
Sustaining Flows



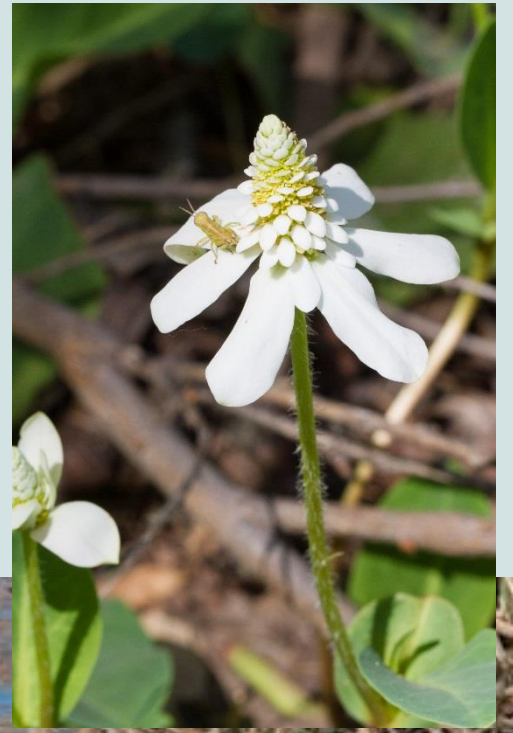
Why do we care about the Verde River?

For about a thousand reasons
Including…





Local Agriculture



Biodiversity

About 2/3 of all life forms in Arizona live in the riparian zone

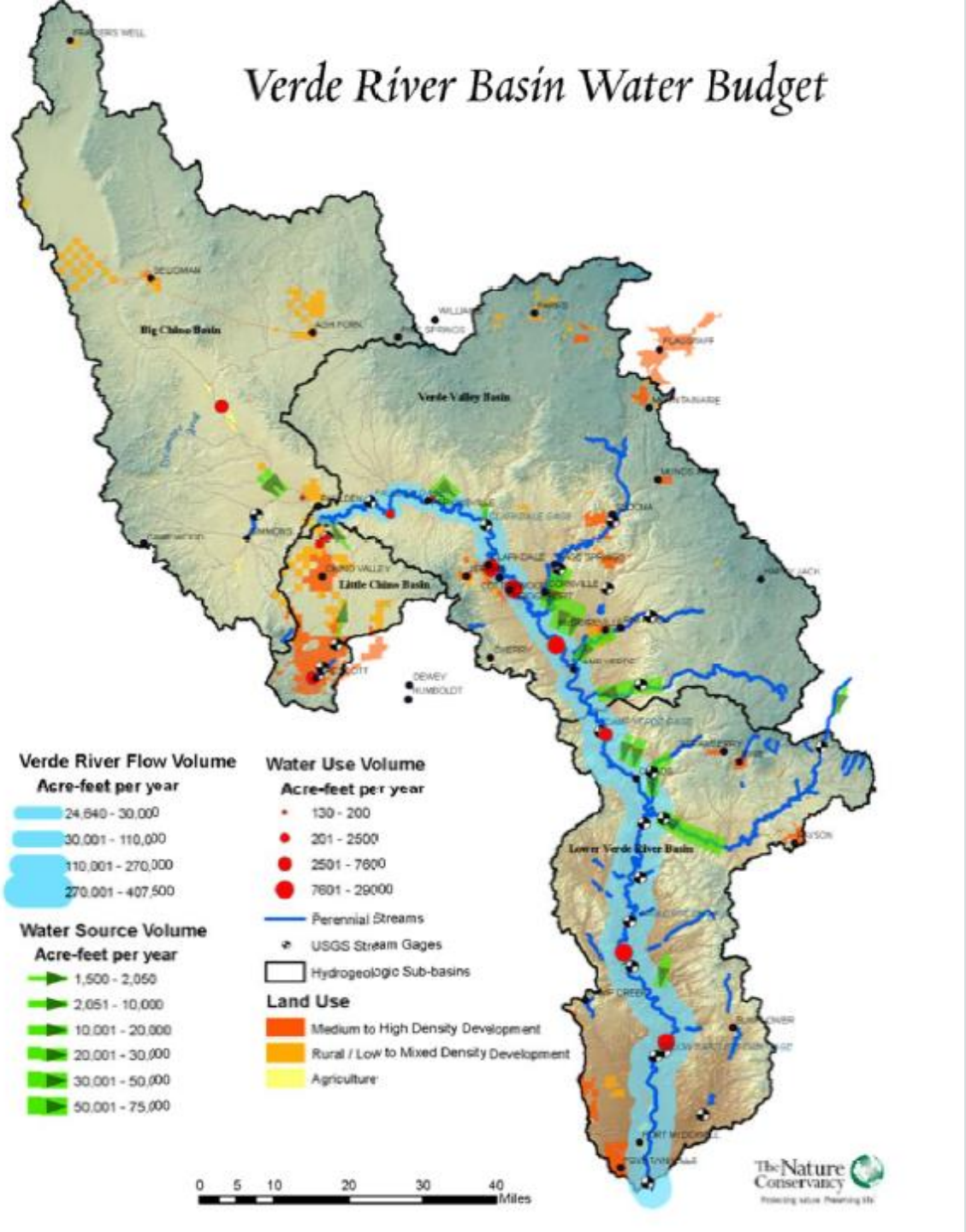
More than 240 species of birds are here because of the Verde

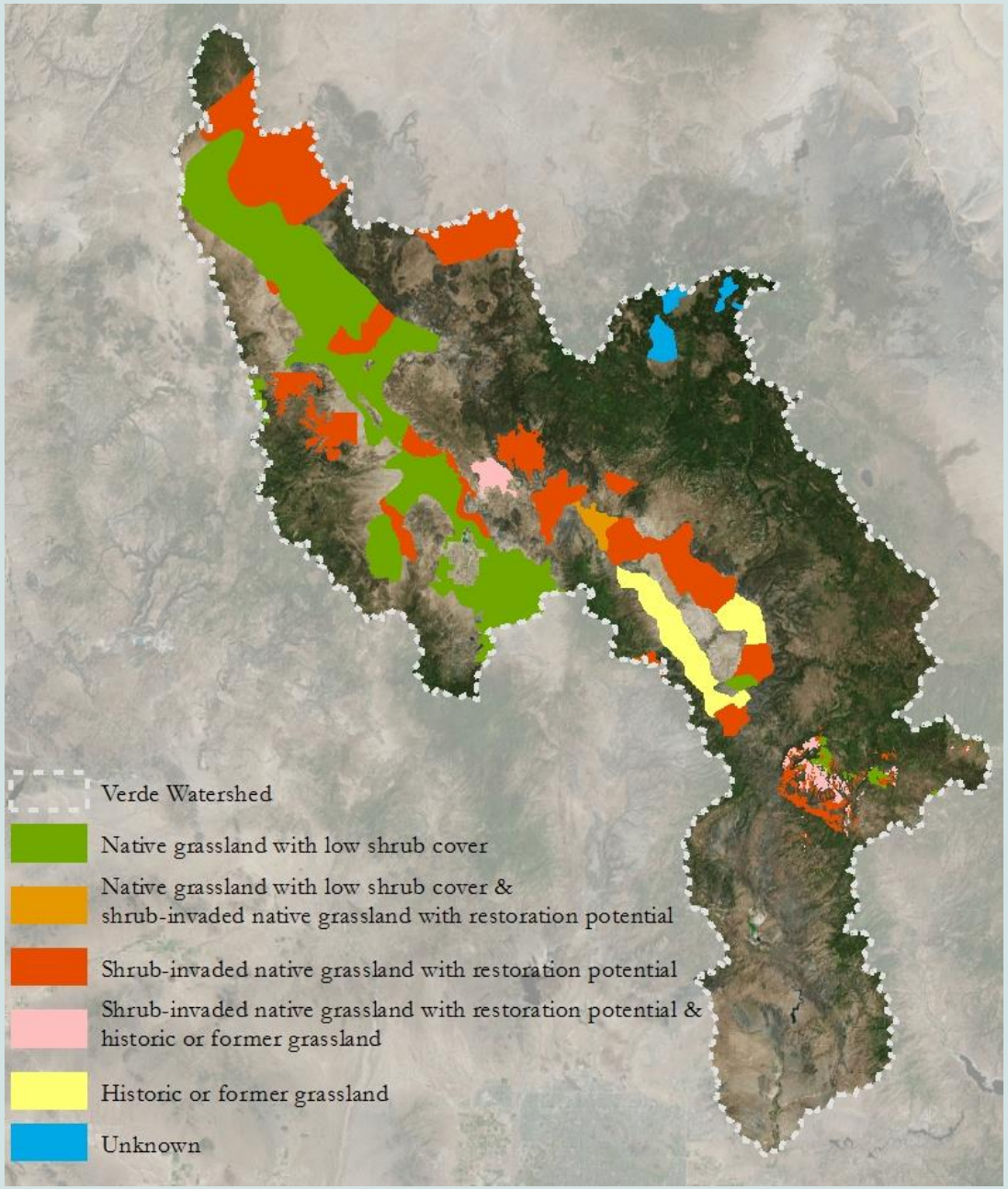
Sustainable Recreation and Economic Development

Verde Front String of Pearls
Nat Geo Ecotourism
River Runner/Outfitters

- The Verde River is the last river in Arizona still flowing all year long for its entire length. Seven other Arizona rivers no longer flow perennially because of groundwater interception and diversions of their surface flows, and the Verde must not become the eighth!
- The Verde River supplies fresh drinking water to more than 2 million people in Maricopa County, and it is the least expensive water supply in that county.
- The Verde River supports more than 700 jobs and $100M in economic activity in the Verde Valley
- As one of the last living rivers in Arizona, the Verde is unique for its scenery, riparian forest, recreational potential, wildlife, biodiversity, endangered and threatened species, and cultural importance to the people who love it.


Verde River
Sources


Verde River Basin Water Budget
Big Chino Basin
Verde Valley Basin
Little Chino Basin
Lower Verde River Basin
Verde River Flow Volume
Acre-feet per year
24,640 - 30,000
30,001 - 110,000
110,001 - 270,000
270,001 - 407,500
Water Source Volume
Acre-feet per year
1,500 - 2,050
2,051 - 10,000
10,001 - 20,000
20,001 - 30,000
30,001 - 50,000
50,001 - 75,000
Water Use Volume
Acre-feet per year
130 - 200
201 - 2500
2501 - 7600
7601 - 29000
Perennial Streams
USGS Stream Gages
Hydrogeologic Sub-basins
Land Use
Medium to High Density Development
Rural / Low to Mixed Density Development
Agriculture
0 5 10 20 30 40
Miles
The Nature Conservancy

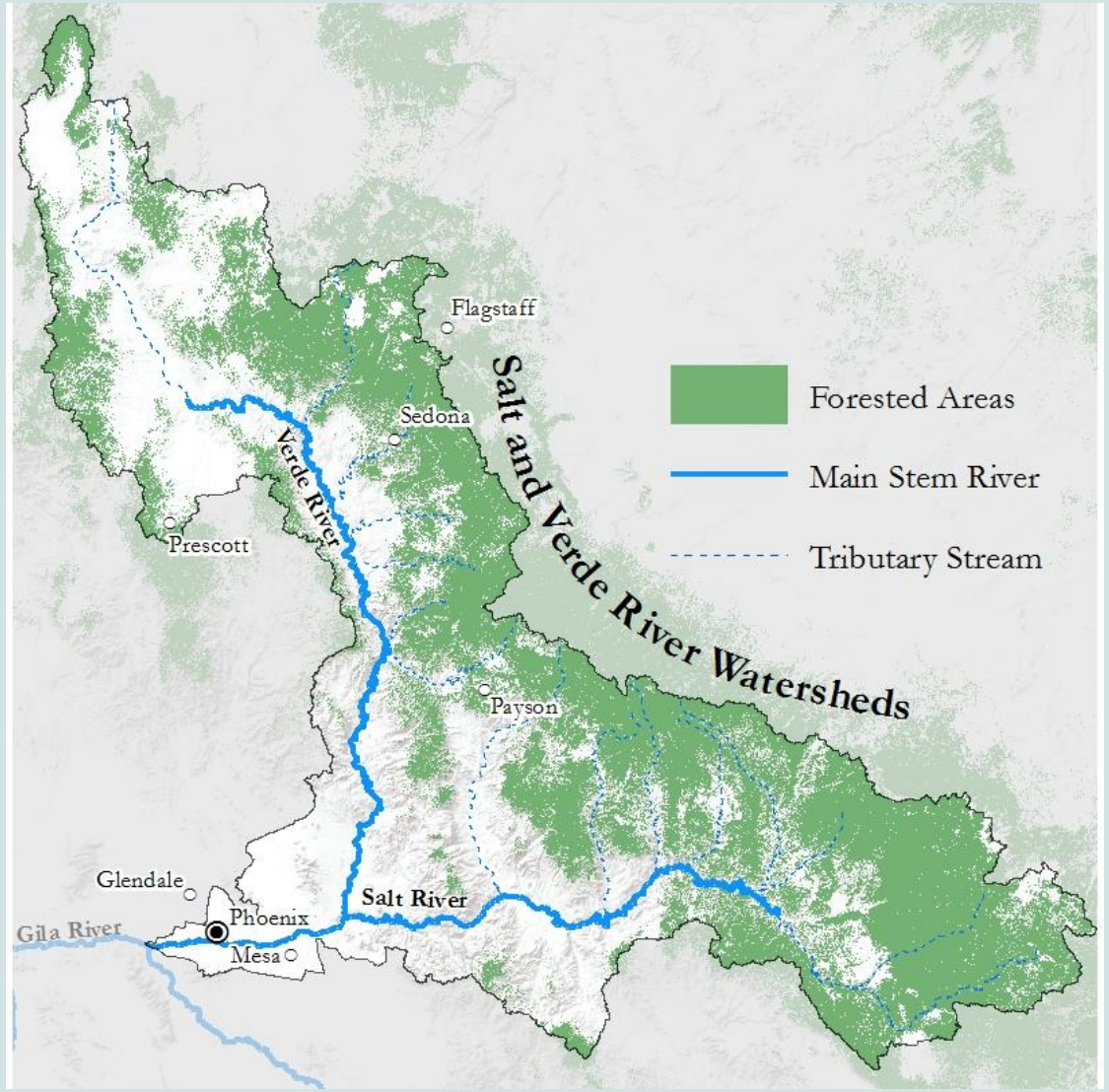


Upper Verde Grasslands

- Provides baseflow for upper 24 miles of the river
- Both Big Chino Aquifer and Little Chino Aquifer are important contributors
- Aquifers are supplied by rainfall on the aquifer – but only a small portion of rainfall actually infiltrates to aquifer

Forests

- Cover a significant portion of the watershed
- Serve to infiltrate water into the aquifers



What is Baseflow?

- Low flow period that is not influenced by storm run-off typically in early summer and winter
- most sensitive to stresses associated with other threats such as water temperature impacts, pollution, and predation
- base flow trends do reflect long-term climate cycles
- Paleozoic aquifers contribute to flows in Middle Verde
- Big and Little Chino Aquifers contribute to Upper Verde

Why Baseflow Matters

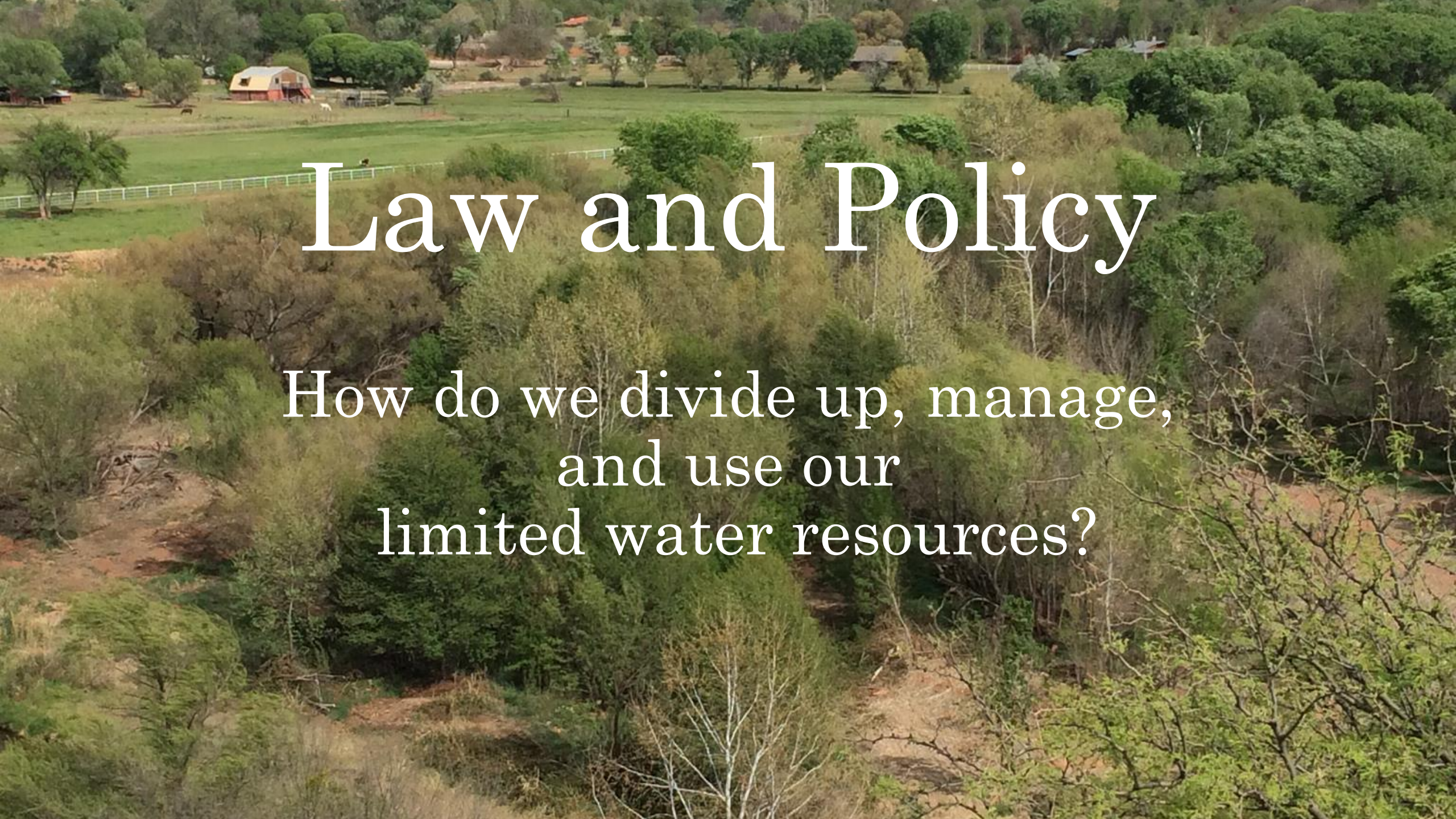
- Provides year-round habitat and refuge for aquatic organisms, including variable water depth and velocity
- Maintains suitable water conditions for varied life history requirements of native organisms (velocity, temperature and dissolved oxygen)
- Supports alluvial aquifer levels sufficient to maintain riparian community growth and survival
- Enables connectivity of stream habitats and refuge for aquatic organisms
- Supports hyporheic functions and organisms, including macroinvertebrates

What are Flood Flows?

- High flow events of varying magnitude
  - Frequent smaller events
  - Large events less often
- Impacted by watershed condition – grazing, urbanization, forest health etc.
- Trends potentially reflect long-term climate cycles
- Can be stored for future use

Why Flood Flows Matter

- Stream power necessary to scour the channel bed and maintain instream habitat
- Sorting and deposition of sediments that form channel bar and riffle habitat
- Flushing of finer sediments to clean channel gravels
- Deposition of fines on bars provides substrate for germination of native riparian plants
- Provide surface and alluvial aquifer conditions conducive to seed distribution, germination, and recruitment of native riparian woody species



Law and Policy

How do we divide up, manage,
and use our
limited water resources?

Surface Water

Maps: EDF

Prior Appropriation

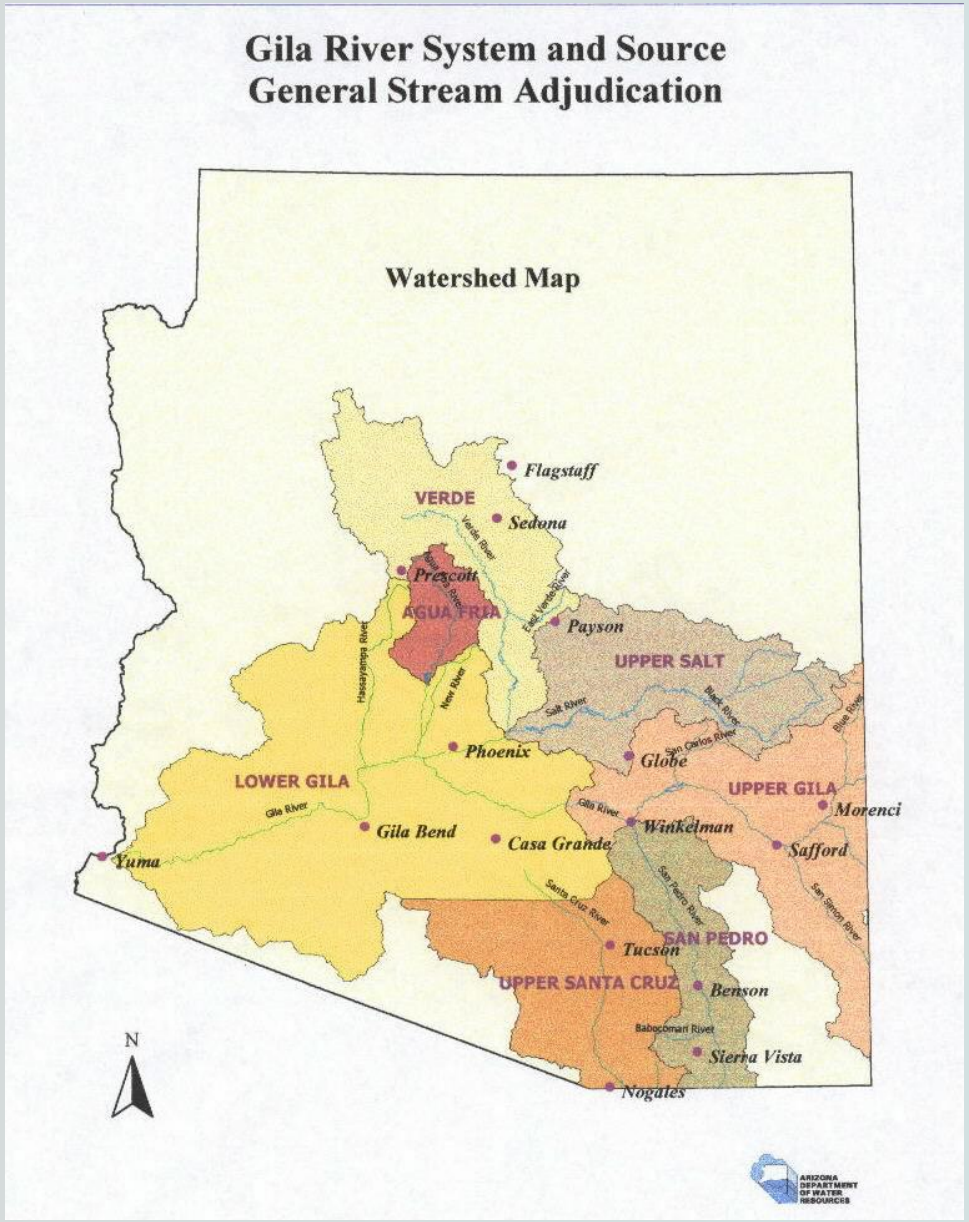
- First in time, first in right
- Beneficial use & notice required
- “Appurtenancy”—rights attached to the land

Why Prior Appropriation?

- “Custom” of miners, irrigators
- Confirmed by state legislature
- A law for taking water <u>out</u> of the stream & putting it to use

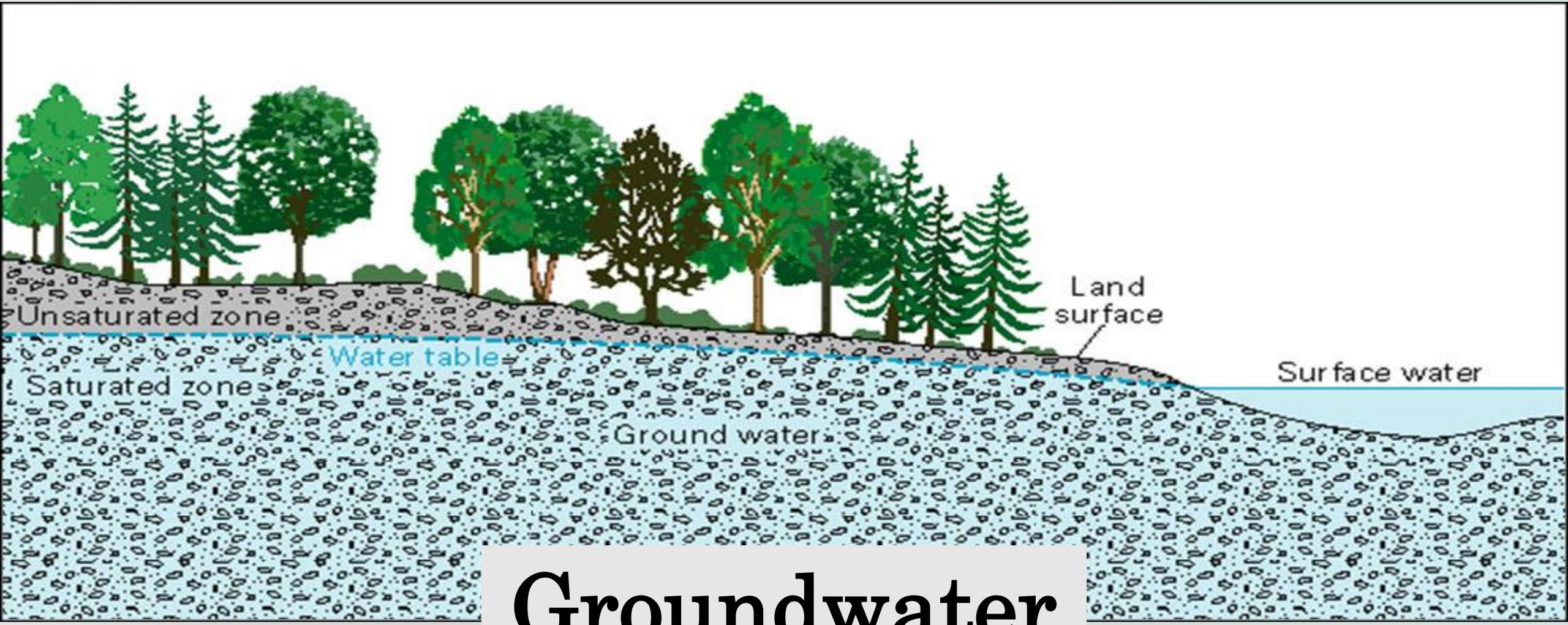
Gila River
General Stream Adjudication

- Quantifies, validates, & confirms priority dates of surface water rights
- >38,000 parties
- Ongoing since ~1974



"The subflow zone is defined as the saturated floodplain Holocene alluvium. DWR, in turn, will determine the specific parameters of that zone in a particular area by evaluating all of the applicable and measurable criteria set forth in the trial court's order and any other relevant factors. All wells located in the lateral limits of the subflow zone are subject to this adjudication. In addition, all wells located outside the subflow zone that are pumping water from a stream or its subflow, as determined by DWR's analysis of the well's cone of depression, are included in this adjudication. Finally, wells that, though pumping subflow, have a de minimus [*sic*] effect on the river system may be excluded form the adjudication based on rational guidelines for such exclusion as proposed by DWR and adopted by the trial court."

--AZ Supreme Court, 2000

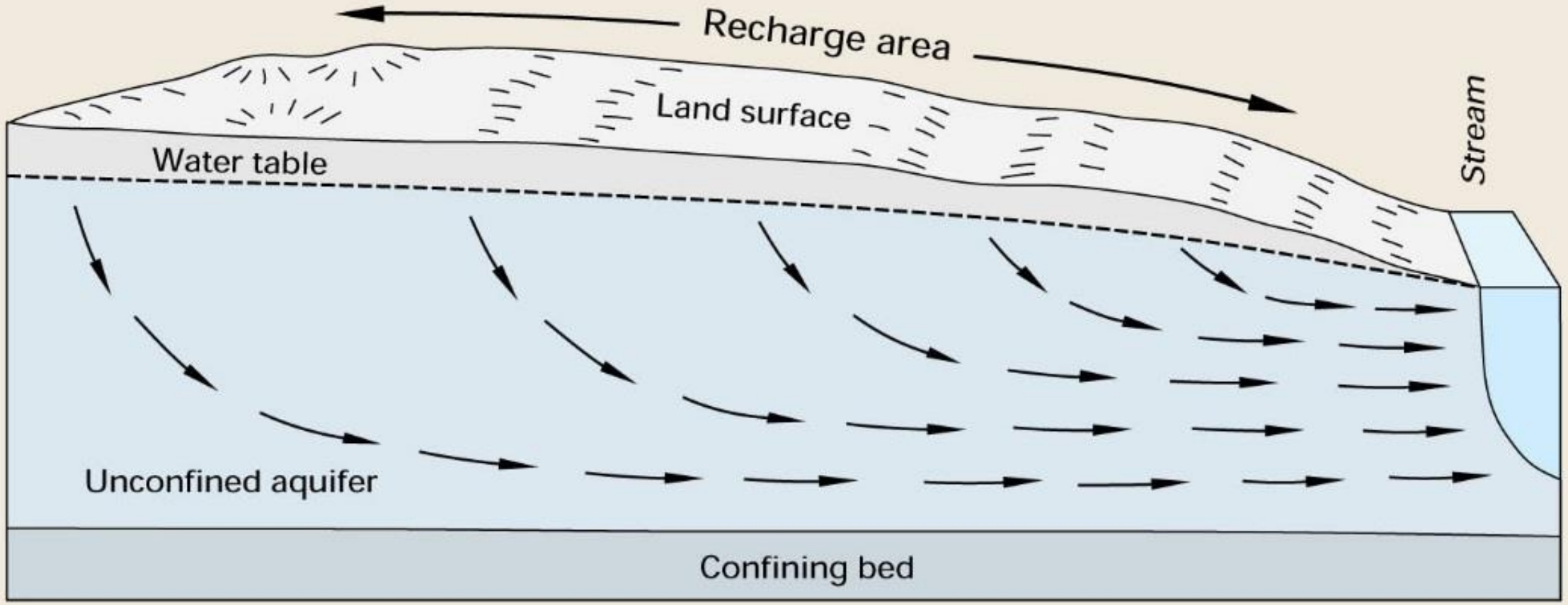


Groundwater

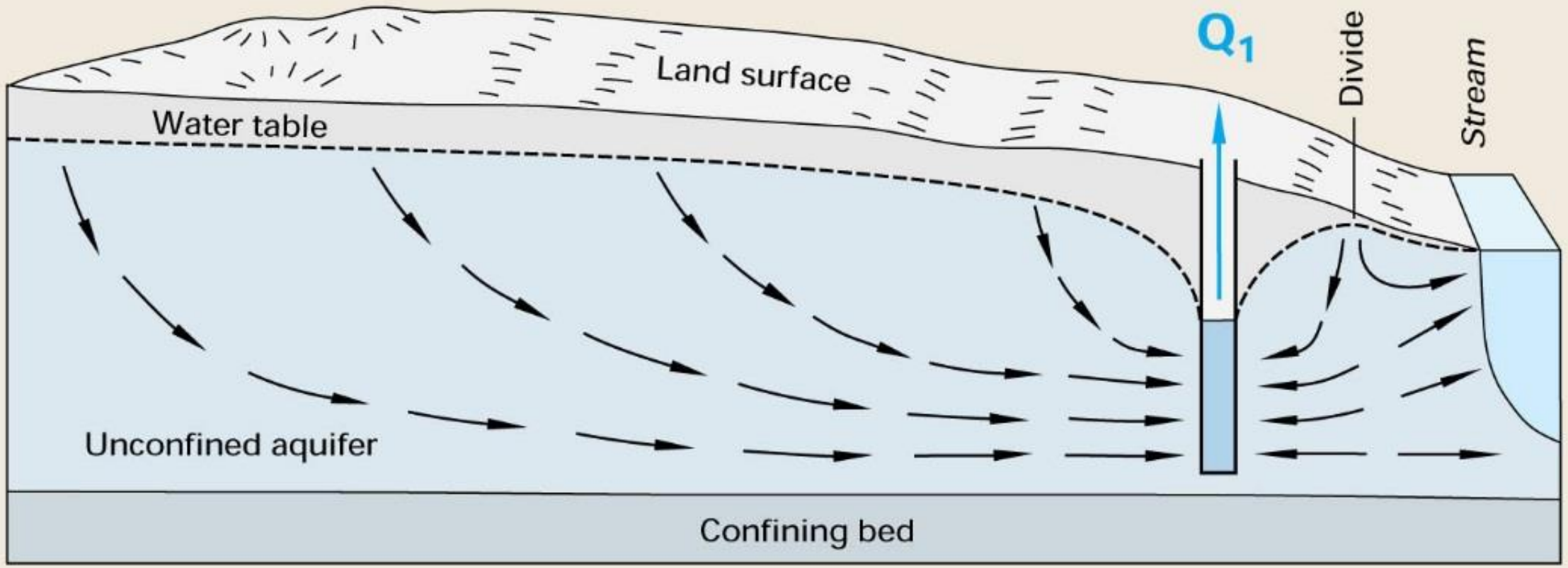
Image: USGS

Photo: USBOR

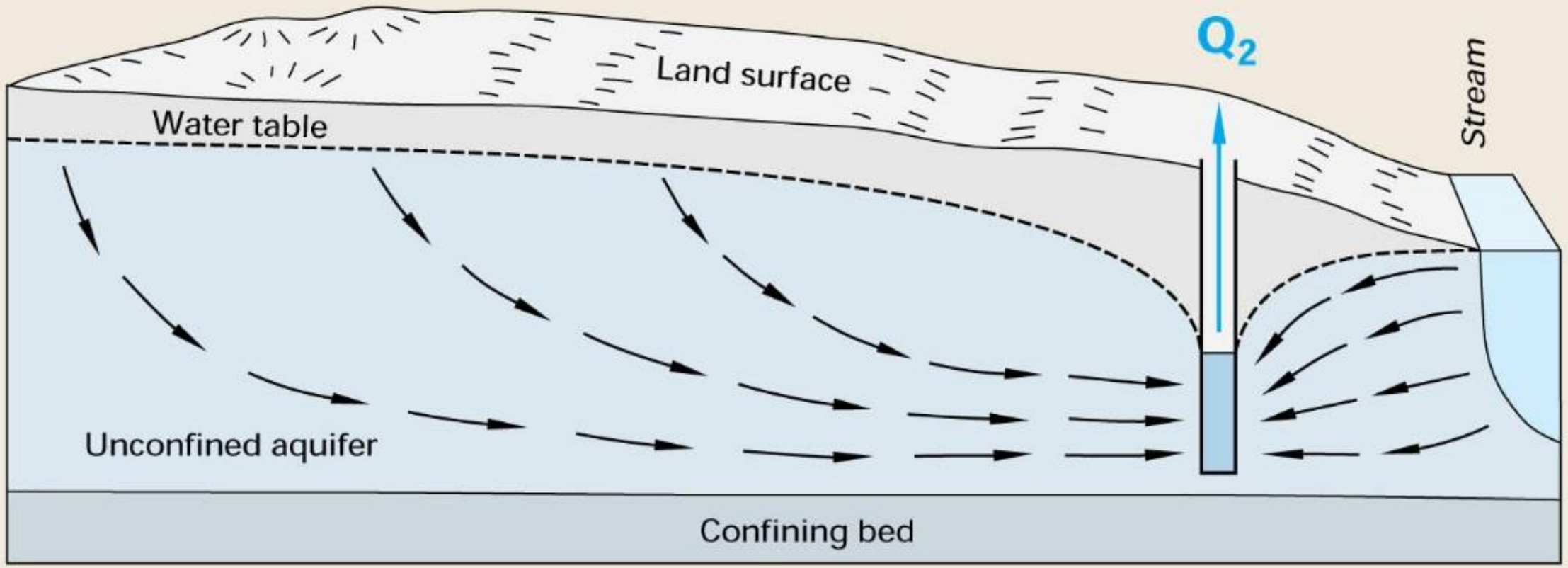

Photo: Rocketbox Productions



From USGS Circular 1139



From USGS Circular 1139



From USGS Circular 1139

Arizona AMAs

Data: ADWR

AMAs: Key Features

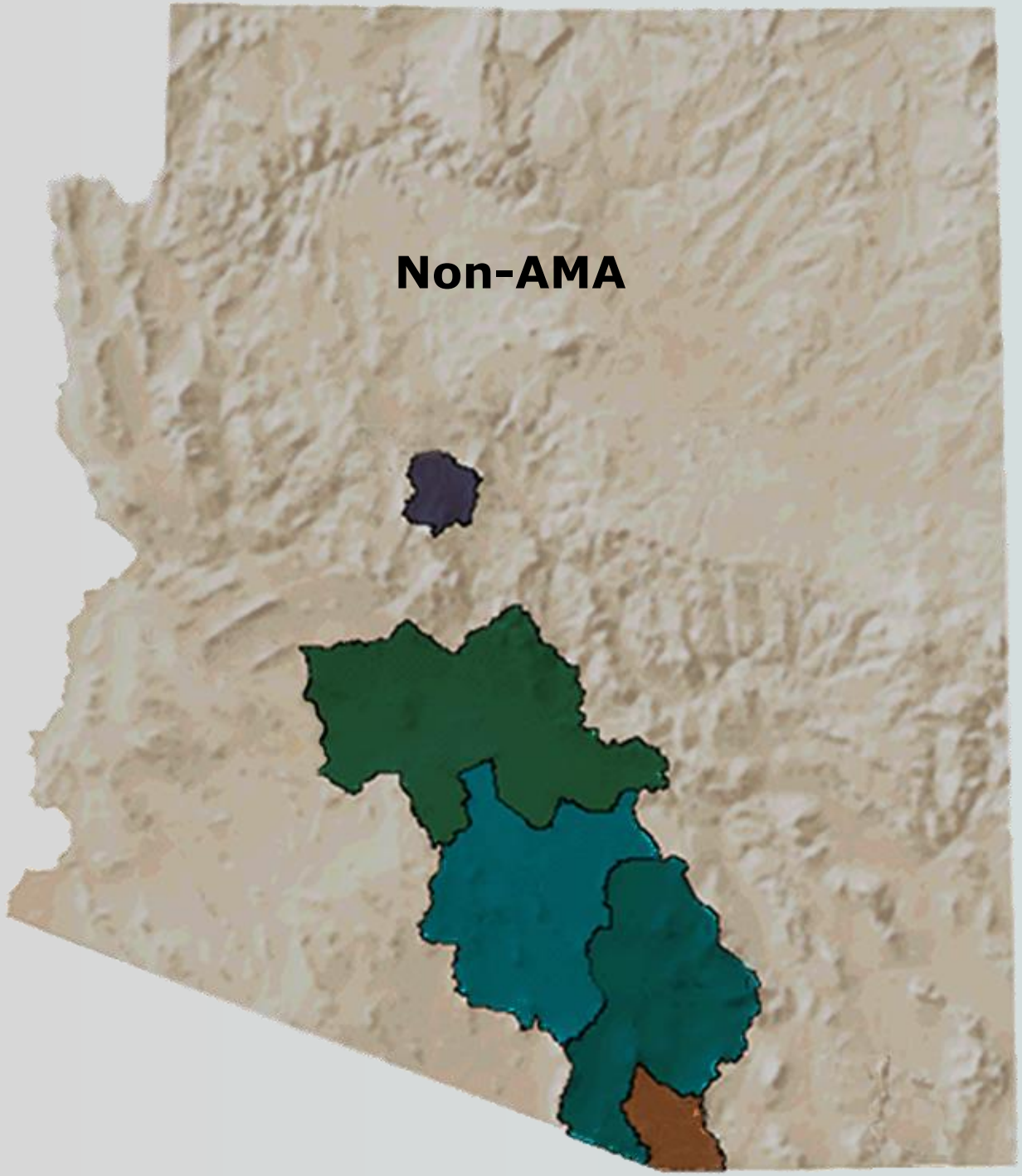
- Groundwater rights & withdrawal permits
- Management plans with conservation, monitoring, and reporting requirements (& goals)
- “Assured Water Supply” program
- Non-expansion of irrigation


SELIGMAN
WILLIAMS
FLAGSTAFF
PAULDEN
SEDONA
CLARKDALE
COTTONWOOD
PRESCOTT
CAMP VERDE
Prescott
AMA
PAYSON
SHOW LOW
PHOENIX
Sycamore Cr.
Oak Creek
Beaver Cr.
W. Clear Cr.
Fossil Cr.
E. Verde River
Verde River
Horseshoe
Reservoir
Bartlett
Reservoir
Salt River
Gila River
N
0
50 Miles
0
50 Km

"The Fourth Management Plan (4MP) programs were developed within current statutory guidelines. However… **full implementation and complete compliance with the conservation requirements outlined… are unlikely to reverse the groundwater overdraft currently experienced** in the basin and result in the achievement of the Prescott Active Management Area (PRAMA) goal to achieve safe-yield by the year 2025."

--Arizona Department of Water Resources,
Prescott AMA Fourth Management Plan, 2014

Arizona AMAs



Data: ADWR

Sustaining Flows: Challenges

Current Condition

Diversions

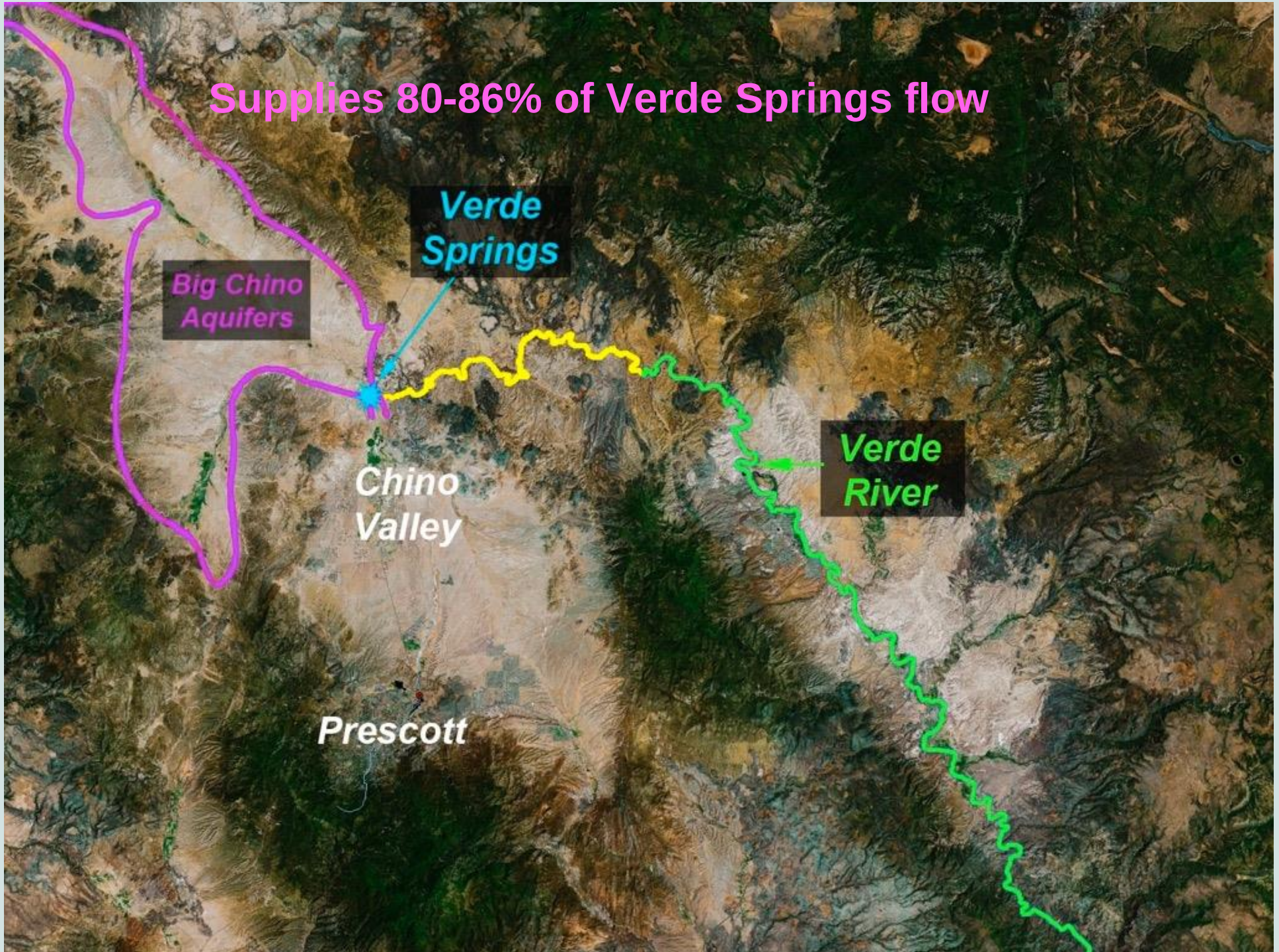
Climate Change

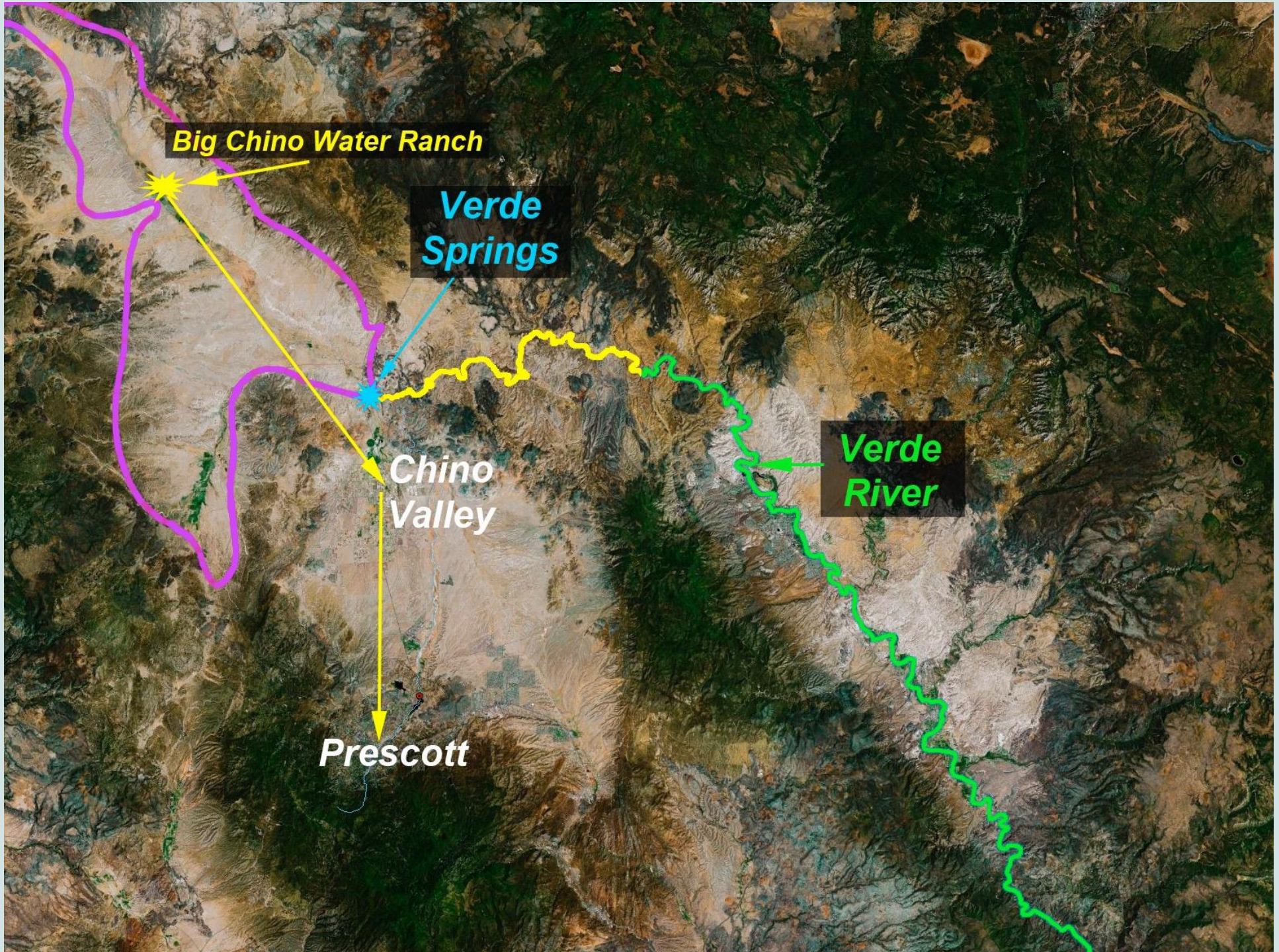
Unconstrained Groundwater Pumping

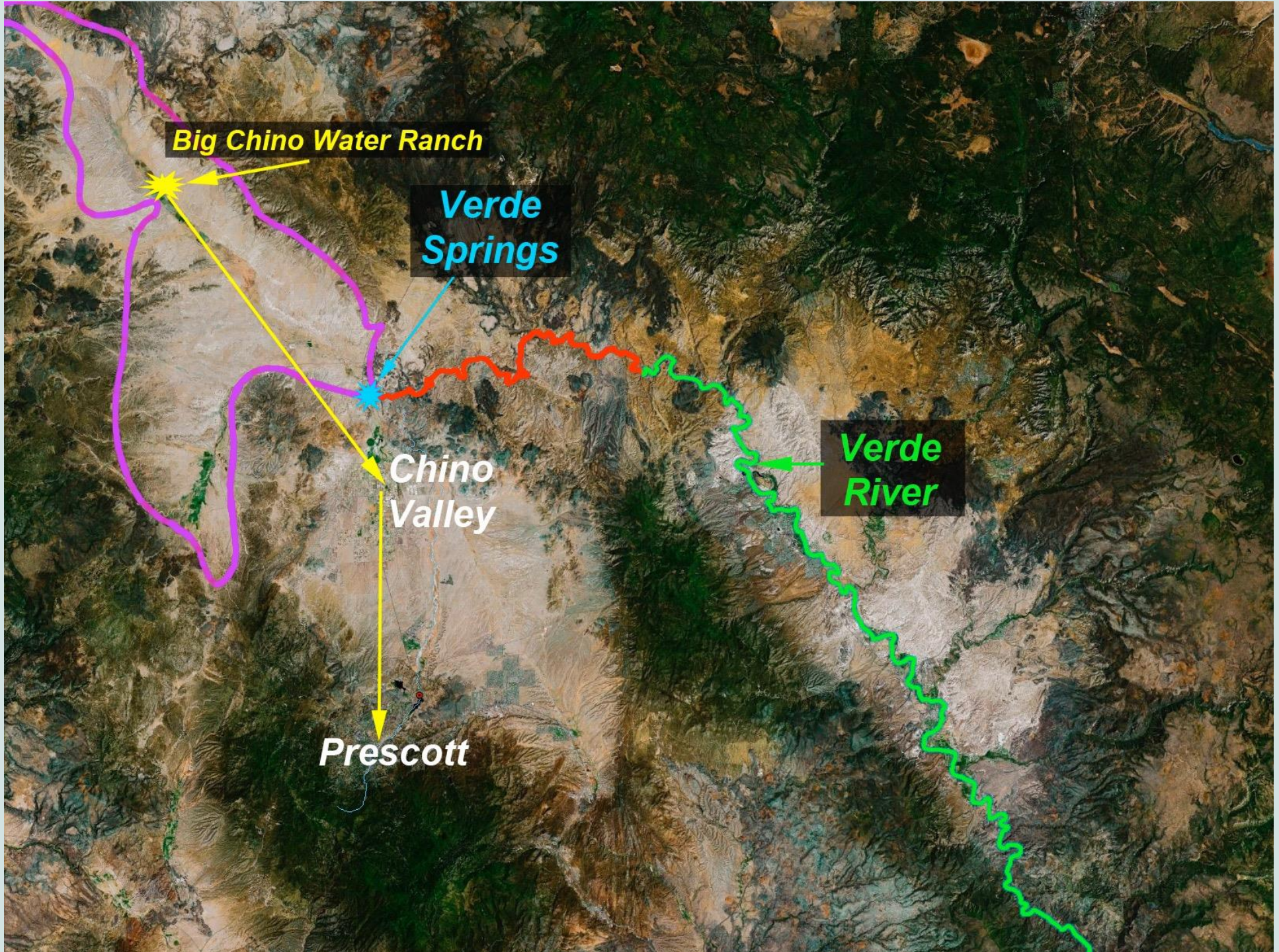
- Longview Pumped Storage Project
- Big Chino Water Ranch
- Expanded agricultural irrigation
- Growth and development


Big Chino Water
Ranch


Verde Springs
Sole source for 25 miles
Verde River
Chino Valley
Prescott


Supplies 80-86% of Verde Springs flow
Verde Springs
Big Chino Aquifers
Chino Valley
Verde River
Prescott


Big Chino Water Ranch
Verde Springs
Chino Valley
Verde River
Prescott

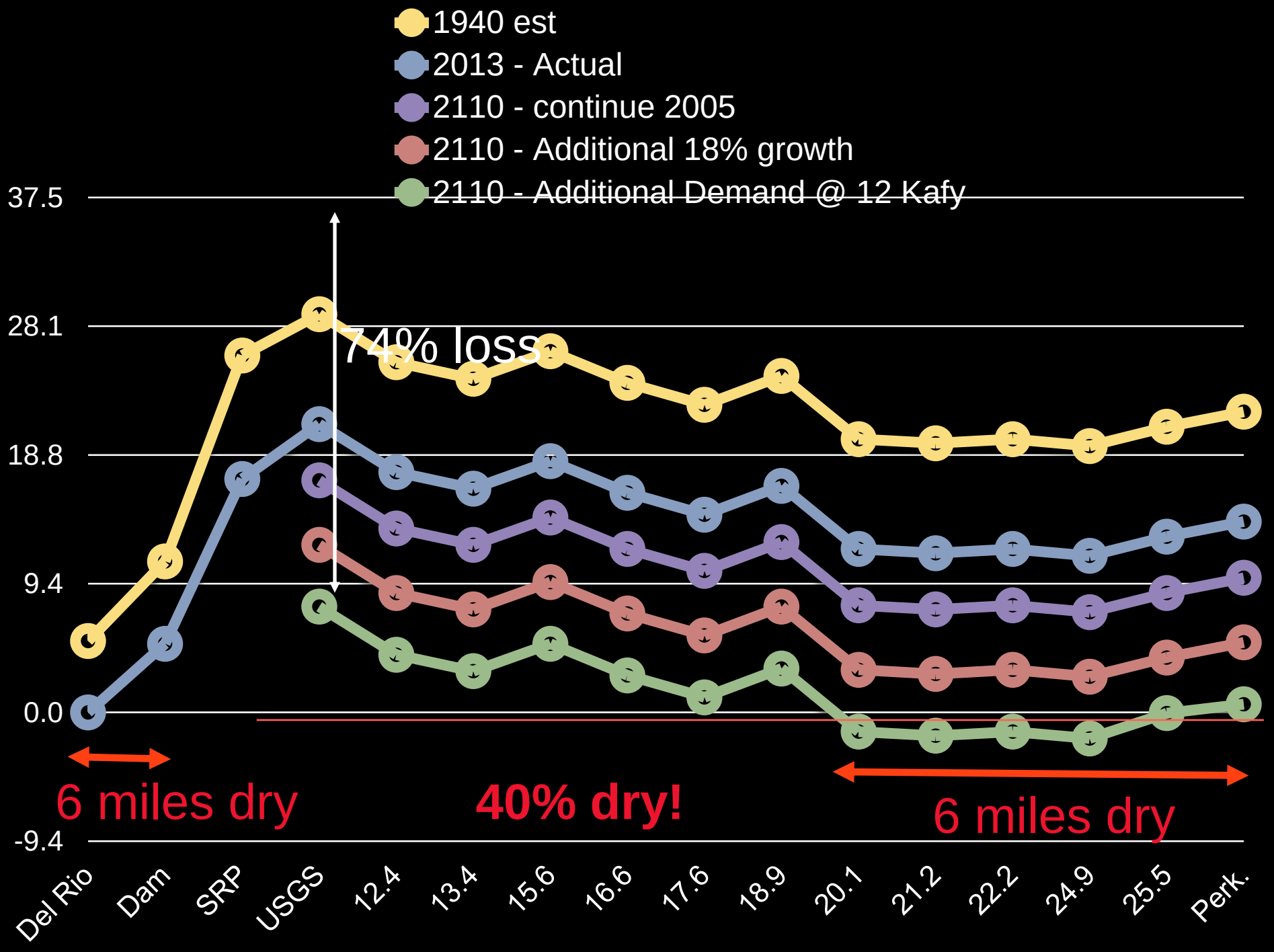

Big Chino Water Ranch
Verde Springs
Chino Valley
Verde River
Prescott

Irrigation

Development

Groundwater Demand - Kafy

	Now	Future
Longview	0	2 - 17
Big Chino Water Ranch	0	8
Historically Irrigated Acreage Exports	0	10.8
Irrigation	~ 3	20
Domestic uses	~ 3	10 - 30
Total Pumping	~ 6	50 ???
Base Flow: USGS Paulden	<15	0


1940 est
2013 - Actual
2110 - continue 2005
2110 - Additional 18% growth
2110 - Additional Demand @ 12 Kafy
37.5
28.1
18.8
9.4
0.0
-9.4
74% loss
6 miles dry
40% dry!
6 miles dry
Del Rio
Dam
SRP
USGS
12.4
13.4
15.6
16.6
17.6
18.9
20.1
21.2
22.2
24.9
25.5
Perk.

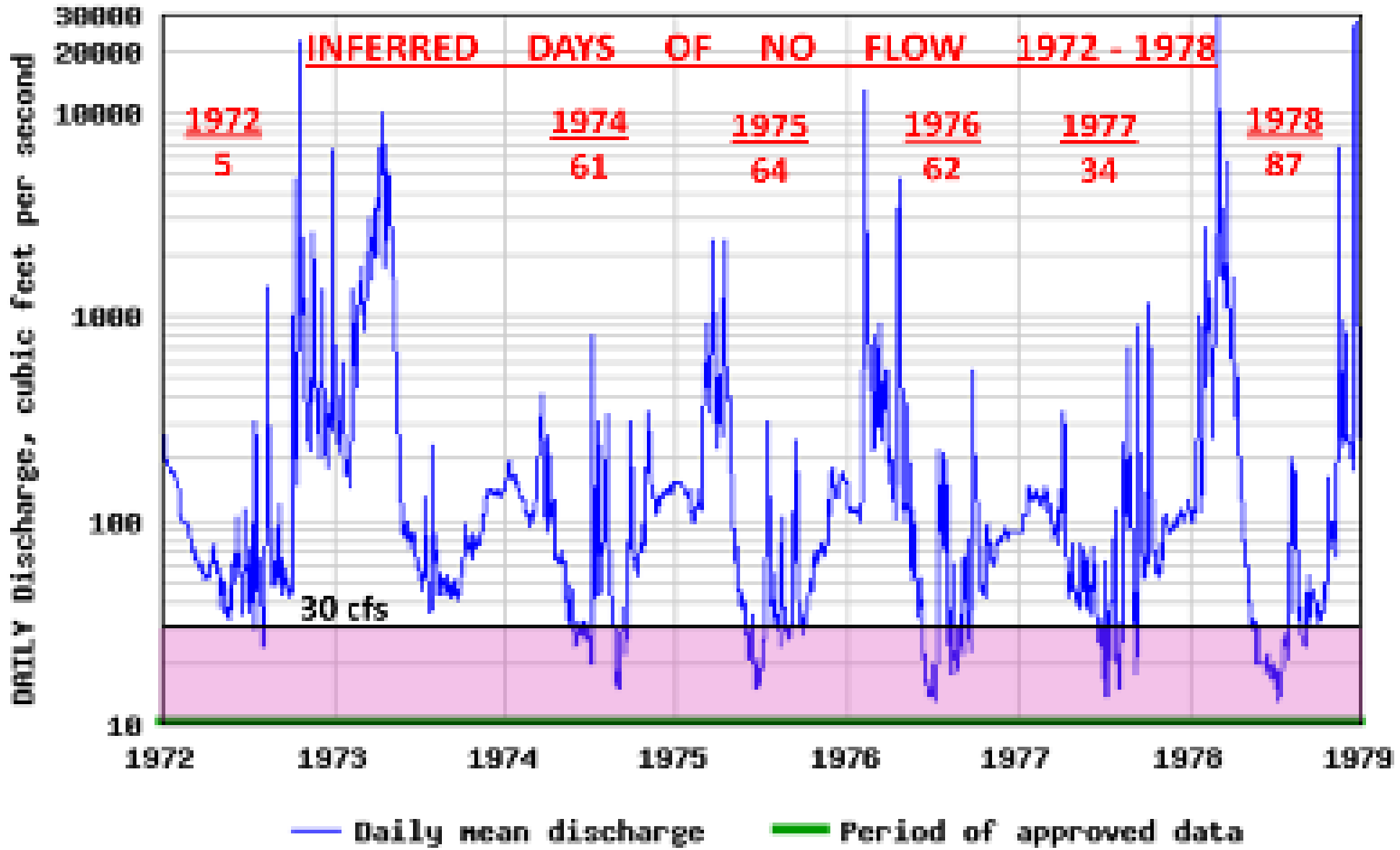
Dry 2110

Sandtrap Tank, rm 24: Dry 2110

Perkinsville Bridge, rm 26: Dry 2110

USGS

USGS 09505550 VERDE RIVER BELOW CAMP VERDE, AZ

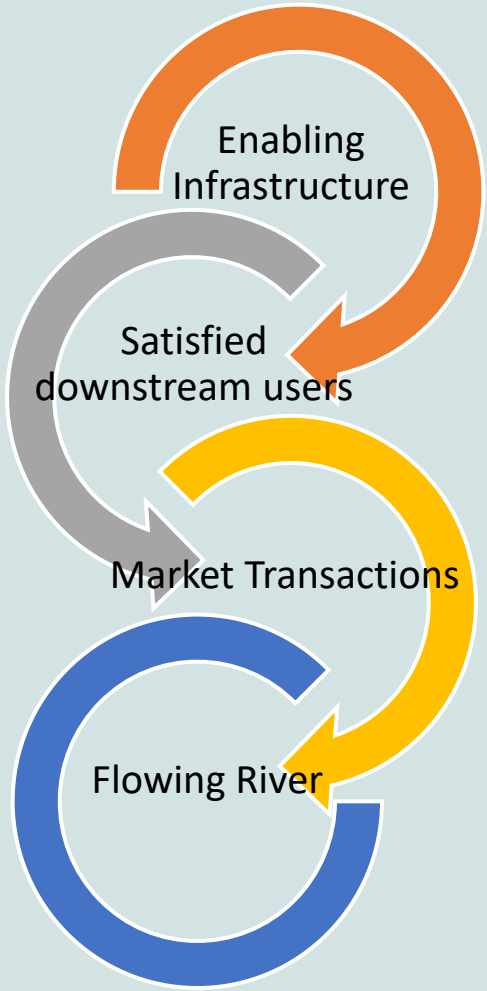


Conclusions

- Verde River is healthy now.
- Currently permitted groundwater pumping in the Big Chino will dry the upper Verde.
- Future groundwater pumping in the Verde Valley will dry the river in summer months.
- Groundwater pumping will degrade the sole surviving perennial river in Arizona.
- Groundwater pumping must be constrained in order to protect base flow.


Innovative Solutions
to Surface Water
Management

Achieving Goals



- Functional Infrastructure – conveyance and on-farm
- By-pass saved water

- All users are fully satisfied
- Downstream users do not need “saved” water

- Crop Conversion agreements
- Diversion reduction agreements
- Mitigate new uses
- Irrigation infrastructure

- Less consumptive use
- More water in critical reaches

Fallow Agreements

- MAKING DO WITH THE LAWS WE HAVE

1. **Full season fallowing**

-Takes land out of production for full year

2. **Summer fallowing**

-Water in the river in summer when most needed

-Land in production a portion of year (pasture or crop)

Crop Conversion

- ECONOMICS TO DRIVE RIVER CONSERVATION

1. **Subsidize conversion**

   -Low water use, low water crops

2. **Develop market interventions**

   -Malt house

   -Partnerships with growers from other regions

Irrigation Infrastructure

- THE RIGHT EQUIPMENT TO DO THE JOB

1. Conveyance Infrastructure

- piping, lining, controls, monitoring, check structures

2. On Farm

- Allows crop conversions
- Decreases water demand

Forbearance Agreements

- PAY FOR PERFORMANCE

1. Ditch flow targets

- Encourages sharing of shortages within users
- Buffers from climate variability

2. River Flow Targets

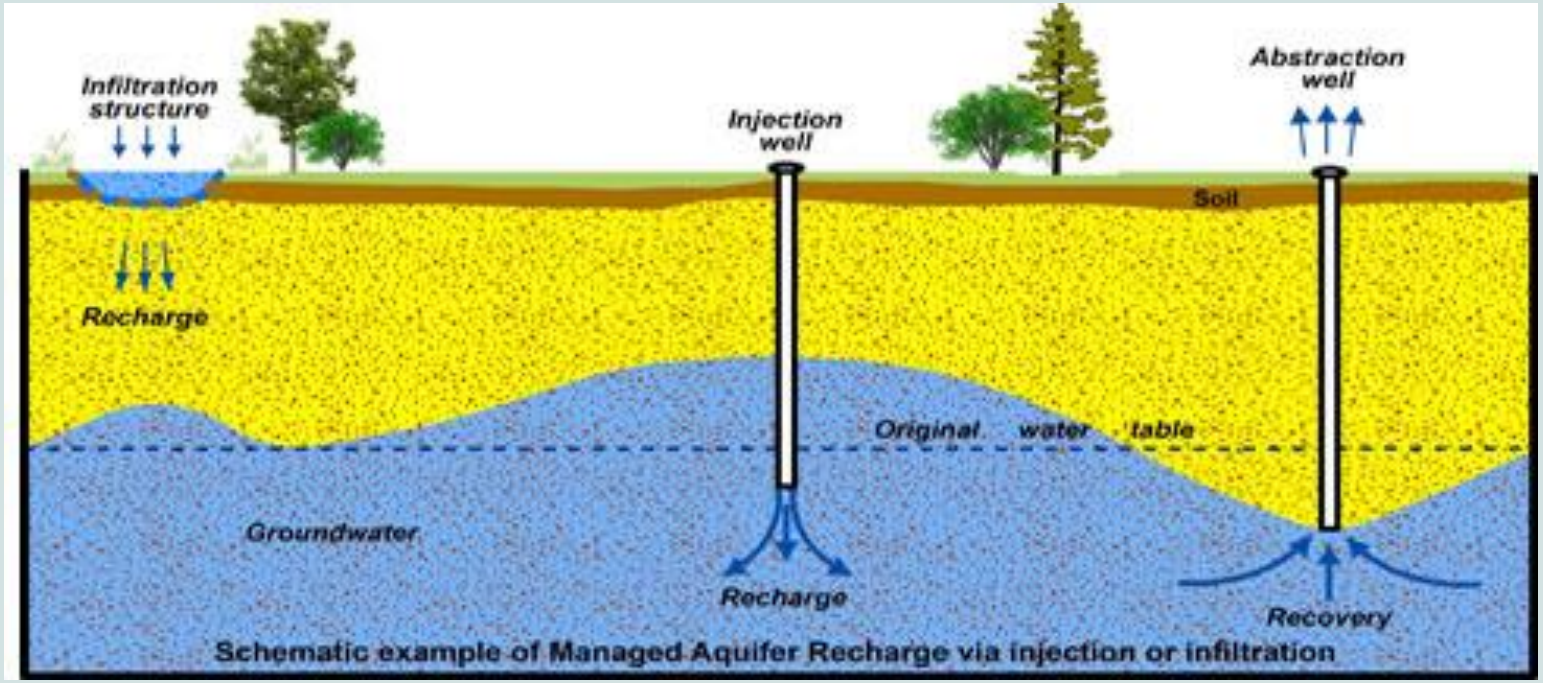
- Increased risk for ditch
- Encourages sharing of shortages

Aquifer Recharge

- UTILIZING ALL OF OUR RESOURCES

1. Aquifer Recharge

- Injection or infiltration
- Actively done by Sedona, soon Cottonwood
- Use effluent in Verde Valley but potential for enhanced urban runoff



KIMBERLY SCHONEK
KSCHONEK@TNC.ORG
928 925 9221

The Verde River Exchange

WATER OFFSET PROGRAM

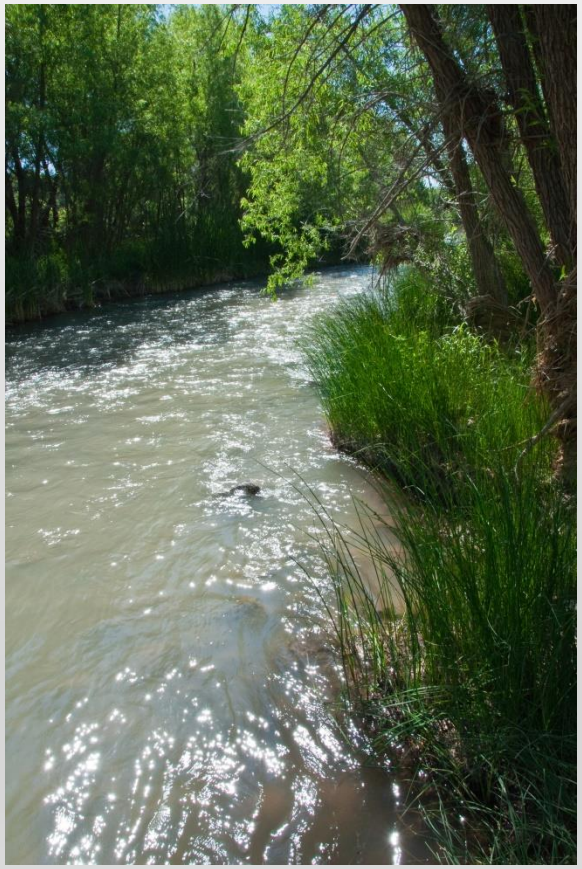
FRIENDS OF VERDE RIVER GREENWAY

FVRG Mission and Vision

Friends of Verde River Greenway works collaboratively to restore habitat, sustain flows, and promote community stewardship to support a healthy Verde River system.

We envision a healthy, flowing Verde River and tributaries that support our unique environment, vibrant economy, and quality of life for future generations.

FVRG Role in Watershed Restoration

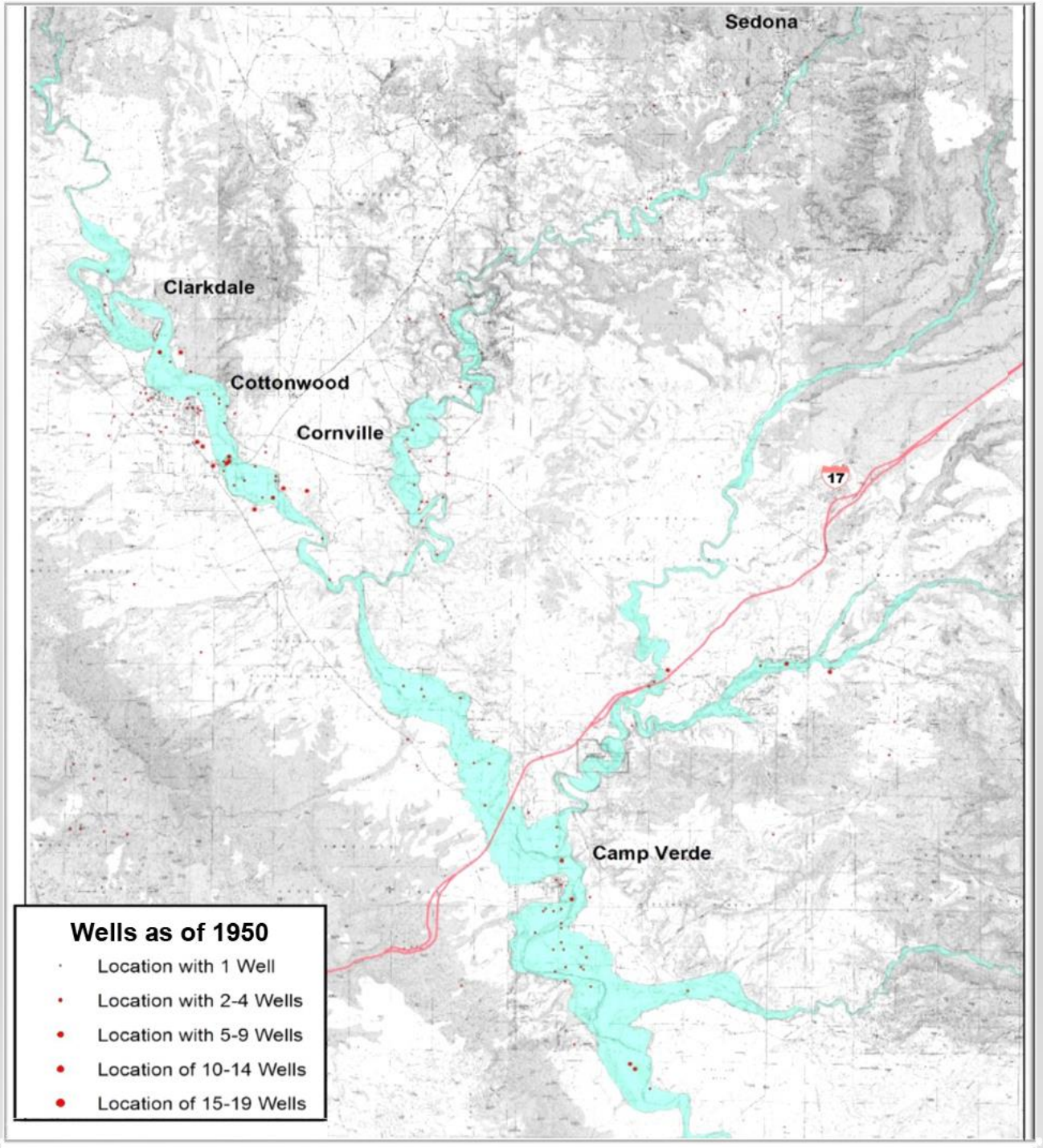


"Boots-on-the-Ground" collaborative projects to promote and implement watershed stewardship

Verde photo: The Nature Conservancy

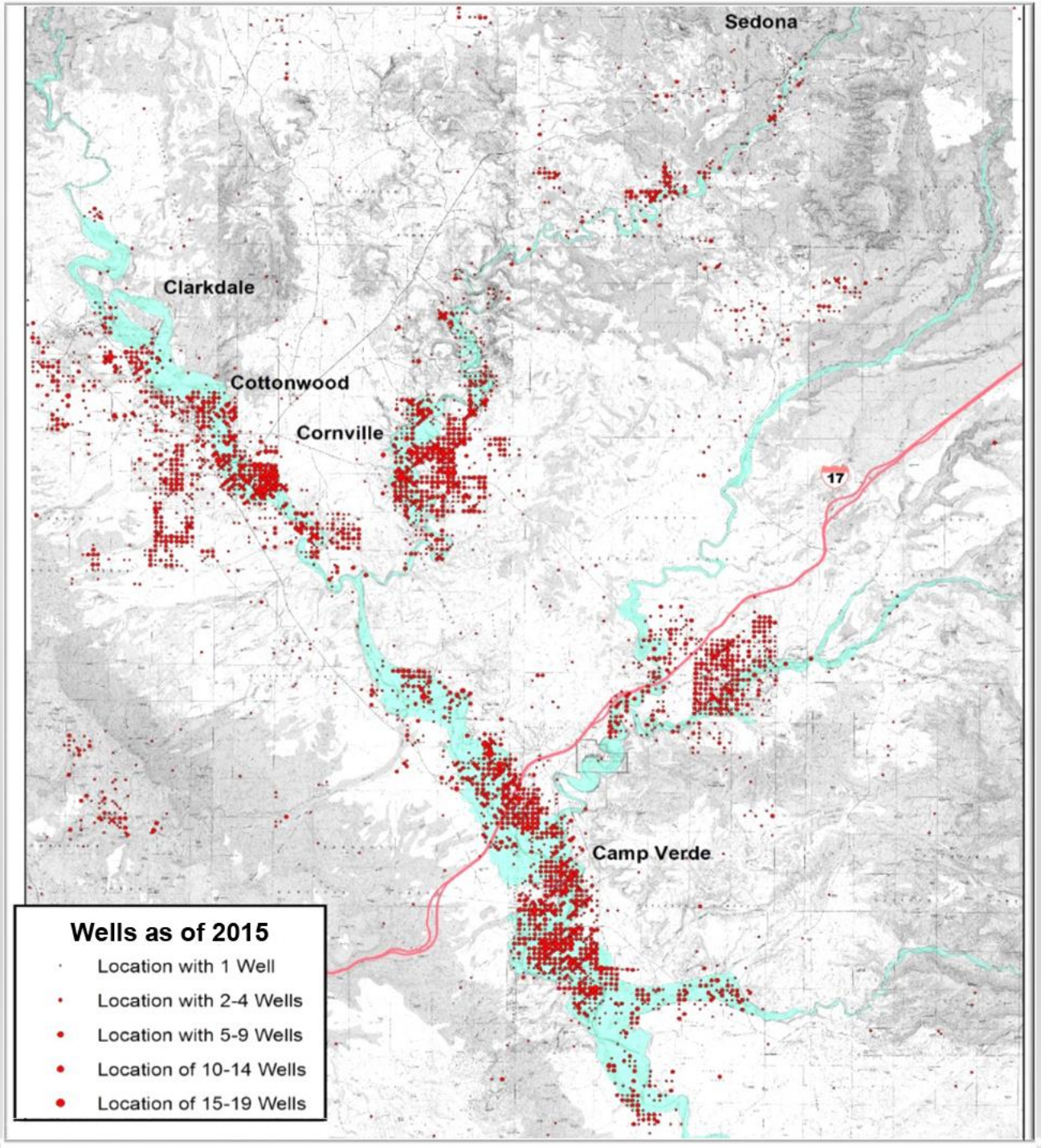
FVRG Programs Include…

What's the Challenge?



1950

Images Courtesy Of
Salt River Project



2015

Images Courtesy Of
Salt River Project

Building a Local Solution

Program Origin, Values

- Implement actionable local solutions that work in the larger AZ water rights and water politics picture
- Respect local economic, environmental and social values
- Preserve property rights and individual water users' autonomy

Program Origin, Values

- Ensure collaboration and shared stewardship among water users and community members from different sectors
- Focus on a positive, voluntary and proactive approach
- Begin to address underlying long-term issues

Partners

EDF
ENVIRONMENTAL DEFENSE FUND
Finding the ways that work

FRIENDS OF VERDE RIVER GREENWAY

WALTON FAMILY FOUNDATION

The Nature Conservancy

bef
BONNEVILLE ENVIRONMENTAL FOUNDATION

Advisory Council

Steve Ayers
Nikki Bagley
Linda Buchanan
Peter Culp
Tim Elinski
Laura Jones
Chris Kuzdas
Chip Norton
Kim Schonek
Doug Von Gausig

What is the Verde River Exchange?

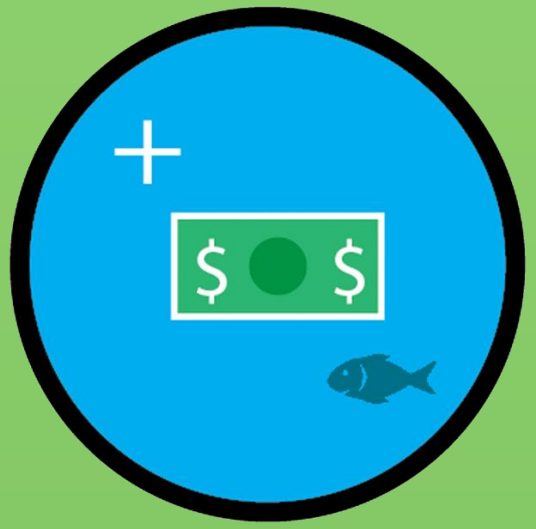
Provides a mechanism for groundwater users to “offset” the impact of their groundwater pumping on the Verde River

How Does It Work?

1. Well pumping lowers Verde River water levels.

2. A Seller (usually a private landowner) voluntarily agrees not to consume a certain amount of water.

How Does It Work?



3. The seller's reduced consumption is recorded as a Water Offset Credit – water that is returned to the Verde River system.

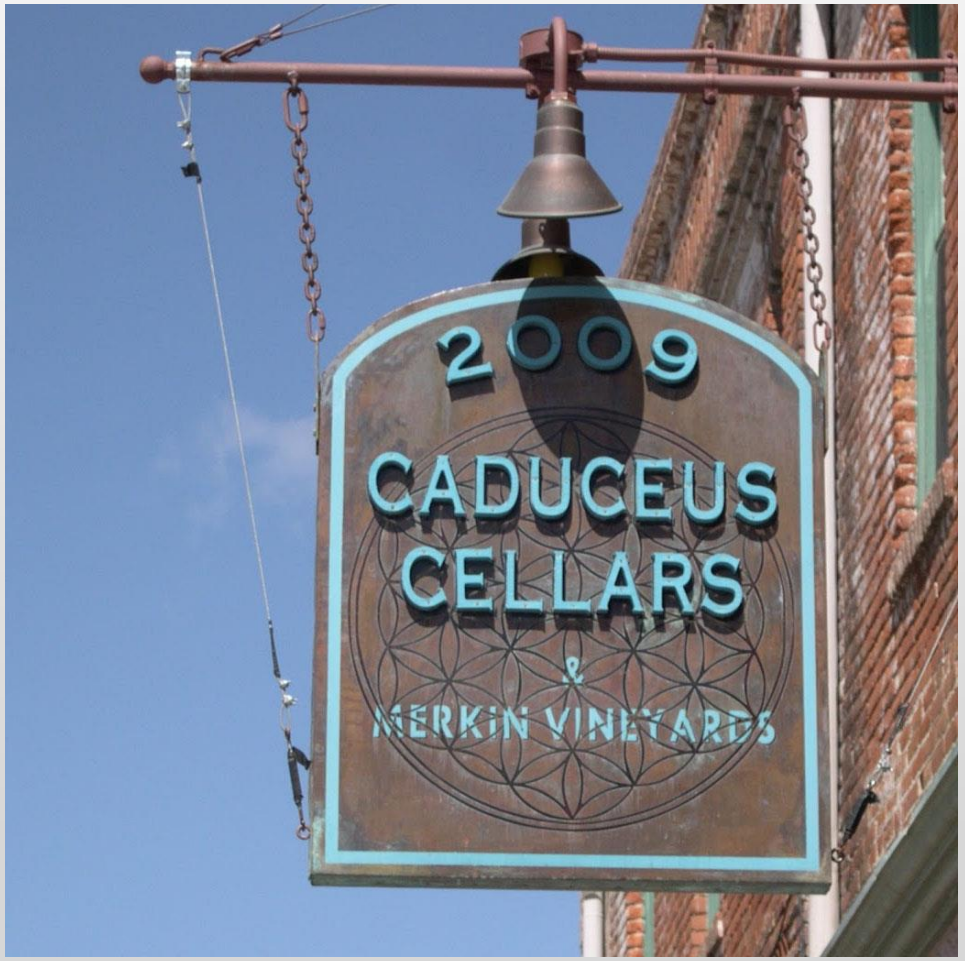
4. A Buyer purchases Water Offset Credits, reducing their "water footprint" and the impact of their groundwater use.

How Does It Work?

5. The result: Through this balancing mechanism, total water use, and its impact on the river system, is reduced.

Pilot Projects


PAGE SPRINGS
VINEYARDS & CELLARS
1500 North Page Springs Road
OPEN 365 DAYS A YEAR
SUNDAY - WEDNESDAY 11 AM - 7 PM
THURSDAY - SATURDAY 11 AM - 9 PM


2009
CADUCEUS
CELLARS
&
MERKIN VINEYARDS

Verde River Exchange Water Offset Program

CERTIFICATE

THIS CERTIFICATE IS PROUDLY PRESENTED TO

Page Springs Vineyards & Cellars

FOR OFFSETTING

1,369,000 GALLONS OF WATER **2016** 4.2 ACRE-FEET

TYPE OF USE OFFSET:
Irrigation of Vineyard

Our livelihoods and quality of life depend on ensuring a healthy river system for all. This Water Offset Certificate is helping to preserve a flowing Verde River and to protect the local water supplies that sustain our community by reducing our collective use of the river and its connected groundwater systems. The Verde River is treasured by the Arizona communities that rely on it, and your participation in the Verde River Exchange Water Offset Program demonstrates your commitment to preserving the flowing waters and the green heart of the Verde Valley.

CERTIFICATE NO. 1

July 15, 2016
DATE

Chip Norton, President

Verde River Exchange Water Offset Program

CERTIFICATE

THIS CERTIFICATE IS PROUDLY PRESENTED TO

Caduceus Cellars & Merkin Vineyards

FOR OFFSETTING

1,369,000 GALLONS OF WATER **2016** 4.2 ACRE-FEET

TYPE OF USE OFFSET:
Irrigation of Vineyard

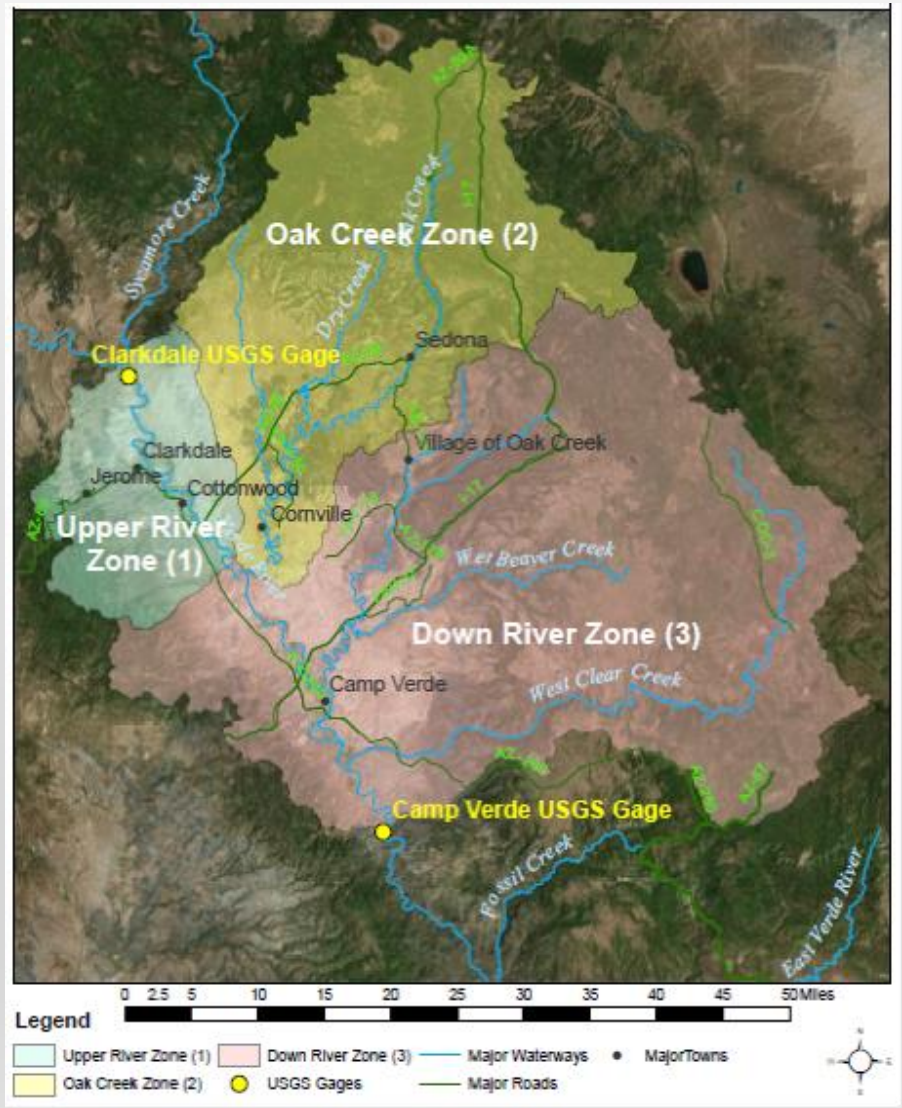
Our livelihoods and quality of life depend on ensuring a healthy river system for all. This Water Offset Certificate is helping to preserve a flowing Verde River and to protect the local water supplies that sustain our community by reducing our collective use of the river and its connected groundwater systems. The Verde River is treasured by the Arizona communities that rely on it, and your participation in the Verde River Exchange Water Offset Program demonstrates your commitment to preserving the flowing waters and the green heart of the Verde Valley.

CERTIFICATE NO. 2

July 15, 2016
DATE

Chip Norton, President

Who Can Participate?



- Eligible residents, businesses in project area
- Matched by zones

Who Can Participate?

- **"Buyers"** in the Verde River Exchange program are businesses, farms, or homes that continue to use the water they need—but **purchase "Water Offset Credits" to help offset the impact of their groundwater withdrawal**.

- **"Sellers"** in the Verde River Exchange program are water users in the Verde Valley who have recently and historically been using water but **agree to cease or reduce their use temporarily, in return for a modest payment.**

Why Participate?

- To promote **sustainable water supply** for the future of the Verde Valley's communities and its economic health
- To **enhance the Verde River** as an environmental, recreational, and scenic asset
- To **reduce your business's water footprint** and share the story of your part in promoting a sustainable water future
- **Community stewardship** is good for business

Why Participate?

- A **valuable investment** in the Verde Valley's future
- **Brand enhancement** supported by recognition of support, promotion of participant businesses
- **Visibility in the Verde Valley**, including annual event with network of other leaders

Building Our Program

- Increase number of projects
- Expand scope and duration of offsets
- Incentivize participation

Long-Term Goals

- Healthy, flowing rivers
- Thriving economy and communities
- Innovative local groundwater management

Knau News and Classical Music

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Fresh Air

We our upgrading our 88.7 transmitter in Flagstaff, during this time, service may be interrupted. Thank you for your patience.

Conservation Program Launches to Reduce Water Usag Verde Valley

By JUSTIN REGAN • AUG 2, 2016

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Conserv
in the n
demand

greenliving AZ • MAGAZINE

Blog, Community Engagement, Environment, Green in the News, Green Life, Innovation, Water

AZ Local Water Conservation Effort: Verde River Exchange

JULY 21, 2016 by GREENLIVINGAZ

NATIONAL GEOGRAPHIC

Water Currents

Insights into the freshwater world

Voices Home | Water Currents Home | BioBlitz | Cat Watch | Explorers Journal | Fulbright Stories | Ocean Views | Voice for Elephants

Two Arizona Vineyards Give Back to a River through a Voluntary Water Exchange

Posted by **Sandra Postel** of National Geographic's Freshwater Initiative in **Water Currents** on July 25, 2016

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WATER
INNOVATION
CHALLENGE

www.verderiverexchange.org

BONNEVILLE ENVIRONMENTAL FOUNDATION

FRIENDS of VERDE RIVER GREENWAY

EDF ENVIRONMENTAL DEFENSE FUND Finding the ways that work

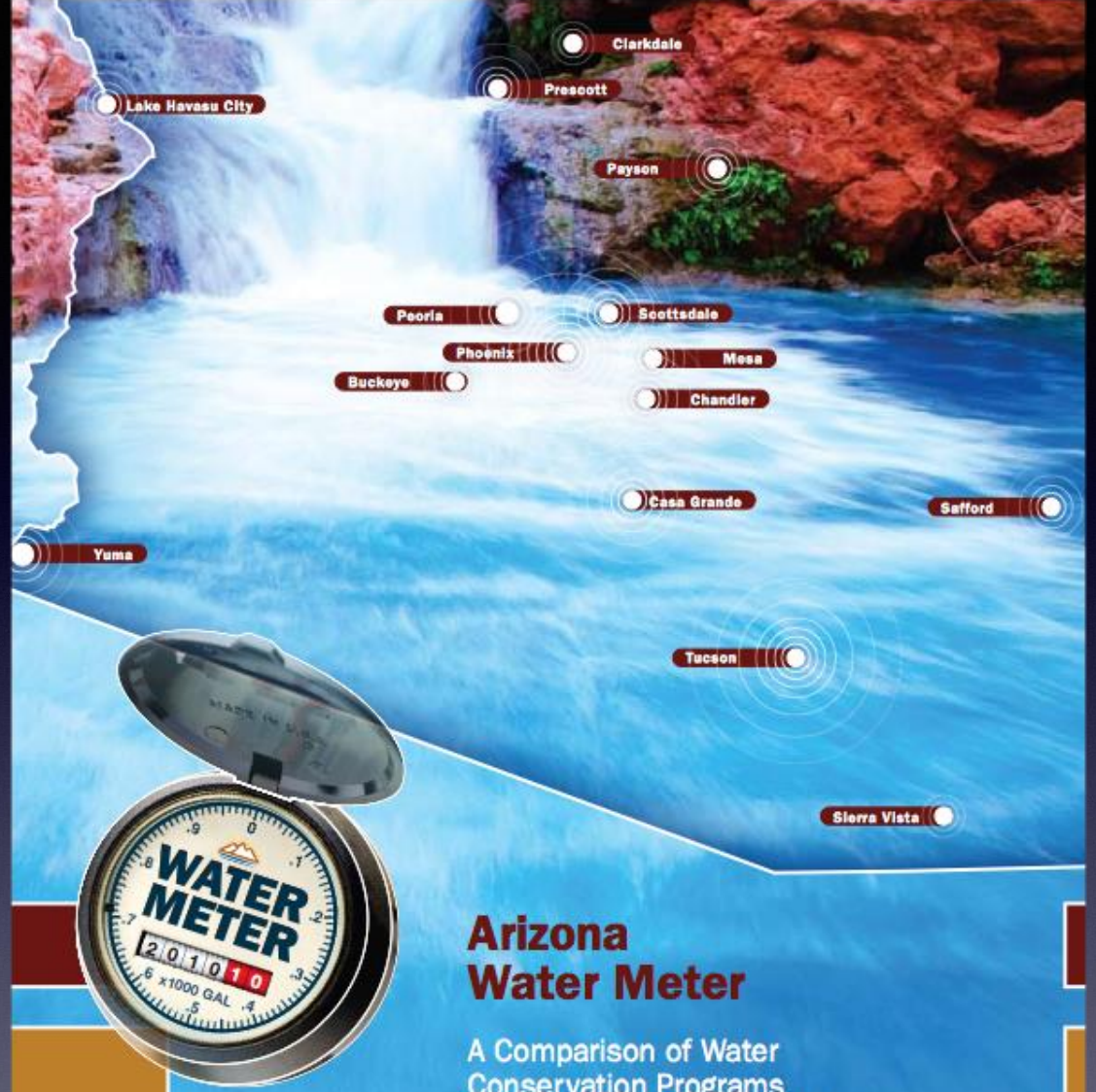
WALTON FAMILY FOUNDATION

The Nature Conservancy

Residential Water Conservation

Why Conserve?

- Its the right thing to do.
- Consumers save on water & sewer bills.
- Least expensive, quickest, & easiest to implement.
- Few legal impediments.
- Can reduce size and cost of expensive importation projects.
- Can prolong use of existing groundwater resource.
- Can help protect the Verde River.



Arizona Water Meter

A Comparison of Water Conservation Programs in 15 Arizona Communities

October 2010

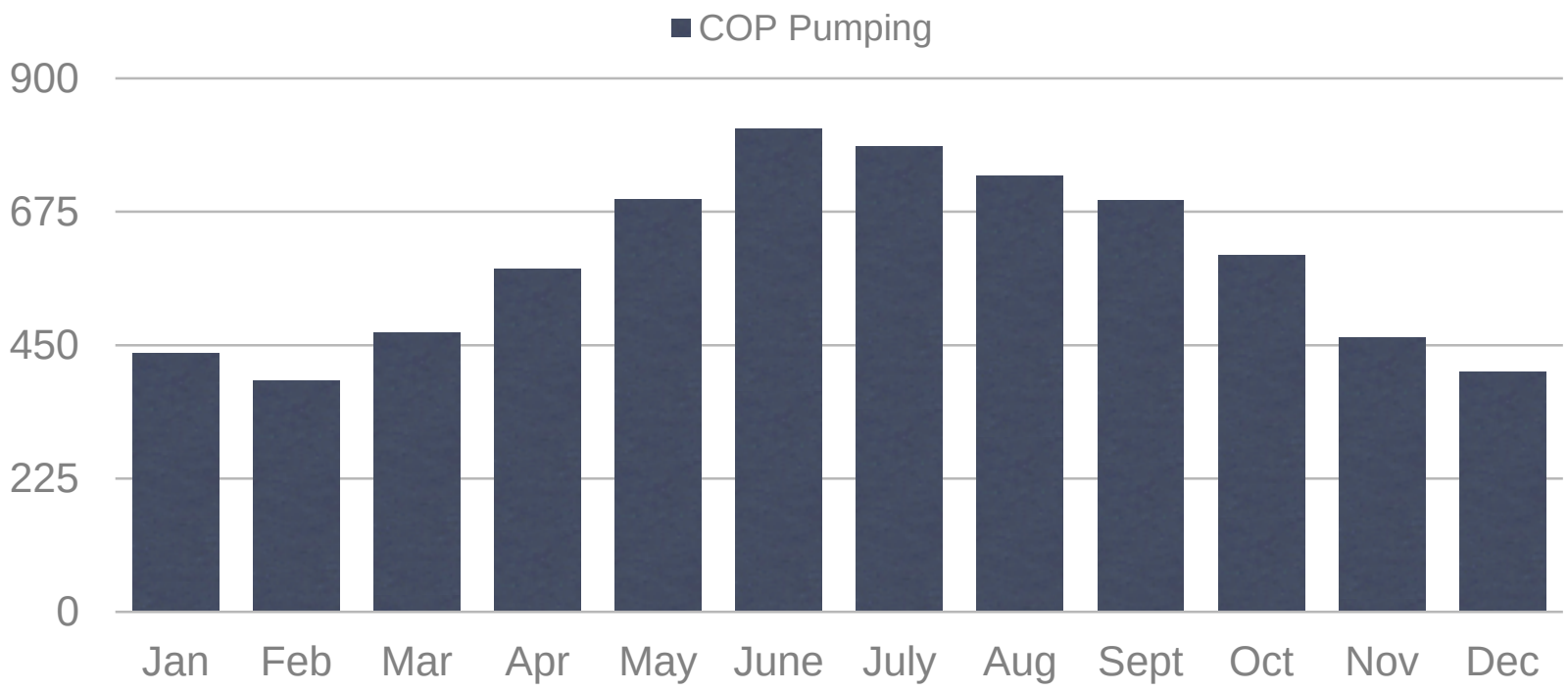
WESTERN RESOURCE ADVOCATES

SINGLE-FAMILY RESIDENTIAL GPCD			
	2008 SFR GPCD	Population Change*	Adjusted GPCD
Buckeye	61	555.0%	400
Casa Grande (AWC)	99	50.2%	149
Chandler	142	23.1%	175
Clarkdale	73	2.2%	75
Lake Havasu City	124	10.8%	137
Mesa	130	4.8%	136
Payson	66	6.5%	70
Peoria	125	39.2%	174
Phoenix	123	10.7%	136
Prescott	98	11.4%	109
Safford	175	0.0%	175
Scottsdale	249	7.5%	268
Sierra Vista (AWC)	105	9.4%	115
Tucson	102	7.5%	110
Yuma	150	0.3%	150

Unrealized Potential

- Why does gpcd vary?
- Now, some residents at 20 gpcd
- Future: Net-Zero Groundwater?

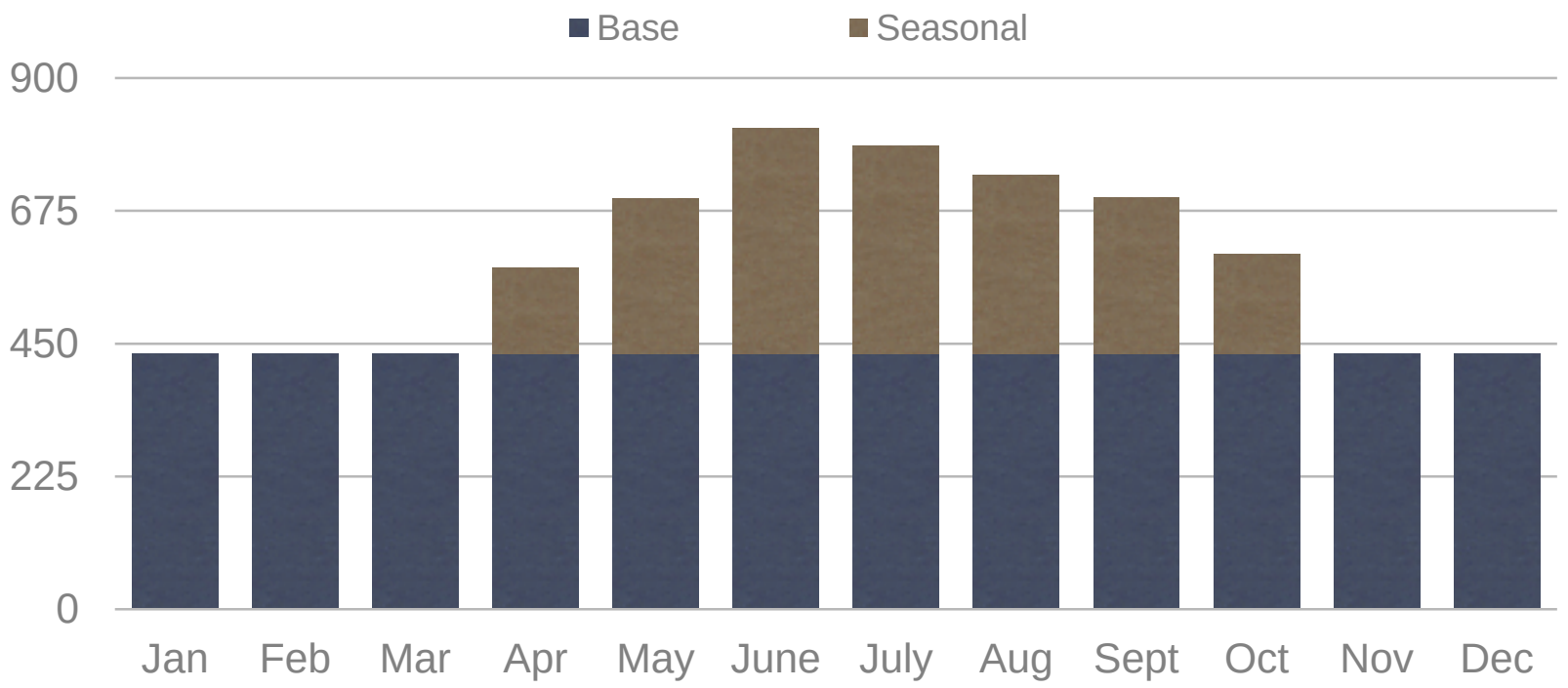
AVERAGE PUMPING 2007-2011
7071 AF



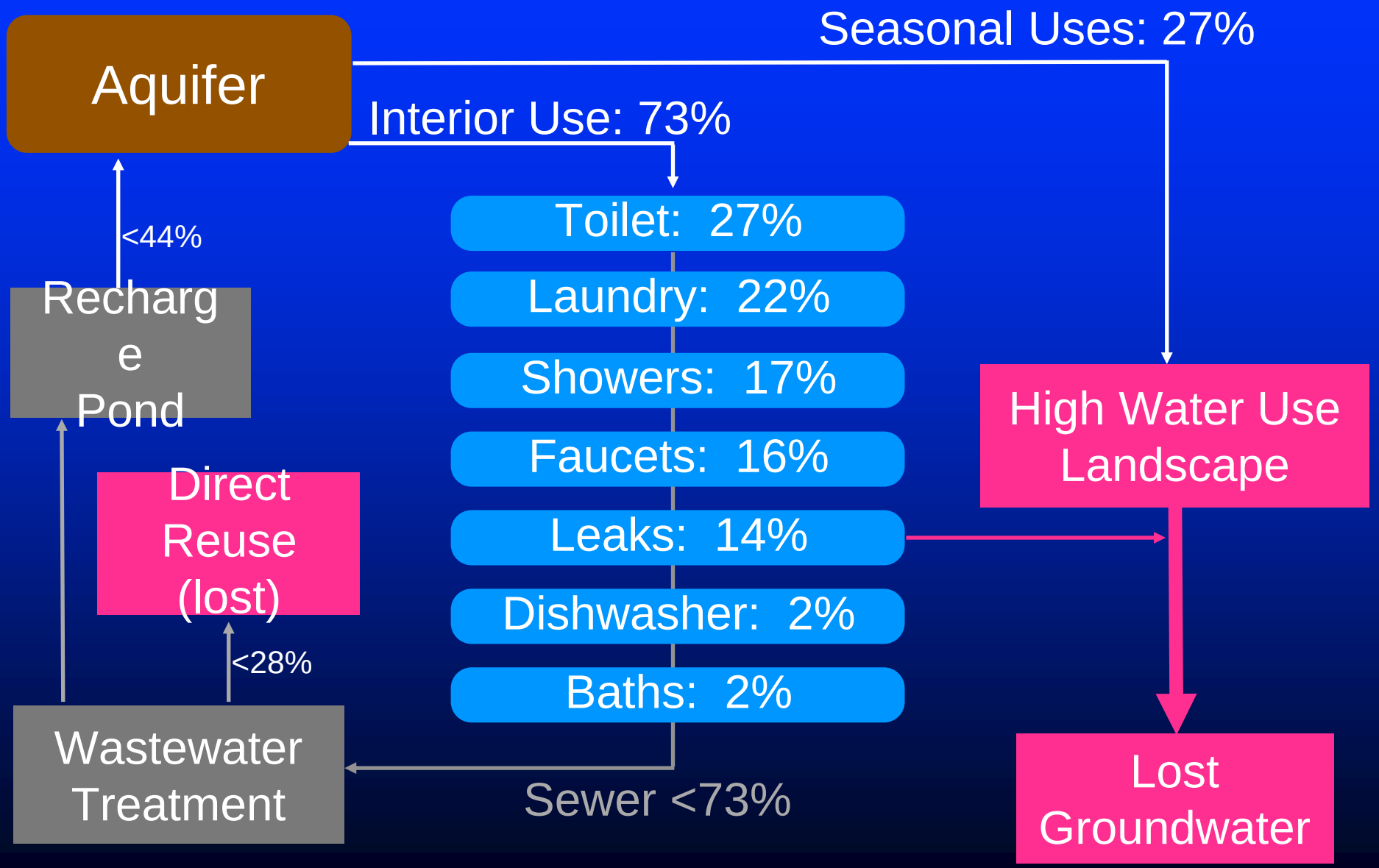
AVERAGE PUMPING 2007-2011

62% INCREASE OVER BASE

SEASONAL USE: 27% OF ANNUAL PUMPING ~1890 AFY



Urban Home: Municipal Utility (water & sewer)



HARVESTING RAINWATER

FOR LANDSCAPE USE

PATRICIA H. WATERFALL
Extension Agent, University of Arizona
Cooperative Extension/Low 4 Program

Second Edition, October 2004
Revised 2006

Dual Flush Toilet

Solids:
1.26 gall/flush

Liquids:
0.8 gall/flush


Outdated,
Inefficient
Washer:
50 gall/load


High-efficiency washer:
12 gall/load

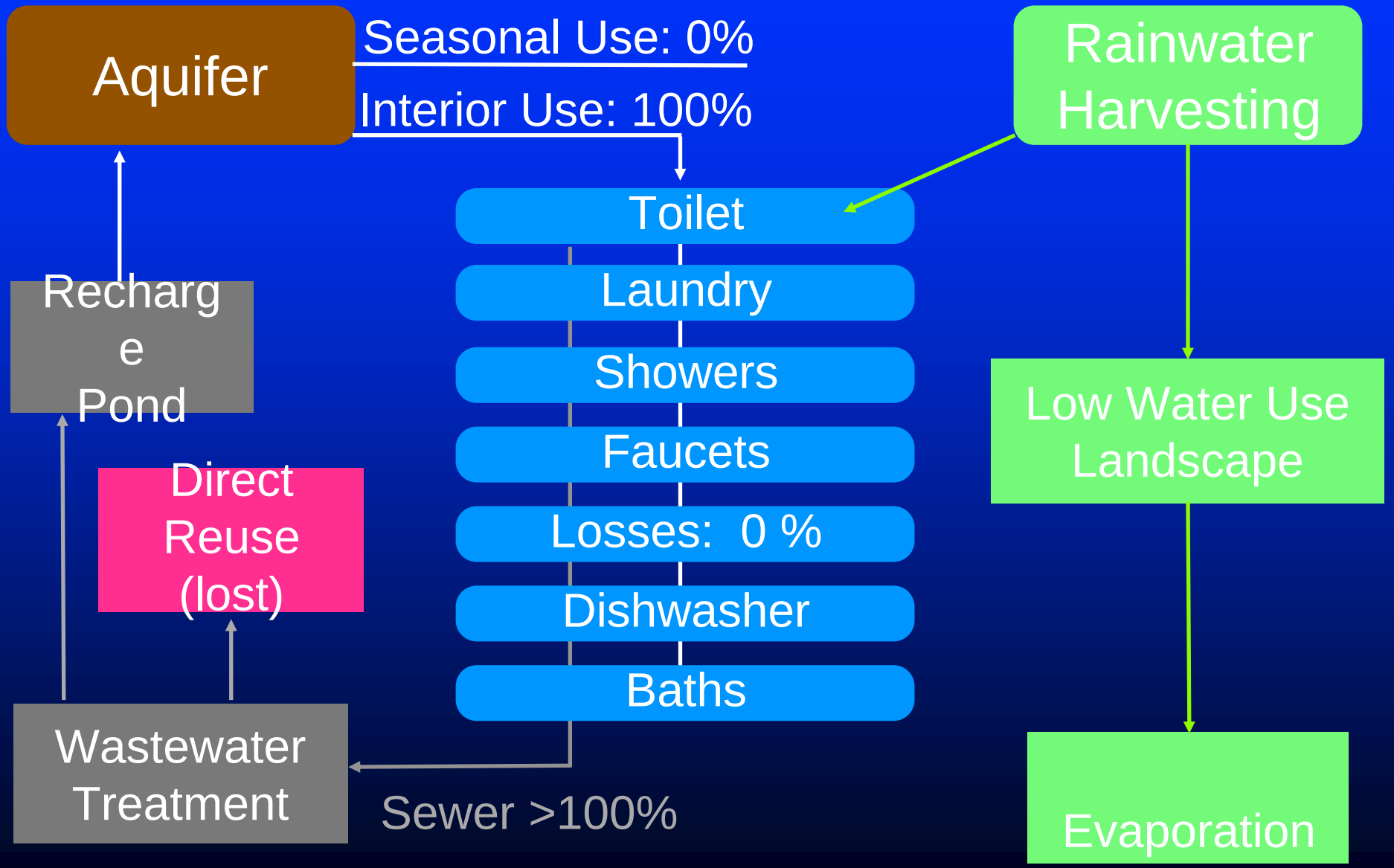
Look for this logo:

WaterSense
Meets EPA Criteria
Certified by
IAPMO R&T

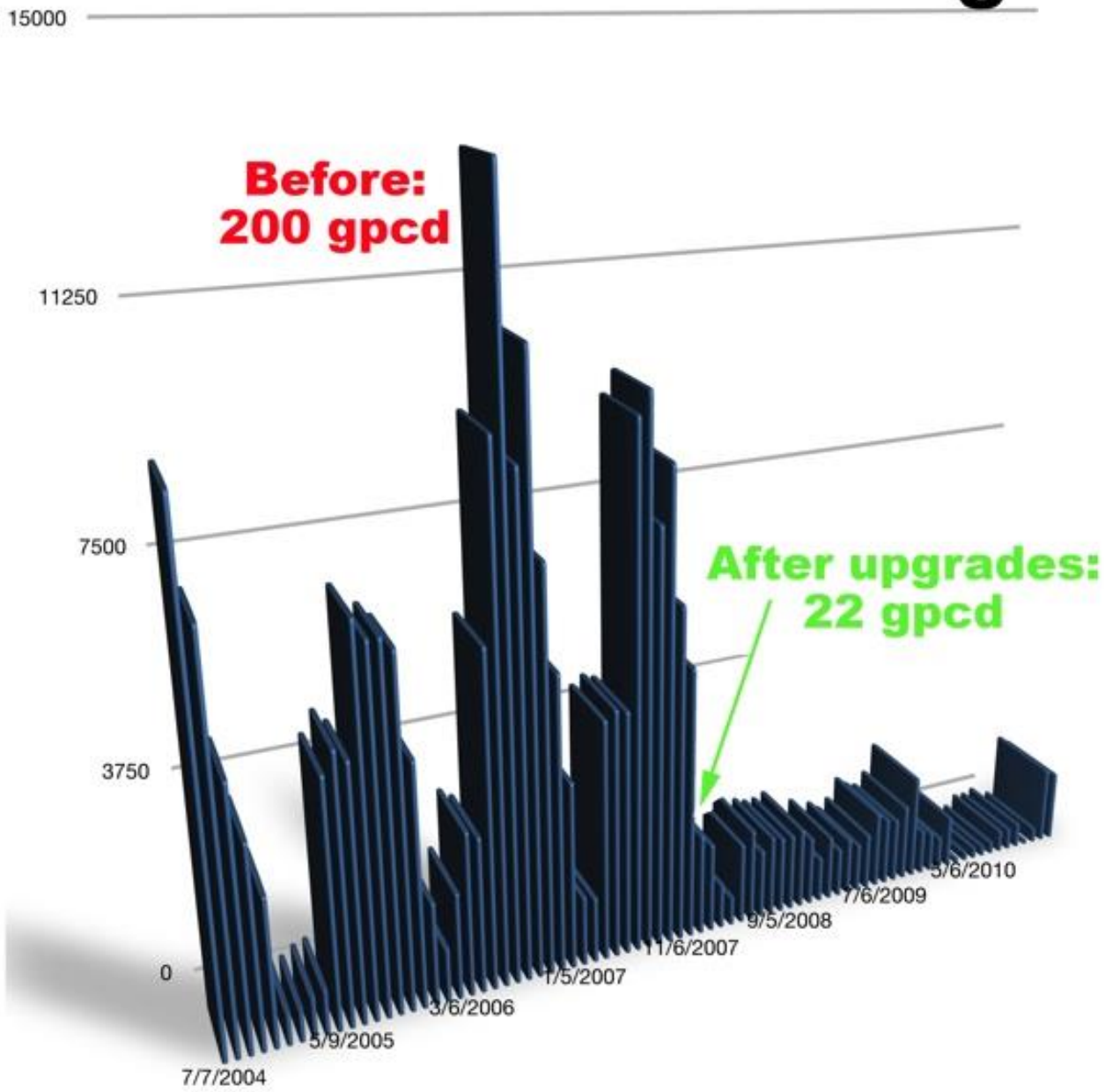
WaterSense
Meets EPA Criteria
Certified by
CSA Group

1.5 gall/min

Urban Home: Municipal Utility + Conservation



Conservation Savings

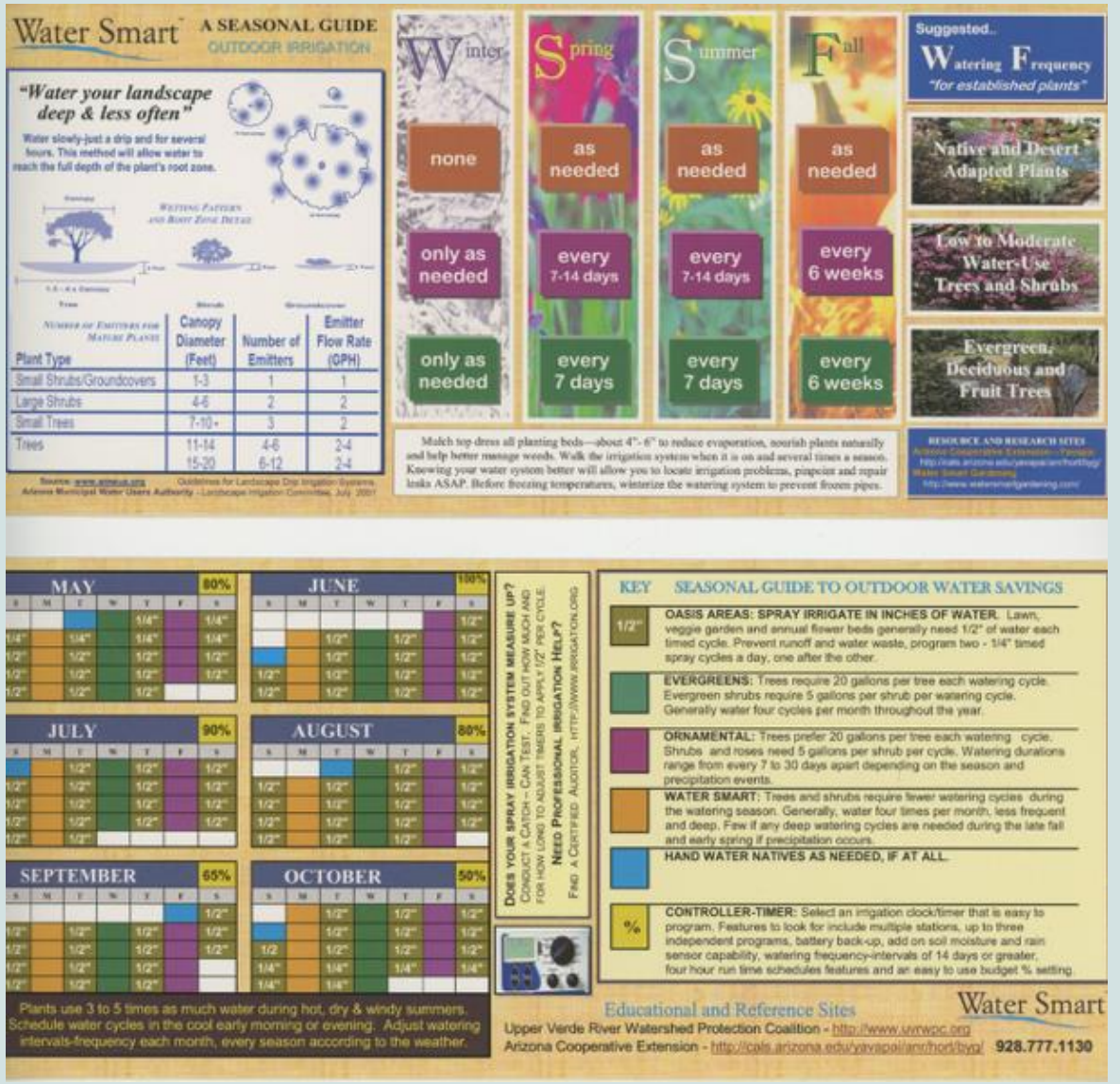


Conservation Checklist

- ☑ *Install rainwater harvesting system.*
- ☑ *Update landscaping.*
- ☑ *Install interior water conservation devices: low-flush toilets, efficient laundry, faucts*
- ☑ *Change personal behavior.*
- ☑ *Result: 22 gpcd*

Why Homeowners Conserve

- *Education/Voluntary:*
  slightly effective
- *Economic incentive:*
  effective
- *Regulations:*
  very effective

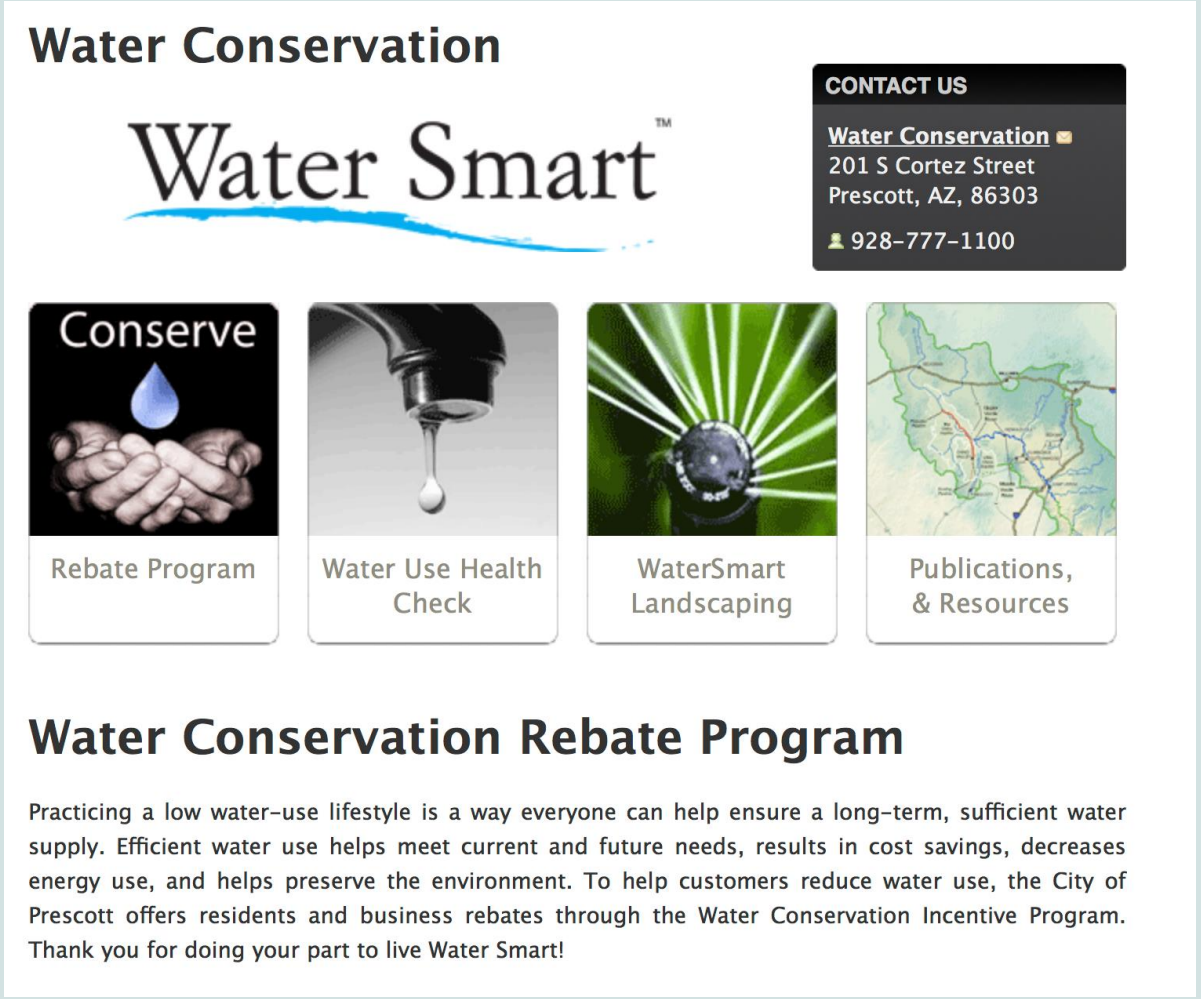


Voluntary: Personal Responsibility

- Moral Sense is rare, small scale (inadequate)
- Education can help

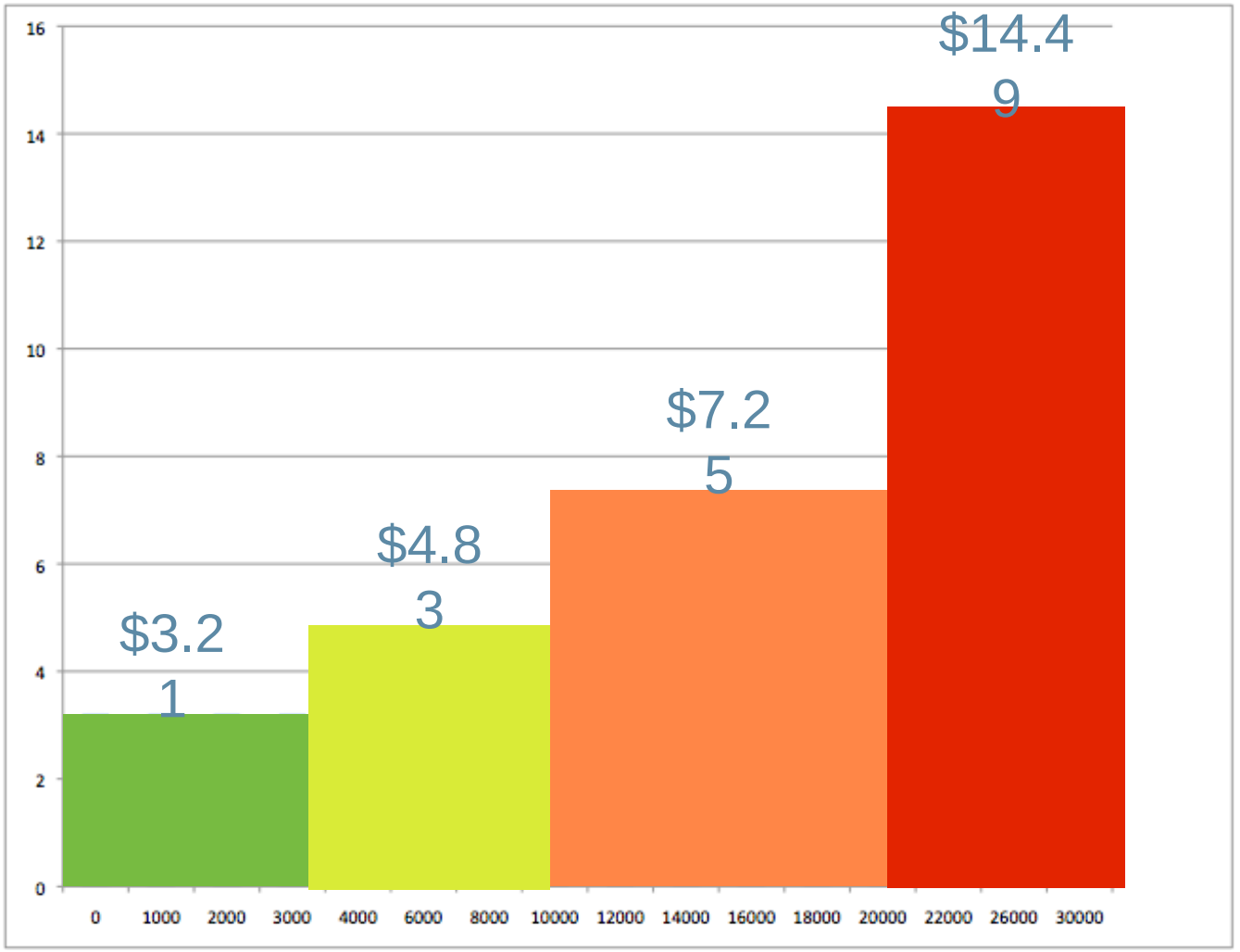
Economic Incentives

- Utility rebates: e.g. turf removal, fixture upgrades, rainwater harvesting.
- Device based: effectiveness depends on amount.
- Tax Credits
- Block Rates



2015 Prescott Tiered Rates

COST/1000 GAL.



GALLONS

Regulatory Policy

- New Construction - very effective
    - eg water conserving landscaping & building codes
- Politically problematic:
    - Restrict landscaping, irrigation, etc.
    - Metering wells = revolution
- No policy guidance from ADWR

CHAPTER 3-10: WATER CONSERVATION CODE

SECTIONS:

3-10-1: ADOPTION OF A WATER CONSERVATION CODE:

This chapter shall apply to any legally adopted plumbing code approved by the mayor and council of the city. (Ord. 1596, 9-13-1982)

3-10-2: PURPOSE:

The purpose of this chapter is to establish maximum rates of flow for plumbing fixtures and other devices in order to conserve water, and to regulate the use of water from the municipal water supply within the city of Prescott and its water service area. (Ord. 1596, 9-13-1982; amd. Ord. 1884, eff. 6-11-1987)

3-10-3: REGULATIONS:

(A) Scope: The provisions of this section shall apply to all new construction and replacement of fixtures in all existing structures. (Ord. 2377, eff. 6-11-1992)

(B) Water Closets: Water closets shall be designed, manufactured, and/or installed so as to be operable and adequately flushed with not more than 1.6 gallons of water per flush. (amd. Ord. 3357, eff. 6-22-1995)

(C) Urinals: Urinals shall be designed, manufactured, and/or installed so as to be operable and adequately flushed with not more than 1.0 gallons per

Effectiveness of Municipal Water Restrictions During Drought in Colorado

TABLE 3. Water Savings During Water Restrictions (May through August, 2002).

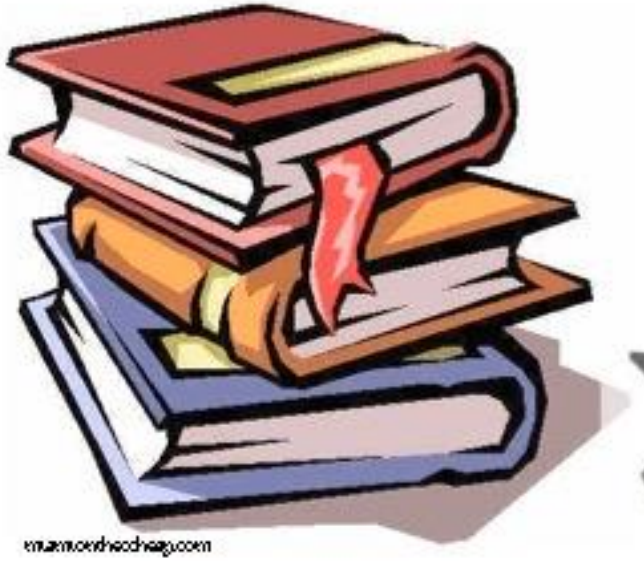
Municipal Water Provider	Basis of Percent Savings Calculation[1]: Entire Study Period — Net Use (%)	Entire Study Period — Per Capita Use (%)	Entire Study Period — Expected Use Per Capita (%)	Voluntary Restrictions Period — Net Use (%)	Voluntary Restrictions Period — Per Capita Use (%)	Voluntary Restrictions Period — Expected Use Per Capita (%)	Mandatory Restrictions Period — Net Use (%)	Mandatory Restrictions Period — Per Capita Use (%)	Mandatory Restrictions Period — Expected Use Per Capita (%)	Model Skill (r2)
Providers Limiting Lawn Watering to Once Every Three Days (2-1/3 times/week)										
Thornton	-8	1	9	-7	2	10	–	–	–	0.71
Aurora	9	12	16	–	–	–	13	15	18	0.72
Denver Water	7	10	13	2	5	7	14	16	21	0.67
Westminster	4	7	14	3	6	11	17	19	27	0.70
Average[2]	3	7	13	0	4	9	14	17	22	--
Cities Limiting Lawn Watering to Twice a Week										
Fort Collins	9	13	18	3	7	12	17	20	24	0.63
Boulder	24	24	27	-2	-2	4	29	28	31	0.62
Louisville	39	39	41	–	–	–	43	43	45	0.77
Average[2]	24	25	29	0	2	8	30	31	33	--
Cities Limiting Lawn Watering to Once a Week										
Lafayette	46	49	50	–	–	–	53	55	56	0.69

Figure 1. Comparison of Actual and Expected Per Capita Water Use for the City of Westminster From May 1 to August 31, 2002.

- Greatest savings - in the cities with greatest mandatory restrictions[11]
- Mandatory restrictions were an effective means of reducing demand and water use[11]
- Voluntary restrictions were of limited value[11]

Social Implications

- Least responsive to voluntary conservation: Wealthy educated Anglo republicans[18]



- During later mandatory stages: people with higher income and education responded best[18]

Conclusions

- *Potential savings:* ***enormous.***
- *Required:* Municipal & Utility policies
- *Needed:*
  - Data collection
  - Research
  - Policy guidance

Integrating Local Land and Water Use Planning to Sustain Flows

Linda Stitzer, Western Resource Advocates

Why Integrate Land & Water Use Planning?

By 2050
Population almost triples to 594,000
Water demand increases by 45,300 af

Local Land Use Planning Toolbox

- Integration options for city/county goverments

✓Planning – Comprehensive and Drought Resiliency
✓Regulations, Guidelines, and Standards
✓Incentives & Voluntary Programs

- Tools for demand reduction, reuse, water capture, resiliency
- 42 local, state and western case studies

Local Land Use Planning Toolbox

- **General & Comprehensive Plans**
  - Integration, Training & Community Initiatives
  - Integration Guidelines & Rating Systems
  - Integrating Land & Water Use Data
- **Development Codes & Standards**
  - Landscaping & Screening Codes & Standards
  - Native Plant Preservation in Land Use Codes
  - Floodplain, Erosion Hazard, Watercourse Codes
  - Stormwater Codes & Design Standards
  - Water Conservation Code
  - Green Streets Policies
- **Water Conservation Ordinances**
  - General Water Conservation:
    - Water Waste
    - Plumbing Retrofit on Resale
    - Sub-metering
  - Outdoor Water Conservation
    - Graywater Reuse
    - Rainwater Harvesting
    - Xeriscape Landscape & Irrigation Efficiency
    - Water Features
    - Golf Courses & Large Landscape Areas
- **Zoning Code**
  - Overlay Zone
  - Growth Area Management
  - Conditional Zoning & Uses
  - TDR & Conservation Easements
- **Subdivision Regulations**
  - Cluster - Conservation Development
  - Pre-app Water Meeting
  - Assured & Adequate Water Supply
- **Developer Incentives**
  - Density Bonus
  - Water Smart Dev Incentive
  - Infill Incentive
  - Water Connection Charges
  - Developer-Community Information Sharing
- **Development Offsets**
  - Offset Fees
  - Water Conservation Bank
  - Water Allocation Policy
- **Water Efficiency Certification**
  - Community / Homebuilder Partnerships
  - EPA WaterSense Homes
  - LEED Certification
- **Stormwater Management**
  - Low Impact Development
  - Stormwater Design Standards
  - Stormwater Management Plans
  - Multi-Purpose Flood Control Projectcs
  - Green Streets Policies
- **Drought Planning & Management**
  - Drought Planning
  - Drought Resilient Design

For each Tool:

- Brief Description of the Tool/Approach
- Case Study w/Model Ordinance or other materials
- Additional Resources

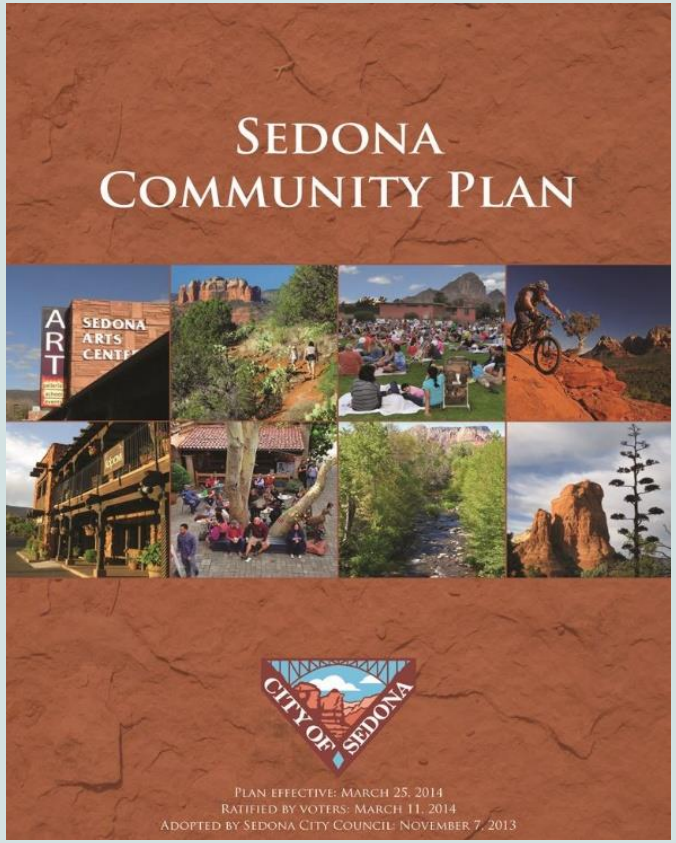
Planning (4)

➢ ***Tool: Guidelines and Rating Systems***

✓ ***Case Study: APA guidelines for sustainable comprehensive planning and self-scoring procedure***

- Water-related best practices
  - Provide and protect green infrastructure
  - Water conservation
  - Plan for a lasting water supply
  - Plan for infill development
  - Establish implementation benchmarks

- Plan-scoring procedure to compare plans against a national standard



Development Codes (7)

➢ ***Tool: Landscaping and Screening Codes and Standards***

✓ ***Case Study: Flagstaff Sustainable Landscape Code***

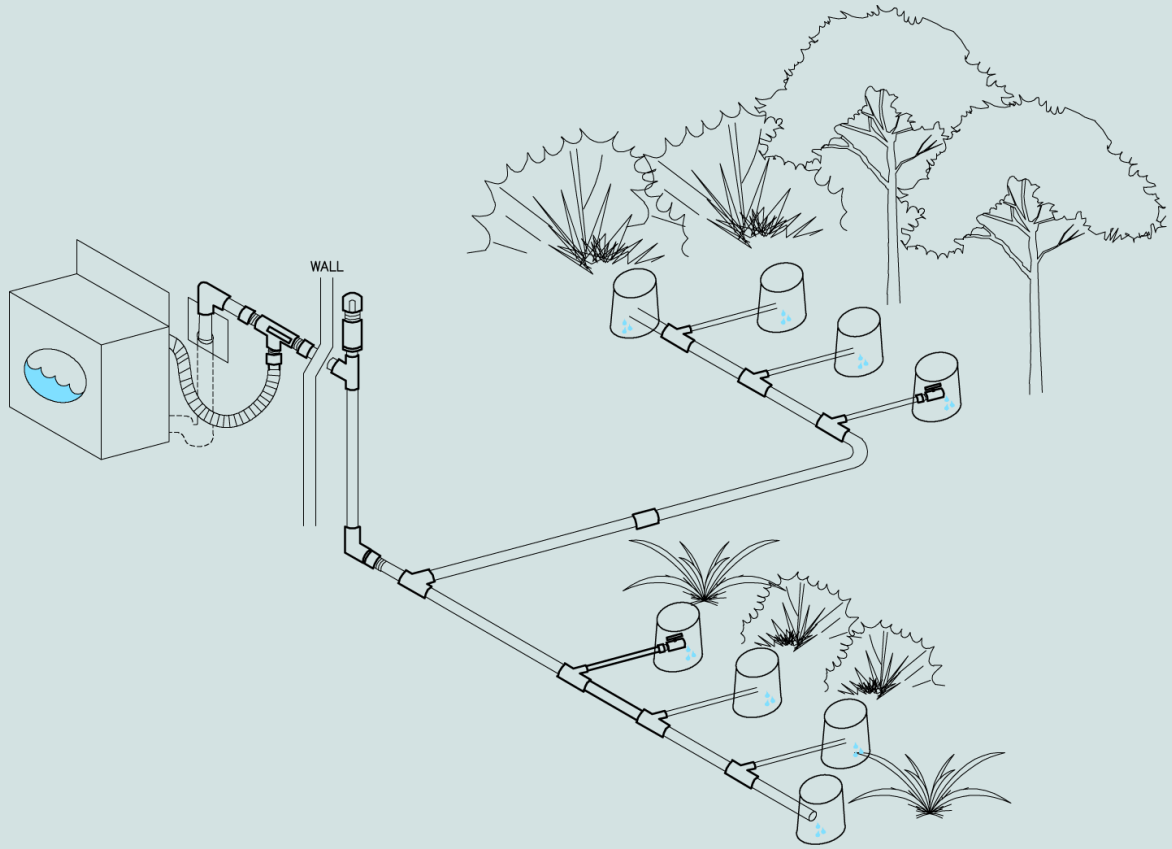
- New developments + 35% increase in units, parking
- Plant list, incentives for natives, efficient irrigation
- Reclaimed water for fields, golf courses in designated zone
- LID practices required – “slow spread and sink” stormwater
  - Integrated rainwater harvesting for irrigation
  - Parking areas designed to capture water runoff

Water Conservation Ordinances (8)

➢ ***Tool: Graywater Reuse Ordinance***

✓ ***Tucson Residential Graywater Ordinance***

- Up to 35 gallons/day savings
- ADEQ BMPs for safe graywater use
- New homes must be graywater plumbed with “stub-out” for voluntarily connection to a graywater system
- + $1,000 rebate incentive

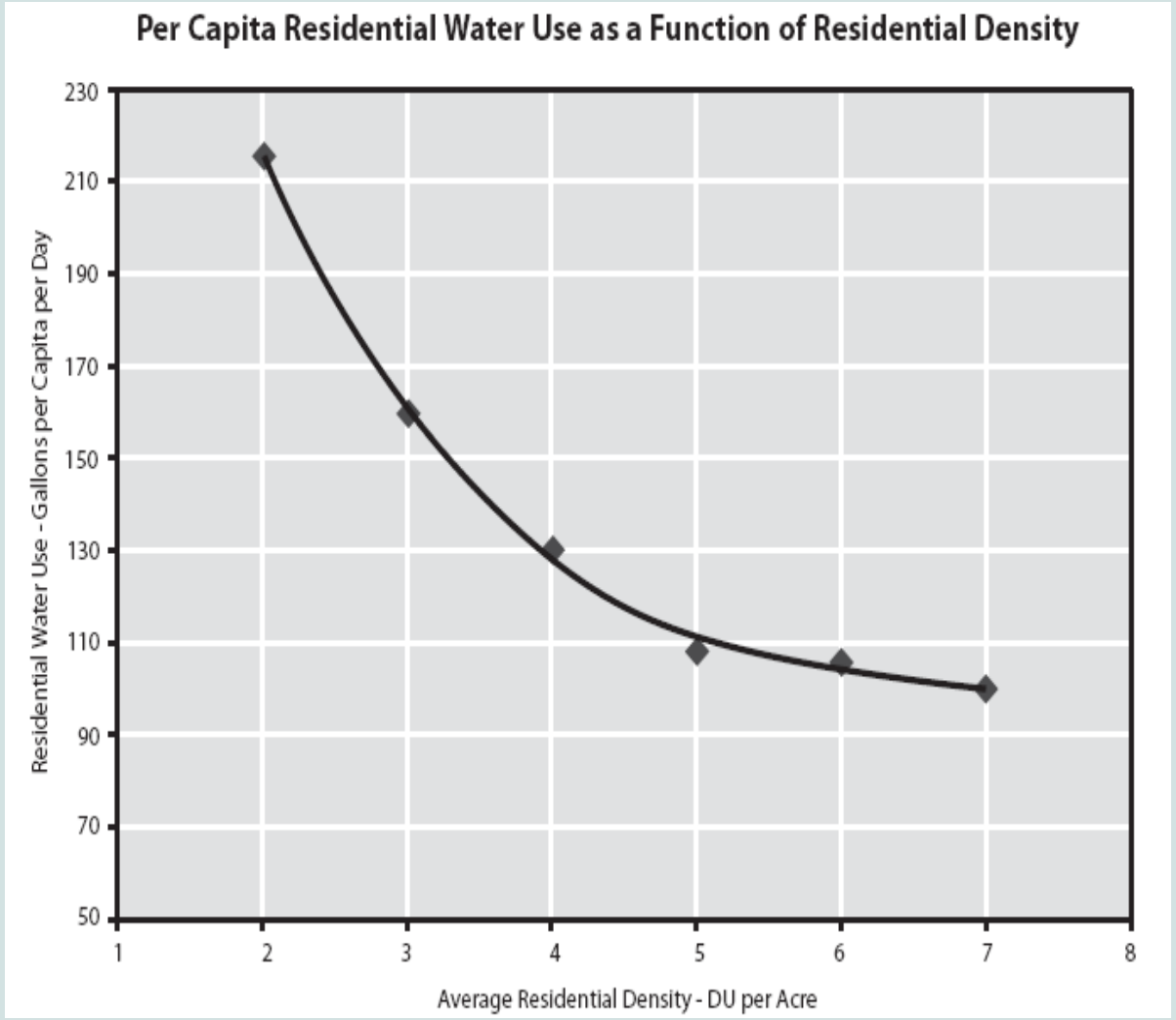


Developer Incentives (5)

➢ ***Tool: Density Bonus***

✓ ***Case Study: Yavapai Co. Zoning Code - Open Space and Sustainable Development Option***

- Developer selects water conservation options (rainwater harvesting, LWU landscaping) in exchange for rezoning to higher density and preserving open space
- Higher density = more homes = less road & utility costs = more $$ for developer



Source: Tim Watkins, Envision Utah

Water Efficiency Certification/Green Building (3)

➢ ***Tool: LEED Certification***

✓ ***Case Study: REI Distribution Center, Goodyear AZ***

- Green building rating system: energy/water/materials points
- New pilot credit program allows use of *Water Restoration Certificates* to earn LEED points
- REI applied Certificates in Verde Watershed to:
  - establish a conservation easement to avoid future subdivision;
  - fund water conserving irrigation infrastructure;
  - remove invasive plants/restore natural vegetation

What's Next?

- Initial meetings + new feedback
- Early Summer: building online toolbox – FVRG website
- Mid-summer: pilot testing website
- Fall: Final
- State & Federal Lands Toolboxes for Watershed Protection

Café!