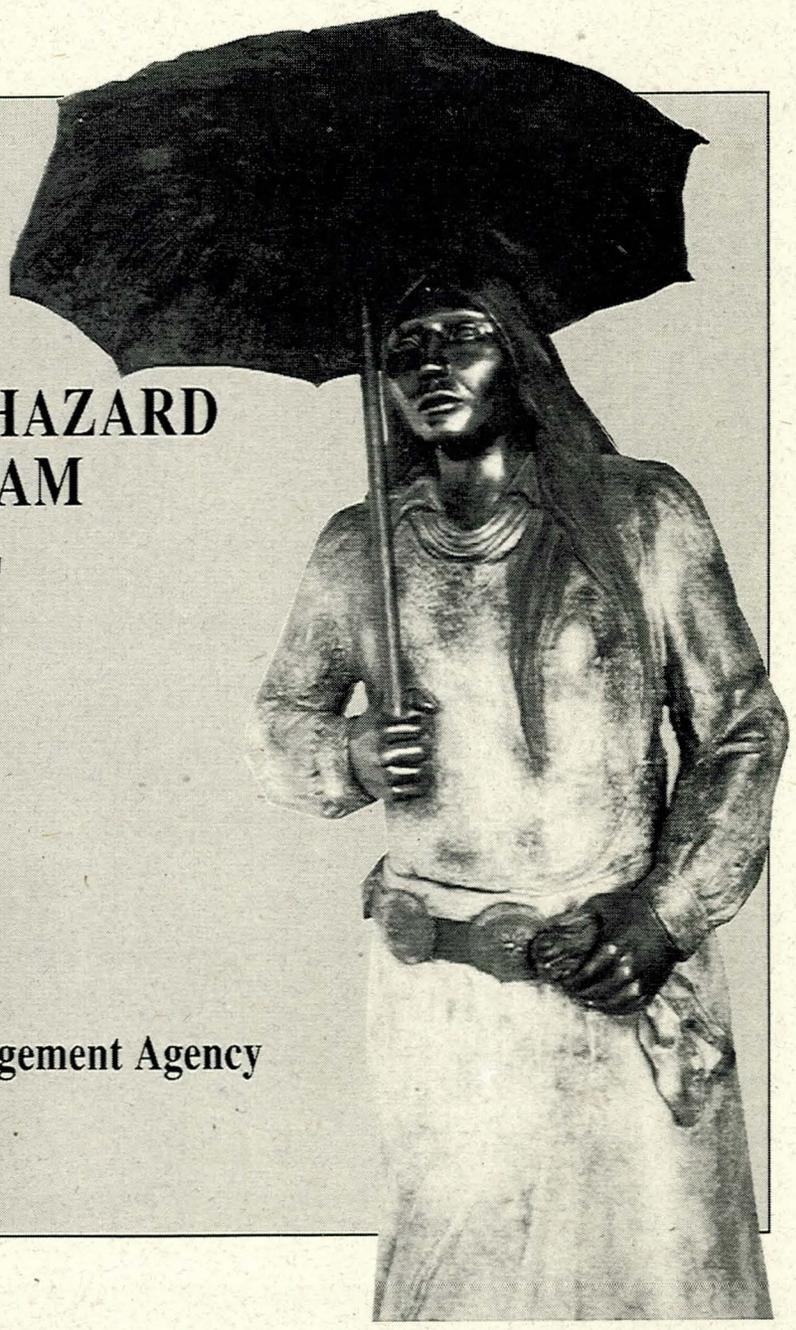


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# HAZARD MITIGATION OPPORTUNITIES IN THE STATE OF ARIZONA

REPORT OF THE  
INTERAGENCY HAZARD  
MITIGATION TEAM  
FEMA-977-DR-AZ



Federal Emergency Management Agency  
Region IX • April 1, 1993

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# HAZARD MITIGATION TEAM REPORT

In Response to the January 19, 1993 Disaster Declaration  
State of Arizona FEMA-977-DR-AZ

## **REPORT COVERING:**

Apache, Coconino, Gila, Graham, Greenlee, Maricopa, Navajo, Pima, Pinal,  
Yavapai, Cochise, Santa Cruz, Yuma Counties

## **PREPARED BY:**

**THE REGION IX INTERAGENCY HAZARD MITIGATION TEAM**

## **FEDERAL AGENCIES**

Federal Emergency Management Agency  
U. S. Army Corps of Engineers  
National Weather Service  
Small Business Administration  
Soil Conservation Service  
Department of Transportation  
Bureau of Indian Affairs  
U. S. Forest Service  
Bureau of Reclamation

## **ARIZONA STATE AGENCIES**

Division of Emergency Management  
Department of Water Resources  
Department of Transportation

## **COUNTIES, MUNICIPALITIES, AND SPECIAL DISTRICTS**

Cochise County, Salt River Project, Santa Cruz County, Pinal County, Gila County, Navajo County,  
Prescott/Yavapai County Tuscon/Pima County, Yavapai County, Town of Patagonia

APRIL 1, 1993

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# INTRODUCTION



This report transmits the recommendations of FEMA Region IX Interagency Flood Hazard Mitigation Team (IHMT) to the Regional Director of the Federal Emergency Management Agency, the Federal and State agencies that participated in the IHMT process, and the affected State and Local governments.

As a result of a series of intense moisture laden tropical storms beginning on January 5, 1993 and continuing for two weeks, the State of Arizona incurred significant flooding and erosion damage to both public and private property. As a result the President declared ten counties in the State of Arizona as a major disaster (FEMA-977-DR-AZ) on January 19, 1993. The counties of Apache, Coconino, Gila, Graham, Greenlee, Maricopa, Navajo, Pima, Pinal, and Yavapai were included in the initial declaration. On January 26, 1993 Cochise and Santa Cruz Counties were declared, and on February 5, 1993 Yuma County was added. All of the counties were declared for both the Public and Individual assistance programs.

## OVERVIEW OF DISASTER ASSISTANCE AUTHORITY AND BACKGROUND

Since 1936, Federal, State, and Local governments have expended in excess of ten billion dollars for structural solutions to flood problems in the United States. In spite of this investment, flood losses continue to increase. In an effort to stem continuing increases in disaster assistance programs and development pressures within the Nation's floodplains, federal emphasis has shifted toward a comprehensive and coordinated approach to floodplain management.

An Office of Management and Budget memorandum of July 10, 1980 provided the basis for the establishment of regional interagency and inter-governmental hazard mitigation teams to promote a comprehensive approach to flood hazard mitigation during the post-flood recovery process. These mitigation measures are to emphasize non-structural measures and to achieve economy of expenditures compatible with the reduction of future losses from flooding to the fullest extent practicable.

## PURPOSE OF THIS REPORT

This report and the team recommendations are intended to provide the framework for flood hazard mitigation measures to be taken during the recovery and reconstruction phase to reduce the potential of future flood losses. This report is considered to be a conceptual guide for all federal agencies providing recovery assistance in this disaster. The FEMA, State, and Local Hazard Mitigation Coordinators will also use this report as guidance to implement the requirements of Section 409 of the Stafford Act.

Section 409 requires the State to review and update its Flood Hazard Mitigation Plan to reflect the current disaster, the lessons learned, and the issues that must be addressed if the loss of life and damage to property from future flooding throughout the state is to be reduced. The State will incorporate the recommendations from this report into their hazard mitigation plan update. This updated State Hazard Mitigation Plan will be submitted to the Regional Director within 180 days of the disaster declaration, or by July 19, 1994.

## INTRODUCTION



The final and the most important element of the Section 409 process is to coordinate and monitor implementation of the State Hazard Mitigation Plan. Federal, State, and the appointed Local Hazard Mitigation Officers must promote implementation of this plan at the local level.

In addition, as a condition of receiving Federal disaster assistance, Section 409 of the Act requires that, at a minimum, disaster recovery activities, including repairs, restoration, or replacement, be accomplished in accordance with applicable codes, specifications and standards. Mitigation may be required as a further condition for receiving disaster assistance if deemed appropriate after consultation with locally elected officials.

# Part I: OVERVIEW OF THE DISASTER



## A SERIES OF STORMS

The persistent El Nino phenomenon in the equatorial Pacific Ocean played a significant role in the meteorological events that preceded the abnormal rainfall episodes in Arizona from late December, 1992 until January 19, 1993.

The combination of a northward-displaced subtropical jetstream, with its supply of abundant moisture, and a southward-displaced polar jetstream, with its storm track, produced a number of precipitation episodes greatly affecting Arizona. The most significant of these events occurred during the following periods in January: 6-8th, 10-11th, 14-15th, and 17-18th.

Many weather stations in Arizona established record rainfalls for the month of January. The rate of streamflow on the Salt, Gila and Santa Cruz Rivers were the highest in ten years. Bursts of heavy rain on already saturated ground caused many stream levels throughout the state to exceed full-bank capacities.

Another factor that contributed to the unusually high runoff was snow melt. The subtropical jet stream's position was farther north than was normal for January, and as a result, areas that do not normally experience snow melt until later in the spring received warm rain on top of the existing snow pack exacerbating the runoff.

Additional severe weather events occurred in association with these storms. Tornadoes were observed in south-central Arizona on the 17 and 18 of January. A strong short-lived tornado caused extensive damage to a residential area in north Scottsdale on the 17th. of January.

The last major storm system moved out of the state on January 19. That same day, the President declared Arizona to be a major disaster area (FEMA-977-DR-AZ).

## DESCRIPTION OF DAMAGES

The series of storms that began in late December and lasted until the 19th of January caused widespread damage throughout the State. With the exception of La Paz and Mohave Counties, the remainder of the State was declared for FEMA's Individual and Public Assistance Programs. Most of the damage resulted from development in floodplains that were inundated by runoff from saturated drainage basins and watersheds.

Normal, dry ephemeral streams that became high velocity, debris laden torrents migrated at will across the width of the floodplain. As an example, Tonto Creek at Punkin Center migrated several hundred feet destroying four homes and eroding forty acres of farm land, peaking at 57,000 cubic feet per second (cfs) on January 8, 1993.

In other cases, creeks, washes, and in some instances rivers, migrated out of the NFIP 100-year floodplain to destroy or damage homes (West Clear Creek in Verde Lake Estates).

## OVERVIEW OF THE DISASTER



Sections of the false work for a new bridge crossing at Mill Avenue (still under construction) in Tempe, Maricopa County were destroyed as flows reached 150,000 cfs. A portion of the 400 acre Tri-City Landfill owned and operated by the Salt River Pima-Maricopa Indian Community (SRPMIC) was in the floodplain of the Salt River. The high flows in the Salt River washed away more an estimated 150,000 cubic yards of buried trash, depositing this material along the banks and in the bed of the Salt and Gila Rivers all the way to Painted Rock Dam, ninety miles to the southwest.

At Roosevelt Dam, prior to the Jan/Feb storms, a cellular cofferdam was constructed in the left (south) spillway to allow the construction of a new left spillway. The inflows to Roosevelt Lake were greater than the release capacities (only the right spillway and the diversion pipeline were available) with the result that the lake rose above the top of the cofferdam. Debris from the construction of the left spillway was swept onto the powerhouse causing significant damage. The spillway construction is part of a larger dam modification program which will raise the height of the dam by 77 feet increasing water conservation and flood control capacity.

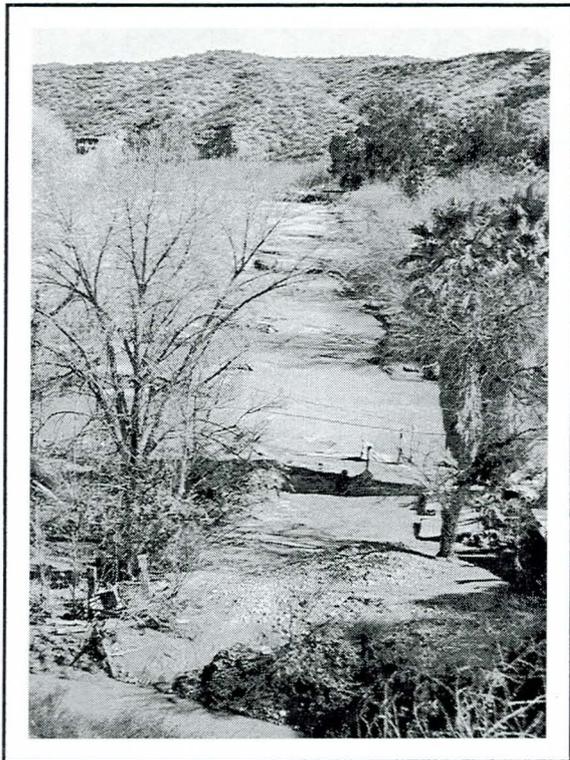
A section of the Town of Winkelman known as the "Flats" was heavily impacted by the Gila River flood flows below Coolidge Dam. Most of the structures are in the 100-year floodplain. All of the families were evacuated with no loss of life. The Flats area was primarily inundated by flows from Coolidge Dam, as the San Carlos Lake level was above the spillway elevation. For fifty years no water came over the spillway. During the 1983 floods Coolidge Dam was discharging at a peak rate of 8,000 cfs. The peak discharge this time was approximately 32,750 cfs (the discharge of record). San Carlos Lake will be below the spillway in late March.

Visual inspection left little doubt that the majority of homes in Winkelman Flats are substantially damaged.

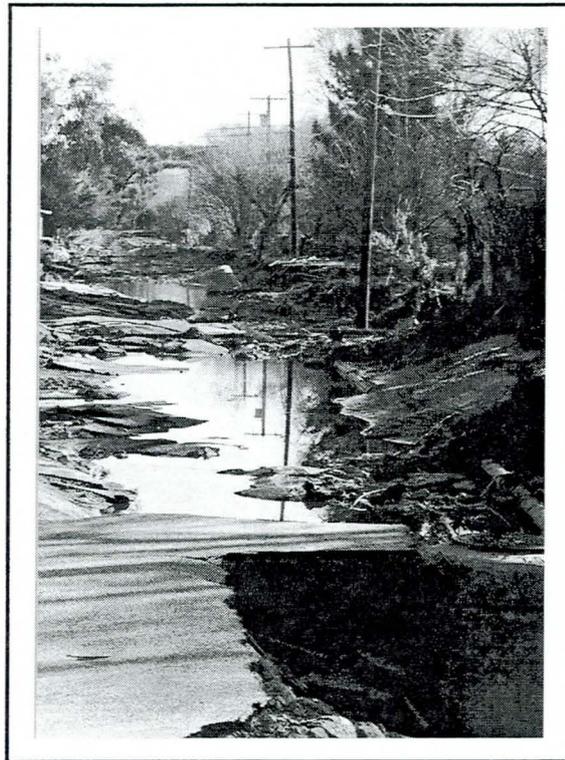


One of the hazards of living in the floodplain - Winkelman Flats.

## OVERVIEW OF THE DISASTER



Streets in Winkelman Flats during the flood.



Street in Winkelman Flats after the flood.

East of Camp Verde on Route 279, Verde Lakes Estates, in Yavapai County, experienced damage. The West Clear Creek overflowed its channel and spread across the width of the original creek bed. Several homes were damaged and a mobile home was carried 2000 feet down stream. High velocity flows destroyed access roads, vegetation and eroded several inches of topsoil.

In 1981, thirty families from Verde Lakes Estates were relocated to a twelve-acre parcel one mile north of Camp Verde. Federal and State funds were used for land acquisition, site improvement, and for relocating the mobile and prefabricated homes to the new site.

Montezuma Lake, also in Yavapai County, experiences repetitive flooding from Wet Beaver Creek, No Name and Russell Washes. Thirty homes are located on what was the original watercourse of No Name Wash. Homes are also located along its currently altered bed. Clogged culverts from sediment out of No Name Wash caused additional back up in the thirty home area. The County Flood Control District estimates this to be a 25-30 year flood event.

The Agua Fria River, which drains basalt-covered tablelands and narrow gorges cut by mountain-fed streams to the north, traverses Black Canyon City in Yavapai County to flow into Lake Pleasant ten miles to the southwest of the City.

Squaw Creek flows into the Agua Fria in Cold Water Canyon at the site of a vast junk-car park. The junk yard straddles the floodways of the Agua Fria and Squaw Creek. The high peak flows from the fourteen days of rain in January, swept away an estimated 200 junk cars and distributed them along the bed of the Agua Fria for ten miles.

## OVERVIEW OF THE DISASTER



The "Old Stage Stop" Mobile Home Park located at the confluence of the Agua Fria and Black Canyon Creek, was severely impacted by the high velocity flows. The channel of the Agua Fria shifted 300 feet to erode a portion of the park and destroy or damage four homes. The remainder of the park is now at considerable risk from future flooding.

### SMALL BUSINESS ADMINISTRATION

As of February 9, 1993 a total of 367 interviews had been conducted. The results are as follows:

<u>Loan Applications Issued</u>		<u>Loan Applications Accepted</u>
Homes	316	111
Business	124	12

### INDIVIDUAL ASSISTANCE

As of 2-11-93 a total of 1,187 registrations were taken, a breakdown follows:

NTC	607	Winslow	115
Winkelman	129	Camp Verde	74
Florence	12	Tucson	72
Duncan	23	Youngtown	23
Punkin Center	37	Safford	48
Marana	36	Leupp	16
Hopi	38		

### PUBLIC ASSISTANCE

The current estimate for categories C through G (permanent restorative work) for the entire State of Arizona, including Indian Communities, Nations, and tribes, but excluding Yuma County, is \$35,769,000. A total of 142 Notice of Interests (NOI) were received from seventy-two local governments, seven state agencies, thirty-seven special districts, fourteen private-nonprofit groups, and twelve Indian Tribes and Nations. In excess of 1000 Damage Survey Reports (DSRs) are projected.

### GOVERNMENT AND REGULATORY STRUCTURE

Local government in Arizona consist of cities, counties and special purpose districts. Cities are incorporated entities of local government, while counties govern the unincorporated areas of the state not otherwise subject to city, state or federal laws.

## OVERVIEW OF THE DISASTER



A city may be a charter or general law community. A charter city is one which deals with local problems by means of approving a charter of its own. The charter is submitted to the electorate for approval, and, if accepted, submitted to the state legislature for concurrence. Charter cities and counties vary the structure of their local government according to their particular needs.

General law is used to describe a form of government under which the city or county is subject to the general laws passed by the state legislature.

### INDIAN COMMUNITIES, NATIONS, AND TRIBES

There are twenty-one Federally recognized Indian Communities, Nations, and Tribes in the State of Arizona. Of the twenty-one, twelve have submitted Notices Of Interest (NOI) for Public Assistance. Notices of Interest have been received from the following Indian entities:

1. Ak-Chin Indian Community
2. Camp Verde Yavapai-Apache Tribe
3. Gila River Indian Community
4. Havasupai Tribe
5. Hopi Tribe
6. Navajo Nation
7. Pascua Yaqui
8. Salt River Pima-Maricopa Indian Community
9. San Carlos Apache Tribe
10. Tohono O'Odham Nation
11. Tonto Apache Tribe
12. Yavapai-Prescott Indian Tribe

The Native American's right of self-government has been consistently protected by the courts. The long history of judicial decision on the nature of Native American tribal power is marked by adherence to the following fundamental principals:

1. A Native American Community, Nation, or Tribe possesses all the powers of a sovereign state;
2. The Tribe is subject to the sovereign, legislative actions of Congress, e.g., Congress's power to enter into treaties with foreign nations, but this does not by itself affect the internal sovereignty of the Tribe; i.e., its powers of local selfgovernment.

## OVERVIEW OF THE DISASTER



### FLOODPLAIN MANAGEMENT IN ARIZONA

Floodplain management and flood control in Arizona is the responsibility of the counties, which by statute, are required to form County Flood Control Districts. County Flood Control Districts, as political taxing subdivisions of the State, control most floodplain management decisions (County Board of Supervisors). The County Flood Control Districts also provide technical assistance to the incorporated areas. Municipalities are allowed to retain the floodplain management responsibilities within their jurisdiction. Tucson, Phoenix, Scottsdale, Tempe, Mesa, Glendale, Paradise Valley, Wickenburg, Peoria, Flagstaff, and a few other cities maintain their own floodplain management programs.

The Board of Directors of the Flood Control Districts or the cities must adopt and enforce regulations governing floodplains and floodplain management in their area of jurisdiction. The Floodplain managers regulate all development of land, construction of residential, commercial or industrial structures or uses of any kind which may divert, retard or obstruct floodwater and threaten public health, safety or the general welfare within their jurisdictions.

Among their duties, they adopt and enforce regulations relating to minimum floodplain elevations, mobile home placement, installation of waste disposal, water supply and water treatment systems. The district can grant variances given adherence to specific criteria. According to Arizona Revised Statutes (County Flood Control Districts) Section 48-3609,7F, all development of land, construction of residential, commercial or industrial structures or future development within delineated floodplain areas is prohibited unless floodplain regulations have been adopted and are in full force and effect.



## HAZARD MITIGATION OPPORTUNITIES AND RECOMMENDATIONS



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Winkelman and its neighboring riverine town of Hayden are early copper mining communities that have suffered from the world-wide decline of copper prices for many years. The town of Hayden still has an operating mine and smelter.

Past flooding in Pinal County emphasizes that large portions of the County are subject to destructive floods. Both the Gila and San Pedro Rivers have the potential for large flood peaks. Erosion combined with shifting channels adds to the potential flood hazards.

Major floods of the San Pedro have traveled across the Gila River channel between Winkelman and Hayden to inundate the floodplain containing the 140 structures of Winkelman "Flats." The San Pedro River did not seem to be the primary cause of flooding in the Flats this time.

### **COOLIDGE DAM AND THE SAN CARLOS RESERVOIR**

Coolidge Dam is located on the Gila River approximately thirty miles upstream from Winkelman Flats. The dam was officially completed in 1931 and is owned and managed by the Bureau of Indian Affairs.

The dam's primary function is to store water for the San Carlos Irrigation District. Regulation of the Gila River by the Coolidge Dam reduces the impact of more frequent floods, but will not mitigate the 100-year or greater events.

San Carlos Reservoir is the recipient of the drainage area of the Gila River--the second largest river in Arizona--beginning on the western slope of the Continental Divide, and comprising 12,866 square miles.

During the recent series of storms, the elevation of the water in San Carlos Reservoir the dam's twenty-mile long reservoir reached 18.5 feet above the safety limitation imposed by the Bureau of Reclamation many years ago. The maximum that can be retained in San Carlos Lake is 910,000 acre feet of water. Once that maximum figure is exceeded, water flows over the spillways in uncontrolled volumes (33,000 cfs for the current event).

### **SUMMARY**

The Gila River communities of Winkelman (especially the Flats), Hayden, Kearney, and Riverside have experienced many flooding incidents over the years. The Gila River floodplain through Winkelman is 0.5 miles wide. The right bank of this floodplain, containing the Flats area, is where the majority of the floodplain development is located.

Flooding from the Gila and San Pedro Rivers has been characterized by high velocity, debris laden flows. In excess of a hundred structures located in the Flats were inundated by five to seven feet of high velocity flow. Because of this, the elevation of structures is not a practicable floodproofing strategy. Local floodplain regulations and codes prohibit the residents of the Flats with substantial damage to their homes (50% or greater) from rebuilding. Relocation is the only viable alternative.

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## IHMT RECOMMENDATIONS

### Recommendation No. 1

**TITLE:** Relocate repetitive flooding victims out of the floodplain.

**BACKGROUND:** The "Flats" section of the Town of Winkelman in Gila County was severely impacted by the recent series of storms. This area has been flooded many times in the past (FEMA-691-DR-AZ, 1983). Over ninety dwellings were substantially damaged (50% or greater). The vast majority of the flooded families are willing to relocate. Twenty-three of the homes carried NFIP insurance. A Local/State task Force has been organized to effect the acquisition of the homes and to help relocate the families.

Verde Lakes Estates in Yavapai County has also suffered repetitive flooding. The substantially damaged residences should be considered for acquisition and relocation. Yavapai County should consider enacting more stringent floodplain management regulations (elevation to more than one foot above the base flood elevation) than are required by the NFIP.

The Tonto Basin area in Gila County was also severely impacted by the series of storms. Tonto Creek, which runs through the Tonto Basin area, flooded several subdivisions, destroying at least five homes and three trailers in the Punkin Center area. Residents have indicated a desire to relocate out of the floodplain. The substantially damaged residences should be considered for acquisition and/or relocation.

The community of Gisela is located along the banks of Tonto Creek. The homes in this area have been flooded five times in the past several years due to the continual breaching of a riverrun sand dike, built to protect the area. During the January, 1993 storm, water from Tonto Creek again eroded the dike and inundated portions of the community. Twenty five homes had two to three feet of water in them. There are no present plans to build a permanent dike on Tonto Creek in the Gisela area. These substantially damaged residences should be considered for acquisition and/or relocation.

**LEAD AGENCIES:** FEMA

State Division of Emergency Management

**FUNDING SOURCES:**

- FEMA Programs: 1362 program for those with NFIP insurance coverage, Section 404-Hazard Mitigation Grant Program, Individual and Family Grants, Public Assistance Program Temporary Housing Program.
- Small Business Administration.
- HUD Community Development Block Grant funds.
- State Congressional appropriations, legislation.
- Other non-governmental programs.

**SCHEDULE:** Immediate and ongoing



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## Recommendation No. 2

**TITLE:** Acquire, centralize, and disseminate river gauge flow data in conjunction with flood projections for all major watersheds in the state.

**BACKGROUND:** During this event flood warnings for certain rivers were not effectively communicated to some communities, as well as some state agencies and other interested parties. This was particularly true for the San Pedro and Upper Gila Rivers. The only functioning flow gage below Coolidge Dam (San Carlos Reservoir) is at Kelvin on the Gila, and that gauge appears to be unreliable. There are two gages on the San Pedro river in Cochise County. The feasibility of installing additional data collection stations would depend upon accessible sites for the gages, data transmission and the population at risk.

**RECOMMENDATION:** A central point of dissemination must be established to assure that all interested parties are apprised of developing areas of concern.

The Arizona Division of Emergency Management would be the appropriate collector and disseminator of critical flood stage bulletins for the major watersheds state-wide.

**LEAD AGENCIES:** Arizona Division of Emergency Management  
Arizona Department of Water Resources  
National Weather Service  
U.S. Geological Service

**FUNDING SOURCES:** FEMA, 404 HMGP  
normal agency budgets

**SCHEDULE:** As soon as practicable

## Recommendation No. 3

**TITLE:** Encourage Residents of Montezuma Lakes Subdivision to elevate or floodproof their homes.

**BACKGROUND:** Residences and facilities in the Montezuma Lakes Subdivision are subject to repetitive damage. Lots in this community were sold as retirement sites. Some of the homes along Wet Beaver Creek, built at grade, are in the path of drainage from surrounding mountains. Many of the residents were not aware of the possibility of flooding when they bought the property.

**RECOMMENDATION:**

1. An outreach program should be developed by the Yavapai County Flood Control District in cooperation with the Arizona Department of Water Resources to educate residents at risk about flood mitigation possibilities that could break the flood-damage-recovery-flood-etc. cycle.
2. Encourage the elevation of residential structures.
3. Allow the Flood Control District to maintain stream channels.
4. Redesign public areas to prevent or minimize damage.

## HAZARD MITIGATION OPPORTUNITIES AND RECOMMENDATIONS



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LEAD AGENCIES: Yavapai County Flood Control District  
Arizona Department of Water Resources

FUNDING SOURCES: None required, normal agency budget

SCHEDULE: As soon as practicable

### **Recommendation No. 4**

TITLE: Improvements To Public Facilities

BACKGROUND: Many counties, cities, and special districts in Arizona experienced similar types of damage to public facilities and infrastructure from the 1993 disaster event. Members of the Interagency Hazard Mitigation Team attempted to categorize the damage and suggest solutions to many of the basic problems.

RECOMMENDATIONS:

1. **BRIDGES:** Improve the design and construction of bridges and bridge approaches to eliminate repeated damage from flooding;
2. **LOW WATER CROSSINGS:** Improve the design and construction of low-water crossings to include the dip sections with flood-warning devices, concrete pads, armored culverts, riprap and gabion basket protection;
3. **RURAL ROADS:** Improve roadway design procedures by adopting Arizona Department of Transportation specifications or other applicable standards;
4. **DESIGN AND MAINTENANCE CRITERIA - CHANNELS, DIKES, AND LEVEES:** Develop design and maintenance standards for new and existing channels, dikes, and levees to include consideration of:
  - Design of new dikes and levees to withstand prolonged wetting, multiple flood peaks, and require regular maintenance;
  - Harden or armor existing dikes and levees;
  - Routinely clean and maintain natural channels through protected areas.
  - Stabilize and harden streambanks;
  - Develop enabling legislation to permit flood control districts to perform routine maintenance on levees, streambanks and streambeds even though the channels and streams may run through private property.
5. **IMPROVEMENTS TO UTILITY FACILITIES:** (dams, waste-water treatment plants, electrical power, telephone, and gas lines, and other facilities)
  - Improve the structural stability of dams and power generating facilities;
  - Avoid future landslides in facility areas by installing matting, piers, etc;

## HAZARD MITIGATION OPPORTUNITES AND RECOMMENDATIONS



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- Rip-rap and/or concrete channels to prevent future erosion of irrigation facilities;
  - Provide deeper and structurally sound foundations for facilities in the floodplain to reduce damage from future floods;
  - If cost effective, relocate waste water treatment plants and other facilities that are repeatedly damaged by flooding.

**LEAD AGENCY:** Affected Agencies

**FUNDING SOURCES:** FEMA Section 404, HMGP  
Arizona Division of Emergency Management  
Local

**SCHEDULE:** ASAP

### **Recommendation No. 5**

**TITLE:** Emergency Power Back-up Generators

**RECOMMENDATION:**

Redistribute back-up generators purchased for use in Florida and Hawaii to strategic regional locations where they would be available for immediate dispatch to disaster sites.

**LEAD AGENCY:** FEMA/ADEM

**FUNDING SOURCES:** FEMA

**SCHEDULE:** ASAP

### **Recommendation No. 6**

**TITLE:** Regulations Pertaining to River Meander Zones

**BACKGROUND:** Many Arizona streams and rivers are braided or meandering and during storm or flooding events change their channels and erode new unprotected areas that are often outside the designated or mapped floodway or floodplain. Most of the problems with accurate floodplain mapping and management in the arid-southwest are related to the movement of solid materials during a flood; aggradation, degradation, braided channels, and channel migration.

**RECOMMENDATION:**

Regulations should be established or present floodplain management ordinances revised to include consideration of river meander zones similar to those now established prohibiting building in Floodways. This would greatly reduce damage from unanticipated bank erosion throughout the State.

The Flood Control District of Maricopa County has underway, a Salt/Gila River Floodplain Delineation Project whose results will contribute greatly to sound floodplain management practices in Maricopa County:

## HAZARD MITIGATION OPPORTUNITIES AND RECOMMENDATIONS



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LEAD AGENCY(S): Arizona Division of Emergency Management  
Flood Control Districts

FUNDING SOURCES: FEMA Section 404 and NFIP

SCHEDULE: ASAP

### **Recommendation No. 7**

**TITLE: Reassess the vulnerability of pipelines that cross rivers to flooding events.**

**BACKGROUND:** The Santa Fe Pacific Pipeline crossing the Gila River near Coolidge, AZ spilled an undetermined quantity of unleaded gasoline into the Gila River. The U.S. Environmental Protection Agency On-Site Coordinator (OSC) suspected that a submerged pipeline valve was the probable cause.

The Gila River Indian Community's EPA Officer detected a sheen on the river, strong gasoline fumes and notified the Arizona Dept. of Environmental Quality, who in turn notified the U.S. EPA. At the time, the Gila River was flooding, impeding boating or hydrocarbon collection, cleanup activities.

The U.S. EPA estimates that many old pipeline river crossings in Arizona are in need of maintenance or replacement.

**RECOMMENDATIONS:**

1. Pipeline companies operating in Arizona should have sufficiently sensitive gauges on their pipelines to detect product loss and immediately shut-down. This is particularly significant for river crossing pipelines.
2. Check valves should be installed outside the floodplain on both sides of the river so that a ruptured pipeline can be isolated.
3. Specific guidelines or regulations should be developed to pressure test a pipeline after a spill. Pressure testing using pure product could be an unacceptable environmental risk. Evacuation of the product from the pipeline and then hydrotesting would be preferable when the true condition of the pipeline is unknown.

LEAD AGENCY(S): Arizona Department of Environmental Quality  
U.S. EPA Region IX

SUPPORT AGENCY(S): U.S. Coast Guard/Pacific Strike Team

FUNDING SOURCES: Normal Agency budgets

SCHEDULE: ASAP

HAZARD MITIGATION OPPORTUNITES AND RECOMMENDATIONS



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FEMA-DR-977-AZ  
**INTERAGENCY HAZARD MITIGATION TEAM**

NATIONAL GUARD MILITARY ACADEMY  
PAGAGO PARK MILITARY RESERVATION  
5636 EAST MCDOWELL  
PHOENIX, AZ.

TUESDAY, FEBRUARY 16, 1993

**AGENDA**

9:00 AM	<b>Welcome</b>	Richard A. Buck, FCO William D. Lockwood, SCO
9:10 AM	<b>Introductions</b>	
9:15 AM	<b>Overview Of The Federal Programs</b>	Bob Schofield, FEMA HMO Hazard Mitigation
9:30 AM	<b>State Hazard Mitigation Grant Program</b>	Barbara Corsette, SHMO
9:45 AM	<b>Description Of The Storm</b>	National Weather Service
10:00 AM	<b>Description Of The Damage</b>	Bill Shough, FEMA
10:30 AM	<b>Morning Break</b>	
10:45 AM	<b>Identification of the Issues</b>	Team Members
12:00 N	<b>Lunch</b>	
1:00 PM	<b>Preparation Of Suggested Work Elements</b>	Individual Teams
3:00 PM	<b>Reports Of Work Element Teams</b>	
4:00 PM	<b>Adjourn</b>	

# HAZARD MITIGATION OPPORTUNITES AND RECOMMENDATIONS



## PARTICIPANTS

### FEMA INTERAGENCY HAZARD MITIGATION TEAM MEETING

FEMA-977-DR-AZ FEBRUARY 16, 1993

NAME	TITLE	AGENCY AND ADDRESS
<b>Jim Payne</b>	Public Affairs Specialist	Tonto National Forest 2324 E. McDowell Road Phoenix, AZ 85010
<b>Rich Martin</b>	Hydrologist	Tonto National Forest 2324 E. McDowell Road Phoenix AZ 85010
<b>John Drake</b>	Planner	U.S.Army Corps of Engineers 3636 N. Central Ave. Suite 740 Phoenix, AZ 85016
<b>Ken Clouser</b>	Safety of Dams & Floodplain Mmgt. Coordinator	Bureau of Indian Affairs Phoenix Area Office Phoenix, AZ 85001
<b>Bob Bobar</b>	Emergency Services Coordinator	Cochise County 619 Melody Lane Bisbee, AZ 85605
<b>Barbara Corsette</b>	State HMO	Arizona Division of Emergency Management 5636 E. McDowell Road Phoenix, AZ 95016
<b>Mike Franjevic</b>	Meteorologist Warning Coordinator	National Weather Service Office, PAB 500, P.O. Box 52025 Phoenix, AZ 85072- 2025
<b>Blaine Akine</b>	Senior Engineer	Salt River Project P.O. Box 52025 Phoenix, AZ 85072
<b>Jim Jepsen</b>	Floodplain	Arizona Dept. of Water Management Resources (see below)
<b>Ed Henry</b>	Coordinator Emergency Transportation	U.S. Department of Transportation Phoenix, AZ 85007

HAZARD MITIGATION OPPORTUNITIES AND RECOMMENDATIONS



NAME	TITLE	AGENCY AND ADDRESS
<b>Teresa Retterbush</b>	Assistant Administrator	Pinal County P.O. Box 727 Florence, AZ 85232
<b>Carmen Corso</b>	Emergency Services Director	Gila County 1400 E. Ash Street Globe, AZ 85501
<b>R.C. Schofield</b>	HMO	FEMA 430 West Shore Road Anacortes, WA 98221
<b>Jim Guyer</b> Arizona Director		U.S. Small Business Administration 2828 Central Phoenix, AZ 85004
<b>Joy Shrilla</b>	Hazard Mitigation Specialist	FEMA 2331 2nd. Avenue Seattle, WA 98121
<b>Kent Deph</b>	Hydrologist	Navajo County Dept. of Public Works P.O. Box 668 Holbrook, AZ
<b>Terri Miller</b>	NFIP Coordinator	AZ Department of Water Resources 15 S. 15th. Avenue Phoenix, AZ 85007
<b>Thomas Burbey</b>	Hydraulic Engineer	Bureau of Reclamation Arizona Projects Office P.O. Box 9980 Phoenix, AZ 85068
<b>Harvey S. Emery</b>	Director	Prescott/Yavapai County Emergency Services Office Courthouse Room 107 Prescott, AZ
<b>Mike Walsh</b>	Coordinator	Tuscon-Pima County O.E.S. Pima County Sheriff's Dept. 1750 E. Benson Hwy. Tuscon, AZ 85714
<b>Thomas Helfrich</b>	Chief Hydrologist and Flood Control	Pima County Dept. of Trans. 201 N. Stone Avenue Tuscon, AZ 85701

## HAZARD MITIGATION OPPORTUNITES AND RECOMMENDATIONS



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NAME	TITLE	AGENCY AND ADDRESS
Ken Spedding	Director	Yavapai County Flood Control District 255 E. Gurley Street Prescott, AZ 86301
Bart Ambrose	Assistant State Conservationist	U.S.D.A.-SCS 201 E. Indianola, Suite 200 Phoenix, AZ 85012
Terry Piper-Morgan	Town Manager	310 McKeown Patagonia, AZ 85624
Dan Stover	Supervisor	Yavapai Co. Highway Department 1100 Commerce Drive Prescott, AZ 86301
Bill Shough	Hazard Mitigation Specialist	P.O. Box 435 Bolin, CA 94924
Stan Eccles	Hazard Mitigation Officer	FEMA, Region X 130 228 Street, SW Bothell, WA 98021-9796
Herman Huggins	Hazard Mitigation	9551 Rainier S. #303 Seattle, WA 98118

**A SUPPLEMENTAL REPORT  
to the Hazard Mitigation Opportunities  
in the State of Arizona Report of April 1, 1993**



In Response to the January 19, 1993 Disaster Declaration  
for the State of Arizona

By

THE REGION IX INTERAGENCY HAZARD MITIGATION TEAM

## SUPPLEMENTAL REPORT



### **SECOND MEETING OF THE INTERAGENCY HAZARD MITIGATION TEAM**

#### **FEDERAL AGENCIES**

Federal Emergency Management Agency  
U. S. Army Corps of Engineers  
National Weather Service  
Soil Conservation Service  
Department of Transportation  
Bureau of Indian Affairs  
Bureau of Reclamation  
Farmers Home Administration

#### **ARIZONA STATE AGENCIES**

Division of Emergency Management  
Department of Water Resources  
Department of Transportation  
Department of Agriculture  
Department of Environmental Quality  
Department of Emergency and Military Affairs

#### **COUNTIES, MUNICIPALITIES, AND OTHERS**

Yuma County  
Wellton-Mohawk Irrigation and Drainage District  
Salt River Project  
Greenlee County  
Fort Yuma-Quechan Tribe,  
Cocopah Tribe  
American Red Cross  
State and Federal Elected Representatives

## SUPPLEMENTAL REPORT



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### OVERVIEW OF FLOODING ON THE LOWER GILA RIVER

During January of 1993, a number of storm systems of tropical origin moved through Arizona dumping record rainfall and snow in the watersheds above Painted Rock Dam. The most significant storms occurred during the following periods: January 6-8, January 10-11, January 14-15 and January 17-18. Saturated soil conditions and the record snow pack in the watersheds above the Salt and Verde Rivers resulted in record discharges from Salt River Project reservoirs resulting in a peak discharge through Phoenix of approximately 150,000 cubic feet per second (cfs). Approximately a third of the total inflow volume to Painted Rock Reservoir was from the Gila/Coolidge and Agua Fria/New Waddell systems.

Combined inflows to Painted Rock Reservoir were the highest since 1888, the first year records were kept. Inflow to the reservoir for the period of January 7, 1993 to February 7, 1993 was 2.67 million acre-feet (MAF). Based on all available records (since 1888), the U.S. Army Corps of Engineers estimates the return frequency of the 1993 flows into Painted Rock Reservoir to be greater than 200 years.

Due to the nature of the storms, the complexity of forecasting runoff, and the flood control purpose of Painted Rock Dam and Reservoir, the Corps of Engineers stored the incoming floodwater until January 11, 1993. Release began on January 12, 1993, at approximately 5000 cfs and varied between 5000 cfs and 12,500 cfs until February 22, 1993.

Another storm during the weekend of February 19, 1993 filled Painted Rock Reservoir to capacity resulting in uncontrolled spillway discharges into the Lower Gila River. Before the 1993 winter runoff, the maximum discharge from Painted Rock Dam had been 5000 cfs. The new peak discharge of 25,526 cfs occurred on February 27, 1993. Since that date, the discharge has declined to and remains at approximately 22,500 cfs.

Taking into consideration the current inflows and the projected spring snow-melt, current policy is to maintain A 20,000 cfs discharge from Painted Rock Reservoir till a safe level has been reached. The goal at that point is to maintain the outflow at approximately 12,500 cfs until the reservoir has been emptied.

### DESCRIPTION OF DAMAGES TO THE LOWER GILA RIVER FLOODPLAIN

Damage downstream of Painted Rock Reservoir is widespread and varied. Immediately downstream and all the way to Yuma, homes, roads and farms suffered extensive damage. Schools were isolated and students were stranded or missed schooling. It is estimated that 45 homes were inundated, or partially damaged. All of the bridges were underwater except 7E. Near 51 E the river has left its normal channel. The major damage was to existing crops, cropland, irrigation and drainage facilities. Estimates are that 20 thousand acres of farmland and crops were damaged. A conservative estimate of damage downstream of Painted Rock Dam including present crop losses, homes, bridges, roads, irrigation facilities, summer planting (1993) and fall planting (1993) exceeds 100 million dollars.

Several areas in Wellton-Mohawk, the North Gila and South Gila Valleys were impacted by water seeping through levees or protective dikes.

## SUPPLEMENTAL REPORT



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### HAZARD MITIGATION OPPORTUNITIES AND RECOMMENDATIONS ALONG THE LOWER GILA RIVER

The Interagency Hazard Mitigation Team (IHMT) selected four major areas that represent the best opportunities to accomplish significant flood hazard mitigation.

1. Enhancement of river channel from 57E to the confluence of Gila and Colorado rivers.
2. Enhancement of existing roads and bridges, including construction of an alternative roadway from Roll to U.S. Highway 95.
3. Enhancement of emergency response system.
4. Creation of additional flood storage capacity in the upper reaches of Gila River and its tributaries.

The Team developed work programs for each of the above areas. The work programs are the agreed upon recommendations of the Yuma Interagency Hazard Mitigation Team.

*An additional area suggested for mitigation was rehabilitation of agricultural lands under the auspices of FEMA. It was determined that this would not be feasible under the current FEMA Congressional mandate and the existing disaster assistance programs. Another source of funding must be found. This still leaves the problem of where the farmer can find financial assistance for the regrading and fertilizing of the soils after each flooding episode.*

*Possible sources of assistance were discussed at a March 9, 1993 meeting held in Phoenix for Arizona Agricultural lenders. A brief discription of these sources follows:*

1. *The USDA Argricultural Stabilization and Conservation Service operates an Agricultural Disaster and an Emergency Conservation Program. Legislative action is needed to roll forward unexpended funds to the current fiscal year;*
2. *The USDA Emergency Watershed Protection Program (EWP) had a \$12 million Bill approved by Congress in 1992, but would need to be allocated by the President through OMB;*
3. *Farmers Home Administration/USDA operates an Emergency Disaster Loan Program and in certain conditions is able to make adjustments of existing debts because of natural disasters. There is also credit guarantee programs for operating farms;*
4. *Small Business Administration has an Economic Injury Loan Program for businesses to help carry debts and provide working capital*

*Without restoration of his economic base, the farmer will be hard put to secure financing for future crops, and concurrently the local financial institutions, to maintain their inclusion in the FDIC, are unable to loan this critical capital without adequate collateral.*

## SUPPLEMENTAL REPORT



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It is the hope of the IHMT that the information and recommendations compiled in this report will lead to actions by citizens, federal, state and local governments, Indian Communities and non-profit organizations to mitigate or prevent flood damage in the future.

Other areas within the disaster declared counties also have significant hazards and opportunities for mitigation. They will be addressed by the FEMA and State Hazard Mitigation Officers as required by Section 409 Stafford Act.

This report also provides the basis for these actions to be included in Arizona's existing State Hazard Mitigation Plan. An update of the Arizona's Hazard Mitigation Plan is due July 19, 1993, 180 days from the declaration date.

### RECOMMENDATION NO. 1

PROJECT TITLE: Channel Enhancement and Flood Control Criteria At and Below Painted Rock Reservoir

Initiate an evaluation of enhancing the channel capacity below Painted Rock Dam and reevaluate the flood control criteria for operation of the reservoir as soon as practicable. Implement the evaluation results upon receipt of authorization and funding.

BACKGROUND: Repetitive flooding has primarily been along the reach between Avenue 57E and the confluence of Gila and Colorado rivers, and is caused by inadequate flood control channel capacity to accommodate flood control releases above 10,000 cfs from Painted Rock Reservoir.

The 2.5 maf Painted Rock Reservoir was designed to discharge flood impounded water into the Lower Gila River at a maximum rate of 22,500 cfs. However, no provision was made for the downstream flood control channel to accommodate flows greater than 10,000 cfs without extensive flooding.

The net result of this discrepancy between maximum outflow and the channel carrying capacity, is that the flood control capabilities of Painted Rock Reservoir have been significantly compromised.

LEAD AGENCY(S): U.S. Army Corps of Engineers  
State of Arizona

SUPPORT AGENCY(S): Bureau of Reclamation  
Wellton-Mohawk Irrigation and Drainage District  
North Gila Irrigation and Drainage District  
Yuma Irrigation District  
Yuma County  
Maricopa County

SOURCES OF FUNDING: Congressional authorization and appropriation  
FEMA Section 404

SCHEDULE: Proceed as soon as practicable.

## SUPPLEMENTAL REPORT



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### RECOMMENDATION NO. 2

PROJECT TITLE: Roads And Bridges

Ensure that the following road crossings will remain open for the flow capacities specified:

Avenue 7E	=	25,000 cfs
Highway 95	=	25,000 cfs
Avenue 20E	=	25,000 cfs
Avenue 40E	=	50,000 cfs
Avenue 64E	=	50,000 cfs
Avenue 75	=	25,000 cfs

BACKGROUND: Gila River floods in 1979, 1980, 1983, 1992 and 1993 forced closing of road and bridge crossings. This has forced the residents living in areas north of the Gila River to drive long distances (in some cases, over 130 miles to reach commercial areas). This has also impeded farmers moving agricultural products to the market in a timely manner, provision of medical services to north bank residents and caused school closures.

LEAD AGENCY(S): Federal Highway Administration  
Arizona Department of Transportation

SUPPORT AGENCY(S): Yuma and Maricopa Counties'  
Departments of Public Works  
U.S. Army Corps of Engineers

SOURCES OF FUNDING: State of Arizona Federal Highway Administration  
U.S. Army Corps of Engineers  
FEMA Section 404

SCHEDULE: Schedule for completion by end of calendar year 1996

### RECOMMENDATION NO. 3

PROJECT TITLE: Enhancement Of Emergency Response System

A central point for data collection and dissemination should be developed for Yuma County enabling all agencies involved in emergency response to be aware of each other's activities throughout the disaster area.

BACKGROUND: There was no single source of data available from normal emergency management sources (State Division of Emergency Management, County Emergency Services, ARC, etc.) about events and people affected by the flooding in the Yuma County area. Data was needed on the number of people still living in the semi-isolated areas, probability of flooding, chronology and severity of events.

LEAD AGENCY(S): Arizona Division of Emergency Management  
City of Yuma Fire Department

## SUPPLEMENTAL REPORT



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SOURCES OF FUNDING: FEMA Disaster Preparedness Improvement Program  
SCHEDULE: Fiscal year 1993-94

### RECOMMENDATION NO. 4

PROJECT TITLE: Creation Of Additional Flood Storage Capacity

Review hydrology of Salt, Gila, Verde and San Pedro rivers above existing dams to determine if additional storage capacity can be environmentally and economically justified.

BACKGROUND: Lack of adequate storage on the Salt, Verde, Gila and San Pedro rivers (additional storage on the Salt River will be available following modifications to Roosevelt Dam) results in loss of a valuable resource from the State of Arizona and causes considerable problems (groundwater and surface flooding, road closures and isolation of residents) downstream of Painted Rock Dam.

Since the 1960's the Gila River has had significant inflows into Painted Rock Reservoir. Additional upstream storage capacity during the 1993 winter floods might have prevented filling of the Painted Rock Reservoir and the subsequent uncontrolled spillway flows that caused so much damage downstream.

LEAD AGENCY(S): U.S. Army Corps of Engineers

SUPPORT AGENCY(S): Salt River Project  
Bureau of Reclamation  
Bureau of Indian Affairs

SOURCES OF FUNDING: USACOE technical assistance  
Bureau of Reclamation

SCHEDULE: Complete by year 2000

SUPPLEMENTAL REPORT



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**GILA RIVER EMERGENCY TASK FORCE  
ARIZONA DIVISION OF EMERGENCY MANAGEMENT**

**DATE:** MARCH 3, 1993  
**TO:** GILA RIVER EMERGENCY TASK FORCE  
INTERAGENCY HAZARD MITIGATION TEAM  
**FROM:** DICK LOCKWOOD, STATE COORDINATING OFFICER  
DICK BUCK, FEDERAL COORDINATING OFFICER  
**SUBJECT:** JOINT MEETING OF GILA RIVER TASK FORCE AND THE  
INTERAGENCY HAZARD MITIGATION TEAM

The Governor's Gila River Emergency Task Force and the FEMA Disaster 977, Interagency Hazard Mitigation team will meet jointly at 8:00 AM on Tuesday, March 16, 1993.

The meeting will be held in Yuma AZ. at Fire Station #1, 298 West 4th Street

This will be a comprehensive Hazard Mitigation/Task Force information and planning meeting. We intend to discuss and develop some coordinated approaches to minimize future damage from uncontrolled flows in the Lower Gila River. In addition, the Yuma County supplement to the Interagency Hazard Mitigation Team Plan will be developed at this meeting.

SUPPLEMENTAL REPORT



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**LIST OF PARTICIPANTS**

FEMA INTERAGENCY HAZARD MITIGATION TEAM MEETING  
AT YUMA, ARIZONA

FEMA-977-DR-AZ MARCH 16, 1993

(\*) = Member of Gila River Emergency Task Force

<b>Ken Clouser</b> Safety of Dams Engineer Bureau of Indian Affairs P.O. Box 10 Phoenix, AZ 85001	TEL: (602) 379-6956 FAX: (602) 379-6835
<b>Representative Pat Conner(*)</b> District 5 Arizona State Legislature 1700 West Washington Phoenix, AZ 85007	TEL: (602) 572-5372
<b>Barbara Corsette</b> State Hazard Mitigation Officer Arizona Division of Emergency Management 5636 East McDowell Road Phoenix, AZ 85008	TEL: (602) 231-6229 FAX: (602) 231-6271
<b>Rosalinda M. Diaz</b> Acting Manager, SW Arizona Chapter American Red Cross P.O. Box 12512 Marine Corps Air Station Yuma, AZ 85369	TEL: (602) 341-2427 FAX: (602) 341-5208
<b>Brad Dierdorf</b> USDA-Farmers Home Administration 2450 South Fourth Avenue, Suite 401 Yuma, AZ 85364	TEL: (602) 726-4707 FAX: (602) 341-1499
<b>Joe Dixon(*)</b> U.S. Army Corps of Engineers North Central Avenue Phoenix, AZ 85012	TEL: (602) 640-2003 FAX: (602) 640-5382 3636
<b>Stan Eccles</b> FEMA Hazard Mitigation Officer Disaster Field Office 2 Gateway Center, Suite 100 432 North 44 Street Phoenix, AZ 85008	TEL: (602) 231-5400 FAX: (602) 220-9753

SUPPLEMENTAL REPORT



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**Bob Edmisten** TEL: (415) 705-2408  
Natural Disaster Manager FAX: (415) 705-1425  
U.S. Army Corps of Engineers  
South Pacific Division  
San Francisco, CA 94111

**Neil Erwin** TEL: (602) 506-1501  
Flood Control District of FAX: (602) 506-4601  
Maricopa County  
2801 West Durango  
Phoenix, AZ 85009

**Mike Franjevic** TEL: (602) 379-4607  
Warning Coordinator Meteorologist FAX: (602) 267-8051  
National Weather Service  
PAB 500, P.O. Box 52025  
Phoenix, AZ 85072-52025

**Jim Frazier** TEL: (602) 782-1646  
Arizona Department of Transportation FAX: (602) 344-2509  
2243 East Gila Ridge Road  
Yuma, AZ 85365

**Lynn Goss** TEL: (602) 231-6376  
Administrative Assistant FAX: (602) 231-6231  
Arizona Division of Emergency Management  
5636 East McDowell  
Phoenix, AZ 85008

**Clyde Gould** TEL: (602) 785-3351  
Manager, WMIDD FAX: (602) 785-3351  
Rt. 1, Box 19  
Wellton, AZ 85356

**Hank Green, Director(\*)** TEL: (602) 783-5960  
Yuma County Emergency Management FAX: (602) 343-8608  
298 West 4th Street  
Yuma, AZ 85364

**Dave Gudge** TEL: (602) 343-8155  
U.S. Bureau of Reclamation FAX: (602) 343-8320  
P.O. Box D  
Yuma, AZ 85366

SUPPLEMENTAL REPORT



**Herb Guenther(\*)**  
WMIDD  
Welton-Mohawk Drive  
Wellton, AZ 85356

TEL: (602) 785-3351  
FAX: (602) 343-8320

**Terry Hamlin**  
Congressional Liaison  
FEMA  
2 Gateway Center, Suite 100  
432 North 44 Street  
Phoenix, AZ 85008

TEL: (602) 231-5400  
FAX: (602) 220-9753

**Ed Henry**  
U.S. Department of Transportation  
Coast Guard Island (PE)  
Alameda, CA 94501

TEL: (510) 437-5841  
FAX: (510) 437-5700

**Christina Herrera**  
Yuma County Emergency Management  
298 W. Fourth Street  
Yuma, AZ 85364

TEL: (602) 783-5960  
FAX: (602) 343-8608

**George Humphrey**  
Yuma Fire Department  
298 W. Fourth Street  
Yuma, AZ 85364

TEL: (602) 343-8749  
FAX: (602) 343-8608

**Lisa Jackson**  
Administrative Assistant  
Congressman Bob Stump  
230 N. First Avenue, Room  
2001 Phoenix, AZ 85025

TEL: (602) 379-6923  
FAX: (602) 271-0611

**Raj Joshi**  
FEMA Hazard Mitigation Specialist  
2 Gateway Center, Suite 100  
432 North 44 Street  
Phoenix, AZ 85008

TEL: (602) 231-5400  
FAX: (602) 220-9753

**Larry Killman**  
River Project Supervisor  
WMIDD  
30570 Wellton Mohawk Drive  
Wellton, AZ 85356

TEL: (602) 785-3351  
FAX: (602) 785-3551

## SUPPLEMENTAL REPORT



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**Dan Lawrence(\*)** TEL: (602) 542-1541  
Chief Engineer FAX: (602) 256-0506  
Arizona Department of Water Resources  
15 South 15 Avenue  
Phoenix, AZ 85007

**Dick Lockwood(\*)** TEL: (602) 231-6245  
Director FAX: (602) 231-6231  
Arizona Division of Emergency Management  
5636 East McDowell Road  
Phoenix, AZ 85008

**John Latourelle** TEL: (602) 231-5400  
FEMA Hazard Mitigation Specialist FAX: (602) 220-9753  
2 Gateway Center, Suite 100  
432 North 44 Street  
Phoenix, AZ 85008

**Mike Lunt** TEL: (602) 359-2074  
Greenlee County  
Route 1, Box 54  
Duncan, AZ 85534

**Brian Munson(\*)** TEL: (602) 207-2384  
Assistant Director, Water Quality FAX: (602) 207-4528  
AZ Department of Environmental Quality  
303 North Central  
Phoenix, AZ 85012-2809

**Maj. Gen. Don Owens(\*)** TEL: (602) 267-2710  
Department of Emergency and FAX: (602) 267-2432  
Military Affairs  
5636 E. McDowell  
Phoenix, AZ 85008

**Liz Pabst(\*)** TEL: (602) 264-9481  
Manager, Disaster Services FAX: (602) 265-5726  
American Red Cross  
P.O. Box 17090  
Phoenix, AZ 85016

**Roger Patterson(\*)** TEL: (602) 329-2300  
Acting County Engineer FAX: (602) 726-5626  
Yuma County Development Services  
2703 Avenue B  
Yuma, AZ 85364

SUPPLEMENTAL REPORT



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**Ron Piceno**  
Congressman Ed Pastor  
332 E. McDowell, Suite  
10 Phoenix, AZ 85004

TEL: (602) 256-0551  
FAX: (602) 257-9103

**William Pyott**  
Land Operations Officer  
Fort Yuma Agency  
Bureau of Indian Affairs  
P.O. Box 1591  
Yuma, AZ 85366-9591

TEL: (619) 572-0248  
FAX: (619) 572-0895

**Patricia Quahlupe**  
Vice President  
Quechan Tribe  
Box 11352  
Yuma, AZ 85366

TEL: (602) 572-0213  
FAX: (602) 572-2102

**Barry Rodriguez**  
CEERT  
P.O. Box Bin G  
Somerton, AZ 85350

TEL: (602) 627-2102  
FAX: (602) 627-3173

**Ed Sanchiz**  
Sen John McCain Office  
151 N. Centennial Way, # 1000  
Mesa, AZ 85201

TEL: (602) 640-2567

**Bill Shough**  
FEMA Hazard Mitigation Specialist  
2 Gateway Center, Suite 100  
432 North 44 Street  
Phoenix, AZ 85008

TEL: (602) 231-5400  
FAX: (602) 220-9753

**William Michael Smith**  
Attorney, Yuma County  
290 First Avenue  
Yuma, AZ 85364

TEL: (602) 783-8875  
FAX: (602) 329-1816

**Dave Stevens**  
Chief, River Operations Branch  
Bureau of Reclamation, Yuma  
P.O. Box D  
Calle Agua Salada  
Yuma, AZ 85366

TEL: (602) 343-8431  
FAX: (602) 343-8320

## SUPPLEMENTAL REPORT



---

**Bobbi Stevenson**  
USDA- SCS  
2450 S. 4th Avenue, Suite 402  
Yuma, AZ 85364

TEL: (602) 726-5562  
FAX: (602) 341-1499

**John F. Sullivan**  
Manager, Water Customer Services  
and Resource Planning Salt River Project  
P.O. Box 52025  
Phoenix, AZ 85072-2025

TEL: (602) 236-5812  
FAX: (602) 236-3405

**Ronald J. Tallent(\*)**  
Arizona Department of Transportation  
206 South 17th Avenue, 176A  
Phoenix, AZ 85007

TEL: (602) 255-7388

**Oren D. Thompson(\*)**  
Associate General Manager  
Salt River Project  
P.O. Box 52025  
Phoenix, AZ 85072-2025

TEL: (602) 236-3455  
FAX: (602) 236-4350

**John L. Wake(\*)**  
Assistant Director  
AZ Department of Agriculture  
1688 West Adams, Room 416  
Phoenix, AZ 85007

TEL: (602) 542-0978  
FAX: (602) 542-0111

**Will Worthington(\*)**  
U.S. Bureau of Reclamation  
23636 N. 7th Street  
Phoenix, AZ 85014

TEL: (602) 870-2494

**Robert Ybarra**  
CEERT  
563 10th Avenue  
Yuma, AZ 85350

TEL: (602) 783-8197

**Don J. Young**  
Chief, Water Operations Division  
Bureau of Reclamation, Yuma  
P.O. Box D  
Yuma, AZ 85366

TEL: (602) 343-8749  
FAX: (602) 343-8320

# APPENDIX A

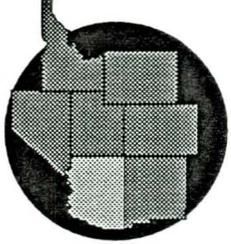


## Water Supply Outlook

March, 1993

APPENDIX A

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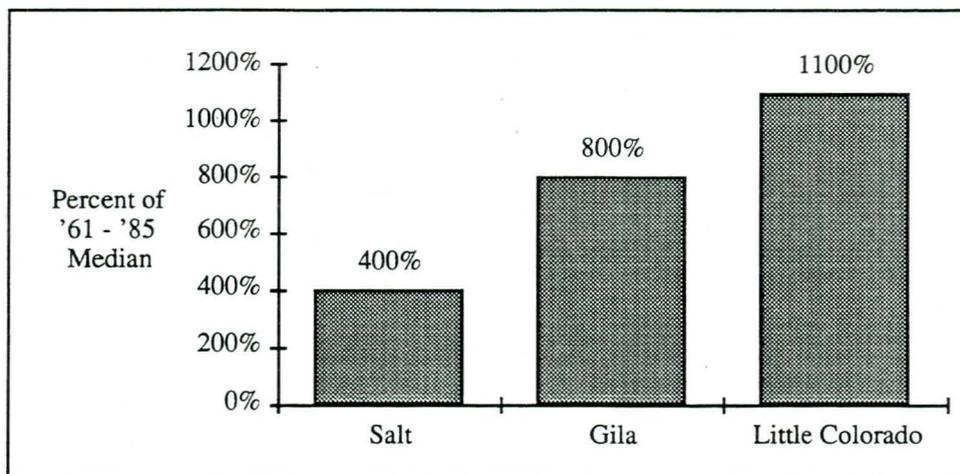
 **WATER SUPPLY OUTLOOK**  
for the  
**LOWER COLORADO**  
*COLORADO BASIN*  
*RIVER FORECAST CENTER*  
*NATIONAL WEATHER SERVICE, SALT LAKE CITY, UT* 

MARCH 1, 1993

**SUMMARY**

The unusually wet winter for most of Arizona continues. Significant storms occurred during the latter part of February resulting in very high streamflows and increases in snowpacks. Runoff volumes are forecast to be much above median for the March through May period.

**MARCH - MAY VOLUME FORECASTS**



**30 DAY WEATHER OUTLOOK**

The National Weather Service 30 day outlook for the Lower Colorado River Basin calls for near normal temperatures and near normal precipitation.

**INSIDE**

Topic	Page
Summary	1
Salt River	2
Gila River	3
Little Colorado River	4
Specific Site Forecasts	5
EOM Reservoir Contents	6
Monthly Streamflows	7
Precipitation Maps	9,10
Use of the Median	11
Additional Information	12

APPENDIX A

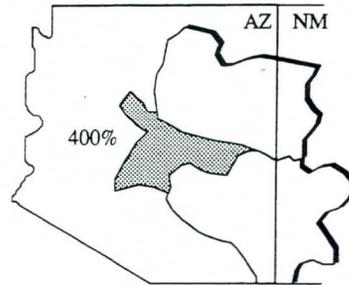


SALT RIVER

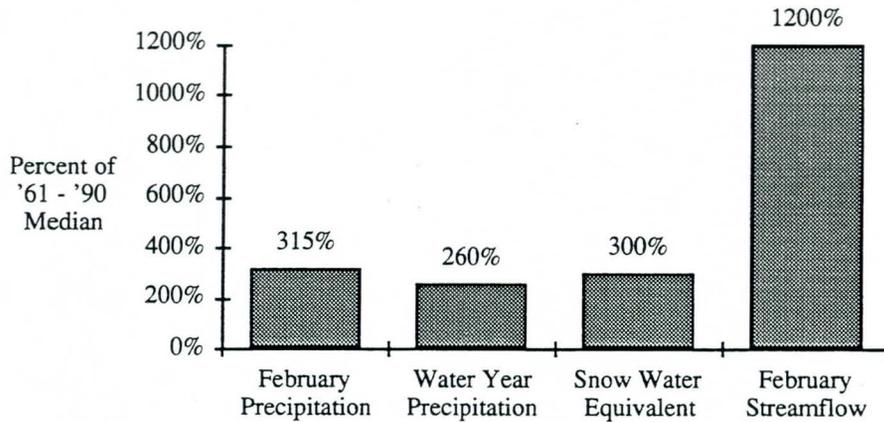
The March 1 water supply outlook for the spring of 1993 is for much above median runoff volumes. Forecasts range from 340 to 570 percent of the 1961 to 1990 median.

The February – May streamflow forecast is as follows:

Salt River / Verde/ Tonto Ck:  
Much Above Median



BASIN CONDITIONS - MARCH 1, 1993



Specific site forecasts are listed beginning on page 5.

## APPENDIX A

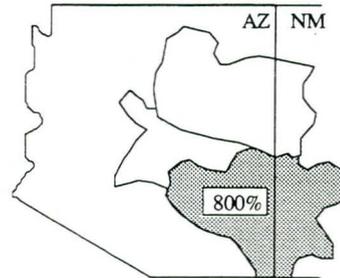
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### GILA RIVER

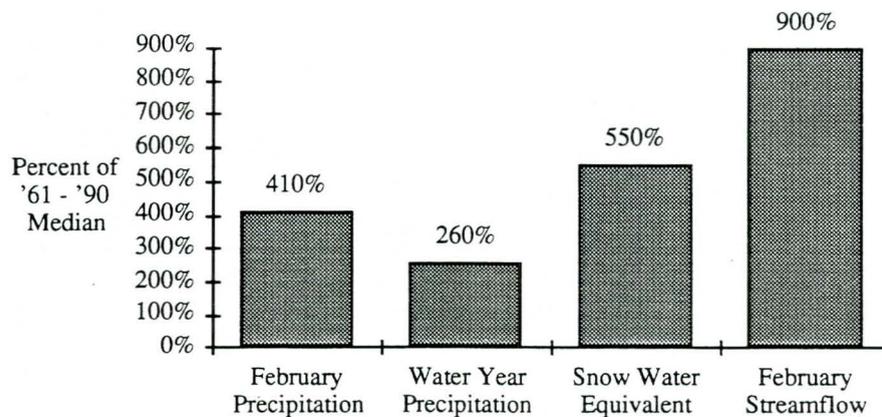
The March 1 water supply outlook for the spring of 1993 once again calls for much above median runoff. Forecasts range from 560 to 1100 percent of the 1961 - 1990 median. Like the Salt/Verde River system, Gila River runoff volumes from last month were very large.

The March – May streamflow forecast is as follows:

Gila River :  
Much Above Median



### BASIN CONDITIONS - MARCH 1, 1993



Specific site forecasts are listed beginning on page 5.

## APPENDIX A

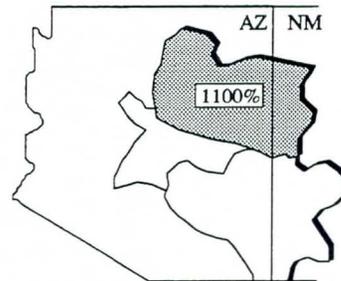


### LITTLE COLORADO

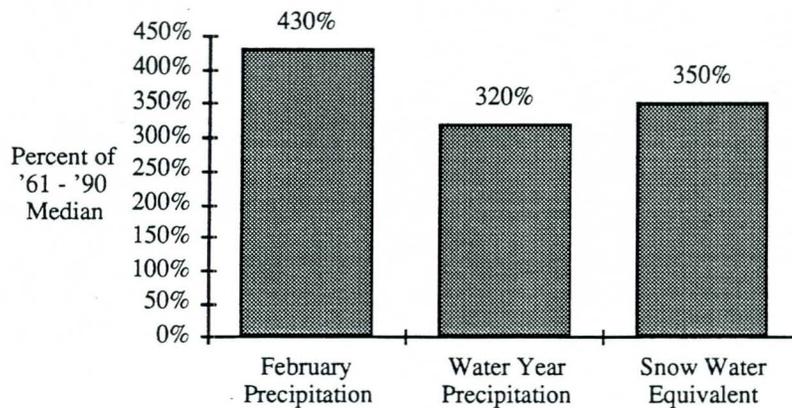
The March 1 water supply outlook for the spring of 1993 is for continued much above median flows. Forecasts range between 260 and 2100 percent of median.

The March – May streamflow forecast is as follows:

Little Colorado River:  
Much Above Median



### BASIN CONDITIONS - MARCH 1, 1993



Specific site forecasts are listed beginning on page 5.

APPENDIX A



SPECIFIC SITE FORECASTS

March through May volume forecasts (except where noted) are listed below.

Stream	Station	Most Probable	Percent Median	Reas. Max	Reas. Min
LITTLE COLORADO ♣	GREER	15.3	259%	19	11.6
	♣ ST JOHNS, NR. LYMAN LK. ABV	32	508%	41	23
	WOODRUFF	45	2100%	61	28
RIO NUTRIA	RAMAH, NR	8.7	723%	13.9	3.5
ZUNI	BLACK ROCK RES. ABV	22	169%	29.8	14.2
CEBOLLA CK	RAMAH RES	4.8	686%	7.7	1.9
CLEAR CREEK	WINSLOW, NR	157	524%	182	132
WALNUT CK	LAKE MARY	13	406%	16.5	9.5
VIRGIN ♣	HURRICANE, NR	265	396%	325	205
GILA	GILA, NR	165	569%	195	135
	VIRDEN, NR, BLUE CK, BLO	225	723%	265	175
	SOLOMON, NR, HEAD OF SAFFORD VLY	515	858%	570	460
	CALVA	465	2370%	500	430
SAN FRANCISCO	GLENWOOD, NR	130	1100%	155	105
	CLIFTON, NR	250	833%	295	205
SALT	ROOSEVELT, NR	900	340%	1065	735
TONTO CK	ROOSEVELT, NR, GUN CK, ABV	120	571%	189	51
VERDE	HORSESHOE DAM, ABV, TANGLE CK,	465	358%	630	300
COLORADO ♣	LAKE POWELL, GLEN CYN DAM, AT	10,100	125%	—	—

♣: April through June forecast period ♣: April through July forecast period

Special Notes:

Colorado - Lake Powell forecast uses a limited set of adjustments with a 25 yr average ('61-'85)

Virgin - Hurricane forecast uses a 30 yr percent of average ('61-'90)

APPENDIX A



END OF MONTH RESERVOIR CONTENTS

RESERVOIR (vol. in 1000 ac-ft)	Usable Capacity	EOM Usable Contents	Percent Usable Capacity
Roosevelt	1,337.0	1,175.0	88%
Horse Mesa	245.0	228.0	93%
Mormon Flat	58.0	54.0	93%
Stewart Mountain	70.0	64.0	91%
Horseshoe	131.0	74.0	56%
Bartlett	178.0	165.0	93%
Total SRP Reservoirs	2,019.0	1,760.0	87%
San Carlos	867.0	936.0	108%
Painted Rock	2,490.0	2,780.0	112%
Alamo	1,045.0	496.0	47%
Lyman	31.0	13.6	44%
Lake Powell	24,322.0	13,913.2	57%
Mead	27,380.0	21,524.0	79%
Mohave	1,810.0	1,709.0	94%
Havasu	619.0	596.0	96%

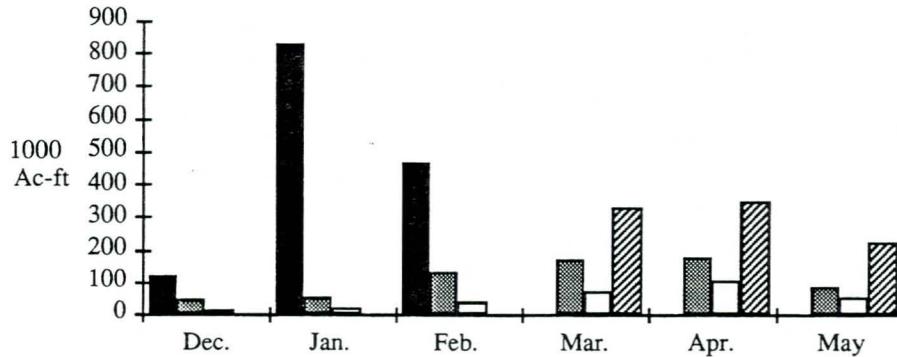
APPENDIX A



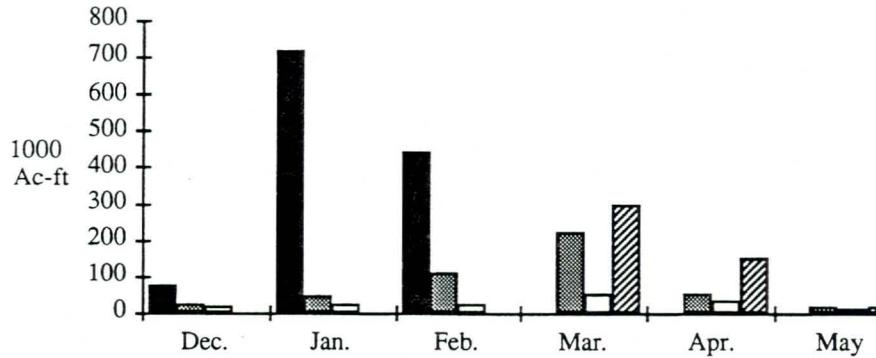
MONTHLY STREAMFLOW

■ 1993 Water Year    ▨ 1992 Water Year    □ 30 yr Median    ▩ 1993 Forecast

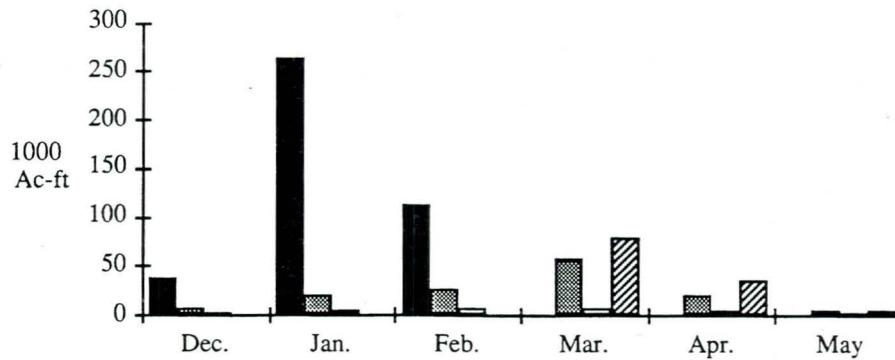
Salt - Roosevelt, nr:



Verde - Horseshoe Dam, abv, Tangle Ck, blo :



Tonto Ck - Roosevelt, nr, Gun Ck, Roosevelt, abv:

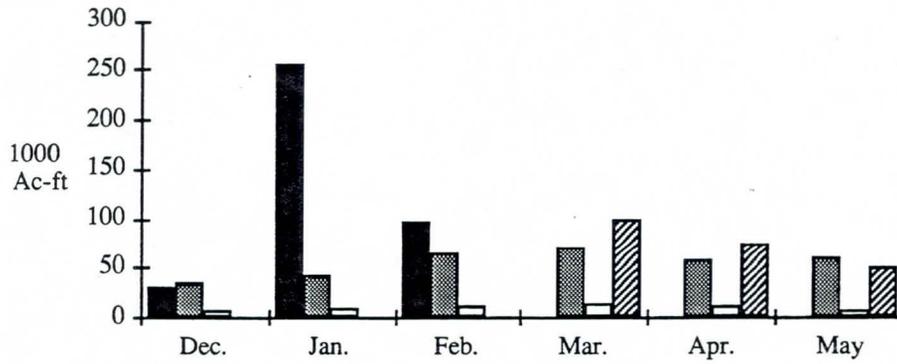


APPENDIX A

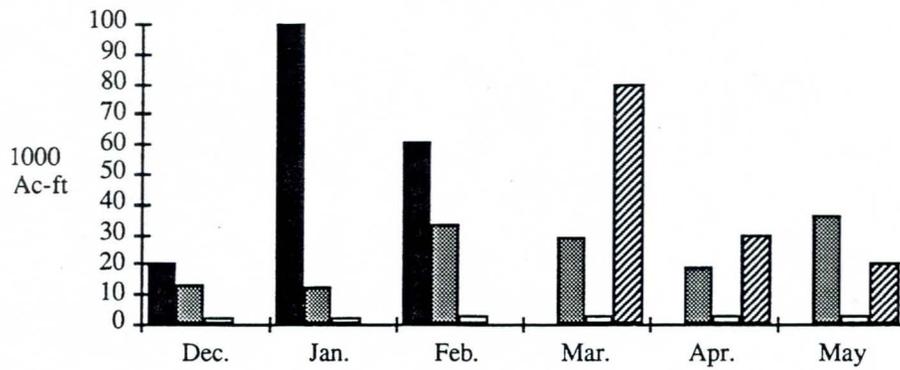


■ 1993 Water Year    ▨ 1992 Water Year    □ 30 yr Median    ▩ 1993 Forecast

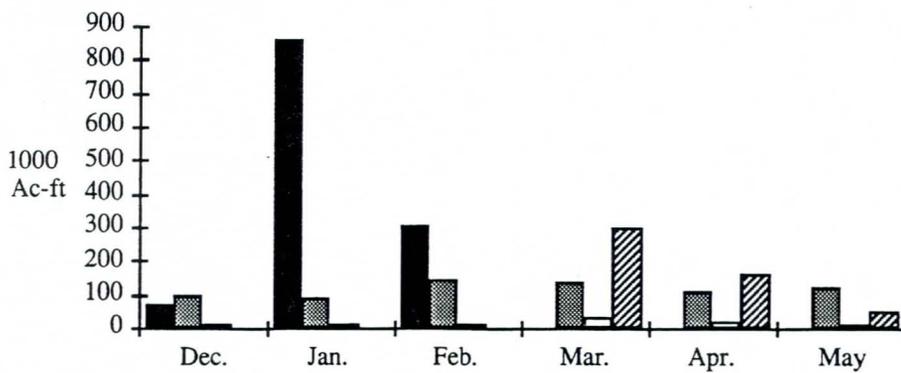
Gila - Virden, nr:



San Francisco - Glenwood, nr :



Gila - Solomon :



## APPENDIX B



Painted Rock Reservoir and Dam

APPENDIX B



Uncontrolled flow over spillway at Painted Rock Dam (25,000+cfs)

Combined inflows to the reservoir totaled 2.67 million acre-feet



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