/2008	Wildfire	\$0	\$0	\$0	Arizona State Forestry, 2009 National Wildfire Coordinating Group, 2010
7/3/2008	Wildfire	\$0	\$0	\$0	Arizona State Forestry, 2009 National Wildfire Coordinating Group, 2010
7/6/2008	Severe Wind	\$7,500	\$0	\$7,500	NCDC, 2008
8/3/2008	Severe Wind	\$10,000	\$0	\$10,000	NCDC, 2010
8/28/2008	Severe Wind	\$15,000	\$0	\$15,000	NCDC, 2010
7/8/2009	Severe Wind	\$3,000	\$0	\$3,000	NCDC, 2010
7/17/2009	Severe Wind	\$30,000	\$0	\$30,000	NCDC, 2010
1/21/2010	Flooding / Flash Flooding	\$20,000	\$0	\$20,000	NCDC, 2010

## **Appendix E**

### **Plan Maintenance Review Memorandums**