

ARIZONA's WATER RESOURCES & GROWTH

AG Outlook Forum

February 27, 2004

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ARIZONA DEPARTMENT OF WATER RESOURCES

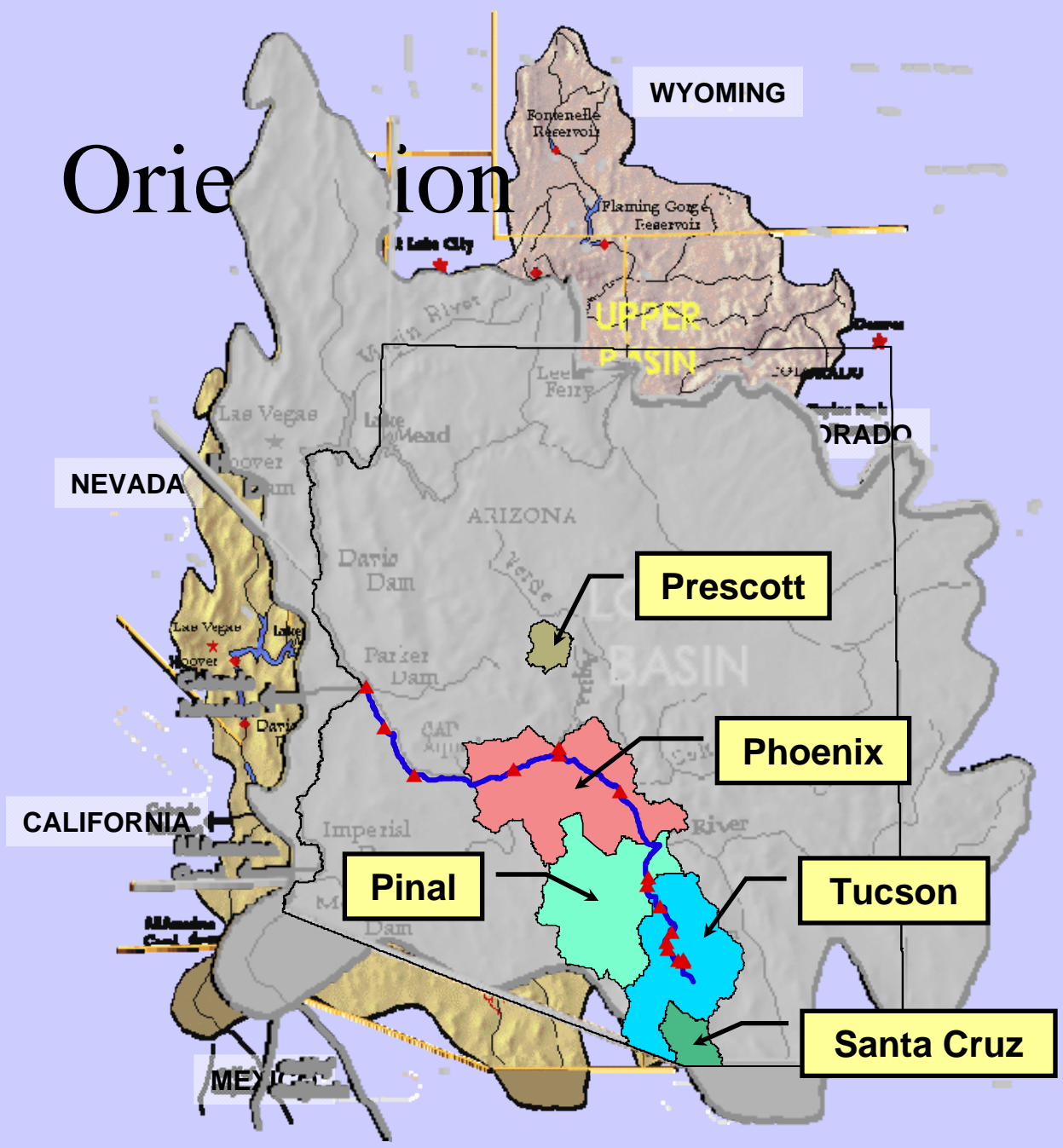


Arizona's Water Resources & Growth

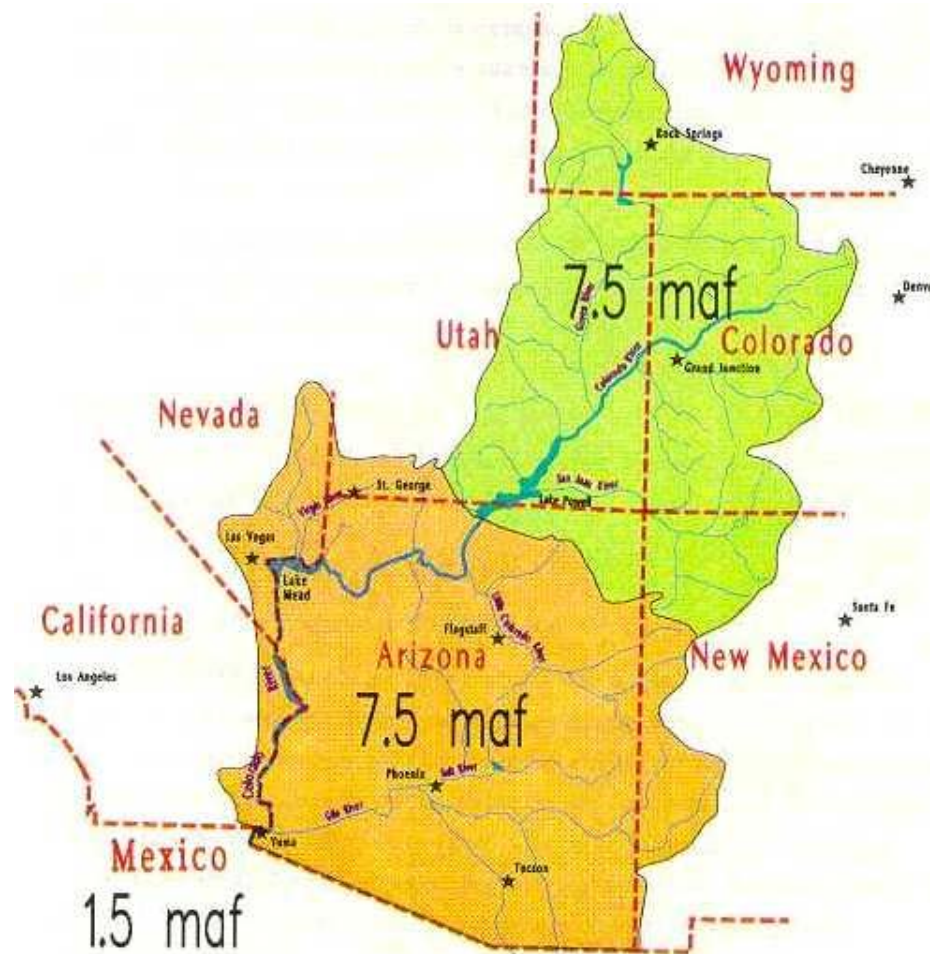
- Overview of water resources & drought
- Overview of water management in AZ
- Water resources & planning for growth
- Current activities & issues



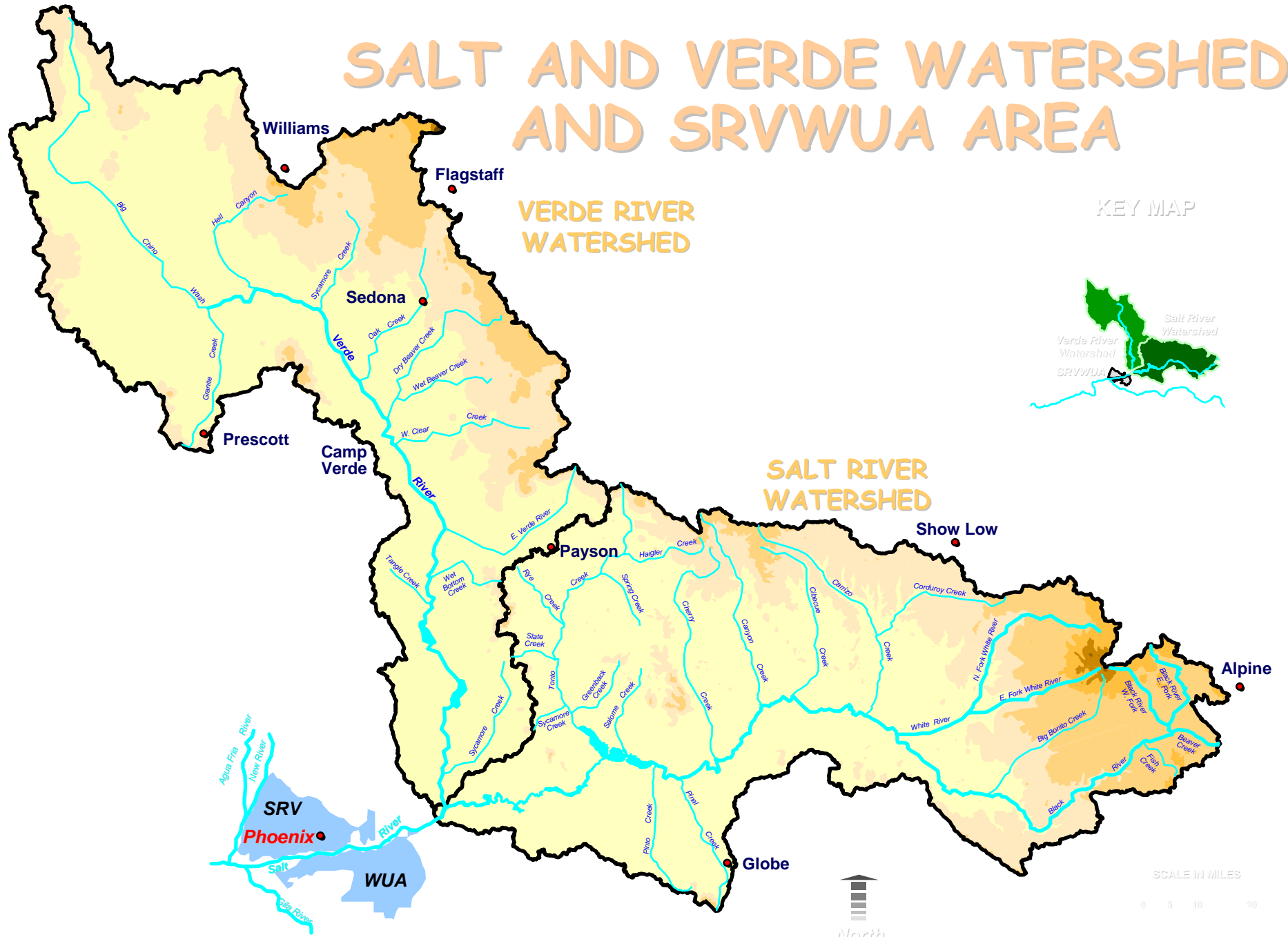
Orientation



Upper/Lower Colorado River Basins



SALT AND VERDE WATERSHED AND SRVWUA AREA



KEY MAP

SCALE IN MILES

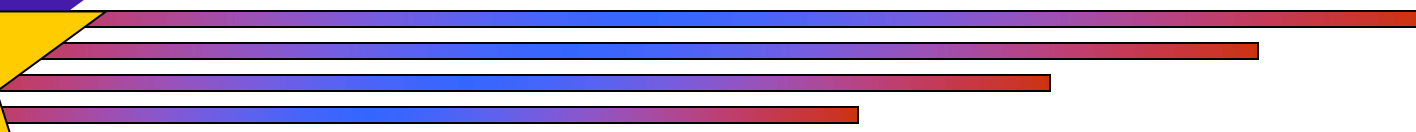


SUPPLY (Source: ADWR)

Water Source	Million Acre-Feet	% of total
SURFACE WATER		
Colorado River	1.3	18
CAP	1.5	21
In-State Rivers	1.4	19
GROUNDWATER	2.9	40
RECLAIMED WATER	0.14	2
<i>Total</i>	7.24 MAF	

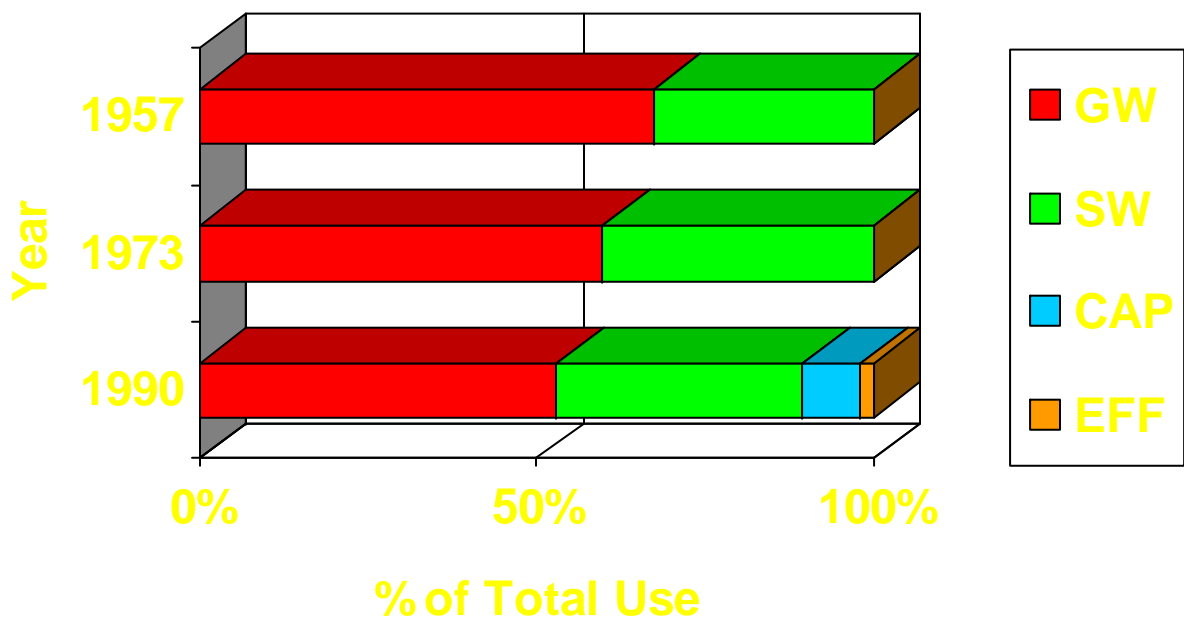


OVERVIEW OF WATER RESOURCES IN ARIZONA



HISTORIC SUPPLY & DEMAND STATEWIDE

WATER USE BY SOURCE

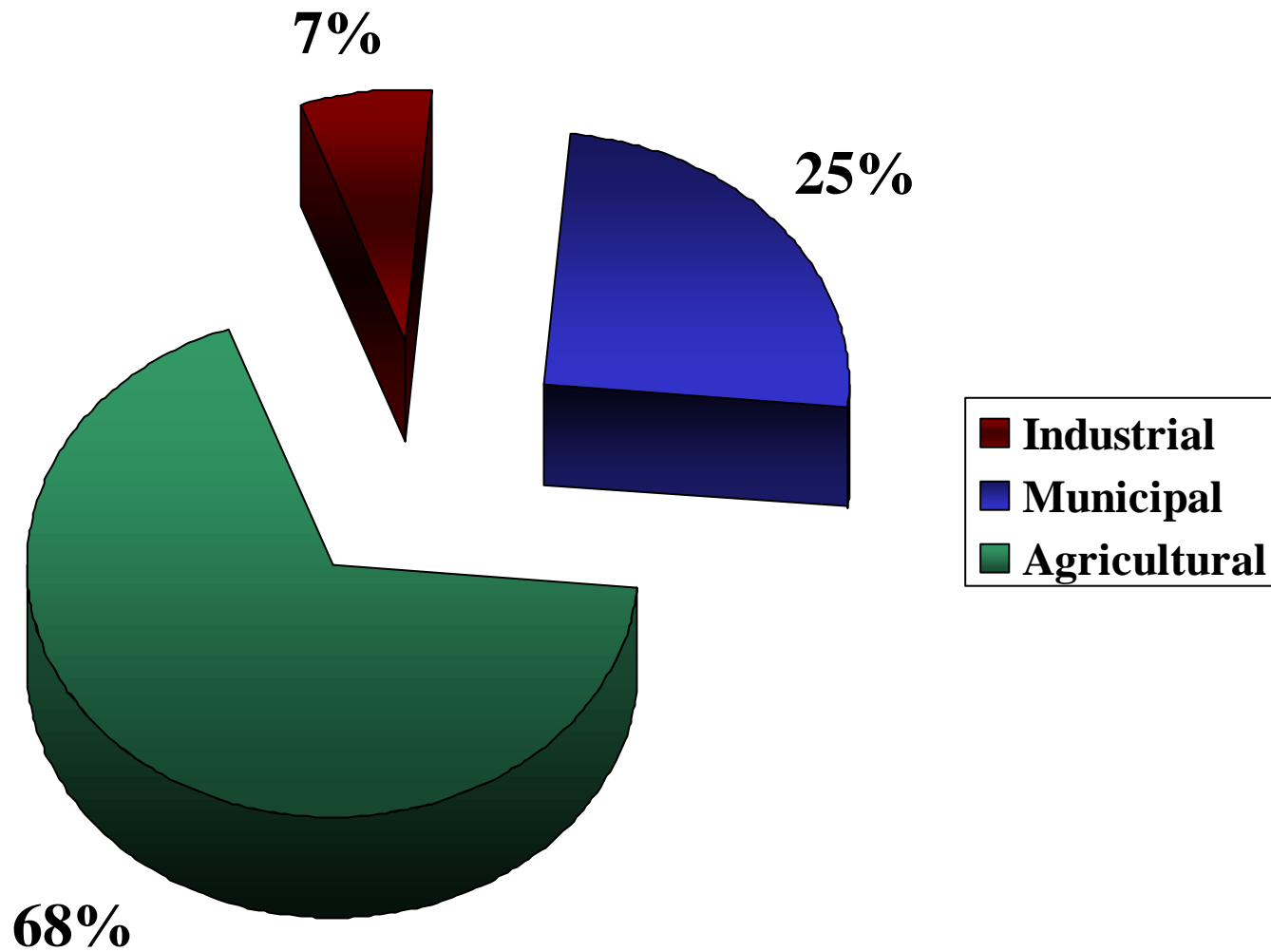


1957
 TOTAL USE
 7,096,000 AF

1973
 TOTAL USE
 8,193,610 AF

1990
 TOTAL USE
 6,299,336 AF

CONSUMPTION



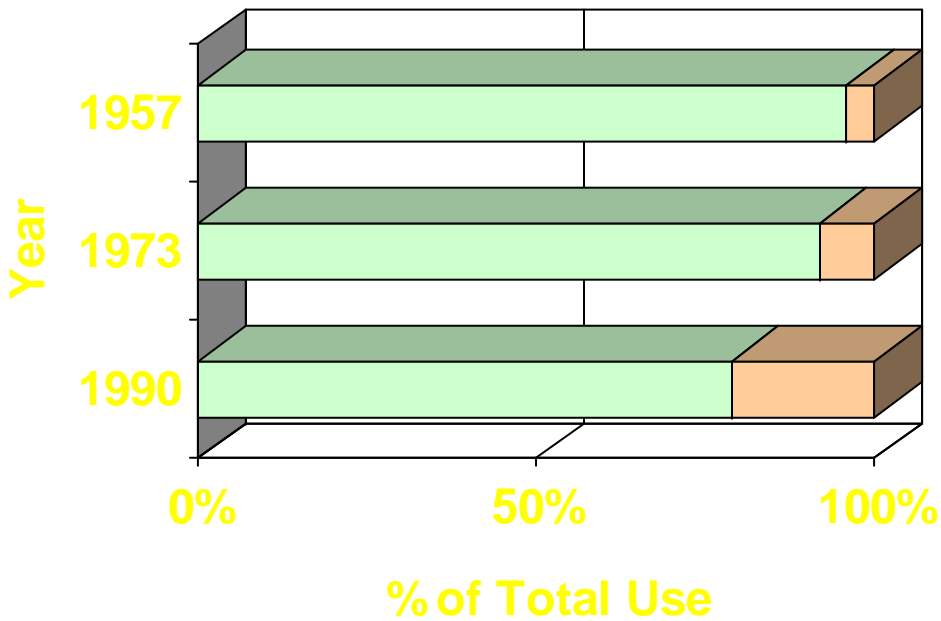
OVERVIEW OF WATER RESOURCES IN ARIZONA



HISTORIC SUPPLY & DEMAND STATEWIDE

ARIZONA DEPARTMENT OF WATER RESOURCES

WATER USE BY SECTOR



1957

AG 6,800,000 AF
M&I 296,000 AF

1973

AG 7,530,211 AF
M&I 663,399 AF

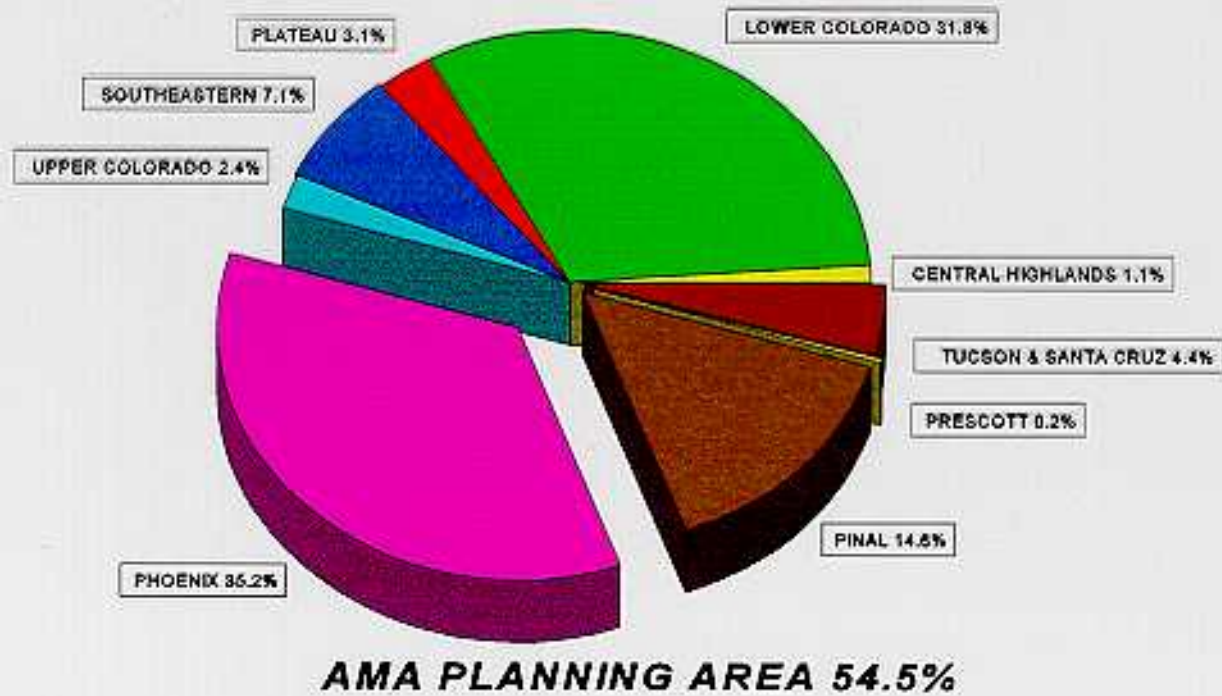
1990

AG 4,901,462 AF
M&I 1,309,565 AF

Water Use

STATE OF ARIZONA 1990 WATER USE

PERCENT WATER DEMAND BY PLANNING AREA

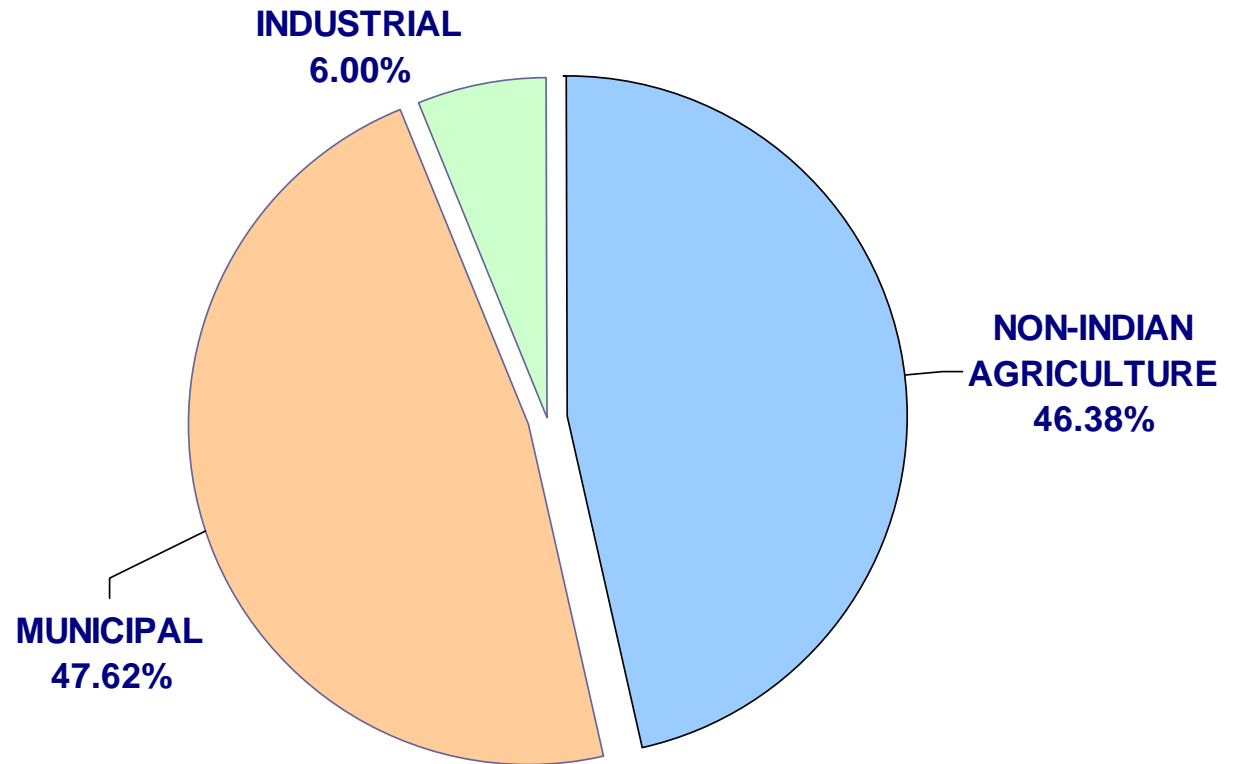


WATER DEMAND CHARACTERISTICS

arizona department of water resources - phoenix ama

~ Demand by Sector ~

2000
Total
Demand:
2.1 MAF

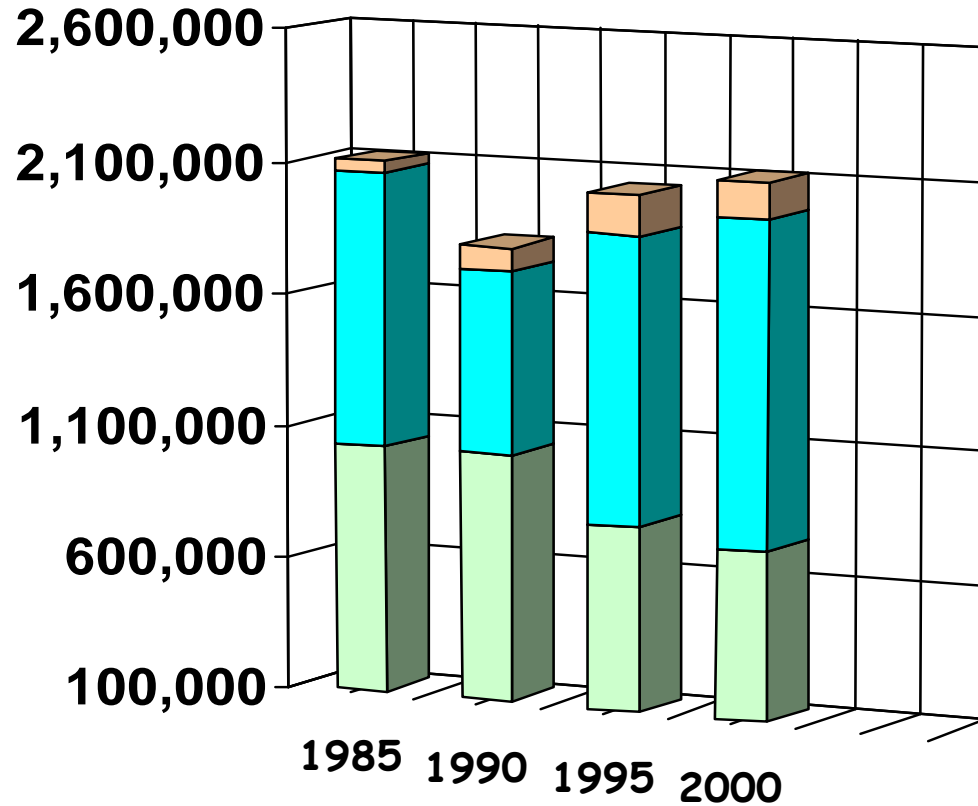


Municipal use includes Palo Verde Nuclear Generating Facility

AMA CHARACTERISTICS

AMA Water Use By Source

arizona department of water resources - phoenix ama



Groundwater (AF)

Surface Water (AF)

Effluent (AF)

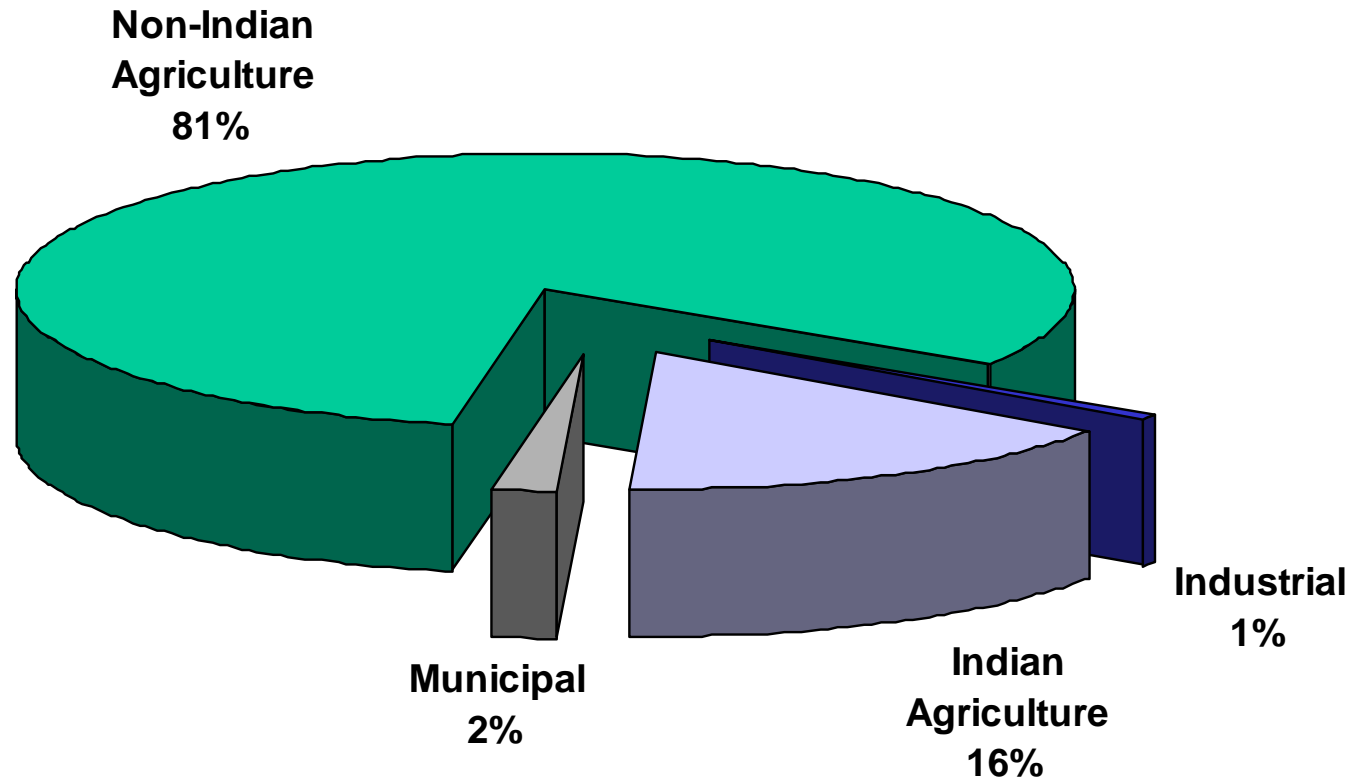
- 1985 GW
47% of
AMA Use

- 2000 GW
35% of
AMA Use

PINAL AMA

Water Demand

1998 Water Use



**Total AMA Water Demand
1,026,372 AF**

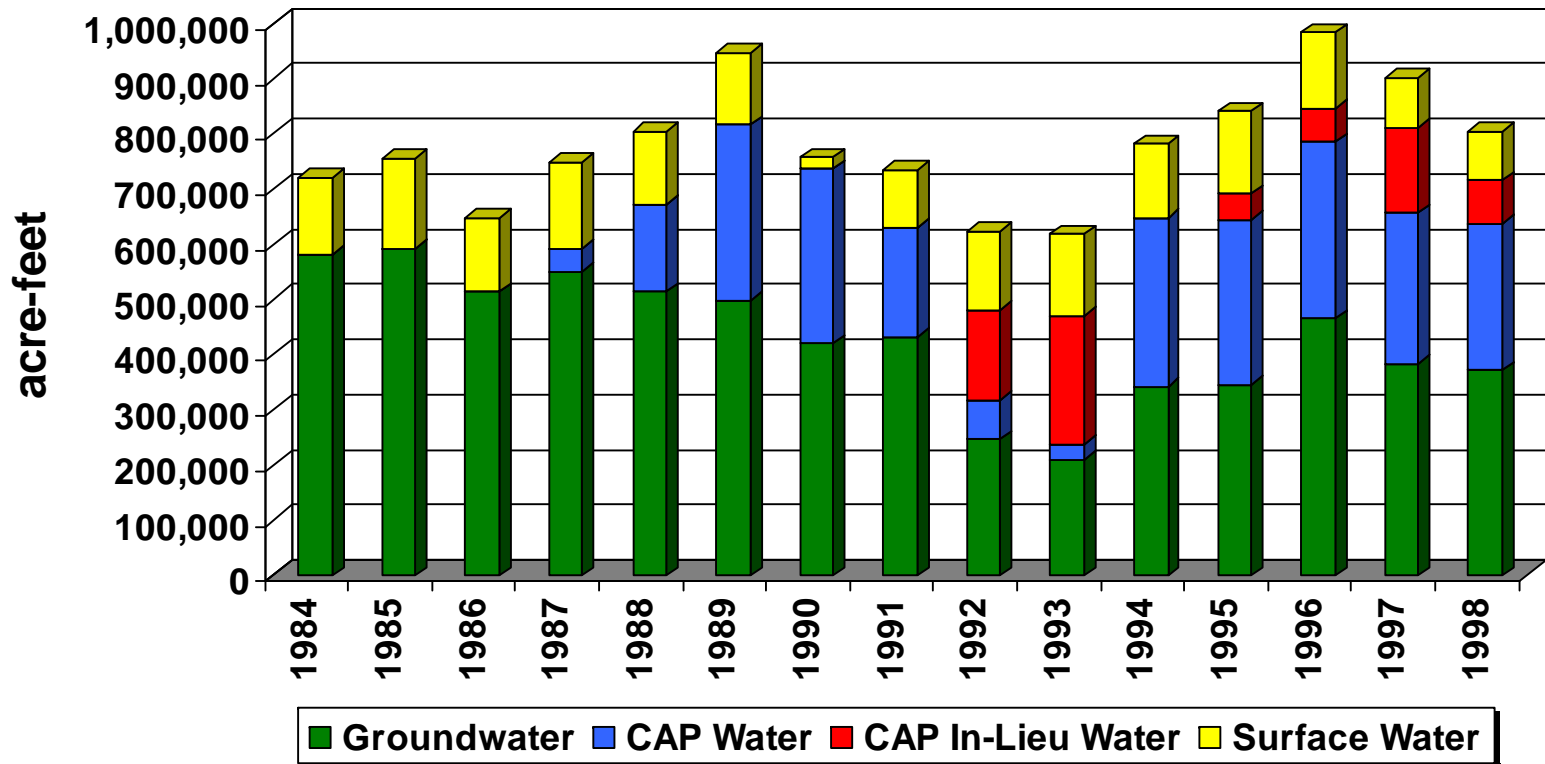
* Indian water use estimated on 1995 data

PINAL AMA

Water Demand

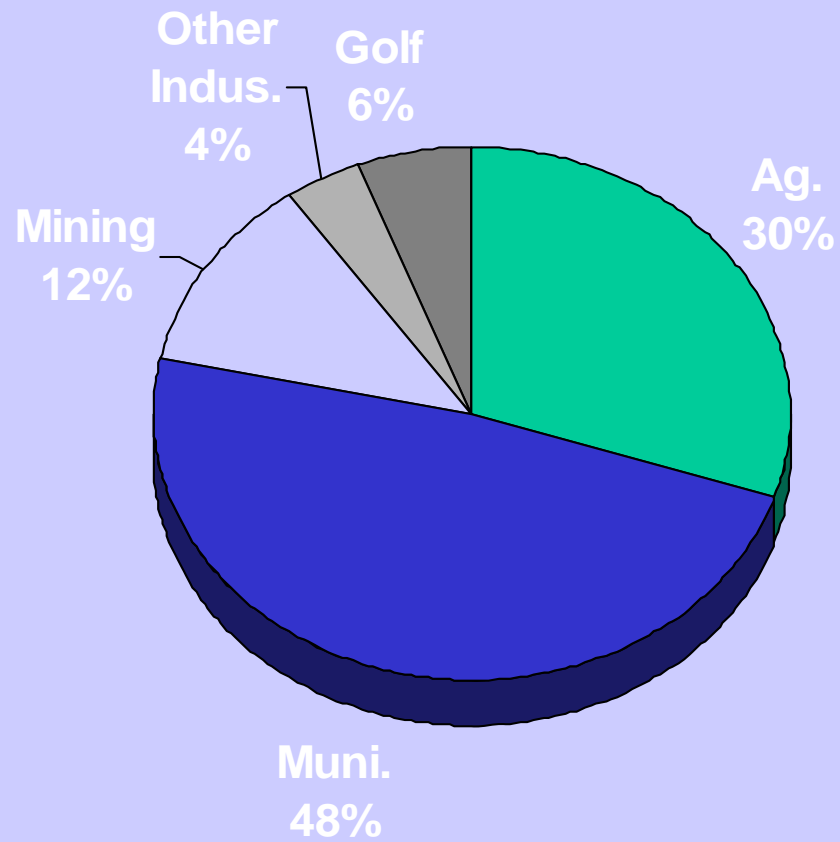
Agricultural Water Use

(Non-Indian)



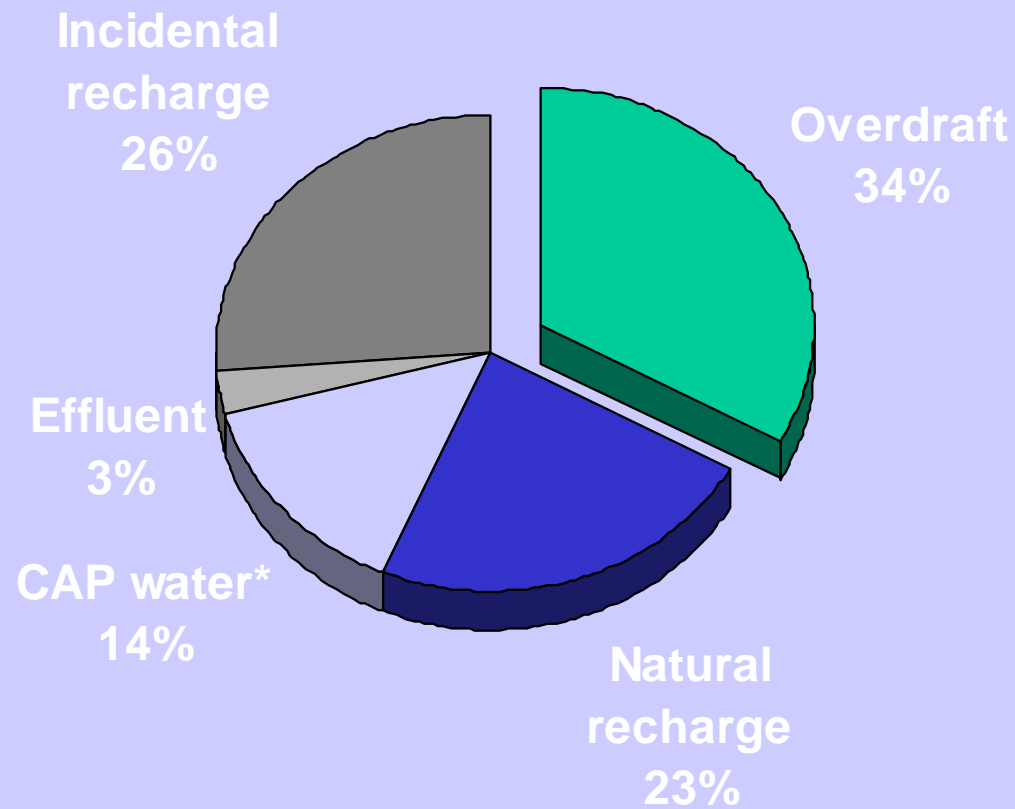
Tucson AMA Demand

Water Use for 1998



Tucson AMA Supply

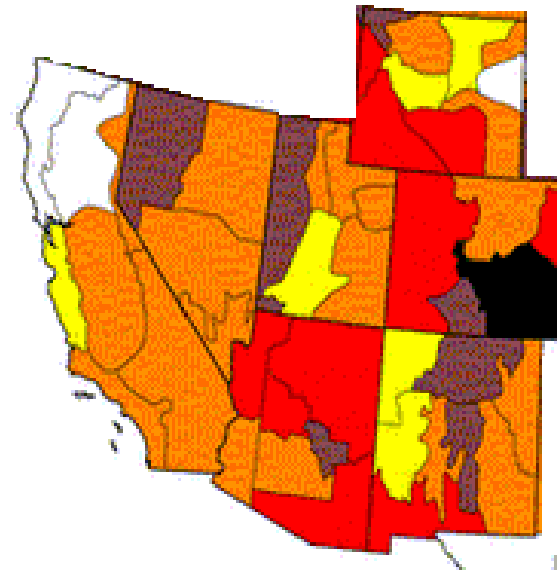
Water Use for 1998



*Includes direct & indirect recharge

Two-year Precipitation in the Colorado Basin

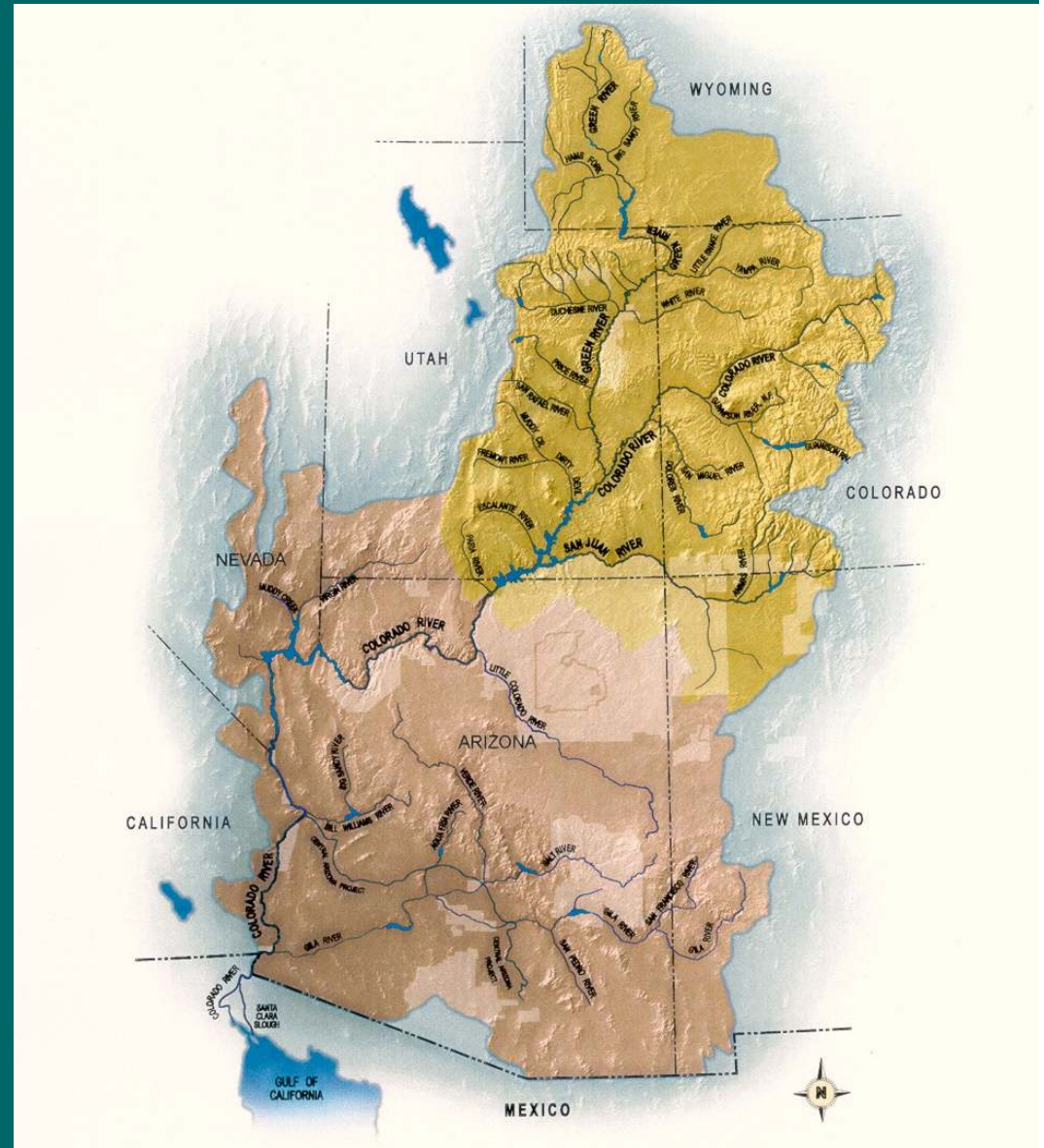
Standardized Precipitation Index February 2002-January 2004



COLORADO RIVER SYSTEM

Lake Powell: 45%
Lake Mead: 60%
Colorado System: 55%
One year ago: 61%

Source: USBR

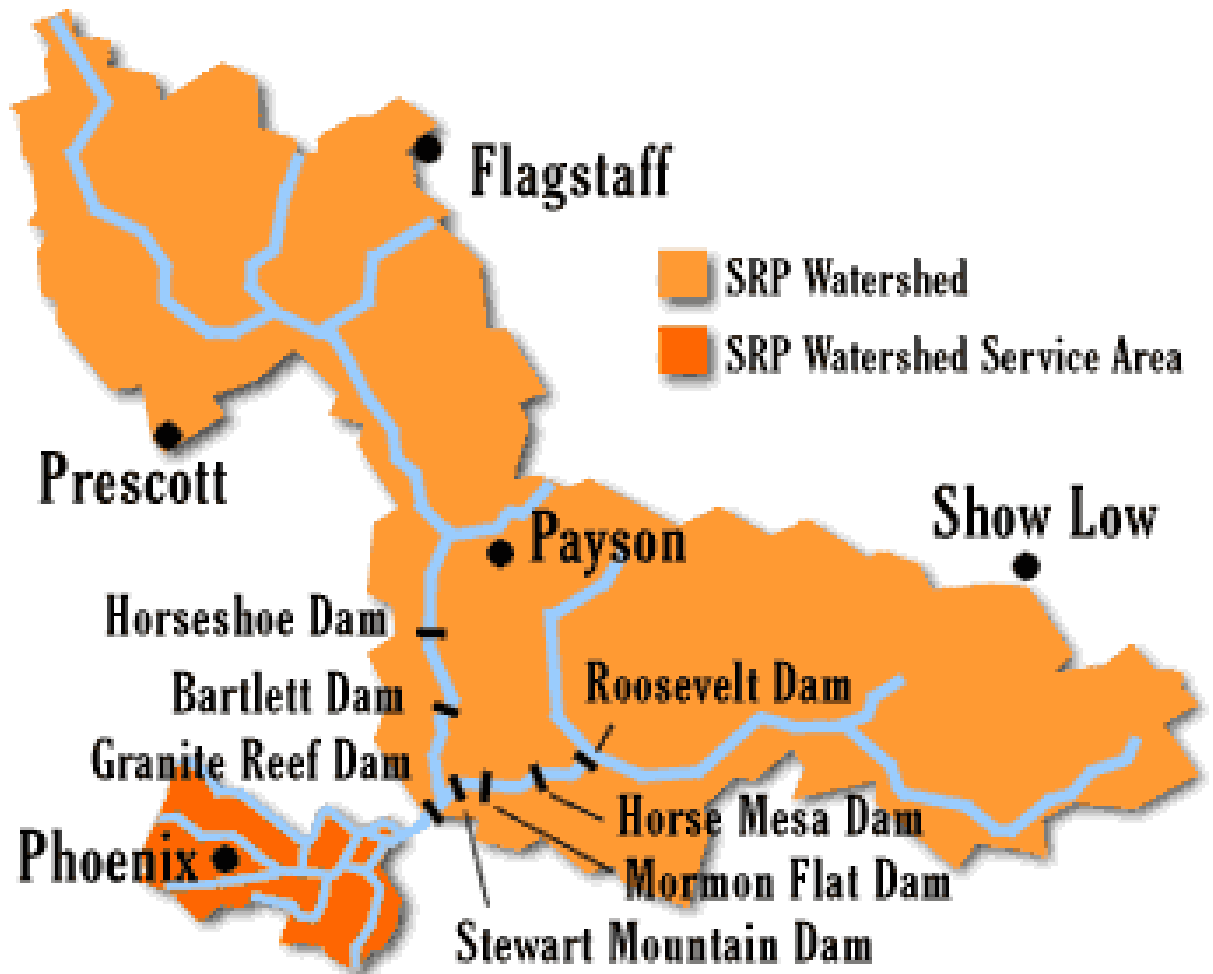


SALT - VERDE STATUS

Storage:

- 41% normal
- Jan. 2003: 27%
- 958,000 acre-feet

Source: SRP

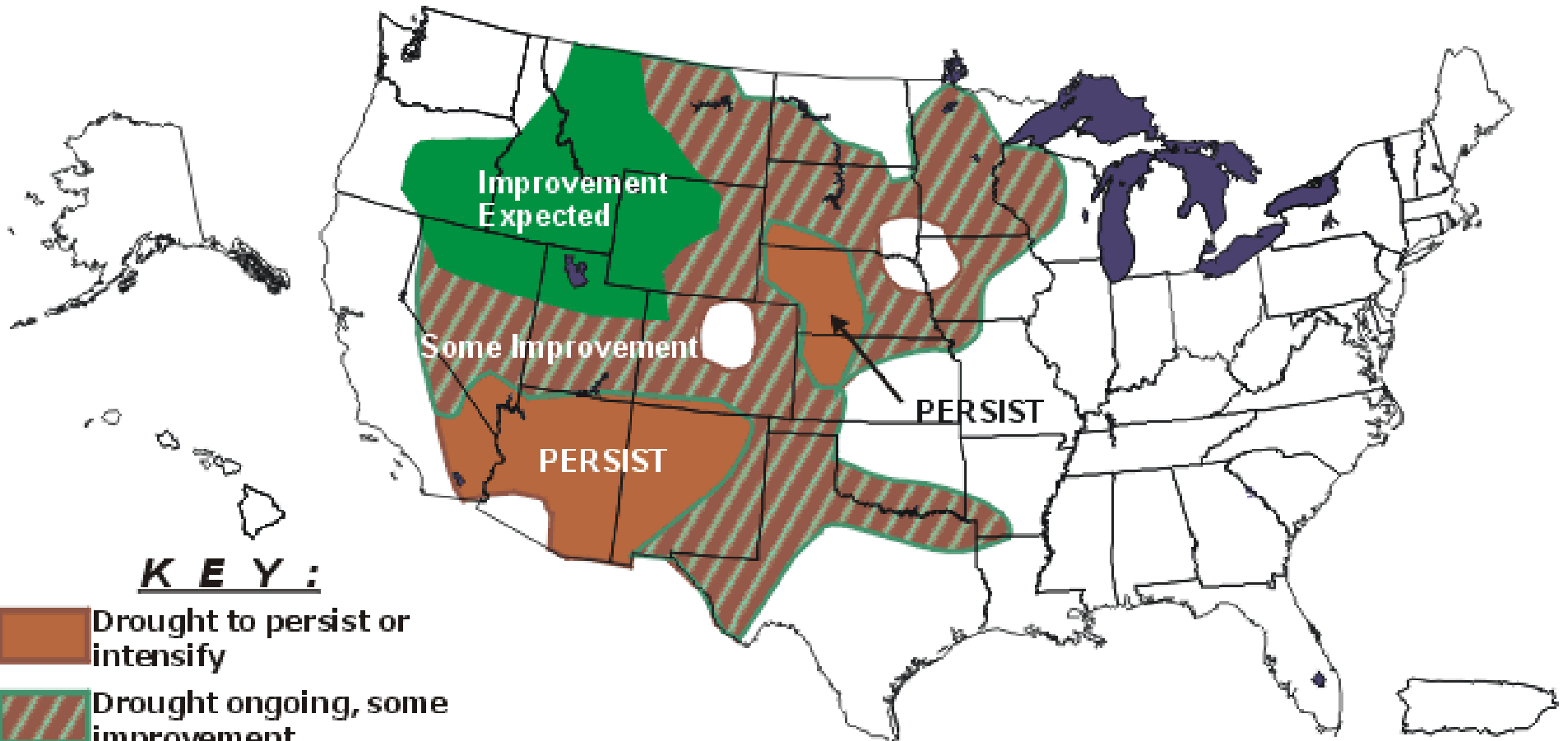





U. S. Seasonal Drought Outlook

Through April 2004

Released January 15, 2004

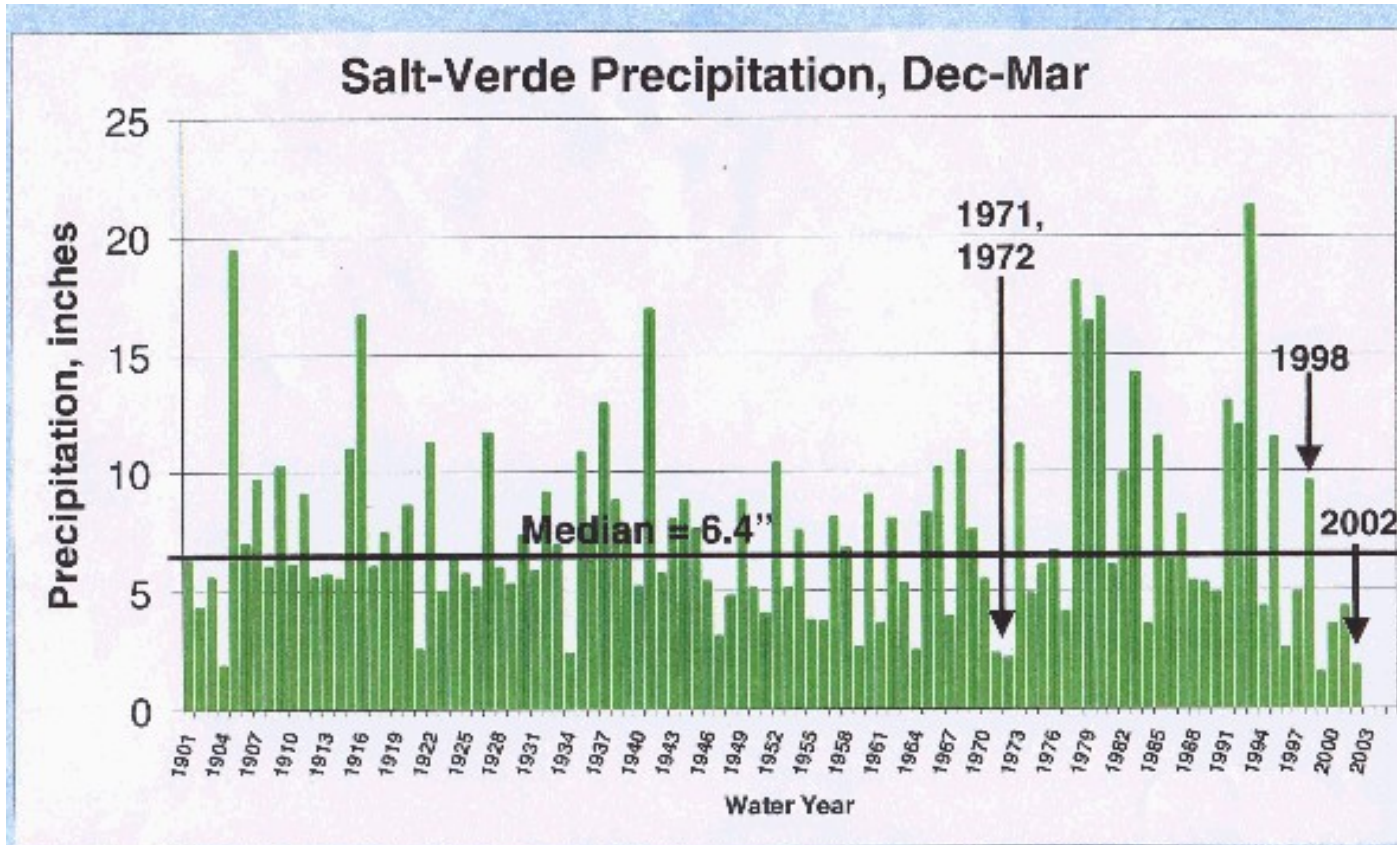


KEY:

-  Drought to persist or intensify
-  Drought ongoing, some improvement
-  Drought likely to improve, impacts ease
-  Drought development likely

Depicts general, large-scale trends based on subjectively derived probabilities guided by numerous indicators, including short and long-range statistical and dynamical forecasts. Short-term events-- such as individual storms-- cannot be accurately forecast more than a few days in advance, so use caution if using this outlook for applications-- such as crops-- that can be affected by such events. "Ongoing" drought areas are schematically approximated from the Drought Monitor (D1 to D4). For weekly drought updates, see the latest Drought Monitor map and text.

Winter Rains



2002: 1.79"

1999: 1.52"

1996: 2.52"

2001: 4.30"

1998: 9.52"

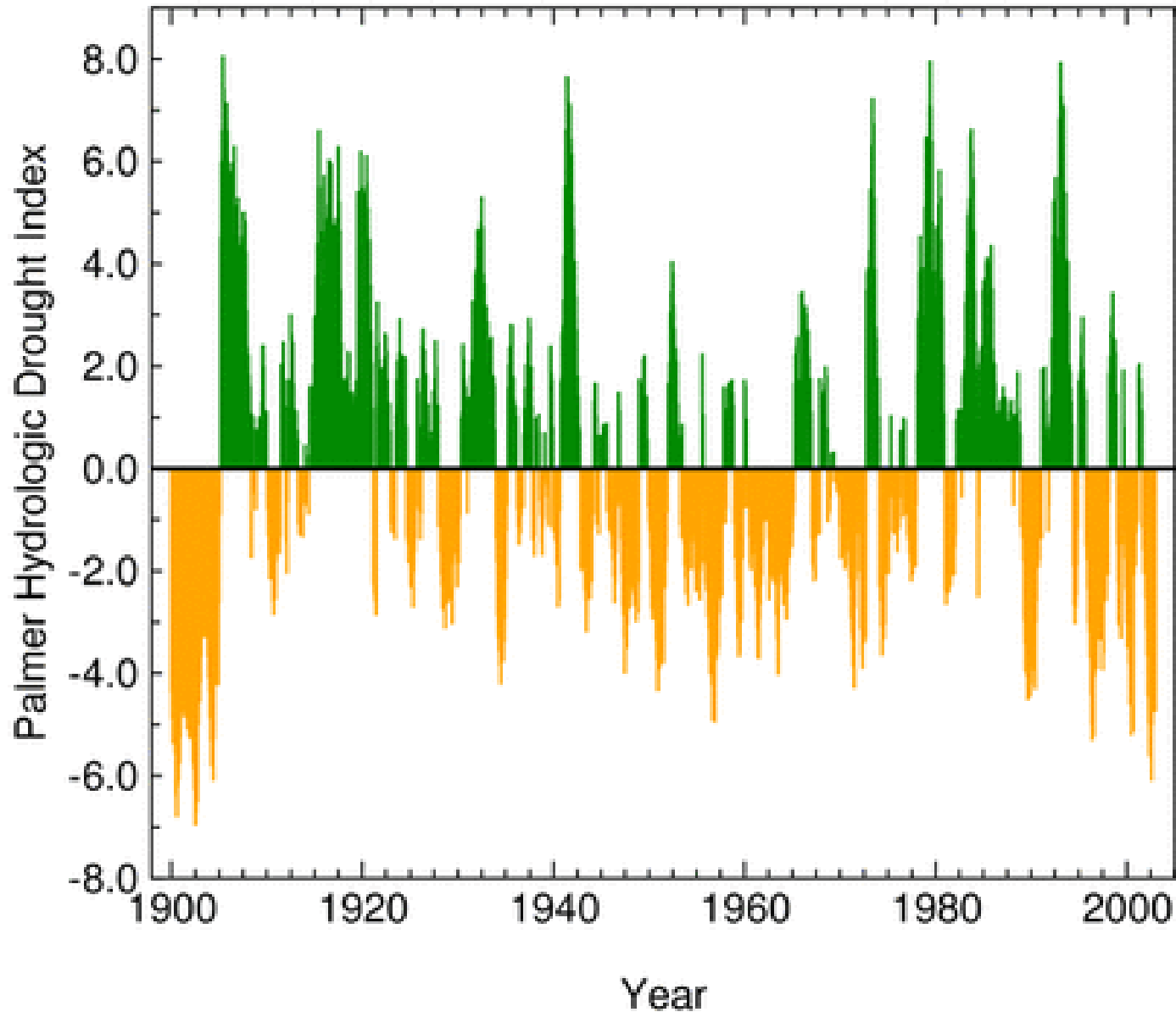
1995: 11.38"

2000: 3.54"

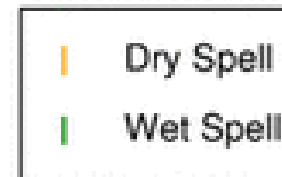
1997: 4.87"

Arizona Statewide PHDI*

January 1900 - January 2003



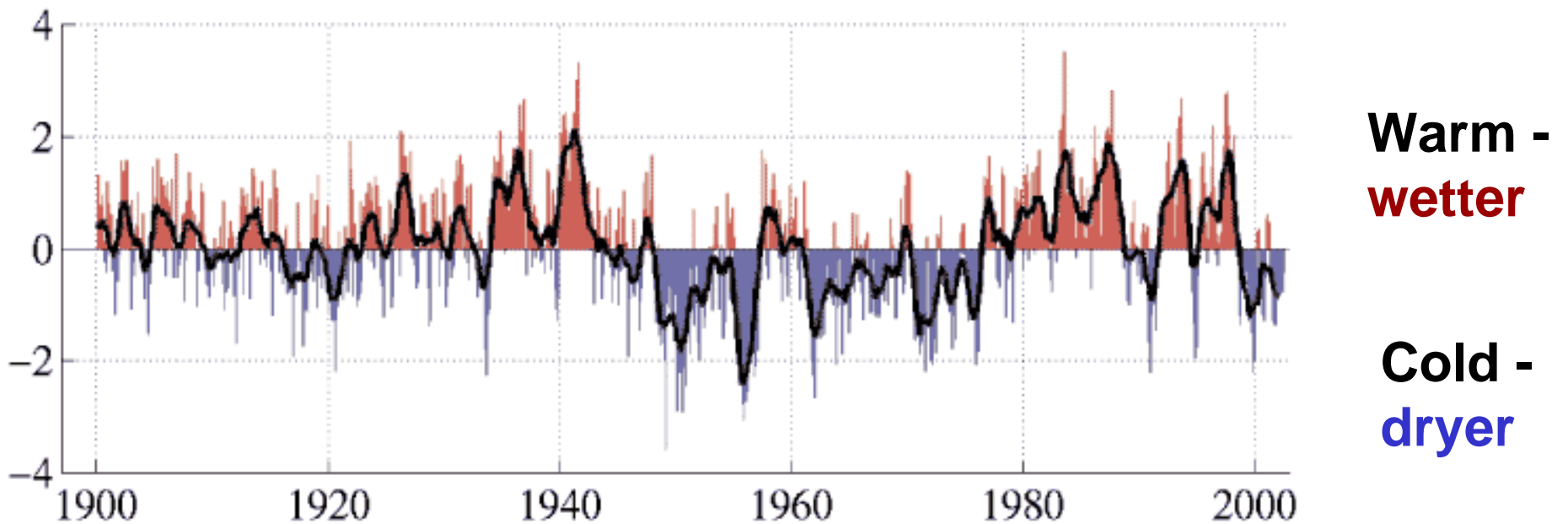
100 Year Drought Index

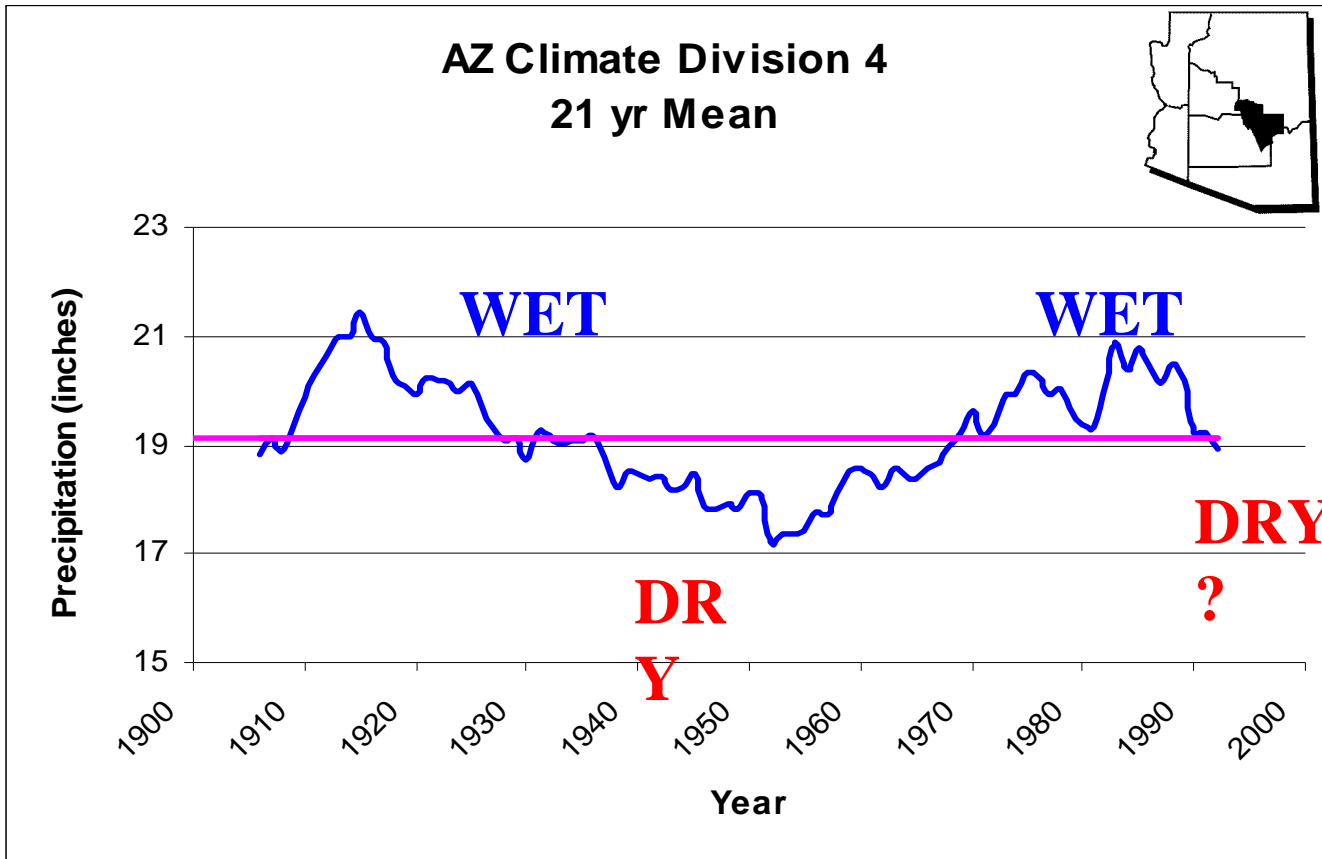


Pacific Decadal Oscillation (PDO)

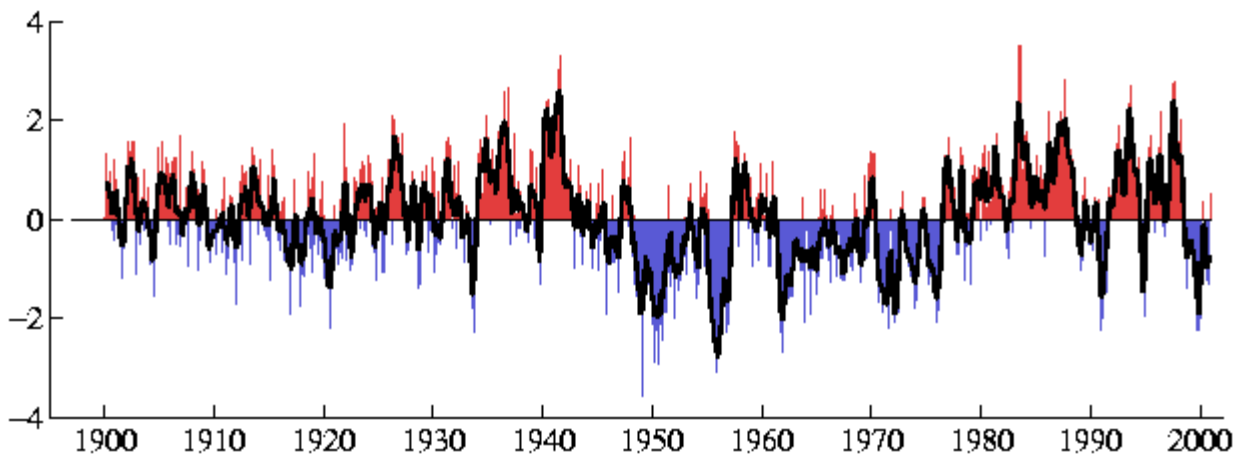
Arizona Precipitation

Figure 19b. Monthly values of the PDO index from 1900 - 2002





Any
long-term
oscillations
or trends?



Pacific
Decadal
Oscillation
(PDO)
- a “long”
version of
ENSO

COLORADO FLOWS

(Source: University of Arizona)

- **Legally Allocated – 16.5 maf**
- **Measured, 1902-32 – 15.8 maf**
- **Deficit: (700,000 af)**

Historic Data – *(University of Arizona research)*

Estimated past flow averages:

- **Tree rings, Upper Basin, 1512-1961 – 13.5 maf**
- **Isotopes, Delta clams, 1500-1950 – 12.5 maf**
- **Lowest 20-year average, 1579-1598 – 10.95 maf**

LOWER BASIN POPULATION

(Source: Bureau of Census)

California	2005	2020
Total So. Cal.	21,264,500	25,909,900
<i>Total California</i>	<i>37,473,500</i>	<i>45,821,900</i>
Arizona	5,553,849	7,363,604
Nevada	2,403,097	2,611,453 <i>(2010)</i>
Total Lower Basin	29,221,446	35,884,957

DROUGHT MITIGATION

- **History: Drought was short-term**
 - Never had a plan
- **Today: Governor's Drought Task Force**
 - Plan now being written
 - Provides framework for mitigation
 - Identifies triggers requiring action by city and state

Arizona Management Choices.....

<i>Re-distributive</i>	<i>Regulatory</i>
<i>Constituent</i>	<i>Distributive</i>

- Regulatory Approach
- Management Areas vs Statewide
- State vs Regional/Local Control
- Groundwater / Surface Water Dichotomy

..... **& Consequences**

Groundwater Management Act



Adopted in 1980

- Legal Battles Over Rights to Water
- Political Efforts to Realize Completion of the CAP
- Overdrafting of Groundwater Supplies



FISSURING

SUBSIDENCE



1957

18.2'

Drop

1991

Groundwater Management Act

GOALS

- Control severe overdraft occurring in certain parts of Arizona.
- Provide a means to allocate the limited groundwater resources to most effectively meet the changing needs of the State.
- Augment Arizona's groundwater supplies through development of additional water supplies.



Arizona Department of Water Resources



Management Structure

- **State-Wide Provisions**
- **Irrigation Non-Expansion Areas; and**
- **Active Management Areas**



ADWR - Water Management



Statewide Water Management Programs

- Well Drilling (NOI) & Construction
- Groundwater Transfer Restrictions
- Adequate Water Supply Provisions
- Surface Water Rights Administration
- Tech Support to Adjudication Court
- Arizona Water Protection Fund
- Rural Watershed Initiatives
- Monitoring, Assessment & Tech Asst.



ADWR - Water Management

IRRIGATION NON-EXPANSION AREAS

- Established 2 (now 3)
Irrigation Non-Expansion
Areas
 - Joseph City
 - Douglas
 - Harquahala Valley (82)



Irrigation Non-Expansion Areas - INAs



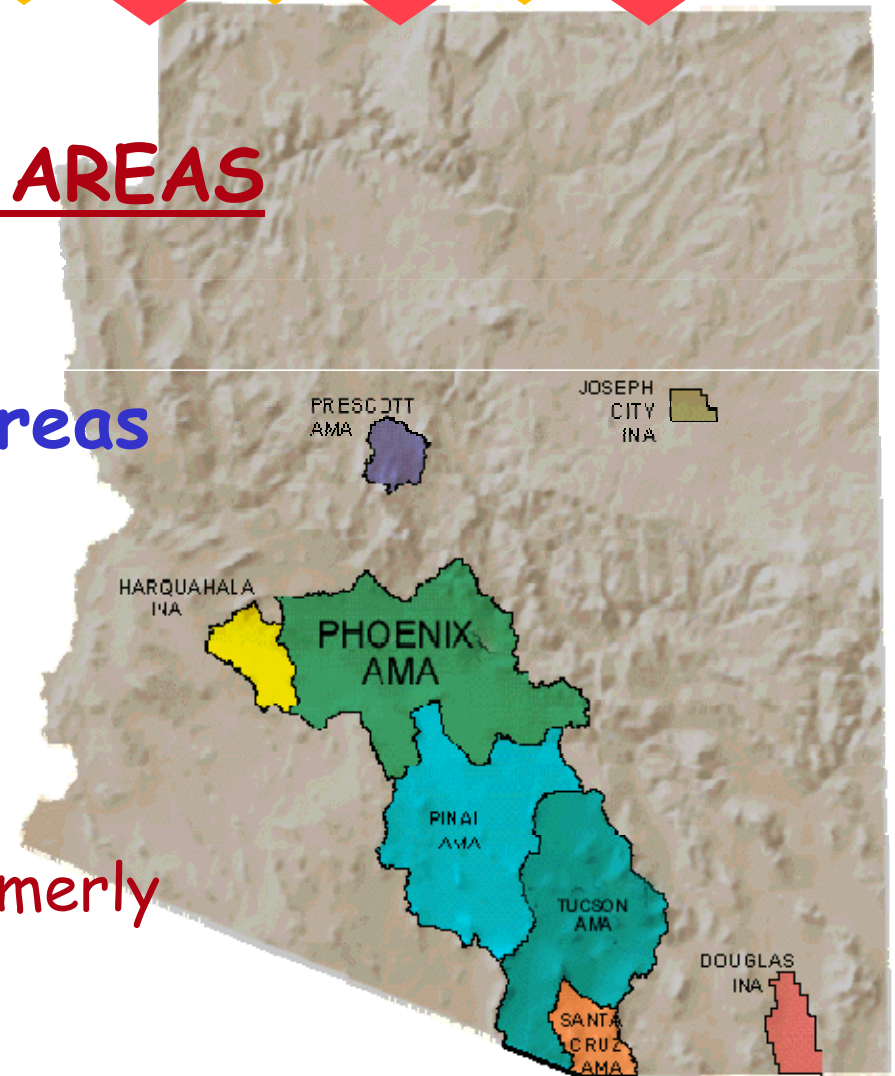
- **Notices of Irrigation Authority**
- **No New Agriculture**
- **Measurement & Reporting**



ADWR - Water Management

ACTIVE MANAGEMENT AREAS

- Established 4 (now 5)
Active Management Areas
 - Phoenix (1980)
 - Pinal (1980)
 - Prescott (1980)
 - Tucson (1980)
 - Santa Cruz (1994 - formerly part of Tucson)



ADWR - Water Management

MANAGEMENT GOALS OF AMAs

- 'Safe-Yield' by 2025
 - Phoenix AMA - Prescott AMA
 - Tucson AMA
- 'Safe-Yield'
 - ...long-term balance between amount of groundwater withdrawn in AMA and amount of natural and artificial groundwater recharge...



ADWR - Water Management



MANAGEMENT GOALS OF AMAs

- **Santa Cruz AMA**
 - maintain safe-yield and
 - prevent local water tables from experiencing long-term declines
- **Pinal AMA**
 - protect the agricultural economy as long as feasible, and
 - preserve water supplies for future non-agricultural purposes



ARIZONA'S WATER MANAGEMENT TOOLS

Active Management Areas

- **Withdrawal Authorities**
- **Conservation Requirements & Use Restrictions**
- **Conversion to Renewable Water Supplies**



ARIZONA'S WATER MANAGEMENT TOOLS - AMAs



WITHDRAWAL AUTHORITIES

- Groundwater Withdrawal Rights and Permits
- Well Drilling Permits
- Measurement & Reporting Requirements



Groundwater Rights & Withdrawal Permits

- Irrigation Grandfathered Rights
- Type 1 Non-Irrigation Grandfathered Rights
- Type 2 Non-Irrigation Grandfathered Rights
- Service Area Rights
- Withdrawal Permits
- Recovery Well Permits
- Exempt Well Permits



Groundwater Withdrawal Permits

- Dewatering
- Temporary Dewatering
- Mineral Extraction & Metallurgical Processing
- **General Industrial Use**
- Poor Quality Groundwater Withdrawal
- Temporary Electrical Energy Generation
- Drainage
- Hydrologic Testing

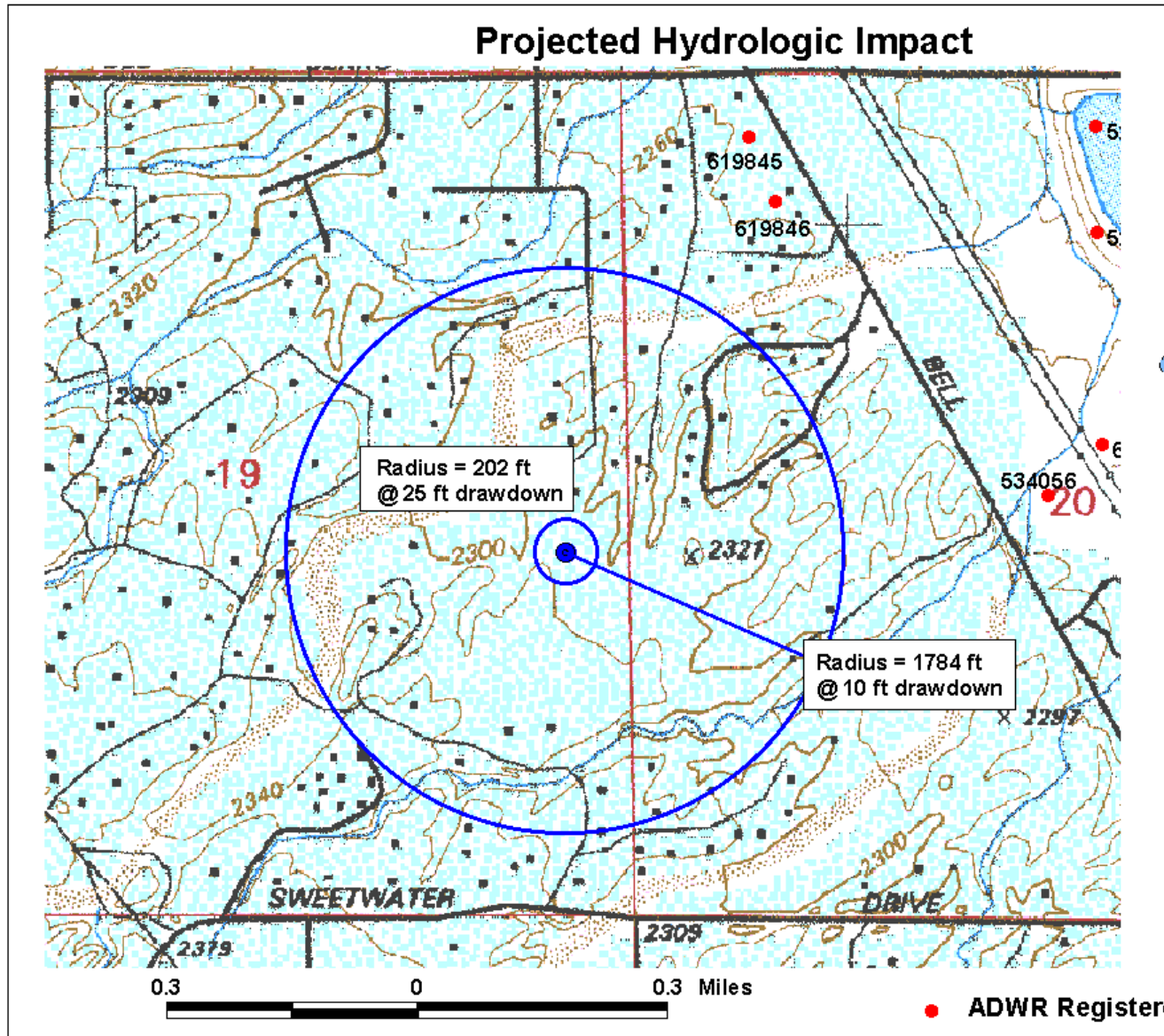
Well Impacts

- If proposed pumping causes >25' drawdown in <5 years....

Waiver required

- If proposed pumping causes between 10' and 25' drawdown....

Mitigation or waiver required



ARIZONA'S WATER MANAGEMENT TOOLS - AMAs



CONSERVATION REQUIREMENTS

- **Five Management Plans:**

- **1st Management Plan 1980 - 1990**
- **2nd Management Plan 1990 - 2000**
- **3rd Management Plan 2000 - 2010**
- **4th Management Plan 2010 - 2020**
- **5th Management Plan 2020 - 2025**



ARIZONA'S WATER MANAGEMENT TOOLS - AMAs

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CONSERVATION REQUIREMENTS

FOR:

- AGRICULTURE
- MUNICIPAL - Cities, Towns, Private Water Companies, and Irrigation districts
- INDUSTRIAL
 - Turf Facilities
 - Power Generation
 - Large Landscaping
 - Mining
 - Dairies/Feedlots
 - Large Cooling
 - Sand & Gravel



ARIZONA'S WATER MANAGEMENT TOOLS - AMAs



CONSERVATION REQUIREMENTS

- Agricultural Users
 - Prohibit new irrigated acreage
 - **BASE PROGRAM**
 - Allotments based on crops historically grown
 - Expected irrigation efficiency increases - Now set at 80%
 - **NEW BMP PROGRAM**



BMP Application Process

- BMP Worksheet
 - Organized into 4 categories
 - Each category allows a maximum score of 3 points
 - The applicant must score a minimum of 2 points in Category 2 to be accepted into the program
 - A total point value of at least 10 must be scored on the Worksheet to enter the BMP Program
- Categories of BMP Worksheet
 - Category 1: Water Conveyance Improvements
 - Category 2: Farm Irrigation Systems
 - Category 3: Irrigation Water Management
 - Category 4: Agronomic Management

BMP Program Practices

- Water Conveyance System Improvements
 - Concrete-lined ditches, pipelines, gated-pipe, drain-back systems



BMP Program Practices

- Farm Irrigation Systems

- Slope systems without uniform grades with tail-water reuse
- Uniform slope systems without tail-water reuse
- Uniform slope systems with tail-water reuse
- Uniform slope within an irrigation district that captures and redistributes return flows
- Modified slope systems
- High pressure sprinkler systems
- Near level systems
- Level systems
- Low pressure sprinkler systems
- Trickle or drip irrigation systems



BMP Program Practices

- Irrigation Water Management (IWM)
 - Laser touch-up
 - Alternate row irrigation
 - Furrow checks
 - Angled rows
 - Surge irrigation
 - Temporary sprinklers
 - Participation in IWM programs
 - Using Irrigation Scheduling Services
 - Participation with I.D. to increase flexibility of water deliveries
 - Measure flow rates to determine amount of water applied
 - Soil moisture monitoring
 - Computer based model using meteorological data (AZMET)



BMP Program Practices

- Agronomic Management

- Crop rotation
- Crop residue management
- Soil and/or water quality testing
- Pre-irrigation surface conditioning



- Transplants
- Plastic mulch or floatable row covers
- Shaping furrows or beds
- Planting in bottom of furrow

ARIZONA'S WATER MANAGEMENT TOOLS - AMAs

CONSERVATION REQUIREMENTS

- Municipal Water Providers
 - Per capita targets - GPCD Program
 - Targets based on existing residential conservation potential & Models for New Housing
 - Non-residential GPCD constant
 - Best management practices
 - Alternative Conservation Program
 - Non Per Capita Conservation Program



ARIZONA'S WATER MANAGEMENT TOOLS - AMAs

CONSERVATION REQUIREMENTS

- Industrial Users - Turf facilities >10 acres
 - Allocation based on 75% irrigation efficiency
 - New golf courses
 - Assume 5 acres turf / hole & 0.4 acres of lake / hole
 - Additional low water use landscaping



ARIZONA'S WATER MANAGEMENT TOOLS - AMAs



Additional Conservation Regulations

- Distribution Systems
- New Public Rights-of-Way
- Lakes Bill Prohibitions
- BMP's for Mines, Sand & Gravel, Power Plants, Industrial Users
- Dairies & Feedlots and Cooling Towers



ARIZONA'S WATER MANAGEMENT TOOLS - AMAs



CONVERSION TO RENEWABLE SUPPLIES

- Incentives for use of Renewable Supplies
- Assured Water Supply Requirements for New Subdivisions
- Underground Storage / Recovery Permits



ARIZONA'S WATER MANAGEMENT TOOLS - AMAs



CONVERSION TO RENEWABLE SUPPLIES

- Assured Water Supply Rules
 - Requires 100 year supply
 - Must be consistent with AMA Goal
 - e.g. safe yield
 - Combines Demand & Supply Management



ARIZONA'S WATER MANAGEMENT TOOLS - AMAs

CONVERSION TO RENEWABLE SUPPLIES

- Underground Storage & Recovery
Program

- Encourage use of renewable supplies through storage and later recovery
- Make use of supplies with less treatment & distribution infrastructure
- Utilize Arizona's Colorado River entitlement & Firming
- Assist communities in meeting Assured Water Supply



ARIZONA'S WATER MANAGEMENT TOOLS - AMAs

Underground Storage/Recovery Permits

- Storage Facility Permits
 - Underground Storage Facility (USF)
 - Constructed
 - Managed
 - Groundwater Savings Facility (GSF)
- Water Storage Permits
- Recovery Well Permits & Criteria



Underground Storage Facility Permits

- Applicant must demonstrate:
 - Technical & financial capability
 - Storage is hydrologically feasible
 - No unreasonable harm
 - water levels
 - water quality
 - Floodplain permits and APP for Effluent



Groundwater Savings Facility Permits

- Applicant must demonstrate:
 - Direct Reduction of groundwater pumping
 - Groundwater pumper agrees to curtail pumping
 - In-lieu water is the only reasonable alternative to groundwater
- Through the development of a Plan of Operation



ARIZONA'S WATER MANAGEMENT TOOLS

Arizona's -- Additional Water Management Tools

- Arizona Water Banking Authority
- Water Rights Settlements
- Surface Water Rights Administration
- Grants for Conservation, Augmentation,
& Monitoring
- Technical Planning and Assistance & Rural
Studies



PLANNING FOR GROWTH



Assured Water Supply Rules - In AMA's

- Requires 100 year supply
- Must be consistent with AMA Goal
 - e.g. safe yield - can not mine groundwater
- Combines Demand & Supply Management



Assured Water Supply Criteria

- Physical, Legal, & Continuous Availability for 100 Years
- Adequate Quality
- Financial Capability
- Consistent with Conservation Targets
- Consistent with AMA Goals
 - Safe-yield in Phoenix, Tucson, Prescott AMAs

Subdivision Requirements and Assured Water Supply

- ... Subdivision: land divided into six or more parcels where at least one parcel is less than 36 acres, which is offered for sale or lease for more than one year
- ... An assured water supply is required:
 - y to gain approval of a subdivision plat by local governments (Titles 9 and 11)
 - y to obtain authorization to sell lots from the Department of Real Estate (Title 32)

Methods of Meeting Goal Requirement

- ... **Use of renewable supplies (either directly or via underground storage and recovery):**
 - y **Surface water**
 - y **Effluent**
- ... **Membership in the Central Arizona Groundwater Replenishment District**
- ... **Groundwater imported from certain basins**
- ... **Dry lot subdivisions of less than 20 lots are exempt**

Central Arizona Groundwater Replenishment District (CAGRD)

- ... Acquires supplies to replace groundwater pumped by its members
- ... Replacement water is recharged into aquifers within the AMA
- ... Net effect: no new groundwater pumping

Two means of establishing an Assured Water Supply:

Certificate of Assured Water Supply
(individual subdivision)

Designation of Assured Water Supply
(blanket for water provider)

Certificate of Assured Water Supply

Required for each new subdivision if
service will be from a provider that is not
designated

Designation of Assured Water Supply

- ... A water provider (city, town or private water company) can demonstrate that they meet the AWS criteria for:
 - existing water demands
 - committed demands
 - at least 2 years of projected growth
- ... No Certificates of AWS necessary

Example #2 CAGR Member Land

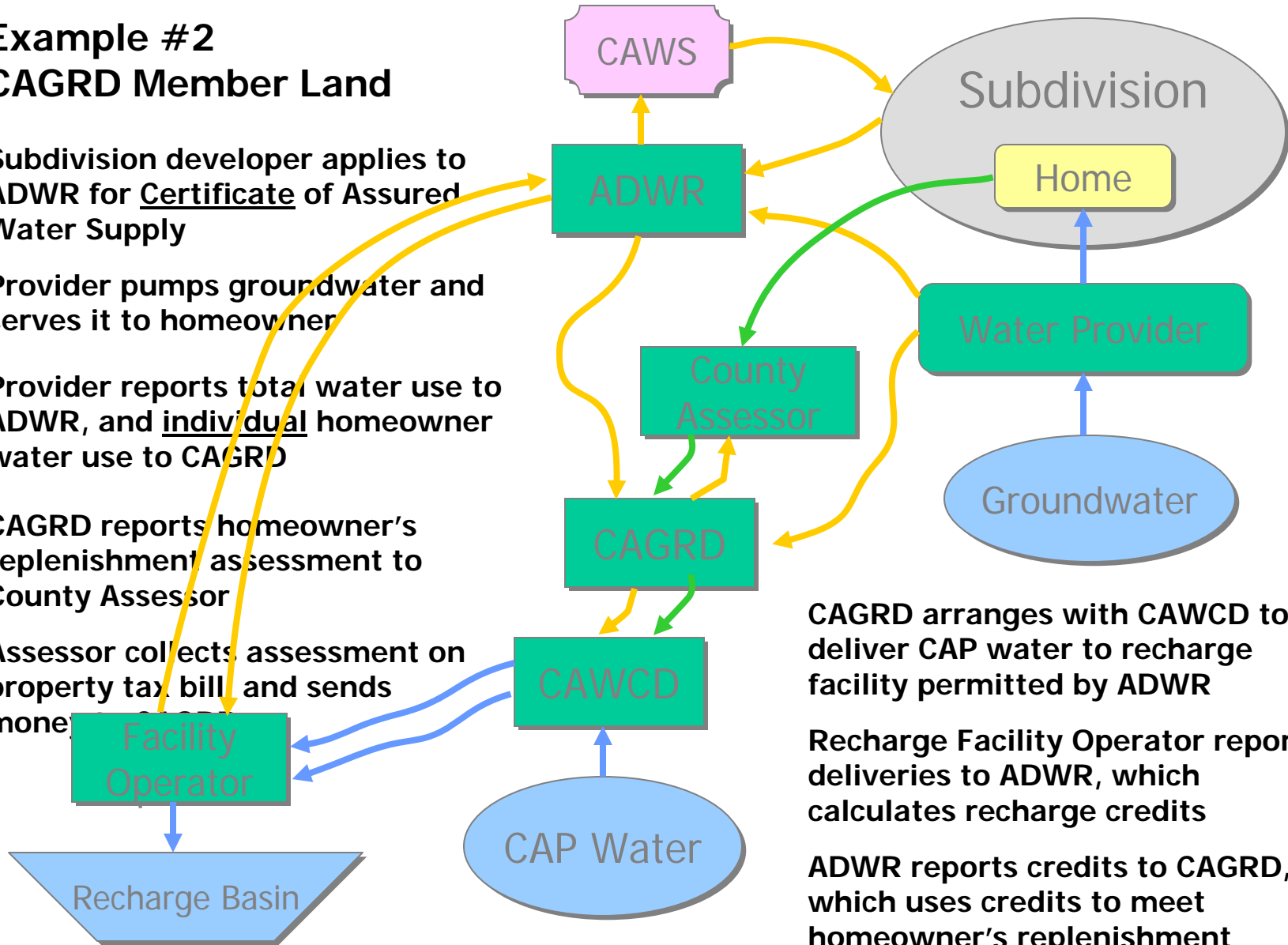
Subdivision developer applies to ADWR for Certificate of Assured Water Supply

Provider pumps groundwater and serves it to homeowner

Provider reports total water use to ADWR, and individual homeowner water use to CAGR

CAGR reports homeowner's replenishment assessment to County Assessor

Assessor collects assessment on property tax bill, and sends money



CAGR arranges with CAWCD to deliver CAP water to recharge facility permitted by ADWR

Recharge Facility Operator reports deliveries to ADWR, which calculates recharge credits

ADWR reports credits to CAGR, which uses credits to meet homeowner's replenishment

PLANNING FOR GROWTH

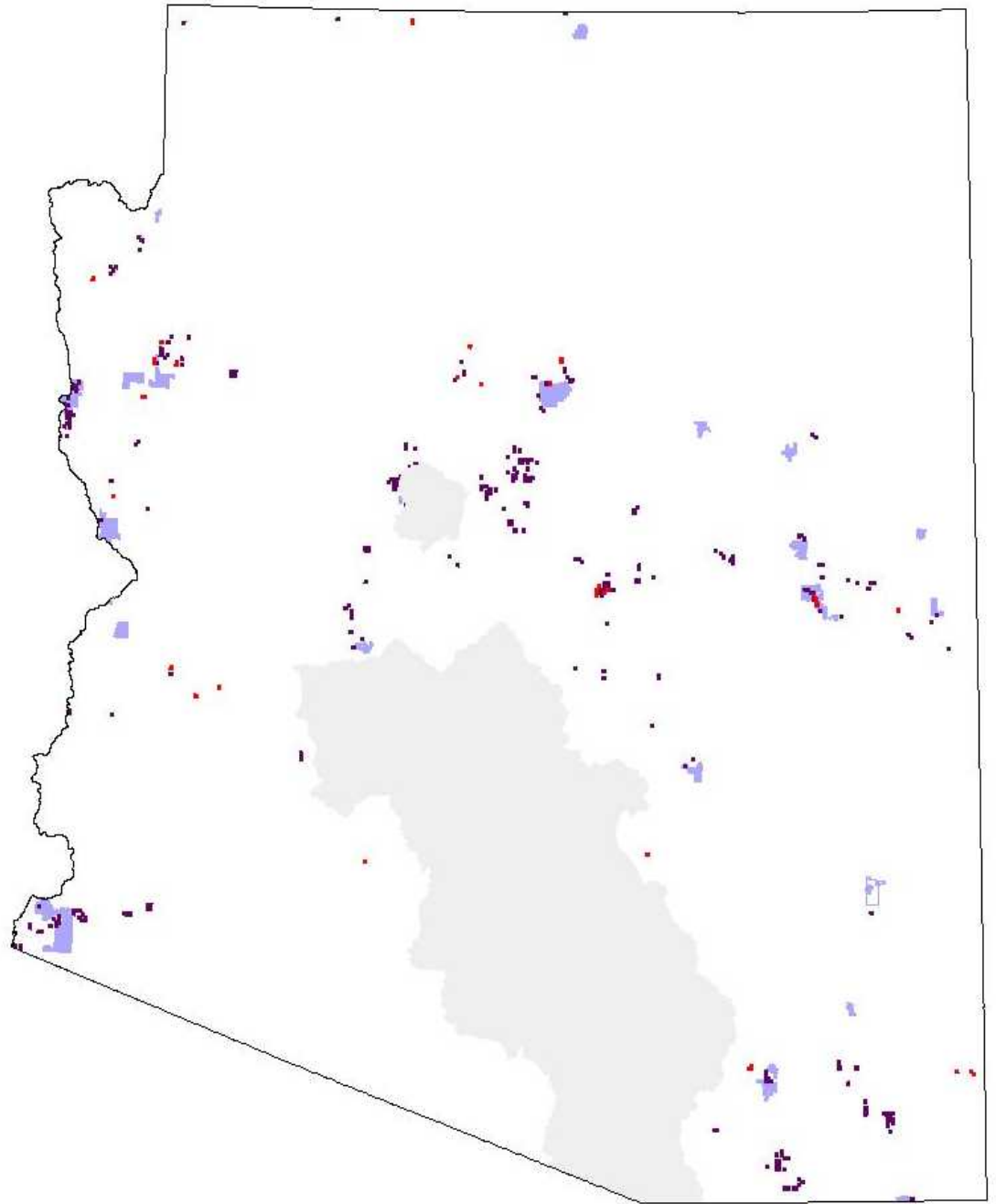
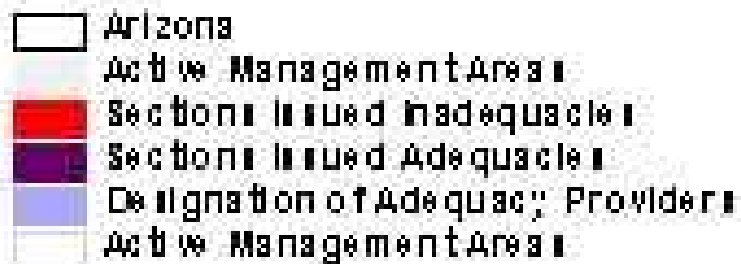


Adequate Water Supply Rules - Rest of State (Outside AMA's)

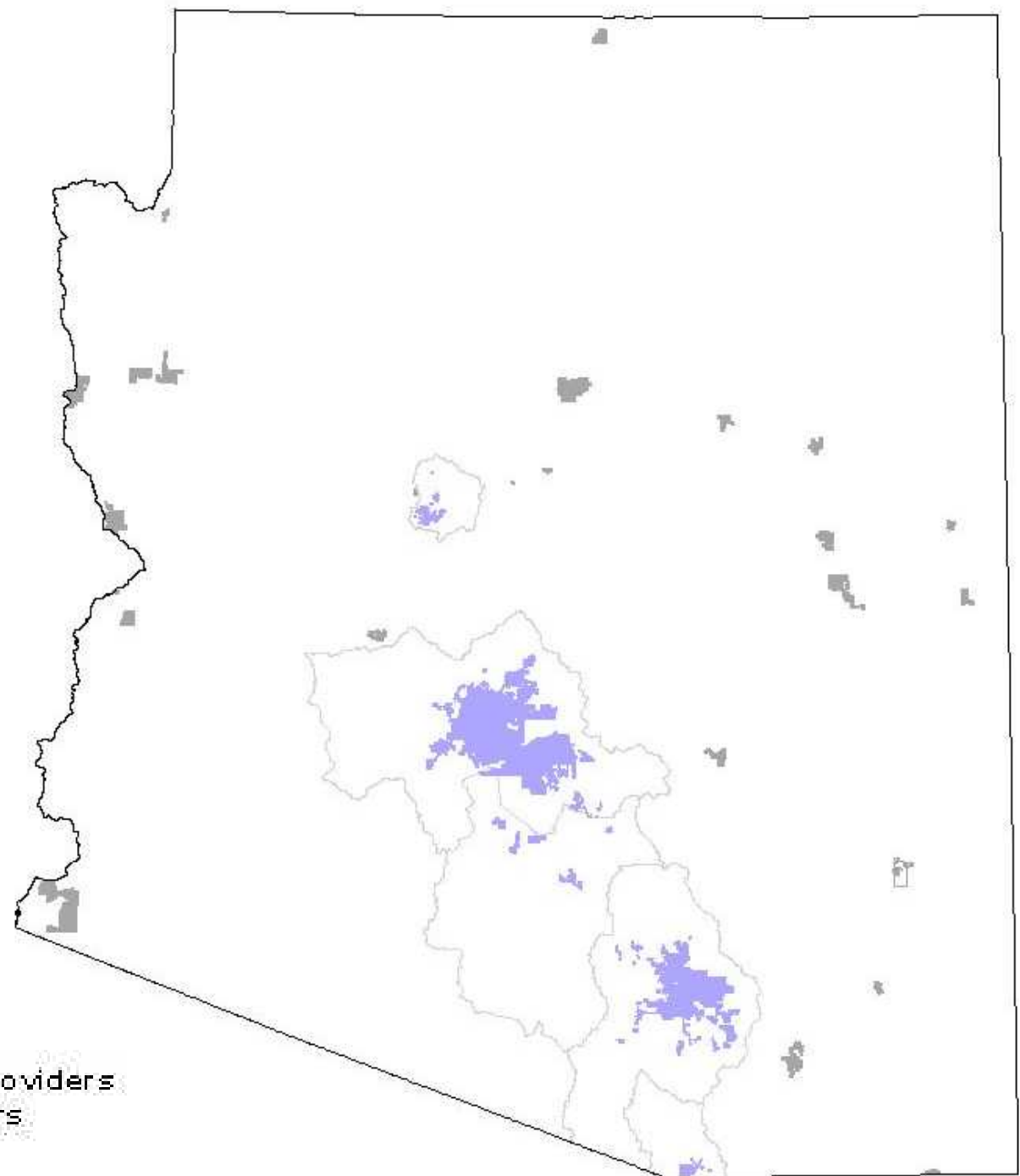
- Requires determination of 100 year supply
- Development can proceed with either "inadequate" or "adequate" supply
- Determination becomes part of public report for 1st sale only



Designations of Adequacy & Adequacies Issued



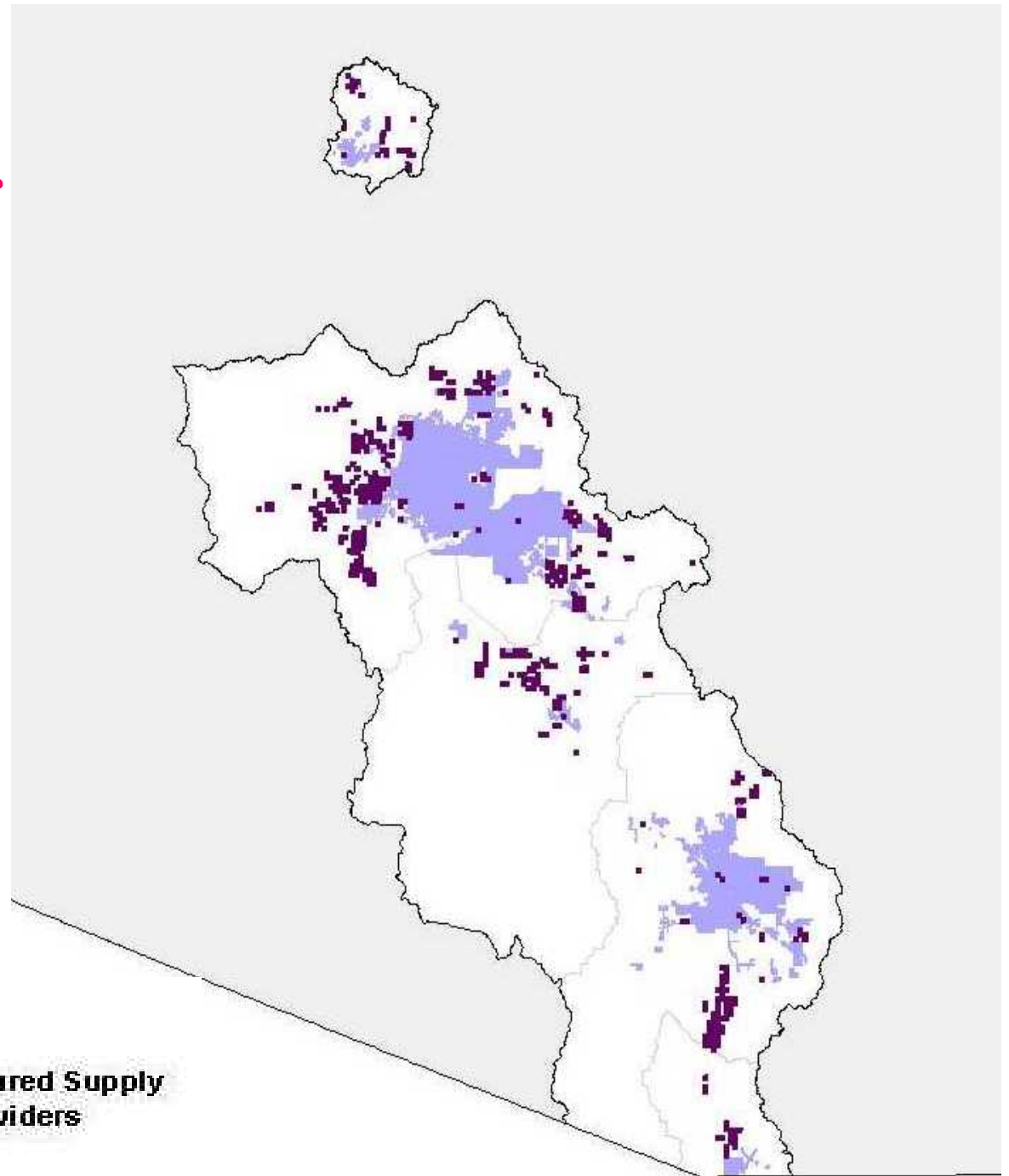
Designated Water Providers



- Arizona
- Designation of Assured Supply Providers
- Designation of Adequacy Providers
- Active Management Areas

Certificates of Assured Water Supply Issued

- Arizona
- Non-AMA Area
- Sections Issued Certificates of Assured Supply
- Designation of Assured Supply Providers
- Active Management Areas



PLANNING FOR GROWTH



Growing Smarter - General Plans

Water Resources Element

- Required for Cities & Towns > 2,500
(unless under 10,000 with growth < 2%/year)
- Required for Counties > 125,000 pop
- 4 counties and 23 communities outside of
AMAs qualify



PLANNING FOR GROWTH



Growing Smarter - Requirements

- Identify known legally and physically available supplies
- Identify future demand
- Identify how demand will be served by currently available supplies or a plan to obtain additional necessary water supplies



CURRENT ACTIVITIES & ISSUES



- Growth & Water Mgmt Trends - Phx Area
- Legislative & Other Water Mgmt Proposals
 - Within AMA's
 - Exempt Wells
 - Recreation Corridor Channelization District
 - CAGRD Plan of Operation
 - Outside AMA's
 - Adequacy Program
 - Well Impacts & Exempt Wells
 - Growing Smarter Modifications



EMERGING WATER ISSUES

- Competition for Water Supplies
- Conflicts over Water, Growth & Property Rights
- Certain Rural Areas Reaching Limits of Supply
- Environmental Concerns
- Groundwater vs. Surface Water
- Need for Regional & Coordinated Mgmt
- State Budget



www.water.az.gov

