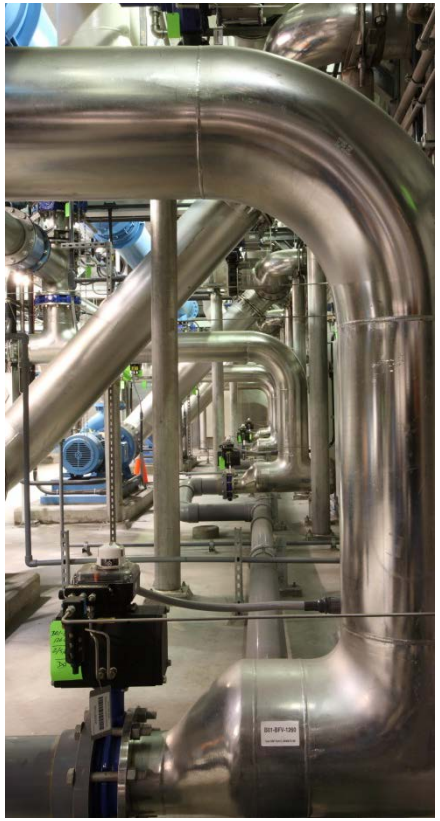
Water Reuse 101

Rob McCandless, Brown and Caldwell
Maria Brady, Stantec Consulting

WATEREUSE ARIZONA



Agenda

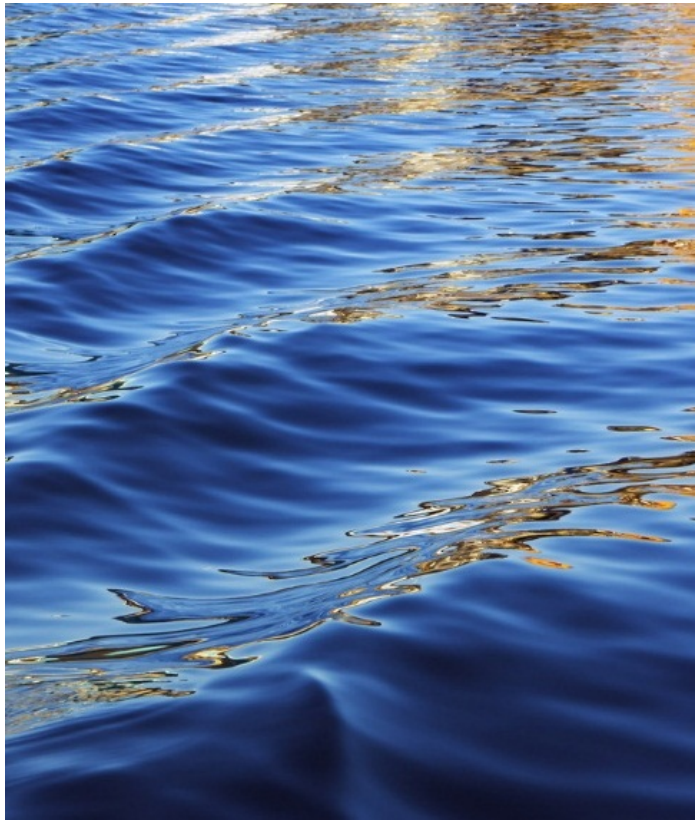
1 Where is water from?

2 Where is water used?

3 Where is water reused?

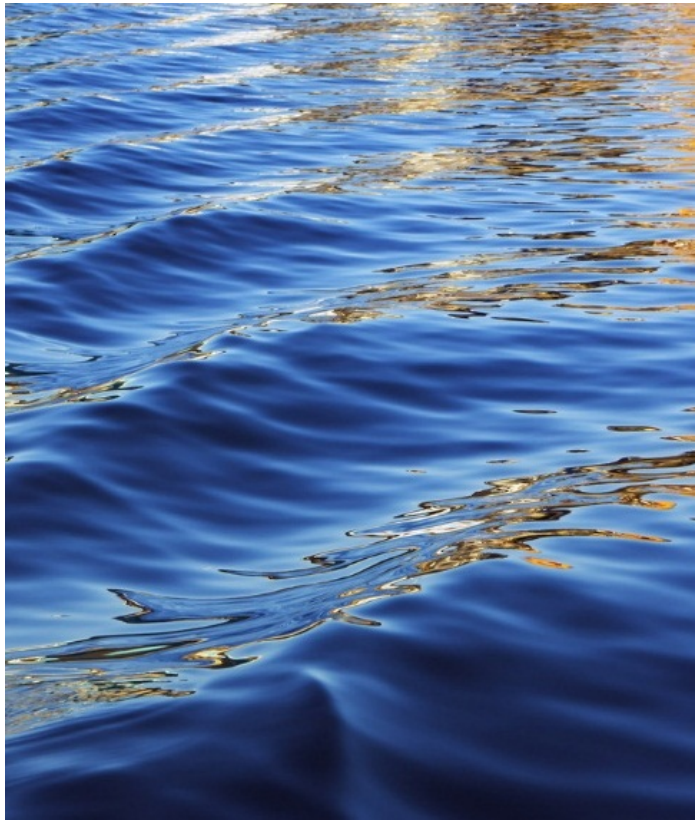
4 Agency Jurisdictions

5 Trends for the Future



Where is water from?

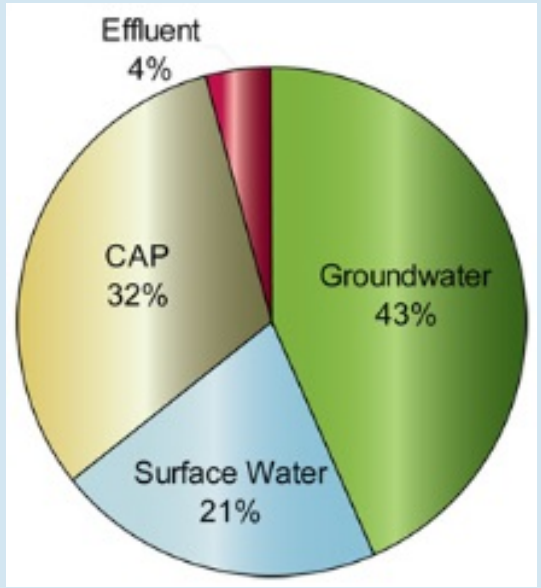
Arizona Water Reuse 101



Where does Arizona's water come from?

Three basic sources:

1. Groundwater
2. Surface Water
3. Reclaimed Water



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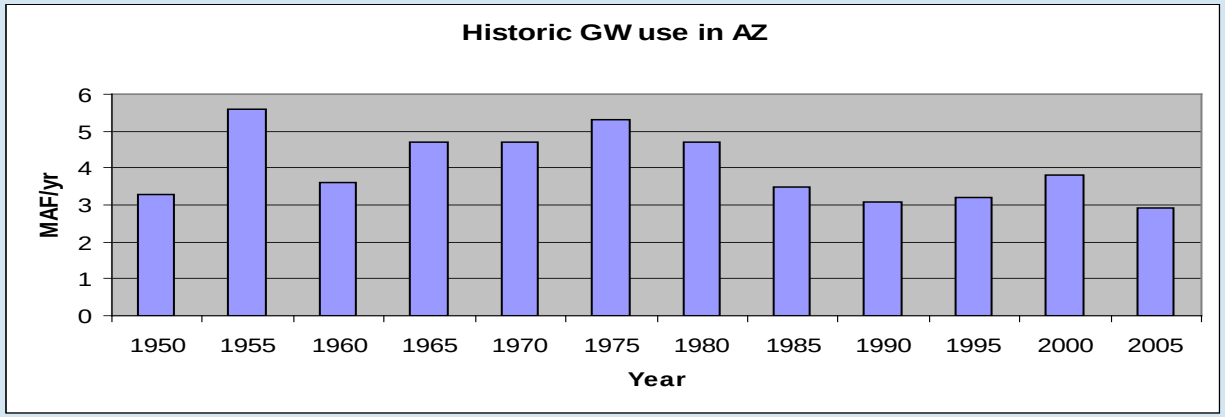
Groundwater Use



- 40% of AZ's water supply
- Groundwater mining (overdraft) is a statewide problem – its not just for AMA's anymore

Groundwater Pumped (2005)
2.9 MAF

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Arizona Water Resources – Groundwater

- 1980 Groundwater Management Act
  - Formed 5 AMAs
  - Formed Irrigation Non-expansion Areas
  - Set Safe Yields
  - Adequate Water Supply Program
- 2007 Mandatory Water Adequacy Legislation
  - Authorizes counties and cities to adopt 100-year assured water supplies outside of the AMAs

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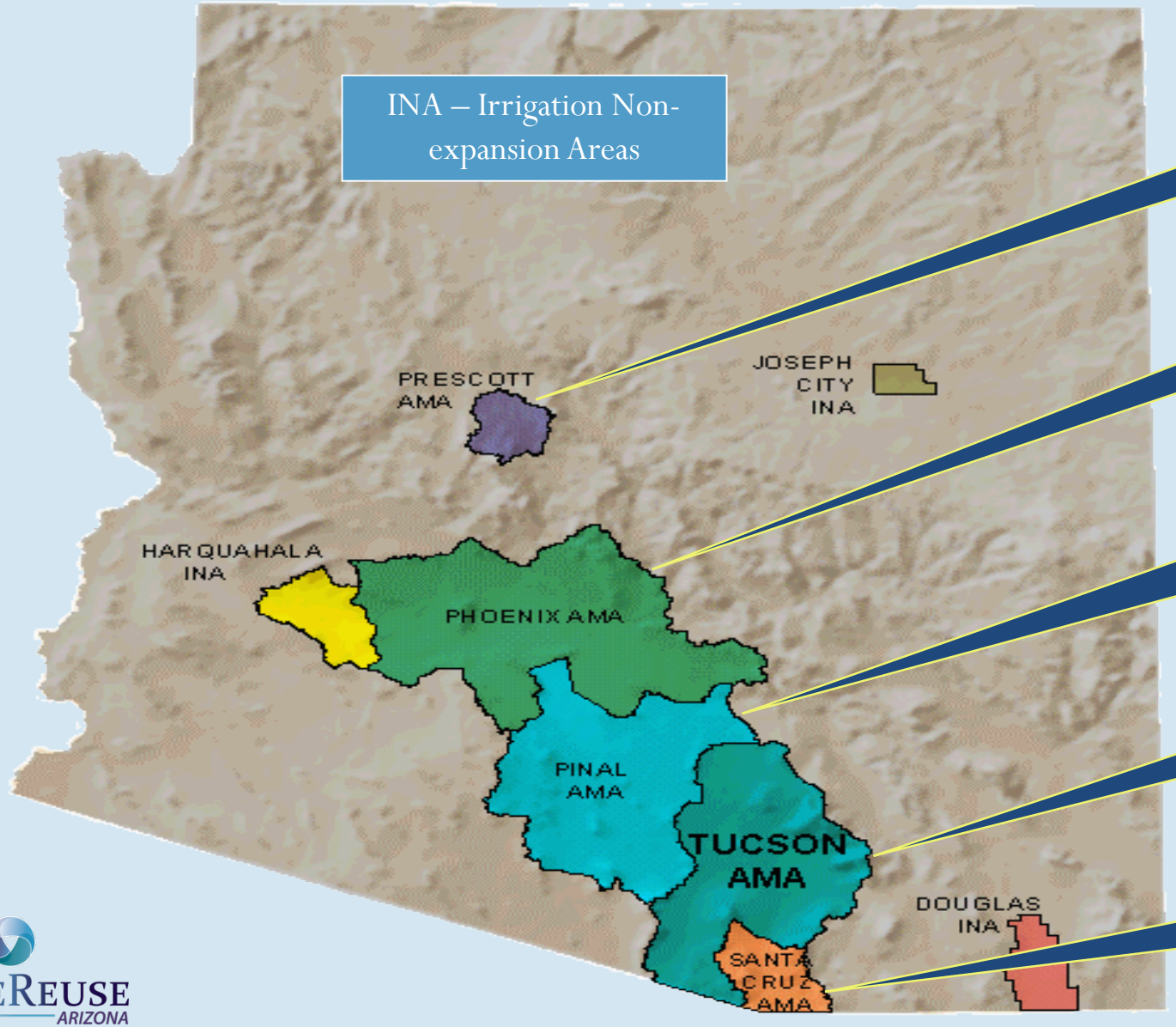
Groundwater Management Areas



Goals

Prescott AMA:
safe-yield by 2025

Phoenix AMA:
safe-yield by 2025

Pinal AMA:
preserve agriculture as long as feasible while preserving groundwater for future needs (1,000 feet depth to water limit)

Tucson AMA:
safe-yield by 2025

Santa Cruz AMA:
maintain safe-yield,
prevent long-term water table declines

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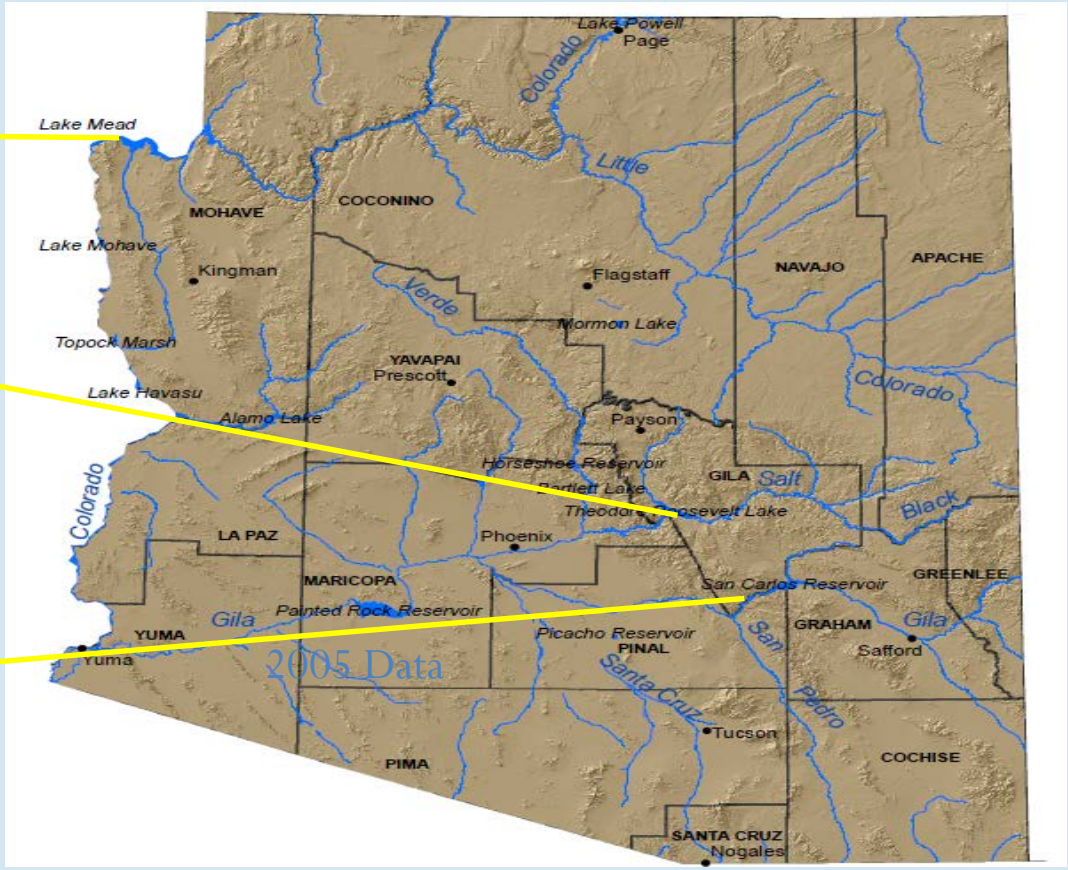
Surface Water

Colorado River
2.8 MAF

Salt/Verde River
1.0 MAF

Gila River
0.4 MAF



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Arizona Water Resources – Surface Water

- Colorado River Compact
  - Managed under compacts, federal laws and court decisions for 7 basin states, environment and Mexico
  - 4 states in Upper Basin and 3 in Lower Basin
  - Arizona v California (1964) and CAP (1968)
  - Colorado River Basin Salinity Act (1974)

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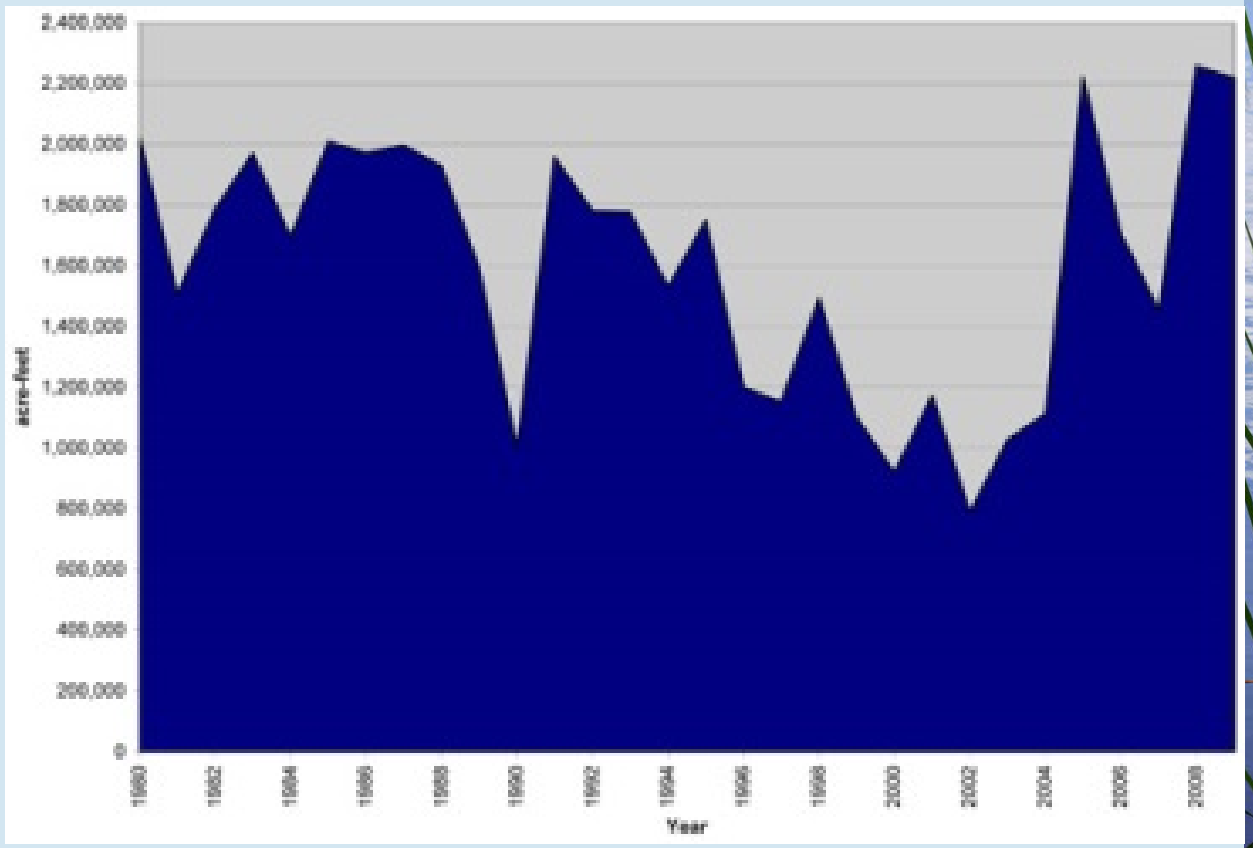
Arizona Water Resources – Surface Water

- Salt River
  - 1910 Kent Decree: which land receives Salt and Verde River Water
- SRP Storage Capacity – 2.3 MAF in 7 lakes
  - Roosevelt: 1.65 MAF
  - Apache: 0.25 MAF
  - Bartlet: 0.18 MAF
  - Horseshoe: 0.11 MAF



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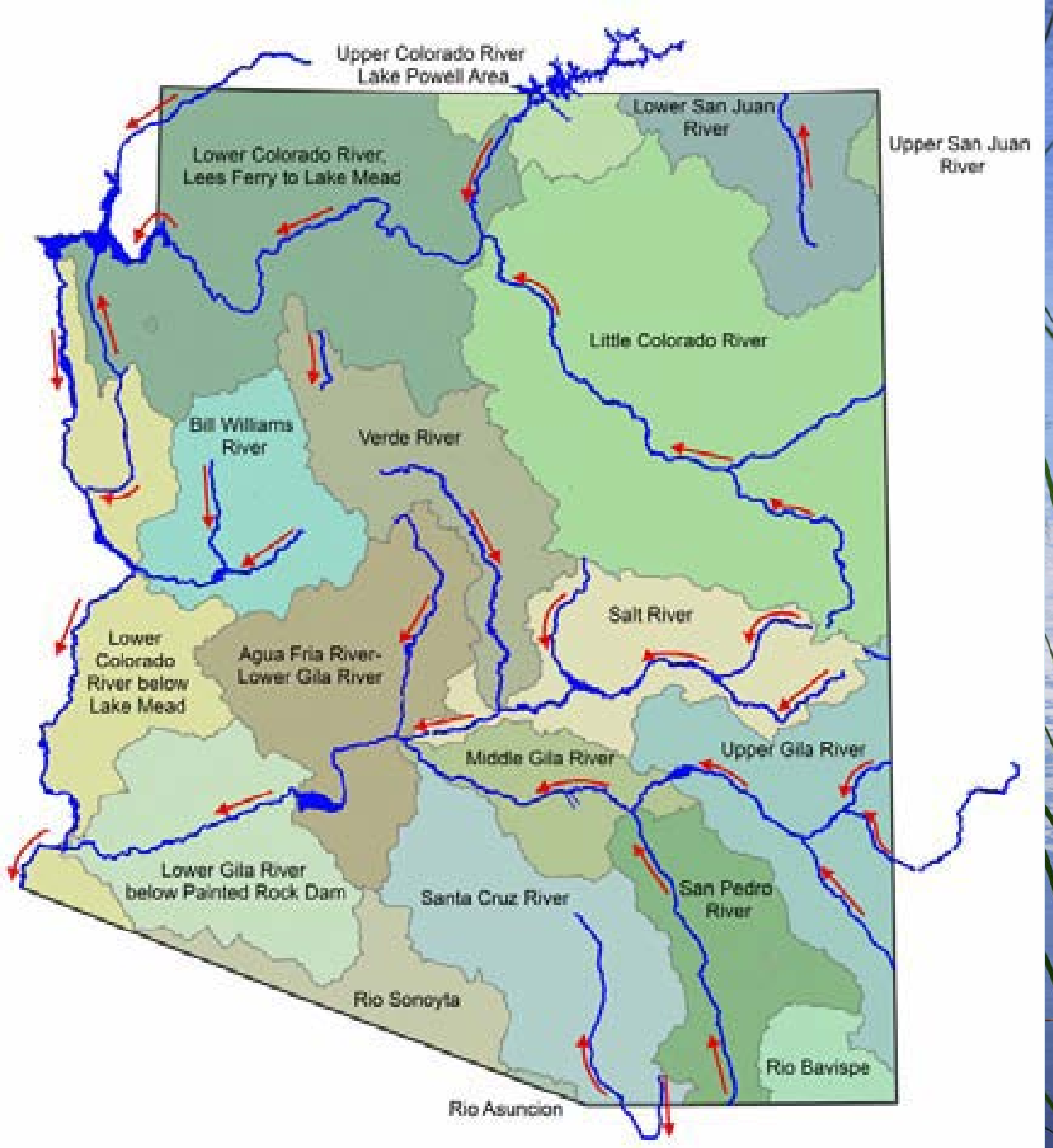
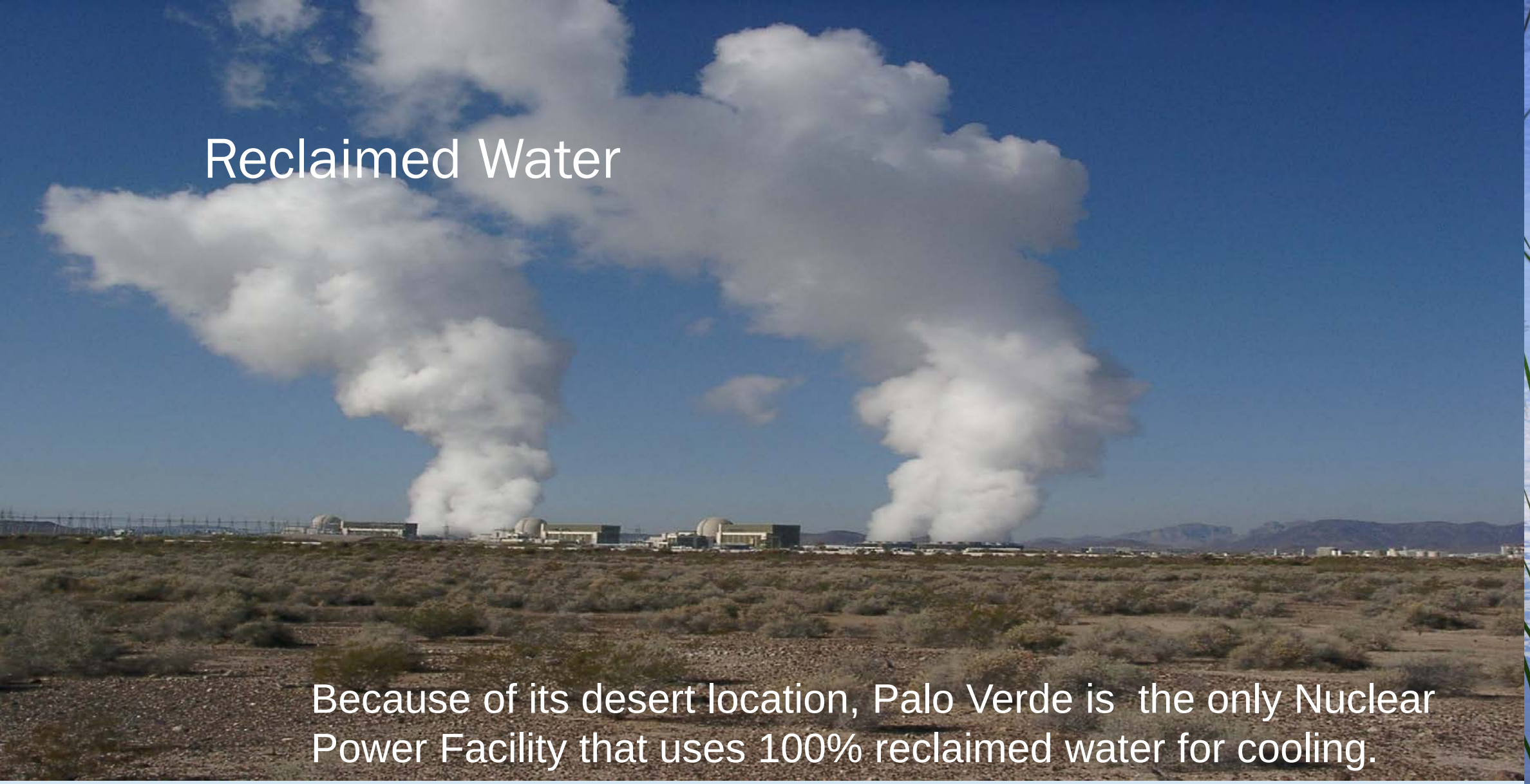
Arizona's Water Sheds

- Water Sheds that feed surface water supplies
  - Colorado River
  - Salt River
  - Verde River
  - Gila River
- Groundwater that feeds surface water supplies



Reclaimed Water



Because of its desert location, Palo Verde is the only Nuclear Power Facility that uses 100% reclaimed water for cooling.

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Arizona Water Resources – Reclaimed Water

- Reclaimed Water
  - Grand Canyon – 1926
  - Tucson Reclaimed System – 1983
- Direct reuse – 2.5% of Az Water Supply
  - ~ 705 for turf or ag irrigation
- Recharged to ground water – directly or indirectly

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Arizona Annual Water Supply Budget

Water Source	Million Ac-Ft	% of Total
Surface Water	4.2	57%
Colorado Water	2.8	38%
CAP	1.6	22%
On-River	1.2	16%
In-State Rivers	1.4	19%
Salt-Verde River Shed	1.0	14%
Gila River and Others	0.4	5%
Groundwater	2.9	39%
Reclaimed Water	0.3	4%
Total	7.4	

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Where is water used?

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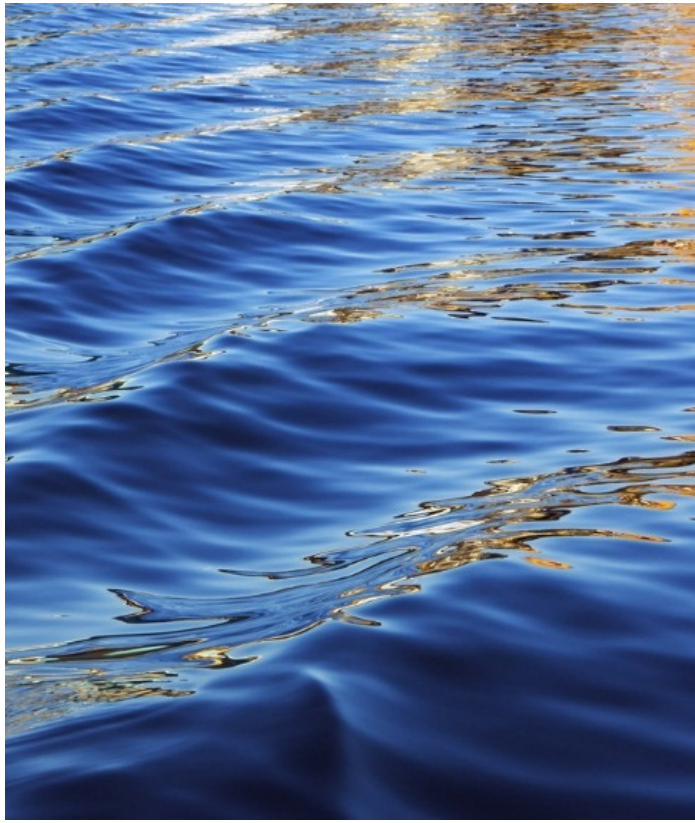
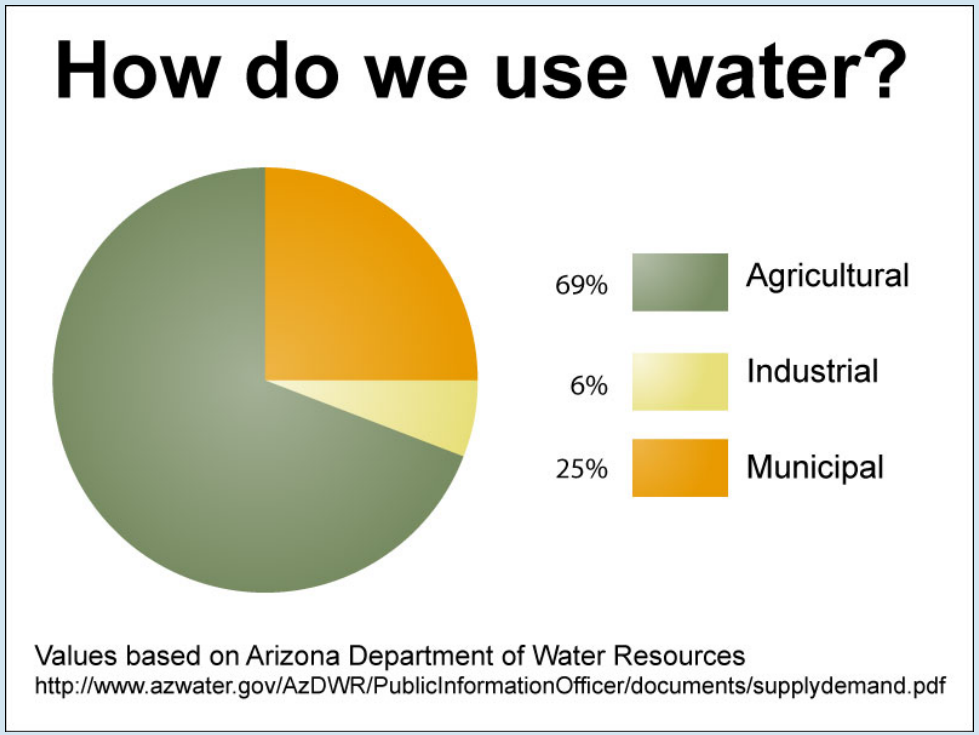


Where is Arizona's water used?



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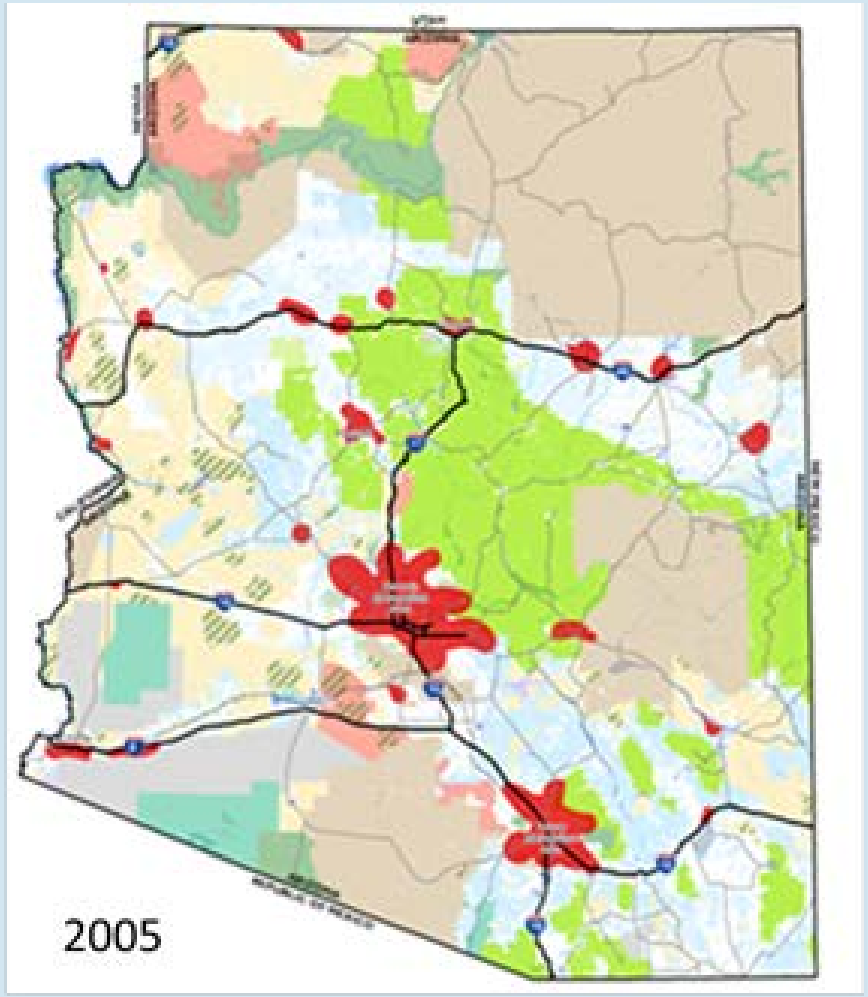
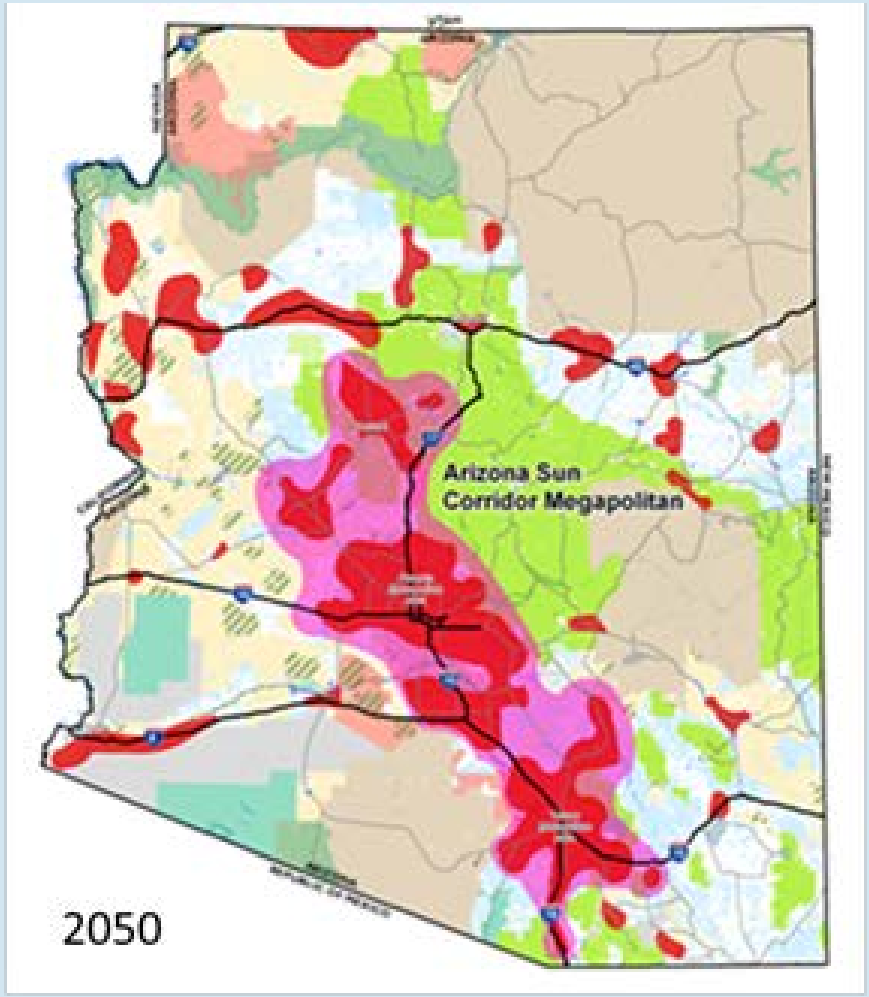
Future Water Needs

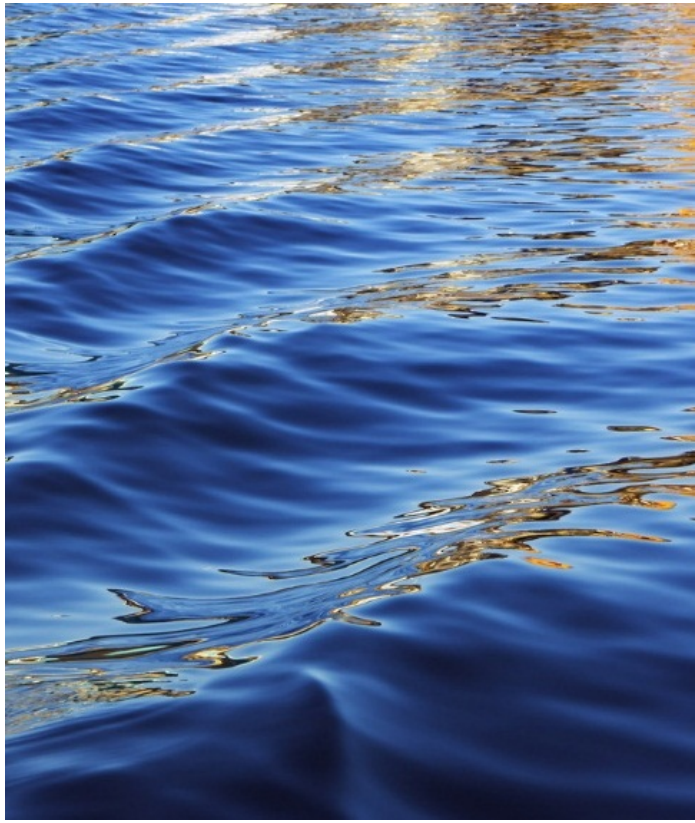




Source: Maricopa Association of Governments

Where is water reused?

Arizona Water Reuse 101



Reclaimed Water Uses

- Recycled Water (Direct) Uses
  - Landscape and Golf Course Irrigation (Scottsdale RWDS)


15th Hole, TPC Scottsdale

- Industrial (Palo Verde Nuclear Generating Station)

Reclaimed Water Uses

- Aquifer Recharge for Credit
  - Engineered Basins (SRP's NAUSP, Prescott Recharge Basins, Gilbert Neely Ranch Riparian Habitat)
  - Vadose Zone (Scottsdale, Gilbert)
  - ASR ???

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Reclaimed Water Uses

- De Facto Recharge in Stream Beds
  - Nogales WWTP
  - Pima County WWTFs
  - 91st Ave WWTP

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Reclaimed Water Uses

- De Facto Reuse via Stream Bed
  - Figueroa Ave Water Pollution Control Facility: Yuma to Mexico
  - 91st Ave Wastewater Treatment Plant to Buckeye Irrigation District

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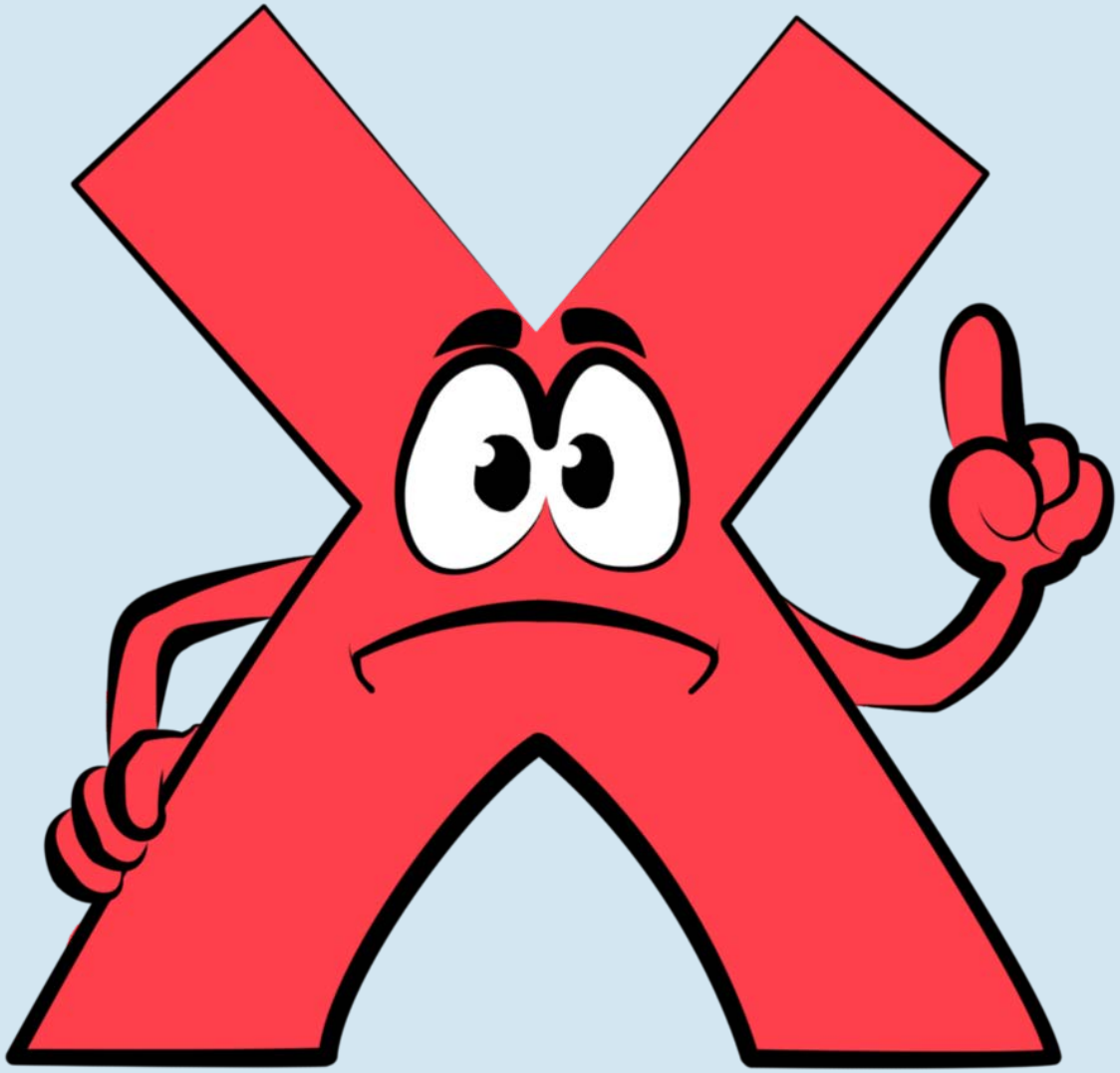
Reclaimed Water Uses

- Direct Potable Reuse
  - Not Permitted in Arizona



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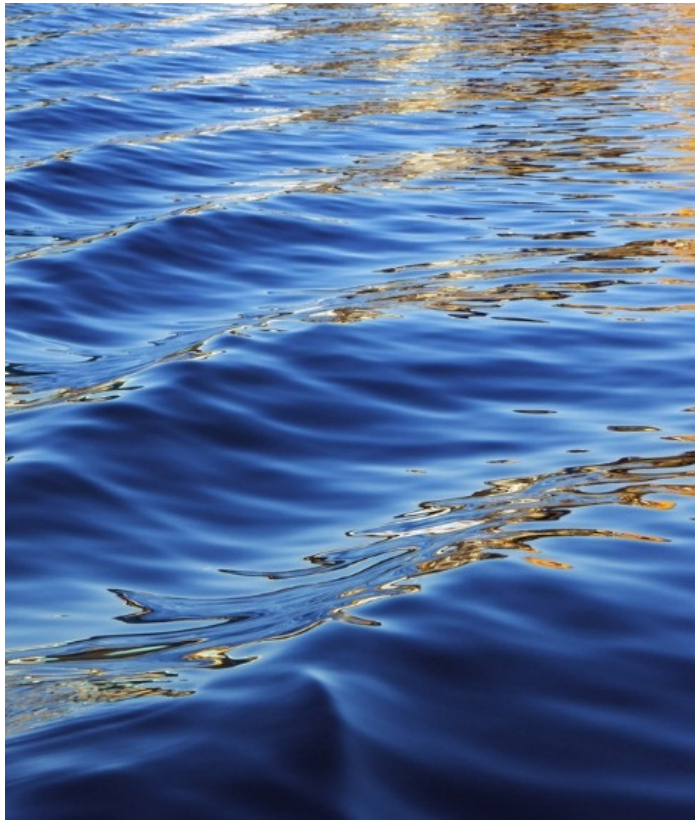
Agency Jurisdiction

Arizona Water Reuse 101



Agency Jurisdiction

Arizona Dept of Water Resources (ADWR)

- Priority : Quantity over Quality
- 1980 Groundwater Management Act – Unique to Arizona
- Surface Water Rights
- Recharge/Aquifer Storage and Recovery

Arizona Dept of Environmental Quality (ADEQ)

- Priority: Quality over Quantity
- Aquifer Protection Permitting, AWQS
- AzPDES, SWQS
- Reclaimed Water Rules and Permits
  - Single end user permit
  - Water agent permit (for multiple end users)

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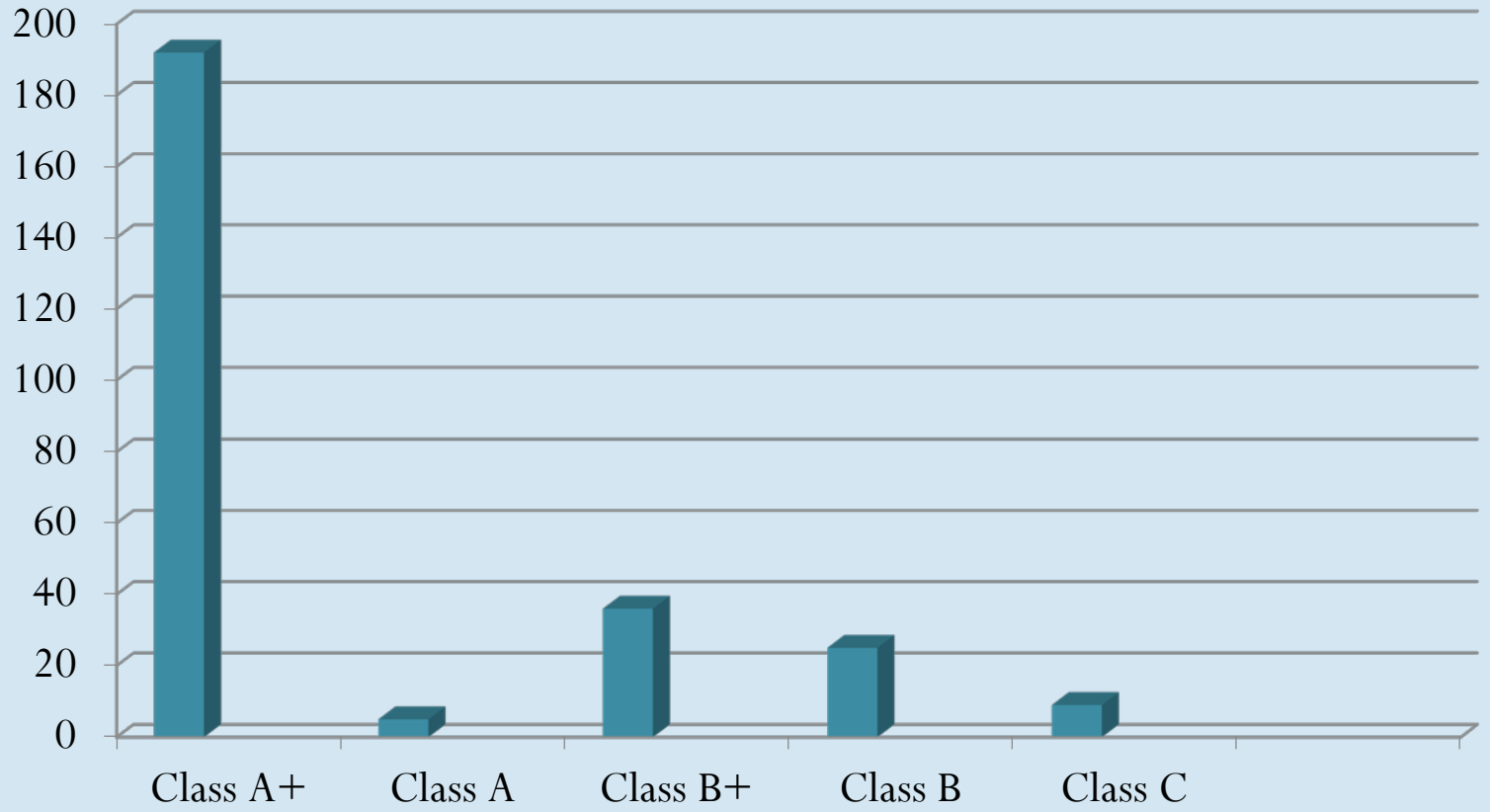
Arizona Reclaimed Water Permits



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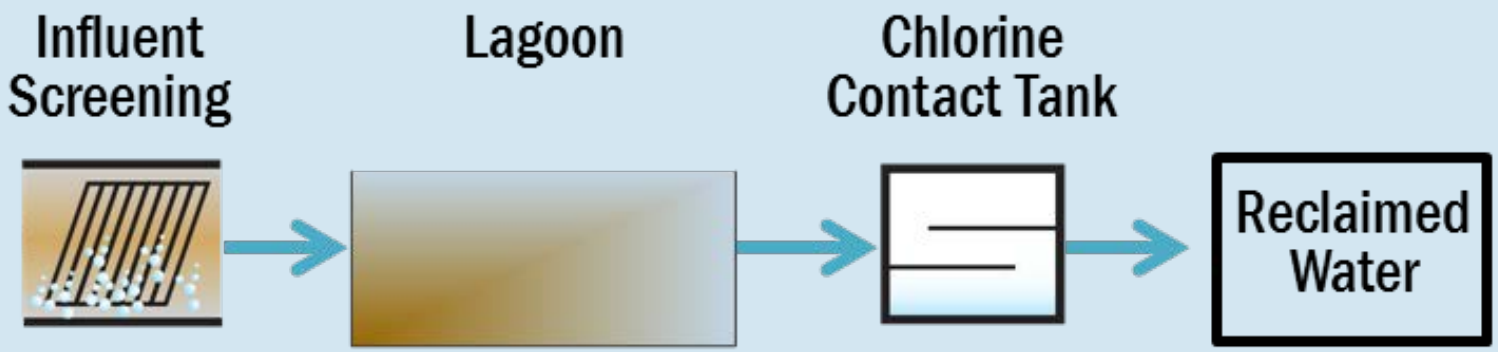
Michele Robertson, ADEQ

Class C

- Regulatory Requirements
  - Reclaimed water is wastewater that has undergone secondary treatment in a series of wastewater stabilization ponds, including aeration, with or without disinfection.
  - fecal coliform (cfu/100ml) <1000 (4 of 7 samples); <4000 sample max



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Class C

Allowable uses

- Pasture irrigation for non-dairy animals,
- Animal watering for non-dairy animals,
- Sod farms
- Fiber, seed and forage crops
- Silviculture

Examples

- Joseph City Sanitary District
  - Uses: on-site pasture irrigation
- Mormon Lake Lodge WWTP
  - Uses: on-site pasture irrigation
- Eyman ADOC
  - Owner: Arizona Dept of Corrections
  - Uses: irrigate fiber, see and forage crops

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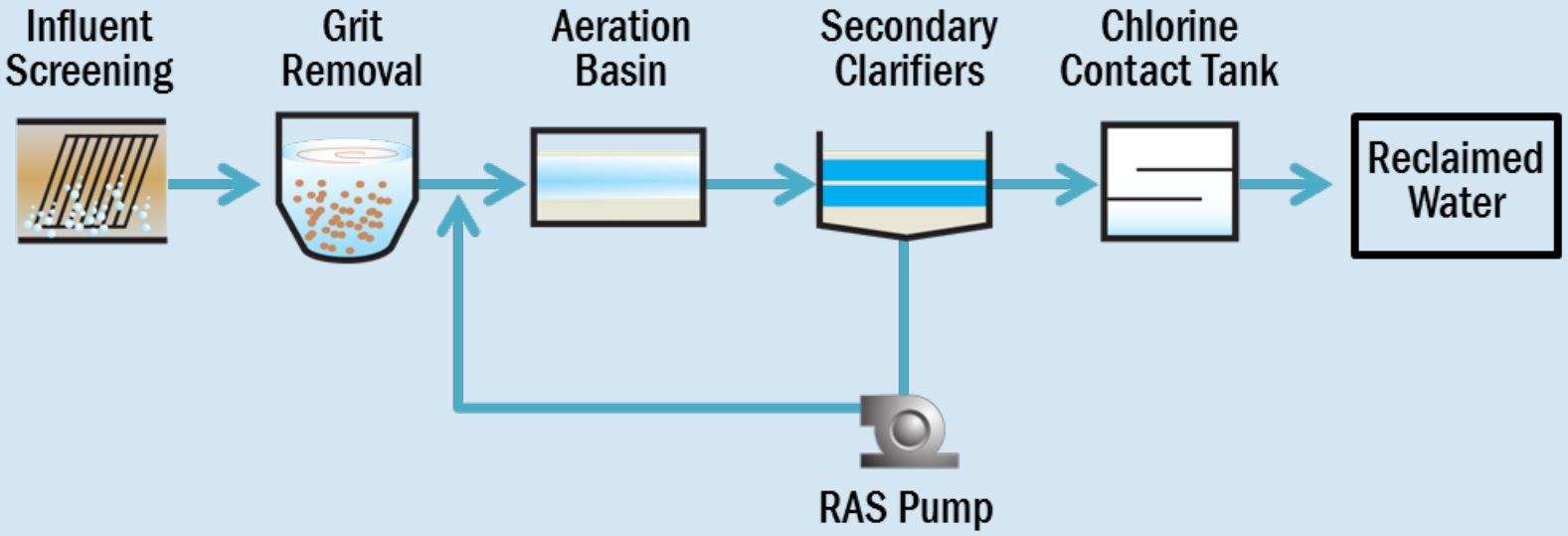
Class B

- Regulatory Requirement:
  - Reclaimed water is wastewater that has undergone secondary treatment and disinfection.
  - Fecal coliform (cfu/100ml) <200 (4 of 7 samples), <800 max sample



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Class B

Allowable uses
(cannot run off site or percolate into ground)

- golf course irrigation,
- restricted access irrigation,
- orchard/vineyard irrigation,
- concrete mixing,
- dust control,
- pasture irrigation for dairy animals,
- livestock watering

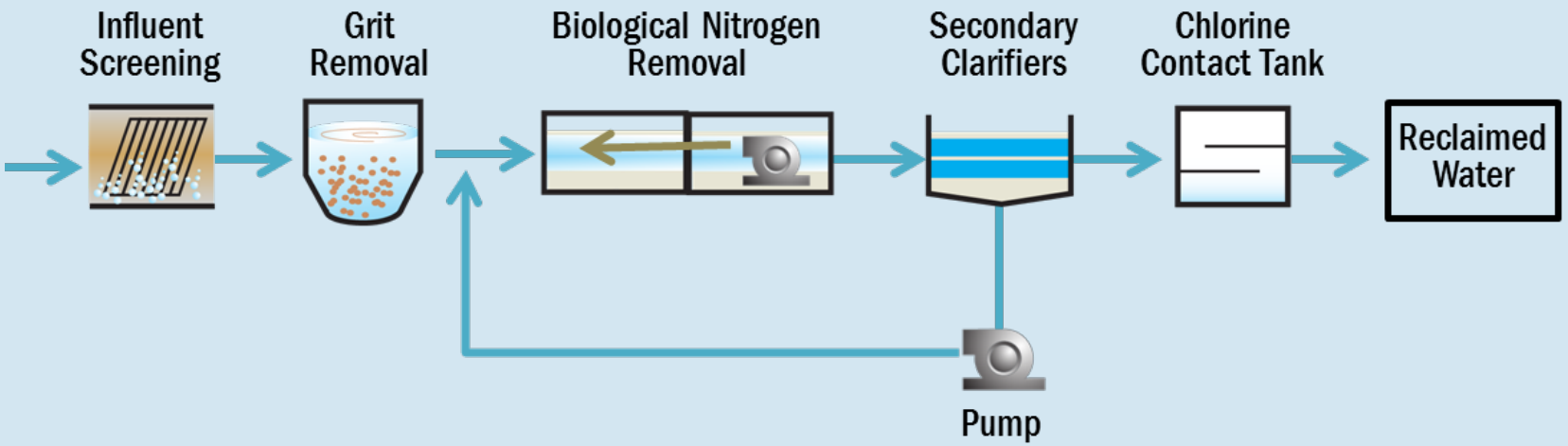
Examples

- Tolleson WWTP
  - Owner: City of Tolleson
  - Uses: landscape irrigation on treatment plant grounds
- Tubac Golf Resort
  - Uses: golf course irrigation
- Kachina Village Improvement District
  - Uses: dust control

WATEREUSE ARIZONA

Class B+

- Regulatory Requirements:
  - Reclaimed water is wastewater that has undergone secondary treatment, nitrogen removal treatment, and disinfection.
  - Fecal coliform (cfu/100ml) <200 (4 of 7 samples), <800 max sample
  - Total Nitrogen <10mg/l



WATEREUSE ARIZONA

Class B+

Allowable uses

- golf course irrigation,
- restricted access irrigation,
- orchard/vineyard irrigation,
- concrete mixing,
- dust control,
- pasture irrigation for dairy animals,
- livestock watering

Examples

- 91st Avenue WWTP
  - Owners: Glendale, Mesa, Phoenix, Scottsdale, Tempe
  - Uses: Wetlands, power plant cooling water, agricultural irrigation
- Agua Nueva WRF
  - Owner: Pima County Wastewater Management Division
  - Uses: Golf course, turf and landscape irrigation via Tucson Water reclaimed water distribution system

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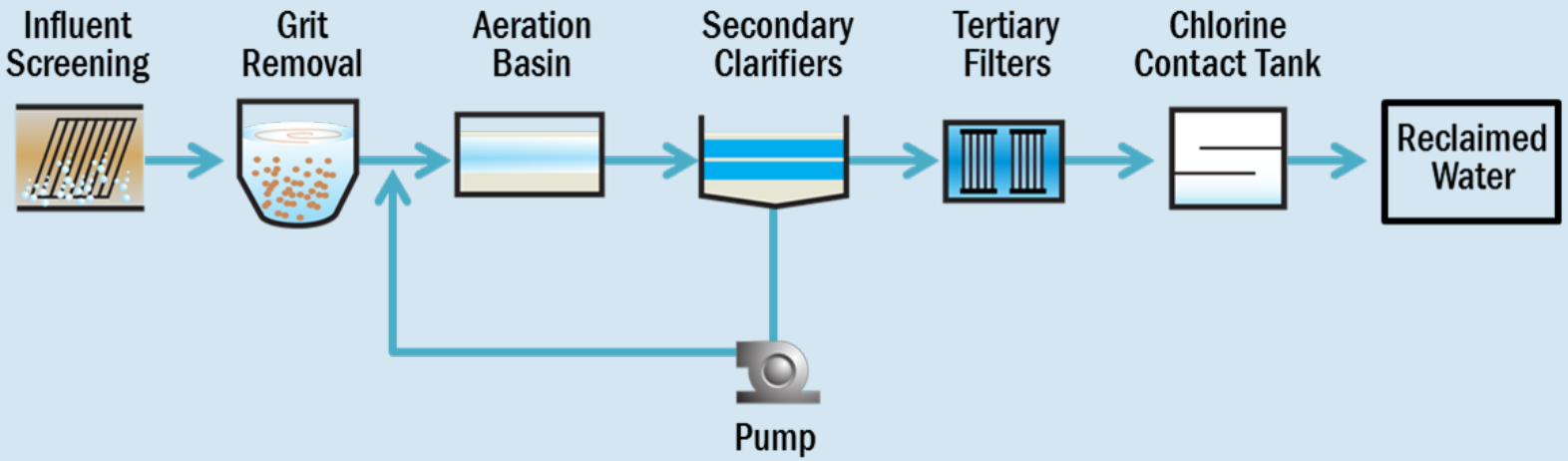
Class A

- Regulatory requirement:
  - Reclaimed water is wastewater that has undergone secondary treatment, filtration, and disinfection.
  - Pathogen-free, turbidity<2NTU 24hr, 5 NTU max



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Class A

Allowable uses
(cannot runoff from site)

- irrigation of food crops,
- residential landscape,
- school ground irrigation,
- toilet flushing,
- fire protection,
- snowmaking,
- closed looped air conditioning

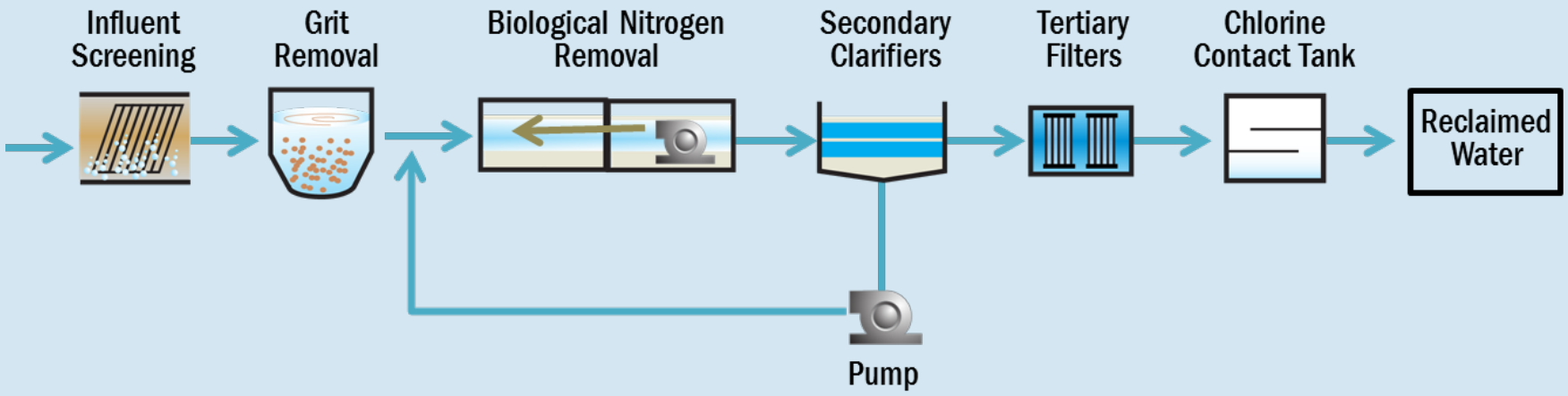
Examples

- Black Mountain WRF
  - Owner: Liberty Utilities
  - Use: Golf course and landscape irrigation
- Luke AFB WWTF
  - Owner: Air Force
  - Use: Golf course and landscape irrigation

WATEREUSE ARIZONA

Class A+

- Regulatory Requirements:
  - Reclaimed water is wastewater that has undergone secondary treatment, filtration, nitrogen removal treatment, and disinfection.
  - Pathogen-free, turbidity<2NTU 24hr, 5 NTU max
  - Total Nitrogen <10mg/l
  - Aligned with BADCT requirements



WATEREUSE ARIZONA

Class A+

Allowable uses

- Open access sites
- Irrigation of food crops
- Residential landscape
- School ground irrigation
- Toilet flushing
- Snowmaking
- Closed looped air conditioning

Examples

- Greenfield Water Reclamation Plant
  - Owners: Mesa, Gilbert, Queen Creek
  - Uses: Crop irrigation (GRIC), golf course irrigation, open space (HOA) irrigation, groundwater recharge
- Rio de Flag WRP and Wildcat Hill WRP
  - Owner: City of Flagstaff
  - Uses: golf course and turf irrigation, toilet flushing, snow making

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Agency Jurisdiction

- Aquifer Protection Permit (APP)
  - Protects groundwater quality
  - Unique to Arizona
  - BADCT Requirements for all new and expanded WWTPs
- AzPDES
  - Must meet Surface Water Quality Standards
  - Unique Waters (Oak Creek, Verde River)

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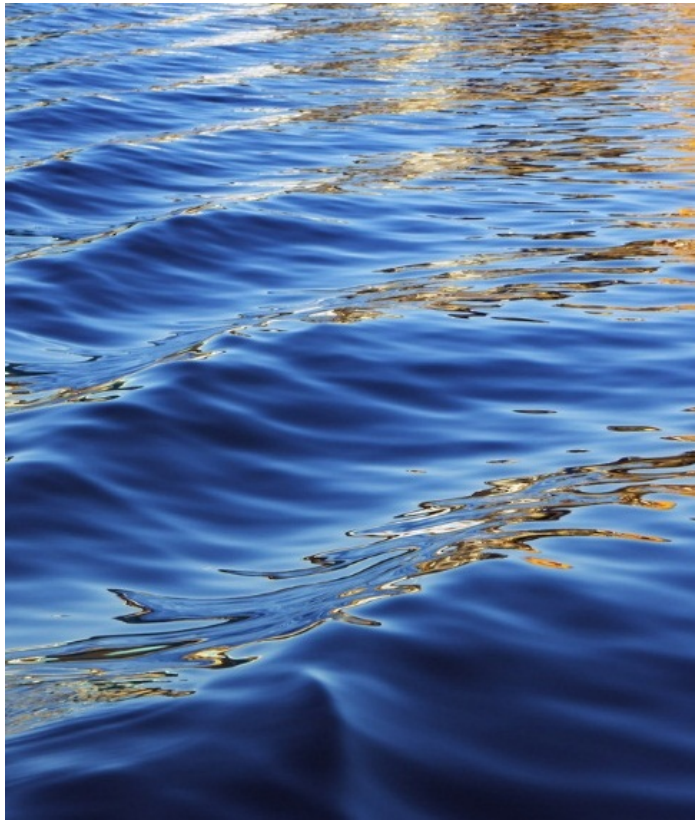
Trends

Arizona Water Reuse 101



Migration toward Potable Reuse

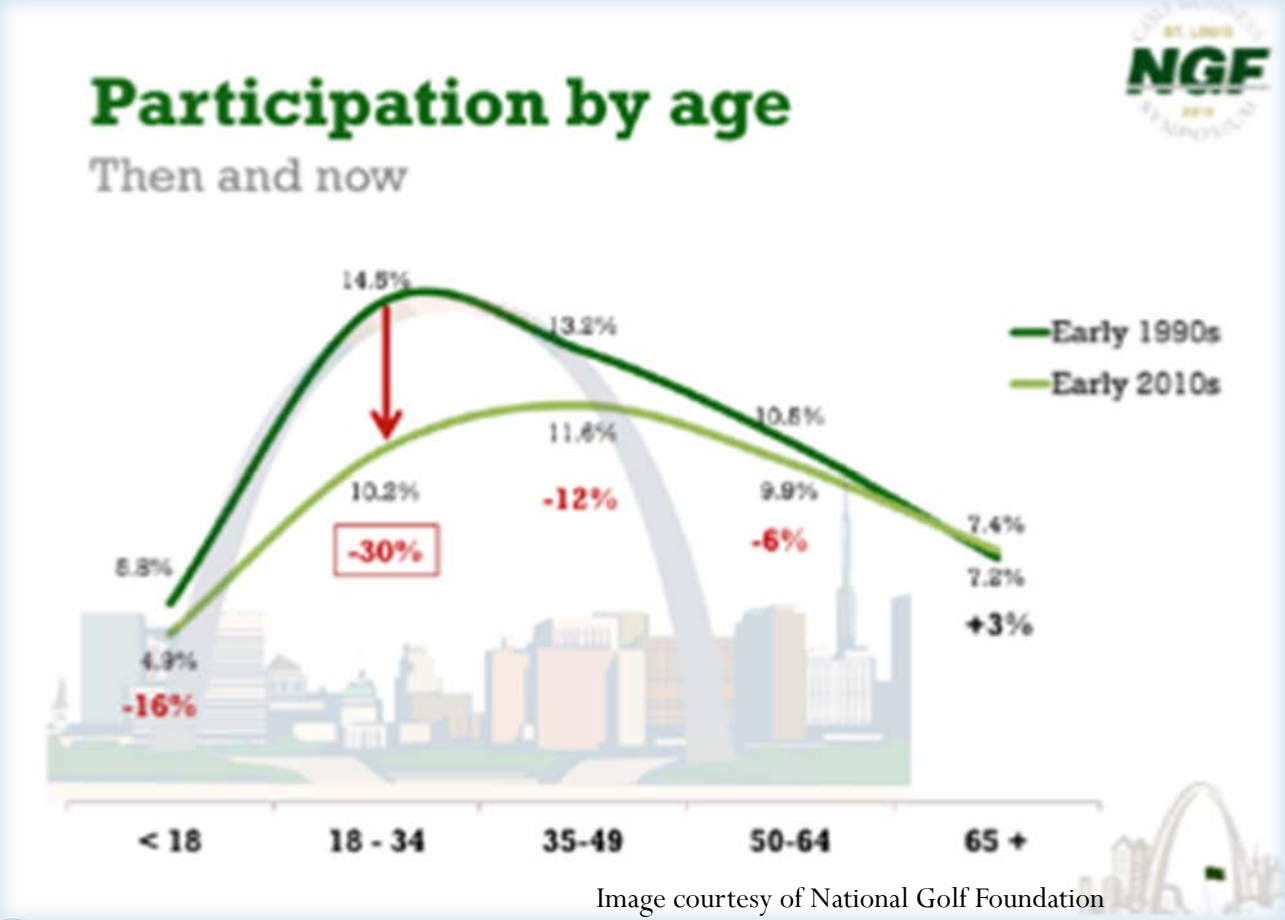


Image courtesy of National Golf Foundation

- Decline in golf participation
- Advances in technology
- Scarcity of water resources
- Costs of maintaining purple pipe system
- Water Quality Issues

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Emerging Contaminants

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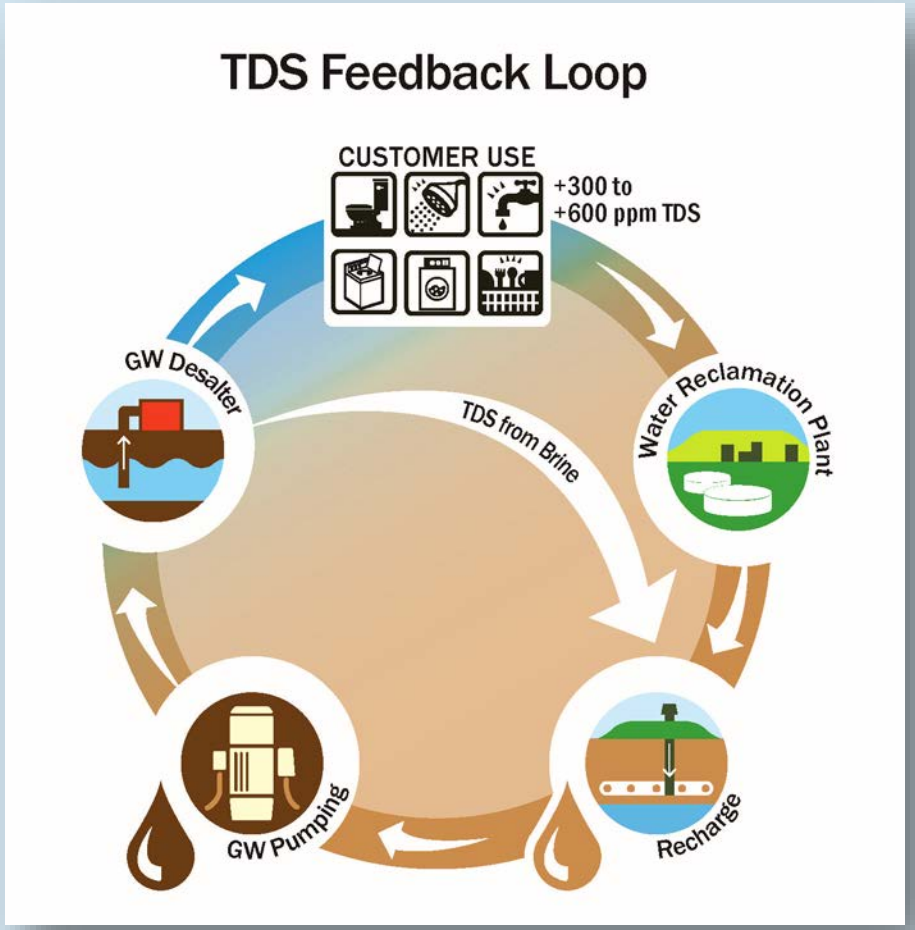
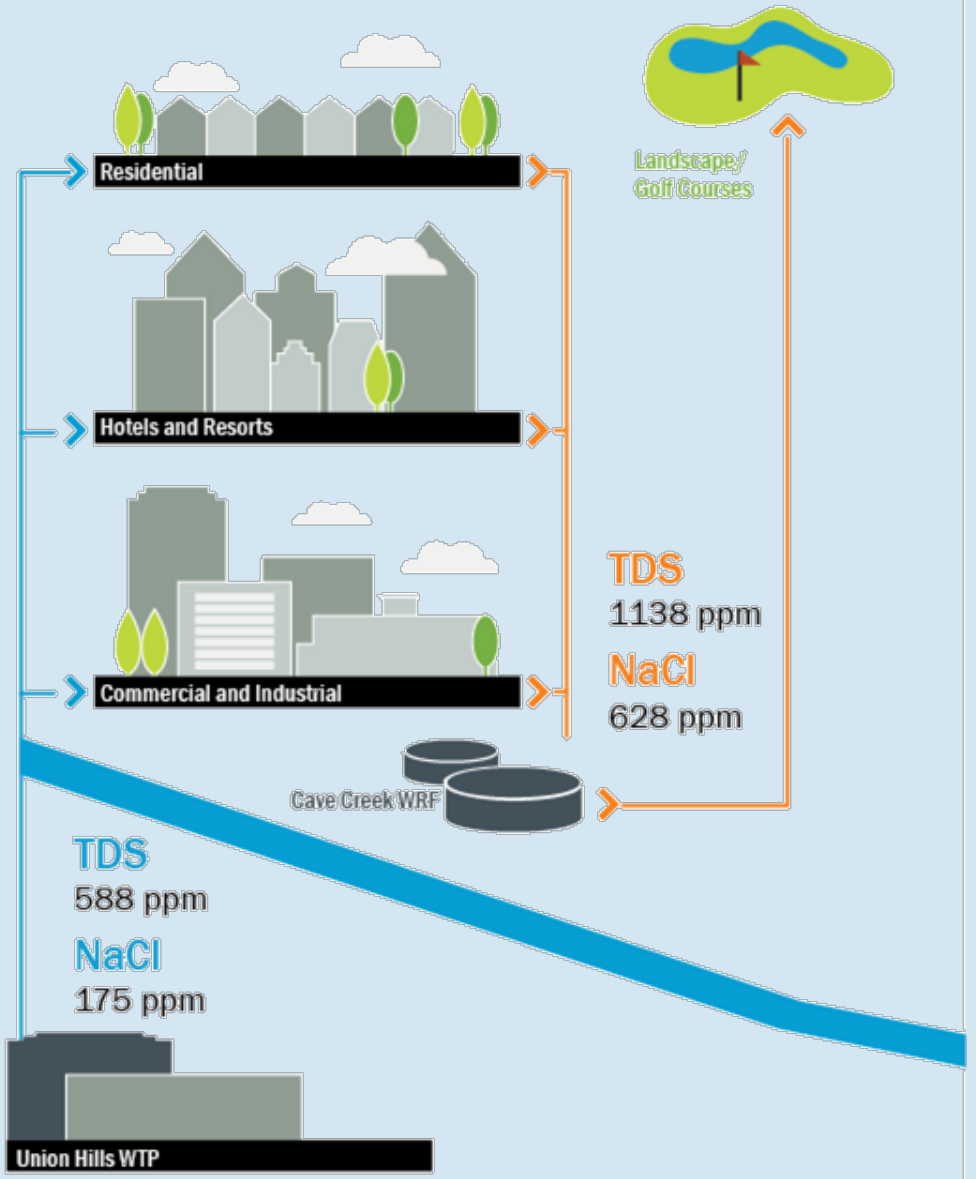
Salinity Issues





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Questions??